ABSTRACT

This article is an overview of the agriculture section in the outline of the Advanced Placement (AP) human geography course. It is intended to provide a more detailed framework on which teachers may develop their own curriculum for the AP class. Special emphasis is given to the practice of agriculture in contemporary industrial societies. It also encourages teachers to balance the cultural and historical views of agriculture contained in many textbooks with an economic and geographic focus. Agribusiness is also given special treatment.

Key Words: Advanced placement, agriculture, food, development

A unit in a human geography course will enable students to understand the processes that have produced the food they eat. They should understand that they are part of a global system of production, transportation, processing, and consumption; and that as consumers they have a direct impact on the production of agricultural products in an amazingly diverse set of locations. Even though many students will never set foot on a farm, as consumers they are part of the agribusiness system.

In addition, students should understand that the invention of biotechnologic approaches to agriculture will have great impacts on their lives. While technology and innovations driving these are not geographical per se, they will eventually move over space in processes that are understandable with the geographical lens. Therefore students will be able to make predictions about changing relationships and production and consumption as the biotechnology revolution unfolds.

They should also come to understand that hunger is not so much an issue of production, but rather of distribution. Tremendous surpluses of food exist at one location, while conditions of hunger prevail in others. The inequitable distribution of food is a result of the inequitable distributions of power, and this topic is open to research with the insights and techniques of political geography.

Finally, as urban residents, the processing and sale of agriculture products takes place within their neighborhoods or within the jurisdictions of the political units to which they belong. Issues such as zoning, the need for workers, or the environmental impact of agricultural processing play a big role in the quality of life in urban locations throughout the world.

There are several themes in an agricultural unit in a human geography course. Cultural geographers in the tradition of Carl Sauer highlight the history of agriculture, the process of agricultural invention, and the diffusion of crops and livestock around the Earth. Alternatively, the landscape school of cultural geography studies settlement patterns, house types, fences, land division, and associated infrastructure that constitute the rural landscape. Economic geography has not only focused our attention on the production, consumption, processing, and redistribution of agricultural products, but also on the ways in which the political economy of a state has dominated the world over time, manipulating agriculture to maintain various schemes of class and social status. All of these approaches are woven into this article, because an understanding of modern agriculture requires a holistic view.
The agriculture section of the Advanced Placement (AP) course has been divided into four parts. The first part focuses on the development and diffusion of agriculture in the Neolithic (the first agricultural revolution). The second describes the major agricultural production regions that have resulted from the industrialization and modernization of agriculture (the second agricultural revolution). The third section is devoted to patterns of rural land use. The fourth covers the impacts that have resulted from the biotechnologic advancements in agriculture (the third agricultural revolution).

**Origins and Dispersals**

The development and diffusion of agriculture is well covered in most human geography textbooks. Most books follow the presentations of economic and agricultural activity that is based on the notions of the nineteenth century geographer Edward Hahn that were modified and further articulated in the United States by Carl Sauer. The structure of the AP course and of most textbooks follows conventional thinking that classifies economic activity into primary, secondary, and tertiary activities. Primary activities—such as hunting and gathering, farming, timbering, mining, and fishing—directly use the resources of the environment.

Certain major events in the history of the world have transformed human life. The invention of agriculture in the Neolithic was one such event because it enabled the human population to differentiate itself from the higher primates. By applying agricultural technologies in a very simple form, humans were able to increase the carrying capacity of the earth.

Every culture on Earth engages in some form of agriculture. We obviously need food to eat, and cultures have developed practices of storing food for times of shortage and for moving food from areas of high productivity to areas of high consumption. In addition to the circulation of food, other aspects of food production attract the attention of human geographers. For example, the spatial patterns of dietary laws that govern production and consumption of crops and animals around the world have fascinated many geographers.

Carl Sauer’s (1969) seminal work, *Agricultural Origins and Dispersals*, first published by the American Geographical Society in 1952, is the springboard for all contemporary geographical discussions about the origins of agriculture. Sauer believed there were 11 separate centers of plant and animal domestication. This great invention probably occurred first in the areas of the tropical seashores where settled fishermen were able to produce a surplus and could invest some of their wealth and time into the experimentation and nurturing of plants and animals. The movement of humans across the surface of the earth diffused plants and animals to nearly every possible environment. Some of the movements are well documented, while others are only vaguely understood.

