

CHAPTER 13

Spatial Arrangement of Agriculture

Topics 5.6–5.9

Topic 5.6 Agricultural Production Regions

Learning Objective: Explain how economic forces influence agricultural practices. (PSO-5.C)

Topic 5.7 Spatial Organization of Agriculture

Learning Objective: Explain how economic forces influence agricultural practices. (PSO-5.C)

Topic 5.8 Von Thünen Model

Learning Objective: Describe how the von Thünen model is used to explain patterns of agricultural production at various scales. (PSO-5.D)

Topic 5.9 The Global System of Agriculture

Learning Objective: Explain the interdependence among regions of agricultural production and consumption. (PSO-5.E)

Without agriculture it is not possible to have a city, stock market, banks, university, church, or army. Agriculture is the foundation of civilization and any stable economy.

—Allan Savory, biologist and farmer, Zimbabwe



Source: Getty Images

High-density cattle feedlots often contain a mill to produce feed which increases the efficiency of beef production. (See Topic 5.6 for how feedlots and other agricultural practices are shaped by economic factors.)

Agricultural Production Regions

Essential Question: How do economic forces influence agricultural practices?

Residents of every continent, except Antarctica, practice agriculture. There are differences in agricultural practices in various regions of the world, and even within individual continents. These differences include the crops or animals raised, level of technology, methods for production, percentage of the population working in agriculture, importance of agriculture to the economy, and gender roles in farming. These variables are important considerations in farmers' decisions about agricultural practices and land use.

Influence of Economic Forces

Among the many factors that influence farmers' decisions are available capital and the relative costs of land and labor. Because of these different costs, farmers balance the use of their resources differently. If land is plentiful and costs little, they use it extensively. If land is scarce and expensive, they use it intensively. In reality, not every farm fits perfectly into one of these two categories.

Geographers often refer to the **bid-rent theory** when discussing land costs for different types of agricultural activities. There is usually a distance-decay relationship between proximity to the urban market and the value of the land, meaning the closer the land is to an urban center, the more valuable it is. The farmer willing to pay the highest price will gain possession of the land. Consequently, the farmer must use intensive agricultural practices to turn a profit on the land closest to market. (See Topic 5.8 for more about bid-rent and von Thünen's model.)

Intensive land-use agriculture involves greater inputs of capital and paid labor relative to the space used. (See Topic 5.1 for more on intensive agriculture.) Intensive practices are used in various regions and conditions:

- Paddy rice farming in South Asia, Southeast Asia, and East Asia is very labor intensive. Commonly used terraced fields makes using machinery difficult.
- Truck farming in California, Texas, Florida, and near large cities is sometimes **capital intensive** because it uses expensive machinery and other inputs. In addition to being capital intensive, it is nearly always **labor intensive**. These large farms produce very large quantities of vegetables and fruit, often relying on many low-paid migrant workers, to tend and harvest crops.

- **Factory farming** is a capital-intensive livestock operation in which many animals are kept in close quarters, and bred and fed in a controlled environment. The term comes from these operations running like a factory. Instead of cars or computers moving along an assembly line, it is the animals that progress from one end of the “factory” to the other end, where they are eventually processed into meat products.
- **Aquaculture (aquafarming)** is a type of intensive farming. Rather than raising typical farm animals in close quarters with a controlled environment, fish, shellfish, or water plants are raised in netted areas in the sea, tanks, or other bodies of water. (See Topic 5.11.)

Extensive land-use agriculture uses fewer inputs of capital and paid labor relative to the amount of space used. Extensive practices, such as shifting cultivation, nomadic herding, and ranching (see Topic 5.1) can be found throughout the world and across the entire spectrum of economic development.

Increasing Intensity

Regions of the world that traditionally relied on extensive agricultural techniques are under pressure because of local increases in demand for food, regional population growth, and global competition to use land more intensely. These demographic and economic forces have placed more stress on the land because they have pushed farmers to use land continuously, rather than allowing land to lie fallow and recover. This shift increases demand for expensive inputs such as irrigation, chemicals fertilizers, and improved seeds.

Those who rely on shifting cultivation have found it more difficult to continue these methods as global demand for tropical cash crops, such as coffee, tea, and cacao, compete for more land use. The timber industry has also put an economic strain on shifting cultivation. For subsistence farmers, increasing population and competition—for space to grow timber, rubber, cotton, or products that are not eaten but used in industry—have resulted in food security issues, most noticeably in Africa.

Methods of Planting

Different methods of planting increase the intensity of land use. **Double** (or triple) **cropping** is planting and harvesting a crop two (or three) times per year on the same piece of land. Another technique, **intercropping**, also known as **multicropping**, is when farmers grow two or more crops simultaneously on the same field. For example, a farmer might plant a legume crop alongside a cereal crop to add nitrogen to the soil and guard against soil erosion.

The opposite of multicropping is **monoculture**, in which only one crop is grown or one type of animal is raised per season on a piece of land. **Monocropping**, or continuous monoculture, is only growing one type of crop or raising one type of animal year after year. As a result, these farmers purchase very specific equipment, irrigation systems, fertilizers, and pesticides designed for their one crop or animal to maximize efficiency.

Large scale monocropping farms can be thousands of acres of just wheat, corn, rice, coffee, cacao, etc. This can result in lower per-unit cost of production, higher yields, and more profits. Negative impacts include soil depletion, decreased yields over time, increased reliance on chemical fertilizers and pesticides, and increased risk since all of the farmer’s resources are invested in one crop.

The Meat Industry

The economic structure of livestock raising has changed in the past few decades. Global consumption of meat increased over 50 percent between 1998 and 2018, mostly because of population growth. Growing demand accelerated the trend toward factory farms and centralized processing centers.

Today, cattle are less likely to graze on large expanses of land, but instead are raised in **feedlots**, which are confined spaces in which cattle and hogs have limited movement, also known as concentrated animal feeding operations (CAFOs). The animals grow bigger in a shorter period of time because of their reduced movement. This new practice maximizes the use of space and prepares the animal for slaughter quickly, thus maximizing profit.

The global expansion of fast-food operations and the increased demand for meat has led to larger ranching operations in the United States and South America. In the United States, the competition for space, desire for larger animals, and reduced raising time have led to an increased use of feedlots.

