Modernization and Transformation of the Rural Sector

There are two things that must be considered when analyzing the contemporary regional patterns of agricultural production - one is the relationship between agriculture systems and the climatic zones, and the second is the complicated set linkages among the production areas and the consumption areas. The roots of modern commercial agriculture can be traced to the vast colonial empires established by European powers in the 18th and 19th centuries. Thus, products like cotton grown in Egypt, Sudan, and India colonized by Europe was bought cheaply, imported to European factories, and made into textiles – much of which was then exported and sold, often in the very colonies where the cotton had been grown in the first place. The evolution of a worldwide transport network still exists today: Ghanaians still grow cocoa, Moçambiquans still raise cotton, and Sri Lankans still produce tea.

Cash Crops and Plantation Agriculture

Nonetheless, we will first examine non-subsistence farming in many poorer countries - a leftover from colonial times. The colonial systems established long ago have tended to lock more peripheral countries into production of one or two cash crops. In the Caribbean, for example, whole national economies depend on sugar exports (introduced by the imperialists). These countries obviously want to make as much profit as possible, but they are not in a position to dictate the prices. It is the importing countries (the core) that set tariffs and quotas, not the exporters, although regional and global agreements limit what can be done. In one extreme case, the United States cut off all imports of Cuban sugar due to an ideological quarrel over capitalism and communism in the 1960s. Although the Soviet Union and Canada continued to import sugar, Cuba’s economy was dealt a staggering blow. Much like the farmers in von Thünen’s Isolated State, who were at the mercy of decisions made by the buyers in the central city – so are the farmers in peripheral locations at the mercy of the buyers in the core regions.

Some producing countries are seeking to form a cartel, much like the members of OPEC did during the 1970s. This kind of collective action is difficult, for several reasons. First, the wealthy importing countries can make deals with countries outside the cartel. Second, the withholding of produce may stimulate domestic production among importers. For example, although cane sugar accounts for more than 70 percent of the commercial world sugar crop each year, some core regions (e.g., U.S., Europe, and Russia) already produce sugar from sugar beets.

Plantations - large estates organized to produce cash crops - are colonial legacies that persist in poorer, primarily tropical, countries along with subsistence farming. Laid out to produce bananas, sugar, coffee, and cocoa in Middle and South America, cocoa, rubber, and tea in West and East Africa, tea in South Asia, and rubber in Southeast Asia, plantation agriculture (7 in the legend on the map on the following page) has outlasted decolonization and continues to provide specialized crops to wealthier markets. Many plantations are still owned by European or American individuals or corporations.

Cotton and Rubber

Two of the most significant contemporary cash crops are cotton and rubber. Cotton production is not grown solely in former colonial areas; it is a major product in the southern U.S., northeastern China, as well as some Central Asian republics. However, British colonists promoted it on a smaller scale in places like Egypt’s Nile delta, Sudan, Mexico, Brazil, and the Punjab region between Pakistan and India. Cotton cultivation expanded initially after the invention of the cotton gin by Eli Whitney in 1793 (which removed the seeds from the cotton fibers many times faster than a person could). His invention also had the negative effect of expanding the slave trade in the U.S., since more raw cotton was needed to be picked in order to keep pace with the cotton gin. Later, the Industrial Revolution produced machines for spinning and weaving that further increased production, lowered prices, and put cotton goods within the reach of mass markets. Today, synthetics such as nylon and rayon compete with natural cotton, yet it is still in high demand. It is for this reason that much of the cotton purchased by Japan, the United Kingdom, and Western Europe comes from the U.S. – an industrial and technological giant, yet also an agricultural giant (especially where there’s money to be made).

The case of rubber is more complicated. Initially, rubber was collected from rubber trees (through tapping) in equatorial rainforests, mainly in the Amazon Basin. In the early 1900s, rubber companies also sprang up in the Congo Basin, but no area did so well
so quickly as in the case of Southeast Asia. Within two decades nearly 90 percent of the world’s rubber came from new plantations in colonial territories in Malaya (Malaysia), the Netherlands East Indies (Indonesia), and neighboring colonies. The reason for the rapid growth is due less to environmental factors than to the availability of labor.

The advent of the automobile was a huge boost for the industry, as most of the rubber produced went to manufacture tires. World War II created a need for alternative sources of rubber, since Japan occupied much of Southeast Asia. This stimulated the production of synthetic rubber – necessity is the mother of invention.

Although most of the rubber production today is synthetic, almost 70 percent of natural rubber is still produced in Southeast Asia.

**Luxury Crops**

The European colonial powers also established huge plantations for the cultivation of luxury crops such as tea, cacao, coffee, and tobacco. **Coffee** was first domesticated in around present-day Ethiopia, but today it thrives in Middle and South America, where approximately 70 percent of the world’s annual production is harvested. The U.S. buys more than half of all coffee sold, and Western Europe imports most of the rest. After petroleum, coffee is now the second most valuable traded commodity in the world! In many cases, coffee is produced on enormous, foreign-owned plantations, where it is picked by local laborers who are hired at very low wage rates. Most coffee is sent abroad; and if the coffee pickers drink coffee, it is most likely the imported and instant variety.