Most popular textbooks and atlases (e.g., DeBlij and Murphy 1999, Fellmann et al. 1999, Knox and Marston 1998, Rubenstein 1999) have maps and charts that portray the assumed regions of plant domestication. These maps are important because they illustrate areas where the wild ancestors of modern crops might be found. The genetic material from wild ancestors is considered precious because it is needed to create new varieties of domesticated plants.

Agriculturists gradually altered their practices in response to different environments and new knowledge. For example, the use of animal energy increased the ability of humans to till the soil. Techniques for harnessing animals evolved from the early practice of tying plows to the heavy horns of cattle to advanced harnessing systems for horses. Europeans developed the heavy horse collar which transferred the weight the animals were pulling away from their windpipes and necks to their powerful shoulders. This made large draft horse more efficient, enabling farmers to till heavier, more productive soils, which ensured better yields of grain. Better yields meant more food for animals, and eventually led to larger and more powerful animals. Although agricultural technology evolved in all parts of the world, the process was slow because fear of crop failure and famine made farmers reluctant to experiment with new, risky ventures.

**Major Agricultural Production Regions**

**Circulation Systems**

It is useful to approach the study of agriculture types using the concepts of systems theory. This approach guides us to ask the same set of geographical questions about each agriculture type. The most frequently asked question focuses on how agriculture binds together various parts of the local landscape. In addition, we ask how the local system is connected to large regional and global patterns of
commodity transfer. We look for boundaries and specialized places. The relationship between the physical environment and agricultural practices are examined, and we try to understand the various innovations that are diffusing through the system.

It is assumed that agriculture was developed by hunting-and-gathering people who lived in an environment so productive that they could not exhaust the local food supplies. This enabled them to settle in permanent clusters. Sauer (1969) assumed this would have occurred on the shore of a shallow tropical sea near the mouth of a river. Gradually the gatherers began to protect valuable plants, such as those used for drugs and dyes. They also domesticated scavenger animals like dogs, pigs, and chickens. Slowly they learned that if they planted pieces of plants, new growth would occur, and the change from protecting to cultivating was made.

As far as is known, early agriculturists lived in villages. The villages claimed land as a group and subdivided the village lands among the families. Villagers were usually all part of a kinship group. Approximately 6,000 years ago productive agriculturists in the river valleys of the Fertile Crescent and the Nile were able to produce surpluses large enough to maintain a sizable urban bureaucracy and military. These grain-based systems included irrigation systems, long-distance trade, mining, and some highly developed craft industries. The essential pattern of the agricultural villages with their preindustrial cities continued until the Middle Ages when the second agricultural revolution began.

Sedentary village agriculture was modified in places with environments that were in some way ill suited to intensive cultivation. The greatest change was shifting cultivation, which exists today in remote areas primarily in the tropics. The agriculturists practicing shifting cultivation clear vegetation by girdling large trees, thereby killing them, and cutting down the rest of the vegetation. The vegetation is then set afire to create a thin layer of wood ash that provides nutrients for the soil. The soil is turned over slightly and seeds and tubers are planted. Crops are then harvested and the cycle is continued, perhaps two to three times. However, the rainfall and high temperatures of the tropics cause the soil to be leached (i.e., have its nutrients washed out) and farmers trying to produce crops from these fields receive less energy than they put in. The fields are abandoned and new fields are cleared. The village moves around its territory clearing land, abandoning it, and moving on to other fields. This form of agriculture works quite well as long as the population does not return to the cleared fields within 20 to 25 years. The two decades provide sufficient time for the indigenous vegetation to reestablish itself and restore fertility to the soil.