Some agricultural products combine extensive and intensive phases. Raising cattle in Wyoming is an example of extensive farming. The cattle roam and feed on grass in large ranches that average nearly six square miles in size. As the cattle reach maturity, the intensive phase begins. Farmers transport the cattle to feedlots in northern Colorado to fatten the animals quickly before being processed into meat for market.

REFLECT ON THE ESSENTIAL QUESTION

Essential Question: *How do economic forces influence agricultural practices?*

Economic Factor	Influence of Economic Factor

KEY TERMS

bid-rent theory	double cropping
capital intensive	intercropping (multicropping)
labor intensive	monoculture
factory farming	monocropping
aquaculture (aquafarming)	feedlots

Spatial Organization of Agriculture

Essential Question: How do economic forces influence agricultural practices?

A number of agricultural trends have changed the agricultural landscape over the past several decades. The most obvious changes involve the decline in small family farms, the development of much larger corporate farms, and the expansion of farmland into what was previously forested or wetland areas. The agricultural landscape has also been altered by the reduction in the variety of crops and the introduction of new crops to a region. Reasons for the evolving agricultural landscape are the growth of **agribusiness**, farms run as corporations, and the globalization of agriculture.

Commercial Agriculture and Agribusiness

Agribusiness involves the integration of various steps of production in the food-processing industry such as research and development, processing and production, transportation, marketing, and retail of agricultural goods. Given the enormity of this system, the largest agribusinesses are owned by **transnational corporations**, or those that operate in many countries. These large-scale operations are commercial, highly mechanized, and often use chemicals and biotechnology in raising crops and animals. The following chart compares farming at the scale of a homeowner and an agribusiness.

VEGETABLE FARMING ON TWO SCALES		
Activity	Homeowner Scale	Agribusiness Scale
Growing food	Raising vegetables in a backyard garden	Owning farms of thousands of acres that are worked by a large staff of employees
Processing food	Eating fresh, home-grown vegetables for dinner and preserving vegetables for future use	Canning and freezing products in factories that are often located near the fields
Selling food	Selling vegetables at a local market	Selling products to wholesale distributors who ship them regionally and globally
Financing the food industry	Giving some vegetables to a neighbor in exchange for using some of their land for a garden	Borrowing money from banks and selling stock to raise money for operating expenses
Researching food options	Growing different varieties of tomatoes to see which grow best	Investing in research and development of new seeds, fertilizers, and pesticides

Impact of Large-Scale Farms

Globalization has accelerated the growth of agribusiness and corporate farms during the latter half of the 20th century. Competition in agricultural products and services encouraged large-scale farms to operate more as a corporation than a family farm. Agribusinesses have often resulted from the consolidation of family farms, thus eliminating many small-scale farm operations. Many of the remaining family-owned farms have shifted to a corporate operating model.

Often, large corporate farms practice **vertical integration**, or the ownership of other businesses involved in the steps of producing a particular good. Owning the contributing businesses gives the large farm more control of the variables and results in greater overall profits. Those businesses might include a research and development company that improves seeds, a trucking firm that transports farm products, a factory that processes the goods, and a wholesaler that distributes the food to stores.

Large-Scale Replacing Small-Scale Farms

Large-scale farms are usually specialized and practice monoculture. As farms become larger, more specialized, and vertically integrated, it becomes easier to take advantage of **economies of scale**, or an increase in efficiency to lower the per-unit production cost, resulting in greater profits. For example, consider a grain farmer who increases the size of his or her farm by purchasing an additional quarter section (160 acres). By using the existing machinery on the farm more efficiently, the farmer can successfully plant and harvest the additional acreage without the purchase of new equipment. This will increase the owner's revenues while the expenses will not increase proportionally. As a result, the cost per unit of grain will decrease and profits will increase.

Larger farms can afford the latest technology, such as better seeds or machinery, and are more likely to produce greater profits through economies of scale. Large corporate farms have made it increasingly difficult for family farms to survive since they cannot compete with the significantly cheaper costs per-unit production of large-scale farming operations.

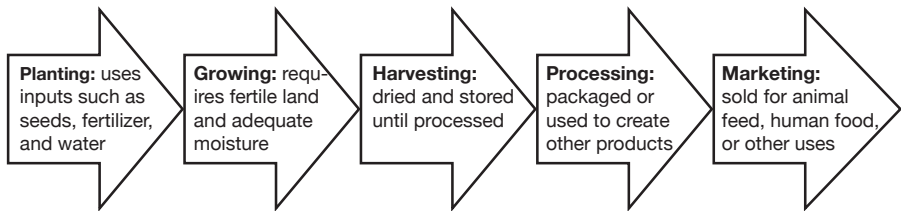
The success and efficiency of large farms has encouraged the World Bank to fund agribusiness ventures in the developing world, often at the expense of family and subsistence farmers. Also, many family farms in the periphery have disappeared because of the rising expenses associated with Green Revolution technology and the need to adopt this technology to survive and compete in an increasingly global market.

Commodity Chains and Consumption

The transformation of agriculture has resulted in a complex system that connected producers and consumers at a global scale. This complex and enormous system enabled someone who lives in a small American town to consume bananas from Ecuador, coffee from Ethiopia, chocolate from Switzerland, and cashews from Vietnam. This transformation may be attributed to advancements in biotechnology, mechanization, transportation, and food preservation.

A **commodity chain** is a process used by corporations to gather resources, transform them into goods, and then transport them to consumers.