In Eurasia at some time in the distant past, some populations separated from the settled farmers and began practicing nomadic herding. The cultural shift that occurred after this separation has puzzled anthropologists and cultural historians for over a century. The normal explanation is that oasis dwellers could not afford to set aside land for rearing animals. Thus members of the group would take their animals into the surrounding desert for grazing. They would be gone for a season and when they returned the surplus animals were slaughtered. By the time the historians of Eurasia began to write, cultural divides had opened between the mounted nomadic herdsmen and the oasis dwellers. Even though the groups traded with each other they were not always on good terms. Like shifting cultivators, the herdsmen moved their territory from pasture to pasture. These three ancient forms of agriculture—subsistence village agriculture, shifting cultivation, and nomadic herding—provided the roots for our present system.

Farmers in the Roman Empire elaborated traditional forms of agriculture to a level that could support dozens of large cities and huge military establishments. The Roman system of agriculture in turn provided the base for three extremely important forms of modern agriculture: mixed crop and livestock farming (both subsistence and commercial variations), Mediterranean agriculture, and livestock ranching. The Roman agricultural system also provided the base for the mechanization of agriculture.

The second agricultural revolution began in seventeenth century western Europe. It involved crop rotation, intensification of agriculture, use of more fertilizers, improvement of harnessing techniques, and basic tools of medieval animal agriculture. The new and expanding commercial agriculture was able to feed the burgeoning industrial cities of western Europe, and was brought to North America by European colonists.

Global Patterns

There are two primary features in the contemporary global patterns of agricultural production. One is the relationship between agriculture systems and climatic zones. The second is the complicated linkage between agricultural production areas and consumption areas.
Climatic Zones

Most atlases and textbooks contain a map of the world showing agricultural types (see Hudson 2000, 38–39 and Rubenstein 1999, 342–373). These maps are based on a map of world agriculture types, drawn by Derwent Whittlesey (1936), showing a pattern of 13 varieties of agriculture that are reflective of environmental zones. Unfortunately, no agricultural geographer has attempted to modernize this map, therefore it must be used with caution.

If students looking at the map have some fundamental understanding of environmental zones they will see very clear patterns. However, farmers have greatly modified the environment, even destroyed major components of it, to create this pattern. Forests that once covered Europe have long been cleared, as have forests that once covered parts of North America east of the Mississippi River. Tilling breaks up soil and eradicates indigenous, or natural, vegetation. The crops that grow in particular places are dramatically modified from their original ancestors and in many cases bear little resemblance to native plants that were in the area before agriculture. Wheat, the dominant plant on the northern plains of the United States, has its origins in southwest Asia. The corn that blankets the U.S. Midwest and the Danubian basin of Europe originated in Mesoamerica.

Linkages and Flows among Regions

Commodity maps in popular atlases illustrate how crops are concentrated and how surpluses move across the surface of the earth (for maps of wheat, maize, and rice see Hudson 2000, 40–42). For example, wheat is produced in several areas around the world. This grain is traded in a worldwide pattern from some very successful production areas to places of population concentration where it is converted to flour. North America, South America, and Australia are major exporters of wheat to Europe, the Middle East, and China.

Maize or corn, another major export crop, is concentrated in North America, the largest production region. Most corn in international trade flows from the American Midwest, down the Mississippi River, out the port of New Orleans, and through the Panama Canal to major consumption regions in China. Another trade flow of corn moves from North America to the Middle East and western Europe. Unlike wheat, which is consumed directly by humans in the form of bread, corn is usually fed to animals being raised for food and therefore consumed indirectly by humans.

The third major grain in world trade is rice. Concentrations of rice production occur in south China and Southeast Asia. Surpluses from these areas flow to Africa, Europe, and the Middle East. Rice is also produced, but to a lesser extent, in the United States in the Mississippi River Valley where it enters world trade, again flowing largely to Africa and Europe. Other commodity flows of interest are the movement of sugar, coffee, tea, fruit, and flowers from the tropics to the mid-latitudes.