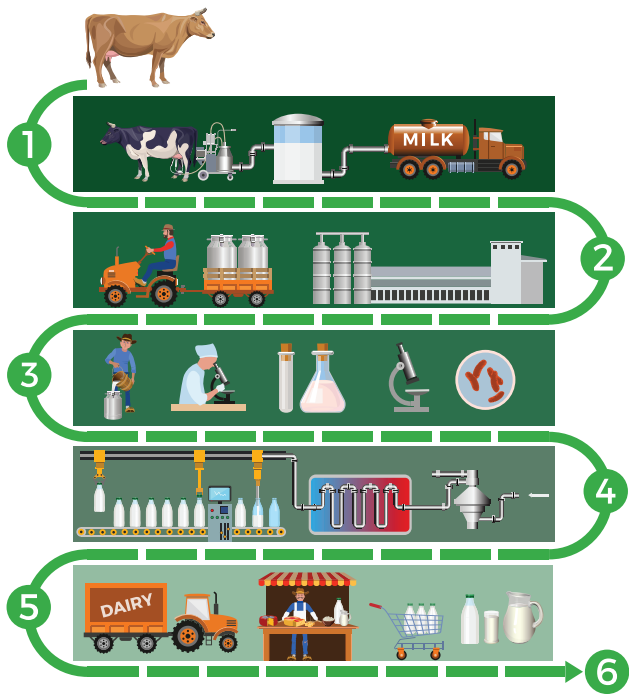
COMMODITY CHAIN FOR CORN



Improvements in agricultural technology, advances in transportation, and an increasingly globalized economy enables farmers to raise crops and animals far from their final market and allows consumers to still purchase the final products at low prices. Corn has numerous uses, such as livestock feed, sweetener, or fuel. Thus, the actual commodity chain of corn would be more specialized and complex than the one shown.

Additional elements of commodity chains that facilitate the process include financial institutions (banks), transportation companies, distributors, and governments. Each plays a key role in getting food from field to store. A detailed commodity chain shows the elements for milk production below.

COMMODITY CHAIN FOR MILK PRODUCTION



Source: Getty Images
Identify the six steps in the milk commodity chain.

Technological Improvements

The number of people that U.S. farmers can support given the available resources, or the **carrying capacity**, has risen tremendously over the past half century. In 1962, an average U.S. farmer fed an average of 26 people. Today, mostly due to technological advances, that figure has risen to 166 people. Farmers in the United States provide enough food to supply the needs of the nation, as well as many people in other parts of the world. Of course, there are other resources that are also necessary for life, such as clean air, water, and fuel.

Benefits Improvement in food production is attributed to technological advancements of the Second and Third Agricultural Revolutions. (See Topics 5.4 and 5.5.) Improvements in the quality and the use of fertilizers, pesticides, insecticides, herbicides, irrigation, soil management, and farming equipment have all resulted in higher yields. A deeper understanding of the science of plants and animals has led to efficient selective breeding programs, hybrid seeds developed through the Green Revolution, and genetically modified organisms (GMOs) created through biotechnology. These developments have had a tremendous impact on the agricultural output of farmers.

Transportation and storage advances have allowed for the more extensive use of **cool chains**, which are transportation networks that keep food cool throughout a trip. Fruits and vegetables from the tropics can be delivered fresh to the temperate climates of North America and Europe at relatively low prices for consumers.

Costs Technological advancements have created some environmental damage. The loss of wetlands and large tracts of rainforest cleared to increase farmable land have led to the loss of biodiversity and water resources. Petroleum-based fertilizers, pesticides, and herbicides have caused soil, water, and air pollution and threatened ecosystems. (See Topics 5.10 and 5.11 for more about environmental challenges due to agricultural practices.)

REFLECT ON THE ESSENTIAL QUESTION

Essential Question: How do economic forces influence agricultural practices?

Large-Scale Agricultural Practices	Impact of Practices

KEY TERMS

agribusiness

transnational corporations

vertical integration

economies of scale

commodity chain

carrying capacity

cool chains

Von Thünen Model

Essential Question: How is the von Thünen model used to explain patterns of agricultural production at various scales?

It is interesting that an almost 200-year-old economic location model, the von Thünen model, is still considered essential by geographers to explain the spatial pattern of agricultural land use. Over the past two centuries there have been many changes to agriculture, as well as transportation, a key component of von Thünen's model, yet it is still used by geographers today.

Location theory, a key component of economic geography, deals with why people choose certain locations for various types of economic activity—factories, stores, restaurants, or agriculture. The **von Thünen model**, an economic model that suggested a pattern for the types of products that farmers would produce at different positions relative to the market (community) where they sold their goods, is the start of location theory. Since his original work, numerous other geographers have built on his ideas and developed their own location theories and models.

Von Thünen's Land Use Model Zones

In 1826, Johann von Thünen, a farm owner in Germany, based his rural land use model, sometimes referred to as the Isolated State model, on numerous assumptions:

- farming was an economic activity
- farmers were in business to make a profit
- there was one market where farmers sold their products
- there was one transportation system
- farmers paid transportation costs, which varied with distance
- the market was situated in the center of an **isotropic plain**, which means flat and featureless with similar fertility and climate throughout
- the area beyond the market and farmland (the Isolated State) was wilderness

The von Thünen model is based on the concept that farmers' decisions regarding what to produce were based largely upon four factors: transportation costs, land costs, intensity of land use, and perishability of the product. Distance from the market impacts the cost of transportation and land. In essence, the land closest to the market is the most valuable and the land farther away decreases in value. Farmers will use land closer to the market more intensely

because it is more valuable. The farther goods are transported, the higher the cost. Perishability relates to how well a product can survive transport without spoiling or breaking.

Zones and the Von Thünen Model

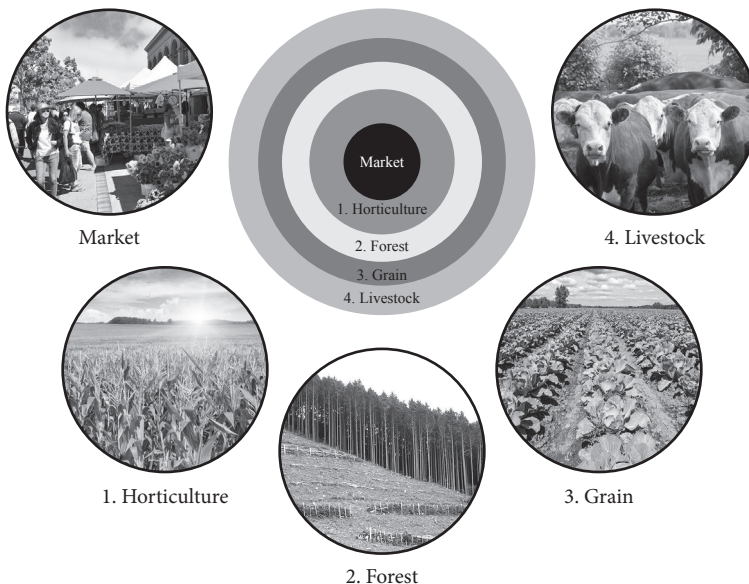
In the zone closest to the market, von Thünen suggested that **horticulture**, a type of agriculture that includes market gardening/truck farming and dairy farming, would occur. Horticulture produces perishable items, and farmers need to get them to market quickly, especially important before trucks and refrigeration. Growing highly perishable crops, such as tomatoes and strawberries, and dairy farming are considered to be intensive forms of agriculture.

Von Thünen's second zone included forests. Wood was an extremely important resource in 1826, both as building material and as a source of fuel. Von Thünen thought that wood products would be close to the market because they were not only important but heavy, costly, and difficult to transport.

Farther from the market, in the third ring, were crops such as wheat and corn. Though valuable, they did not perish as quickly as vegetables and milk and were not as difficult to transport as wood. In addition, corn can be used to feed live stock located in the second and fourth rings.

The final ring was used for grazing of livestock, such as beef cattle. Livestock could be located farther from the market since they have lower transportation costs because farmers can walk them to market.

The extensive nature of grain and livestock farming meant that the farms were larger than those located in the inner ring of the model. While there is more farmland available in the larger outer rings, that was not necessarily the reason for these crops to be located there. Grain and livestock farmers could find adequate space in the innermost ring if they were willing to pay enough to acquire the land.



Land Value

The value of land was influenced by its spatial relationship to the market. Because the land in the inner ring was closest to the market, it was more valuable. Therefore, few farmers could afford large amounts of it. Consequently, only farmers who could use a small amount of land intensely and make a profit from it could be successful in the inner ring. They needed to grow high-value crops there, such as fruits and vegetables, in order to make a living.

Grain and Livestock Land farther from the market was less valuable. Because grain and livestock are less perishable than the crops in the inner ring, the farmers could locate in the area of cheaper land farther from the market and still transport the product to market successfully. Meat is perishable after it is processed, so farmers could avoid spoilage if they walked their livestock to market and had them slaughtered there. This was the common practice when von Thünen developed his model two centuries ago.

Wheat Farms in North Dakota Recent studies have shown that the distance to the market still greatly influences land prices, even for farmers who raise the same crop. One example from the 21st century is value of land for North Dakota wheat farmers. For them, the market is often the nearest grain elevator. The elevator owner purchases the grain from many farmers and then resells it to companies in the food processing business. In one study reported by the United States Department of Agriculture, land within 5 miles of a grain elevator was worth double the amount of land approximately 25 miles away. That disparity in land value grew even larger farther than 25 miles away from a grain elevator.

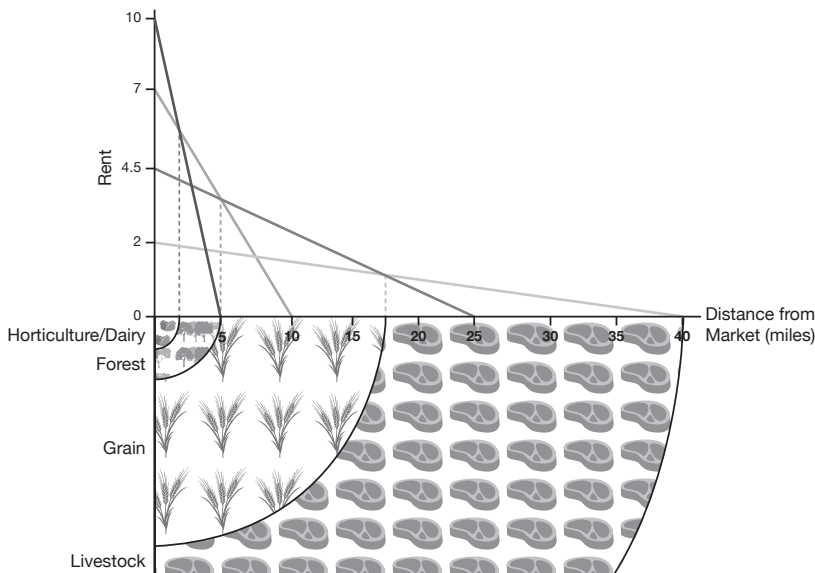
The Bid-Rent Curve

In the case of von Thünen's model, the bid-rent theory, which refers to the changing value and demand for land as the distance from the market increases, is used to determine what type of agriculture is located in each zone. A graph known as a **bid-price curve** or **bid-rent curve** can be used to determine the starting position for each land use relative to the market, as well as where each land use would end.

Each line on the graph reflects the farmers' willingness to pay for land at various distances from the market. Farmers are willing to pay more for land near the market than for land farther away. However, how much more varies with the types of activities. In a **free-market economy**—where supply and demand, not government policy, determine the outcome of competition for land—the farmer who will have the greatest profit will pay the most at each location to occupy the land. It is where the uppermost line on the graph intersects with the next uppermost line that represents the end of one zone and the start of another.

For example, where the strawberry line intersects the forest line indicates the end of where strawberries will be grown and the beginning of where forests will be found. Where the forest line intersects the wheat line indicates where the forest zone ends and the wheat zone begins.

BID-RENT CURVE AND VON THÜNEN'S MODEL



The bid-price curve is used to determine the borders of each land use. Determine the starting and ending distance for each of the four agricultural land uses shown in the graph.

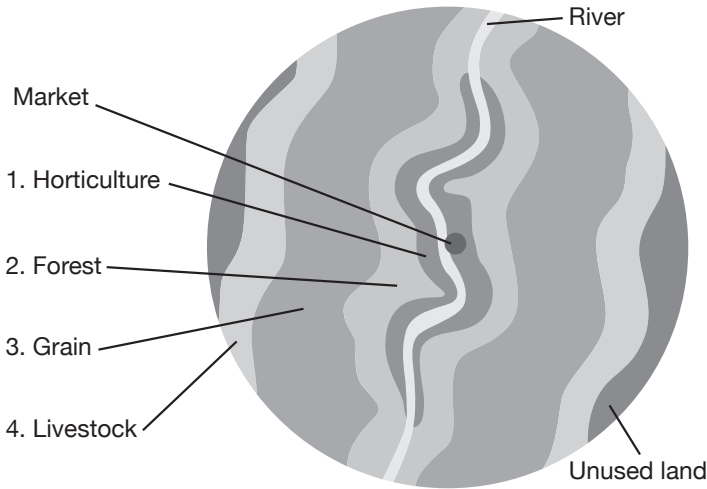
Application of Von Thünen's Model

Von Thünen's model has been valuable in many ways. It has had application far beyond the topic of agriculture. His recognition of the spatial pattern in how farmers made decisions about using resources was the first economic location model. It provided the basis for the industrial location models of Alfred Weber and others who followed.