Barriers to the Movement of Food

In contemporary times there is controversy about the flow of food around the world. Many governments think of food as a strategic material and want to ensure that their local production is adequate should warfare interrupt the flow of international trade. In addition, farmers using their political clout have raised barriers to prevent competition from food imported from other areas. One of the significant developments in the international trade of food in the 1990s has been the growing resistance in Europe to the importation of American crops that have been produced using the technologies known as genetic engineering. While selective breeding of crops and livestock has been going on consistently for thousands of years, breakthroughs in genetics in the last 25 years have enabled more sophisticated manipulations of the characteristics of crops through gene splicing and actually introducing genetic material from other plants. This has alarmed many people around the world, both in production and consumption areas. Should opposition to genetically modified crops increase, tremendous problems will develop because of the growing reliance of American farmers on the superior productivity of the new crops.

Rural Land Use and Change

Location and Land Use Models

Like other forms of economic activity agriculture is influenced by transportation costs or the friction of distance. In areas of a seemingly homogeneous landscape, a pattern of land use will frequently develop that is reflective of transportation costs.

The most fundamental model of agricultural landuse was developed by Heinrich Von Thunnen...
in the nineteenth century to describe and explain land uses on the north German plain. The model has been described in many popular textbooks (e.g., DeBlij and Murphy 1999, Fellmann et al. 1999, Knox and Marston 1998, Rubenstein 1999). The important thing about the von Thunnen model is the way in which it enables students to think about accessibility, thereby breaking free from explanations of agriculture that are based on outmoded notions of ethnicity and environmental determinism. The model is particularly useful in explaining the sequence of agriculture that occurred with the settlement of North America when a combination of so-called frontier crops, primarily wheat and small grains, mixed with ranching, particularly cattle ranching. These activities moved from east to west across the continent with the expansion of the urban system and improved transportation. Therefore, even though the most ideal bioclimatic zone for wheat would be the Ohio River Valley and the great prairies of Iowa, Illinois, and Indiana, wheat is grown on the high plains farther west in the arid region. Wheat is grown there not because it is the best place to grow it, but because it is the crop that will yield a profit there while other crops will not.

The extensive agriculture at the edge of the von Thunnen model involves large land areas. An average sized farm in Saskatchewan is 1,000 acres, while in North Dakota it averages 1,300 acres. This is contrasted with intensive commercial agriculture close to the market where the farms may average 40 acres or less. Maps of relative value per acre of farmland show the von Thunen principle quite clearly (see, for example, Abler et al. 1971 DeBlij and Murphy 1999, Fellmann et al. 1999, Knox and Marston 1998, Rubenstein 1999). Land close to markets has much higher value than land more distant.

Settlement Systems

About half the world’s population still lives in rural regions dominated by agriculture. The architecture of the buildings in these agricultural settlements varies from place to place and has long fascinated geographers. The building materials used by farmers reflect local conditions, as well as the availability of commercial products from elsewhere. There is a relationship between the form of the architecture and the function that is quite visible in certain areas. Because most agriculturists live in villages, it is important to view the nature of these rural settlement patterns in some detail.

Villages are frequently referred to as nucleated settlements. They are contrasted with the dispersed settlement pattern that exists in the Midwest and northern plains of North America where individual farmhouses are separated from one another and farmers live on their own property. Nucleated settlements, in general, reflect fundamental features in the local culture. They include sacred spaces such as groves or graves of ancestors, the local status structure, and the physical environment. Villages in Thailand do not arrange houses in straight lines, as this thwarts the movement of bad spirits that can only travel in straight lines. In Africa, higher status people live near the center of the village. Villages also were sited to take advantage of local microclimates in places sheltered from harsh cold winds or in areas with low risk of flood. Frequently, older villages were defensive in nature, with houses close together and surrounded by some sort of wall. Even though the threat of invasion is over in most places, these villages maintain their compactness and lack of a regular street pattern. Geographers have also classified villages according to their shape or form. Linear villages with houses lined up along a road are called strassendorfs. Other villages are described as round, cluster, or walled.

In various parts of the world, agriculturists built villages with whatever materials were at hand. In northern Europe, the rainforests of the Pacific coast of North America, and other places with plentiful timber, houses and outbuildings were made of wood. Where wood was not readily available, farmers built with various types of brick. In the Middle East, northern China, the arid U.S. Southwest, northern Mexico, and other areas with dry sunny climates, people constructed their villages with mud bricks baked in the sun. Fired or kiln baked brick is more common in the areas where sun-dried adobe is inefficient. Stone, although difficult to work with, is also used in parts of Europe and alpine South America.