In addition, even though von Thünen created his model nearly two centuries ago, it continues to be applicable today. The basic insight of the model is still valuable, but like all models, it needs to be adapted to actual conditions and changes in technology.

Non-Isotropic Plains Von Thünen's model assumed that land was an isotropic plain—but real land includes rivers, mountains, and other physical features that make it non-isotropic. Von Thünen considered how various landscape situations would alter the shape of each land-use ring and possible impacts on transportation. For example, if a river flowed through the plain, making transportation easier and cheaper, then the zones would stretch out along the river. In addition, some areas have better climates or soil conditions for certain crops. These areas have a **comparative advantage**, or naturally occurring beneficial conditions, that would prompt farmers to plant crops differently from those predicted by von Thünen's model.

AGRICULTURAL ZONES AROUND A RIVER



Multiple Markets Von Thünen assumed that a farmer had one primary market, but they often have secondary markets as well. A dairy farmer might primarily sell milk to a local dairy. But the farmer might also make and sell cheese, which does not spoil as quickly as milk, in a distant market.

Changes in Transportation The development of trains, cars, planes, and storage techniques, such as refrigeration, has allowed food to be transported much longer distances without spoiling compared to 1826. As a result, the rings in the model now are wider than originally created by von Thünen. For example, rapidly perishable goods, such as strawberries and milk, can be produced much farther away from the market than in von Thünen's time. Strawberries and milk are still produced closer to the market than are grains and livestock. It is the size of the rings that has changed, not necessarily the relative position of the rings.

The cut flower market demonstrates the impact of transportation on the application of von Thünen's model. Cut flowers are very perishable and have to arrive at the market quickly, so they are similar to horticulture and dairy products that the model predicts will be produced nearby and trucked to market. However, many flowers sold in New York City are grown in the Caribbean and South America and flown to market. While air travel costs from these areas are far higher than truck transport from the outskirts of New York, other costs of flower production are much less. Land, labor, and energy costs are so much lower in the Caribbean and South America than in the outskirts of New York City that the savings outweigh the extra transportation costs. Therefore, producers can grow flowers for New York more profitably in the Caribbean than in nearby locations.

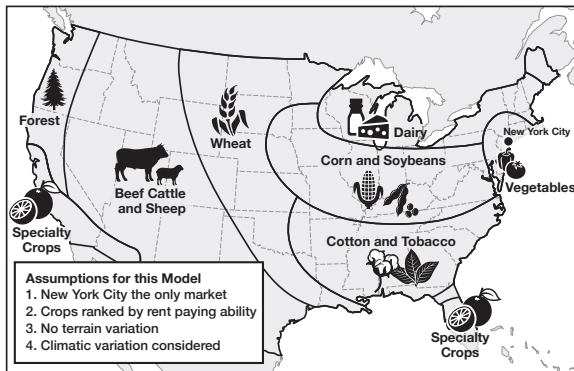
Other Changes in Technology Changes in technology have modified demand for products. Since 1826, wood has been mostly replaced by oil,

natural gas, and electricity as fuel for heating homes, so forests as a source of fuel are not particularly important any longer. Forests were also important for producing lumber required for construction of homes and barns. Today, transport trucks can easily and efficiently bring the necessary lumber to the market from distant forests. As a result of both of these changes, forests are rarely located near communities today. Now, forested land at a city's edge is probably highly valued as a *greenbelt*, an area of recreational parks or other undeveloped land (see Topic 6.8), rather than a source of fuel or lumber.

Von Thünen Model at a National Scale

The improved transportation and storage methods have created changes in the use of the von Thünen model today. Since agricultural products are now transported much greater distances to markets, the model can be applied at a much larger scale than von Thünen allowed. The image below illustrates what the general pattern of agricultural land use in the continental United States would look like if the zones were positioned according to the farmer's rent-paying ability, as suggested by von Thünen. The model assumes that the New York City area is the market, and thus the rings radiate away from there. Also, the map recognizes that there are climatic variations across the country and therefore indicates some pockets of specialty crops as well as distorted rings.

AGRICULTURAL LAND USE IN THE UNITED STATES



What would be similarities between von Thünen's model and this agricultural land-use map for the United States? How might they differ?

Von Thünen's model was based upon southern Germany, a much smaller region than the United States. His assumption of an isotropic plain does not apply well to the diversity of physical features and climate of the United States. Also, von Thünen's assumption of a single market is true for virtually no farmers in the United States or anywhere in the world.

Special Circumstances No model accounts for every variation that occurs in practice. For example, von Thünen's model does not fit some areas of specialty farming, such as citrus farming in Florida or the variety of crops grown in the Central Valley of California. Nor does it explain the decisions by

developers who speculatively purchase land close to a city and use it for less-intensive agriculture. These developers usually want to invest as little money as possible into the farmland while they wait for the optimal time to build homes, retail space, or commercial structures on it.

Criticisms of Von Thünen’s Model

Many of the criticisms of the model involve the assumptions made by von Thünen.

VON THÜNEN MODEL	
Assumptions	Limitations
Farming was an economic activity	Government policies can interfere with a free-market economy and effect farmers’ decisions.
Farmers were in business to make a profit	Simply to provide enough food for his or her family, not profit, is the goal for many farmers, especially in less-developed areas.
There was one market where farmers sold their products	Modern agriculture systems have multiple markets; rarely is just one market available.
There was one transportation system	Planes, trains, and trucks (especially modern refrigerated transportation) have changed distance considerations for farmers.
The market was situated in the center of an isotropic plain	Differences in land formation, soil fertility, and climate exist in agricultural regions, making isotropic plains uncommon

REFLECT ON THE ESSENTIAL QUESTION

Essential Question: How is the von Thünen model used to explain patterns of agricultural production at various scales?