Such examples illustrate that agriculturists were close to the environment and used whatever materials were at hand. As transportation improved and manufactured products could be brought into more areas, the vernacular styles and building materials tended to disappear under the pressure of cheaper and more stylish factory-made products.

The size and structure of villages and other forms of rural settlement reflect the availability of space and local environmental conditions. The North American farmstead is larger, for example, than many villages in Africa, Asia, and Europe. Likewise the North American farm has a highly dif-
ferentiated set of buildings reflecting the function of activities. The pre-modern villages tended to be much more compact, with buildings having several different functions combined.

**IMPARTS OF BIOTECHNOLOGY ON MODERN AGRICULTURAL CHANGE: THE THIRD AGRICULTURAL REVOLUTION**

During the twentieth century a third major phase in the evolution of agriculture began. The second agricultural revolution greatly intensified during its closing phase, the hundred years after the American Civil War. The development of barbed wire, various forms of harvesting machines, and tractors to replace draft animals brought dramatic changes. The revolution's major impact was the reduction of the number of people needed to operate farms.

The third agricultural revolution, beginning in the late twentieth century, has three parts. The first distinctive feature has blended the boundary of agriculture as a primary activity with secondary and tertiary activities. The second feature is more intensive mechanization and the third is biotechnology. Farmers and agriculturists now engage in the primary activity of crop production, some sort of secondary activity of manufacturing or processing the crops, and tertiary activities of marketing and advertising their products through cooperatives and other marketing organizations.

Food processing (i.e., the adding of economic value to agriculture products) is the portion of the revolution that is attracting most energy and investment. Farmers frequently talk about this phase as value-added as they expand into secondary and tertiary activities. The term agribusiness is used in the United States to describe the blending of old agricultural farm-centered cultures into this new, more integrated form of production and marketing. One of the most significant features of the third agricultural revolution is the elimination of differences between urban and rural life styles.

Mechanization began replacing animal and human labor in the United States during the late nineteenth century (Figure 1). After World War II, mechanization spread to Europe and other parts of the world. Machines became larger, more powerful, and more efficient.

The biotechnologic phase began with chemical farming or the substitution of inorganic fertilizers and manufactured products for manure and humus to increase soil fertility. A wide variety of chemical herbicides, pesticides, and fungicides was developed in a never-ending effort to enhance yields. This practice became widespread in the United States in the 1950s, spread to Europe in the 1960s, and to the rest of the world during the last three decades of the twentieth century.

The industrialization of agriculture in general has caused four changes in agrarian societies. First, the application of rural labor has changed as machines replace or enhance the efficiencies of human labor. In a sense, the industrialization of agriculture creates surplus labor in rural areas that can be used for urban activities. Second is the development and introduction of new and innovative inputs such as seeds, chemicals, and different kinds of technologies that supplement or replace locally produced products. Third, substitutes have been developed for some kinds of agricultural products. Fourth, new uses for agricultural products, such as the conversion of corn to sugar to use in soft drinks, have been developed.

**The Green Revolution**

The third agricultural revolution began in the 1960s when a combination of technology was made available to countries in Asia and to Mexico in an effort to improve the diets of people in these regions. Publicists labeled this the Green Revolution, and it has attracted much attention. But the Green Revolution is just one part of the exporting or diffusion of industrial agriculture from the developed world. In general, we can think of this as the globalization of industrial agriculture.

![Figure 1. As mechanization preceded, self-powered machines became common. The combine cuts the grain stock, threshes the head off the stock, separates the grain from the straw and chaff. This entire process can be accomplished by one driver.](image-url)
In the mid-1940s the Rockefeller Foundation sent American agriculturists to Mexico to determine if they could export some of the U.S. technology that had increased wheat production. The results were phenomenal. Within seven years new forms of wheat seeds were available, and in the 1960s the effort was transferred to other countries.