Concepts of the von Thünen Model	Application of the Concepts

KEY TERMS	
location theory	bid-price curve (bid-rent curve)
von Thünen model	free-market economy
isotropic plain	comparative advantage
horticulture	

The Global System of Agriculture

Essential Question: How is there interdependence among regions of agricultural production and consumption?

Globalization has become a firmly entrenched aspect of the economy of most countries, particularly in food production. Part of this has been the spatial expansion of the **supply chains**, all the steps required to get a product or service to customers. The physical distance from producers to consumers can cover thousands of miles. For example, research and development of new seeds might take place in a laboratory in the United Kingdom. The new seeds could then be sent to Ghana where the crop is grown and harvested. After some minor processing or refining in Ghana the product could be frozen and transported to China where it is manufactured into a finished product. Once packaged, it could be sent to the United States where it is sold to consumers.

The level of interdependence, or connections among regions of the world, has increased greatly. If one country experiences a problem such as crop failure, damaged infrastructure, or disruptions in trade due to political decisions, the repercussions could be significant for many countries.

Regional Interdependence

The globalization of agriculture has increased interdependence among countries of differing levels of development. Developed countries such as the United States rely on producers in Mexico, other countries with warm climates, and ones in the Southern Hemisphere, for fresh fruits and vegetables year-round.

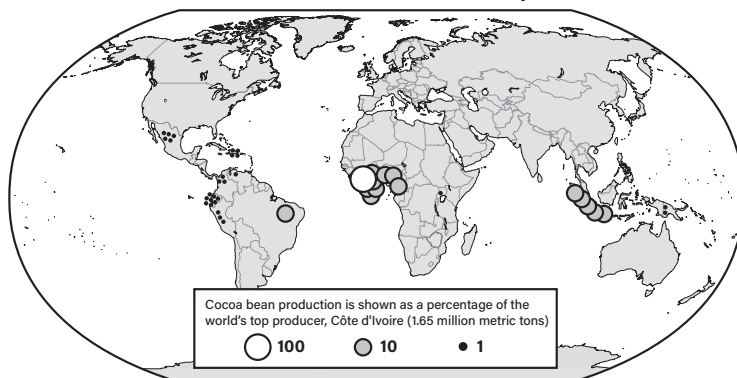
Food on a Global Scale

Developed countries also sell food to around the world. For example, nearly half of U.S.-grown soybeans are exported. Purchasers of significant amounts of U.S. agricultural products include China, Mexico, and countries in Europe.

Low-latitude countries with tropical climates produce crops such as coffee, tea, bananas, and pineapples that are desired in core countries. **Luxury crops** are not essential to human survival but have a high profit margin. These crops including cocoa beans, which are eventually processed into chocolate, are often grown on large plantations commonly controlled by transnational companies. Plantations usually practice monoculture, specializing in only one crop. The transnational companies, which are usually controlled by shareholders in core countries, provide the capital necessary to develop and run the plantations. They take advantage of the opportunity for inexpensive land and labor, and a

favorable climate. In some situations, they also take advantage of weak labor and environmental laws, which allow them to reduce costs and increase profits.

COCOA BEAN PRODUCTION, 2012



Source: Wikimedia Commons

As with most plantation agriculture of luxury items, cocoa is produced in the periphery but consumed primarily in the core.

For periphery and semiperiphery countries, the globalized commodity chain provides both markets for products and problems:

- Farmers who produce luxury crops might not be able to afford to purchase what they produce.
- As the supply of locally grown food decreases, prices for local consumers can increase. A farmer in Honduras who grows chili peppers for the global market is not growing corn, beans, or other foods for local consumers.
- Countries may become very dependent on one or two export commodities. When global markets shift these countries' economies become vulnerable and unstable.
- Competition to sell products might cause farmers to follow practices that cause soil erosion or chemical pollution, which endanger the long-term use of the land.

Political Systems, Infrastructure, and Trade

The efficient exchange of food around the world depends on effective political systems, strong infrastructure, and supportive trade policies. These conditions have evolved over time to make agricultural trade vital in most countries.

Colonialism and Neocolonialism Many connections that exist between Europe and the developing world were established through colonization. Although there are very few colonies in the world today, the economic relationship between core countries and periphery and semiperiphery countries resembles certain aspects of colonialism. **Neocolonialism**, the use of economic, political, and social pressures to control former colonies, can be one way to describe the current state of global food distribution.

For example, while growing and processing coffee beans is expensive, the profit margin in selling brewed coffee drinks is very high. Most of the revenue

generated from coffee remains with the transnational corporation based in the wealthy country while very little revenue finds its way back to the coffee growers in developing countries.



The image shows a coffee plantation in Brazil. People who live in nearby villages provide the labor for the plantation.

Fair Trade In recent years, many consumers have become more aware of the disparity between the high incomes of those in developed countries, who manage trade, and the low incomes of the producers in the developing world. One result of this awareness is the **fair trade movement**, which started with the Fair Trade certificates for coffee in 1988. It is an effort to promote higher incomes for producers and more sustainable farming practices. Other fair trade agreements between retailers and producers have been reached for crops grown in the developing world, including bananas, cane sugar, cocoa, and cotton. While these agreements often increased the price for consumers slightly, they provided a bigger share of revenue to producers and growers.

To reduce poverty for farmers and workers in the periphery, the fair trade movement promoted numerous basic principles:

- Direct trade that will eliminate the intermediary. Transactions directly between the producer and the importer ensure more money to the producer.
- Fair price paid promptly to farmers by importers. Also, the producer must pay workers a fair price.
- Decent conditions are provided for laborers, such as a safe working environment and no use of child or forced labor.
- Environmental sustainability that required farmers to use environmentally safe practices and prohibited genetically modified organisms (GMOs).
- Respect for local culture through shared agricultural techniques with farmers.

The fair trade industry has made significant gains since 1988. More than 1.5 million farmers and workers participate in fair trade and their standard of living has improved, particularly for those in the coffee industry. However, the

movement faces the challenge that many consumers feel they cannot afford to pay higher prices for fair trade products.