The Green Revolution was based on the development of new, higher yielding, hybrid seed varieties, the continuation of a technology developed in the U.S. Midwest in the 1930s. The aggregate increases in production were significant. In Asia, rice production grew 66% between 1965 and 1985. India became self-sufficient in wheat production by the 1980s. In addition to producing higher-yielding plants, the agronomists developed plants that were stronger and shorter so they used less nutrients to produce straw, yet could support the larger seed heads. The Green Revolution included new plants, irrigation, fertilizers, pesticides, and capital improvements. The successful farmers were able to implement the entire package and gain significant amounts of wealth while their neighbors who were unable to invest in the technologies at the same rate found their competitive edge worsening.

Despite dramatic increases in food supply and reduction in hunger in the world as a result of the diffusion of the Green Revolution package, numerous people have found reasons to criticize this innovation. The division between rich and poor that existed in the rural areas of the developing countries was made wider by the Green Revolution. Some observers argue that the economic and social disparities resulting from the Green Revolution more than offset the gains accomplished by increasing the food supply. Others argue that crops produced by the Green Revolution are less nutritious, less flavorful, and less palatable. They also point out that the fertilizers and chemicals which are part of the revolution come from fossil fuel, a nonrenewable resource. Critics also feel that the Green Revolution can increase erosion and environmental contamination. The need for capital from the West to implement necessary infrastructure changes has put pressure on local economies to grow more crops for export and take land away from production of goods for local consumption. It is also pointed out that the Green Revolution’s focus on rice, corn, and wheat—crops of particular interest in Asia and Mexico—has had little impact on Africa. African agriculture is based on different kinds of crops, and soil fertility is considerably lower so the potential return on the investment is also lower.

Despite criticisms, the Green Revolution has clearly been successful, as countries where it was put into place have been better able to feed their populations.

The Diffusion of Industrialized Agriculture

For many years, governments have offered either direct or indirect subsidies to agricultural producers in order to regulate the flow of food goods in and out of their countries to maintain production, consumption, and their own national corporate profits. Therefore agriculture can never be thought of in purely economic terms. Politics are the order of the day.

Over the years U.S. farmers have produced tremendous surpluses, and the government has purchased grain from farmers and stored it, hoping to sell it when prices increased. However, grain cannot be stored indefinitely, so the government would either donate or sell it to other countries at a very low price. This had the effect of undermining the price for locally grown grain in the receiving areas and hurting local producers.

In addition to being concerned with their internal food production, wealthier nations have engaged directly and indirectly in the agriculture sectors of other nations, as food and agriculture development aid are widespread throughout the world. Many large-scale agricultural development projects have begun around the world, but not all have been successful. Over the past 20 years, one of the lessons learned has been that small-scale projects sensitive to local, cultural conditions and environmental concerns seem to be more successful over the long run, while large-scale environmental modification schemes have generally been unsuccessful.

Organization of Industrial and Commercial Agriculture: Agribusiness

A useful way to envision the industrialization of agriculture is as a complex circulation system based on the urban industrial cores. As land use devoted to agricultural activities becomes more tightly connected to urban industrial cores, the nature of agriculture changes and becomes more urbanlike. Agriculture develops divisions of labor, and the population working on farms is not self-sufficient. Farmers now buy their food in grocery stores rather than grow their own.

The most important concept to use when think-
ing about the organization of industrial agriculture is the term *agribusiness*. This refers to a system of economic and political relationships that organize food production from the development of the genetic makeup of seeds to the retailing and consumption of the agricultural product.

Agribusiness is organized into flows of political and economic power that are focused on commodity, or food, chains. A food chain is usually composed of inputs, outputs, production, distribution, and consumption. There is an associated landscape with each of these factors. Many of these commodity chains link a variety of physical environments together. They also link production areas with areas of consumption and the manufacturing areas that serve them.

In a sense, agribusiness occurs on a global scale in the same way that a subsistence village worked in the preindustrial area. In the subsistence village, forms of production, processing, distribution, and consumption were organized on the local scale, and on occasion several villages interacted and exchanged surpluses. Now with industrialization and improvements in circulation technology, entire regions of the world are linked together in production, processing, and consumption.