Government Subsidies and Infrastructure Governments across the world often provide **subsidies**, or public financial support, to farmers to safeguard food production. Examples of directly subsidized crops include rice in Japan, wheat and corn in the United States, and soybeans in China. The subsidies are designed to achieve these goals the government believes are in the best interest of the public:

- protect national security by ensuring a dependable food supply
- help farmers by increasing agricultural exports
- help consumers by reducing food costs

Transportation infrastructure is critical to move agricultural products locally, nationally, and globally. **Infrastructure** includes the roads, bridges, tunnels, ports, electrical grids, sewers, telecommunications, etc. of a country. Global systems of agriculture would not be possible without this infrastructure. Governments, communities, and companies pay to build and maintain a quality infrastructure.

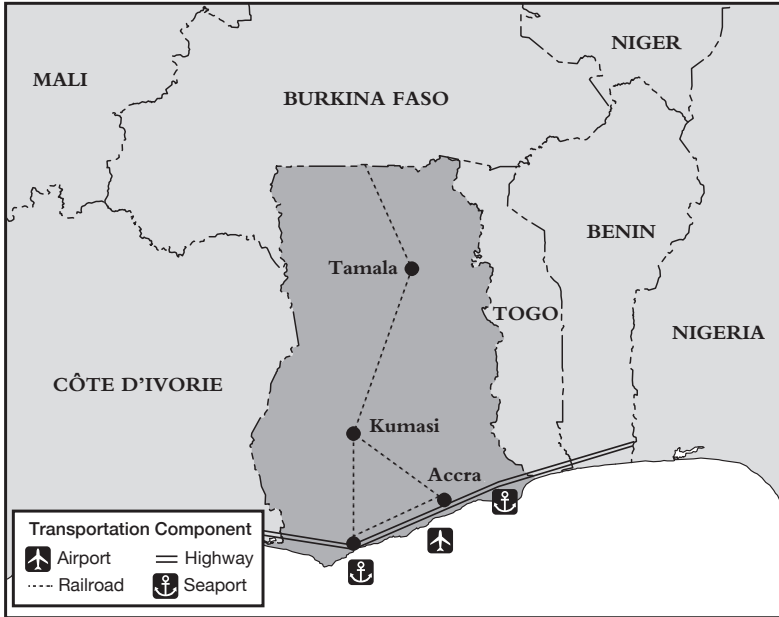
For example, the U.S. government indirectly subsidizes the exports of corn, soybeans, and other agricultural products from the Midwest by spending money to make the Mississippi River navigable for barge traffic. Because water transportation is inexpensive compared to land travel, these products enter the global food supply chain with a lower price than they would have without government support. Because of subsidies, consumers in Mexico City can purchase corn more cheaply from the United States than from rural Mexico. These U.S. policies help people in Mexico City, but at the expense of Mexican farmers.

Similarly, Canada protects its dairy farmers from competition with U.S. dairy producers. This helps Canada's farmers, but raises costs for Canadian consumers.

Most infrastructure improvements in developing countries connect resources to ports so goods can be exported. Often, other infrastructure in the country is lacking. As the map of the west African country Ghana on the next page shows, the major rail lines in the country connect the interior, where resources are located, to the ports where they can be exported to the developed world.

Ghana has significant mineral and agricultural resources. However, much of revenue from selling these resources leaves the country. Agricultural products commonly exported from Ghana include cocoa, cotton, coffee, palm oil, and cassava, and gold is the main mineral export. Consequently, there was little money to spend on additional infrastructure, and the population received few benefits from the mineral wealth. See *Geographic Perspectives: Ghana as a Case Study in Development* (page 327), to learn more about its development strategies.

TRANSPORTATION ROUTES IN GHANA



Ghana's major rail line connects ports to the mines and agricultural regions in the interior of the country.

REFLECT ON THE ESSENTIAL QUESTION

Essential Question: *How is there interdependence among regions of agricultural production and consumption?*

Causes of Increased Interdependence

Effects of Increased Interdependence

KEY TERMS

supply chain
luxury crops
neocolonialism

fair trade movement
subsidies
infrastructure



GEOGRAPHIC PERSPECTIVES: GHANA AS A CASE STUDY IN DEVELOPMENT

In the mid-1990s, the president of Ghana presented a framework known as Ghana Vision 2020, which included long-term plans for economic and social development policies, including agricultural and industrial programs. The goal was to raise Ghana into the ranks of the middle-income countries of the world by 2020. For example, the plan stated, “by the year 2020, Ghana would have achieved a balanced economy and middle-income country status and standard of living, with a level of development close to the present level of development in Singapore.”

In addition to social development, Ghana Vision 2020 focused on rapid economic growth. Ghana attempted to accelerate economic growth with improvements such as modernizing agricultural inputs, increasing private investment, and developing transportation infrastructure. The purpose of these efforts was to raise income and improve living conditions for Ghanaians, thereby stabilizing the economy.

Ghana does not appear to have fully reached all of its goals for 2020, but it is poised to continue its social and economic development in the future. Offshore oil has generated significant new wealth and could provide a boost in the future to the country’s development efforts—as long as the revenue from the petroleum is well managed and stays within the country. A February 2020 report from Bloomberg Opinion recognized the gains of the past two decades and suggested that Ghana is Africa’s top candidate for an economic leap. The country’s continued dependence on raw materials is the biggest obstacle that has to be overcome.



Source: Wikimedia Commons

A busy street in the capital city of Accra, Ghana, with bustling markets, cars, and economic activity.

1. Explain why Ghana wants to diversify its economy and not rely on just mining or agriculture.
2. Explain the importance of transportation infrastructure for Ghana’s economy.



THINK AS A GEOGRAPHER: EXPLAINING PATTERNS IN MEXICAN EXPORTS

At the scale of a country, Mexico is a vitally important region for the food that people in the United States eat. Around 45 percent of the vegetables imported by the United States come from Mexico. But at the scale of states in Mexico, the distribution of food throughout the country is not even, nor are the exports consistent throughout the year. Mexico exports twice as much in the six months from December through May as it does in the other six months of the year.

Use the map to answer the questions below.

EXPORTS OF FRUITS AND VEGETABLES FROM MEXICAN STATES



1. Suggest one or more possible reasons to explain why Mexican exports have the seasonal pattern you see on the map.
2. What might explain the spatial pattern in Mexican exports?
3. The state of Veracruz has a climate similar to part of the east coast of India. Why does Veracruz export more fruits and vegetables to the United States than do similar regions in India?