The Europeans developed the first such global system, linking together the colonial territories to provide food for consumption in the European sector. Early in the colonial period saw the beginning of a food regime that linked wheat production in the Shenandoah Valley with consumption in France. In the nineteenth century, Australia, Canada, and New Zealand specialized in producing food for Europeans.

**Poultry in the United States: A Commodity Chain**

Because the concepts of commodity/food chains, or circulation systems, are so fundamental to an understanding of current food supplies, the example of the U.S. poultry industry is discussed in some detail.

In the 1930s, feed dealers in the American South realized that they might be able to expand their business by providing farmers with newly hatched chicks and chick feed on credit. The farmers would be able to repay the loans when the birds were sold. Until this time most farmers across the United States had a small barnyard flock of chickens that survived by scavenging and getting handouts from the farm wife, who usually had responsibility for the birds and took the profits from selling eggs. The birds were harvested for meat at the end of their useful life as egg-layers, and chicken was reserved for a Sunday dinner. Mass production of chickens for consumption has so revolutionized the poultry industry that chicken is now the cheapest and most commonly consumed meat in the United States.

Today, chickens are produced by large agribusiness companies operating hatcheries, feed mills, and processing plants. They supply chicks and feed to the farmers. The farmers are responsible for building a house and maintaining proper temperature and water supply. Once a week the companies fill the feed bins for the farmers, and guarantee them a price for the birds. The companies even collect market-ready birds and take them away for processing and marketing. Most of the nation's poultry is handled by a half dozen very large corporations that control the process from chicks to chicken pieces in stores.

Over the years selective breeding has produced a very efficient chicken. In 1940 it took about 17 pounds of feed and 15 weeks to produce a four-pound broiler. Forty years later it took only eight pounds of feed and seven to eight weeks to produce the same size bird. In that same 40 years the size of operations increased dramatically. In 1940, broiler houses containing 1,500 birds were considered to be large; contemporary broiler houses hold 20,000 birds or more. In addition, mechanization of watering and feeding operations have reduced labor requirements from about 250 hours per 1,000 birds in 1940 to fewer that 25 hours. Today broiler production is an attractive option for small farmers because it requires only a few hours of labor each day and can be combined with off-farm work.

Today, broiler production is concentrated in widely scattered areas, however, it developed on the eastern seaboard before World War II. Immediately after the war it grew rapidly in northeastern Georgia and northwestern Arkansas. Subsequently concentrations developed in central Mississippi, northwestern Georgia, the Piedmont areas of North Carolina, the Shenandoah Valley of Virginia, and the Delmarva Peninsula.

Many people believe that the broiler production process is really manufacturing rather than farming because it is not directly connected to the land. Areas that produce large numbers of chickens are districts that are feed deficient (i.e., feed consumed by the birds has to be shipped in, primarily from the Midwest). The long, low one-story broiler hous-
es are essentially factories that use birds as machines to convert raw materials of corn and soybeans into a finished product of meat for human consumption.

Chickens are efficient producers of manure and one of the major issues of broiler production has been the disposal of the manure. While ideally it should be returned to the land because it is excellent fertilizer, it is frequently fed back to the animals. The manure is rich in protein and after being dried and flavored with molasses it looks like soybean meal and can be fed to chickens or cattle.

**Globalization of Crop Regimes**

Contemporary research indicates that in addition to the grain-meat food regimes such as beef and pork production that link various parts of the world, there are others that involve perishable commodities such as fresh fruit, vegetables, and flowers. These systems use rapid transportation, air travel, and refrigerated systems to deliver fresh fruits and vegetables to Europe, North America, and Japan. This system was developed at the turn of the twentieth century, when companies like United Fruit pioneered the growing of bananas in Middle America and marketed them to middle class households across the United States.