CHAPTER 13 REVIEW:

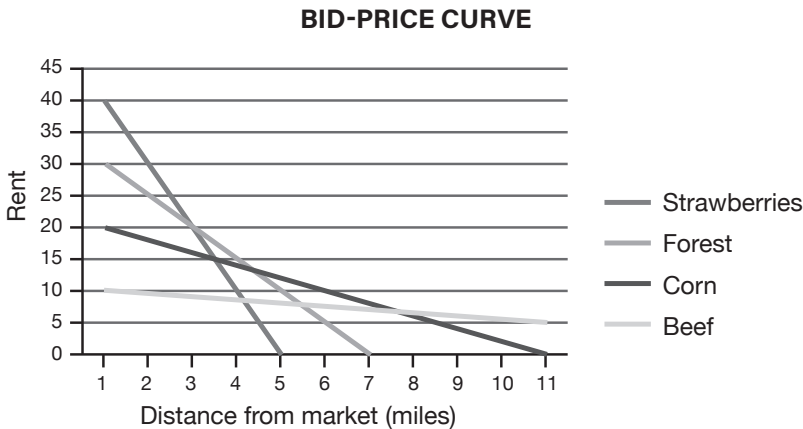
Spatial Arrangement of Agriculture

Topics 5.6–5.9

MULTIPLE-CHOICE QUESTIONS

1. The von Thünen model has changed because of developments in transportation. The change that is most evident is that the
- (A) market is no longer at the center
 - (B) width of the rings has increased
 - (C) width of the rings has decreased
 - (D) rings now stretch along rivers
 - (E) model now includes a ring for transportation

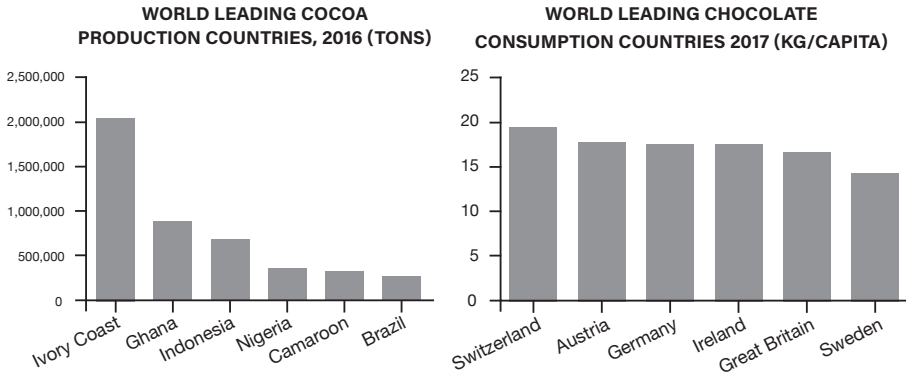
Question 2 refers to the image below.



2. Based upon the bid-price curve above, in which zone should corn be grown?
- (A) 1.0 mile to 11.0 miles
 - (B) 3.5 miles to 4.5 miles
 - (C) 4.5 miles to 7.6 miles
 - (D) 7.6 miles to 11.0 miles
 - (E) 4.5 miles to 11.0 miles

3. One result of the development of cool chains is that they
- (A) eliminated the need for air transport of agricultural products
 - (B) decreased the use of high-speed rail for transporting food
 - (C) increased the distance that fresh fruits and vegetables could travel
 - (D) reduced agricultural productivity
 - (E) caused a need for large ships to transport meat products

Question 4 refers to the graphs below.



Source: International Institute for Sustainable Development

4. The two graphs shown above provide support for which of the following statements regarding cocoa production and chocolate consumption?
- (A) Cocoa production is highest in equatorial regions and chocolate consumption is greatest in tundra regions.
 - (B) Cocoa production is highest in periphery and semiperiphery countries and chocolate consumption is greatest in core countries.
 - (C) Cocoa production is highest in the Eastern Hemisphere and and chocolate consumption is greatest in the Western Hemisphere.
 - (D) Cocoa production is highest in core countries and and chocolate consumption is greatest in semiperiphery countries.
 - (E) Cocoa production is highest in the Northern Hemisphere and and chocolate consumption is greatest in the Western Hemisphere.

5. Which statement best explains why a large quantity of agricultural products are imported into the United States from Chile?
- (A) Inexpensive labor in Chile reduces the cost of production.
 - (B) The growing season in Chile allows U.S. consumers to have fresh fruits and vegetables in the winter.
 - (C) Subsidies in the United States make agricultural products cheaper.
 - (D) Better technologies have increased Chile's agricultural output.
 - (E) The number of U.S. farmers has declined so significantly that the country cannot produce enough food for consumers.
6. Which lists products in the order in which they will be produced, starting closest to the market, according to von Thünen's model?
- (A) Grain, forest, beef cattle, dairy cattle
 - (B) Tomatoes, grain, forest, beef cattle
 - (C) Dairy cattle, beef cattle, forest, grain
 - (D) Dairy cattle, forest, grain, beef cattle
 - (E) Forest, tomatoes, beef cattle, dairy cattle
7. A very large corporate farm in the United States is most likely to take advantage of which of the following opportunities?
- (A) Fair trade certifications
 - (B) Traditional farming techniques
 - (C) Local markets to sell its products
 - (D) Vertical integration strategy
 - (E) Low-wage child labor

FREE-RESPONSE QUESTION

1. There are a variety of types of agriculture that occur around the world and range from commercial to subsistent. Coffee is one of the world's most valuable traded commodities and is considered a luxury crop.

COFFEE PRODUCTION, 2016	
Country	Production (in tons)
Brazil	3,019,051
Vietnam	1,460,800
Colombia	745,084
Indonesia	639,305
Ethiopia	469,091
World total	9,221,534

Source: FAOSTAT of the United Nations

- (A) Describe the difference between subsistence agriculture and commercial agriculture.
- (B) Identify TWO globally traded crops other than coffee that are currently grown on commercial plantations today.
- (C) Using any of the countries listed in the sources, describe ONE advantage it has in the production of coffee.
- (D) Identify a world region where most of the coffee is grown for export.
- (E) Explain ONE problem facing countries when they dedicate large tracts of land to the production of a luxury export crop, such as coffee.
- (F) Explain the view that coffee production is neocolonialism.
- (G) Describe the primary goal of fair trade in coffee production.