The exotic products that people are now consuming are related to the high expendable income within the wealthy nations and the notions of class and health that are formed around food consumption. Since the Green Revolution, there has been less focus on hunger and famine as an issue in the world agricultural community. It is generally recognized that most long-term famines are the result of political disruption, inequitable distribution of food and resources in totalitarian states, and short-term climatic fluctuations such as changes in rainfall rather than long-term inefficiencies of agriculture. Therefore the focus now is on producing crops for the ever more affluent populations of wealthy nations and the sectors of the developing world that are also enjoying an increase in expendable income and are changing their diet expectations.

Cuisines have always been associated with status, and it is no surprise that food continues to be an item that differentiates social class. The great cuisines of the world emerged in the courts of Iran, China, and France, and food was used as a way to separate the elite from the commoners. The health-food fad in the developed world is simply the contemporary version of the epicurean concepts of food and class that developed in the ancient world.

**Impact of Agriculture on the Environment**

By harvesting timber and grazing flocks in the highlands, farmers in ancient times modified the landscape around the Mediterranean Sea. Erosion was increased and major decreases in soil fertility occurred. Other ancient civilizations also impacted their environment through irrigation and increasing salinity of the soil. Agriculturists today still have major impacts on the environment. For example, in traditional systems, once the vegetation cover is broken the soil is susceptible to wind and erosion. This continues on steep slopes or in areas where wind is intense (Figures 2 and 3). Additionally, modern agriculturists have used a variety of chemicals, such as DDT, that have huge impacts on non-agricultural life.

![Figure 2. Alternating strips of row and cover crops planted along contours. This form of conservation tillage is an effective way to minimize runoff and erosion.](image)

![Figure 3. Minimal tillage is a sustainable agriculture practice. A new crop is knifed into the soil over the stubble of the previous season. This technique eliminates the need to use energy for deep plowing and disking, and the stubble prevents wind erosion during the fallow season.](image)
Perhaps the most dramatic impacts have occurred on the margins of arid regions where topsoil and vegetation are thin. Overgrazing and tillage cause changes in the nature of this landscape increasing the rate of erosion and thereby creating desertlike soils on the surface. The desertification process has been sped along by short-term climatic fluctuations in some areas, but it is primarily brought about by human activity.

It is cliché to say that farmers have had more impact on the environment than any other sector of the economy. Whether this is true is impossible to measure. What is clear is that agribusiness, with biotechnology, has new ways to modify the environment. Biotechnology refers to the process or technology that uses living organisms or parts of organisms to make or modify products, to improve plants or animals, or to develop microorganisms for specific uses. Biotechnology is distinct from the Green Revolution because it uses gene manipulation, tissue cultures, cell fusion, embryo transfer, cloning, and a variety of techniques unknown to the agriculturists of the 1950s. Biotechnology has been responsible for what are sometimes called super plants that produce their own fertilizers and pesticides and are resistant to disease. The cloning technique has made it possible to take tissues from one plant, use them to form new ones, and produce millions of identical plants, thereby reducing the chances in variation in yields from particular seeds.

While critics fear that cloned material will make plants more susceptible to diseases, elm trees with resistance to the elm virus have been successfully cloned and planted in great numbers in the American Midwest. The debates about biotechnology certainly are vociferous, and a geographer has no way to determine which side is going to be correct. One thing is clear: biotechnology is a continuation of the industrialization of agriculture. It is also based on private ownership and capitalism. The biotechnologic processes are patented, new seeds cannot be planted without paying the company that developed them. As a result, the gap between rich and poor may widen even further, and there is no reason to expect the benefits of biotechnology to be equally distributed.

CONCLUSION

Every student is inextricably bound into the web of agribusiness. All of us are consumers. Many of us have agribusiness processing facilities in our neighborhoods. All of us share a concern for the impact of agribusiness on the environment as a whole. The geographic approach to this topic enables us to view the myriad of connections among people and places around the world that combine to feed humanity. Cultural perspectives, transportation and communication technology, biotechnology, and environmental connections all play a part in agricultural production, but the total system can only be seen through the lens of geography.

Author’s note: All photos are courtesy of Al Withers of Minnesota Agriculture in the Classroom.

REFERENCES


Appendix A. Resource list.