**Tea** is consumed in greater quantities in areas where it is grown: India, China, Sri Lanka, and Japan. Tea was grown in China perhaps 2,000 years ago, but it became popular in Europe only during the late eighteenth century. The famous Boston Tea Party occurred in 1773, after Britain forbade the colonists to purchase or consume any tea other than the kind that came from their fledging East India Company. Today, tea is the dominant beverage in Eurasia.

**Commercial Livestock, Fruit, and Grain Agriculture**

By far the largest areas of commercial agriculture lie outside the tropics, and follow pretty closely to certain bioclimatic zones. **Dairying** (1) is widespread at the northern margins of the mid-latitudes – particularly in the northeastern U.S. and in northwestern Europe. Fruit, truck, and **specialized crops** (2) are found in the eastern and southeastern U.S. (major oases can also be found in the Sahara and in Central Asia). **Mixed livestock and crop farming** (3) is widespread in the more humid mid-latitudes, including the eastern U.S., Western Europe, Western Russia, and in small pockets elsewhere.

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**WORLD AGRICULTURE**

1. Dairying
2. Fruit, Truck and Specialized Crops
3. Mixed Livestock and Crop Farming
4. Commercial Grain Farming
5. Subsistence Crop and Livestock Farming
6. Mediterranean Agriculture
7. Diversified Tropical Agriculture
8. Intensive Subsistence Farming - chiefly rice
9. Intensive Subsistence Farming - chiefly wheat and other crops
10. Sedentary Sedentary Cultivation
11. Shifting Cultivation
12. Livestock Ranching
13. Nomadic and Semi-Nomadic Herding
14. Non-agricultural Areas

This map was drawn by Derwent Whittlesey and published by the *Annals of the Association of American Geographers* in 1936. Unfortunately, no agricultural geographer has attempted to modernize this map, and therefore it must be used with caution.
Commercial grain farming prevails in the drier parts of the mid-latitudes, including southern prairie provinces of Canada, the mid and western U.S., as well as a large belt of wheat farming from Ukraine through Russia into Kazakhstan. Argentina and Australia have small, yet productive wheat-producing zones.

Livestock ranching is widely distributed. The raising of cattle and sheep developed in the wake of European colonization on vast tracts of natural pasture. In addition to the large ranching areas of the U.S., Canada, and Mexico, much of eastern Brazil and Argentina, Australia and New Zealand, as well as South Africa are devoted to ranching. You may see a Thünian pattern here: livestock ranching on the periphery and consumers in the urban cores. Refrigeration has overcome the problem of perishability, and high volume has lowered the unit cost and increased the transferability of animal products.

Other Types of Agriculture

Note that commercial rice growing is not a separate item in the legend, although it is extremely important. The United States is the world’s leading exporter of rice, perhaps the world’s most widely eaten grain. The reason why the U.S. is so dominant has to do with the nature of rice production; it is typically grown on small plots and is labor-intensive. Contrast this with wheat farming, which is carried out on huge landholdings with large machines that sow and harvest the grain. This reality along with the fact that most Southeast Asian farmers (and many East Asian farmers) are subsistence farmers, it is easy to see why the U.S. is such a rice-producing giant.

Only one form of agriculture mentioned in the legend refers to a particular climatic zone: Mediterranean agriculture. This type of farming only occurs in areas where dry summer climate prevails: along the Mediterranean Sea, in parts of California and Oregon, central Chile, South Africa’s Cape, and in parts of south and southwest Australia. Specialized crops grow in these locations: grapes, olives, citrus fruits, figs, certain vegetables, dates, and others. From these areas come many wines, oils, and other commodities are exported all over the world, and demand high prices.

One important type of crop that cannot be easily mapped is one that is turned into illegal drugs. Because of their high demand – particularly in the core regions – farmers in poorer regions may find it more profitable to cultivate opium poppy, coca, or marijuana than to grow standard food crops. Cultivation of these plants increased steadily through the 1980s and 1990s. Today, over half of the world’s cultivation of coca occurs in Colombia alone. Heroin and opium, derived from the opium poppy, is grown predominantly in Southeast and Southwest Asia. Over 90 percent of opium production worldwide comes from Afghanistan and Myanmar. There are even places in the U.S. where drugs are cultivated for a large profit.

The Green Revolution

The First Agricultural Revolution began around 12,000 years ago with the invention of farming. The Second Agricultural Revolution reached its peak during the years from the post U.S. Civil War era to the mid 1900s. This period saw the development of barbed wire, various forms of harvesting machines (particularly Cyrus McCormick’s reaper), and was further boosted by the Industrial Revolution, that introduced inventions like the tractor — first with a steam engine and then with a gasoline engine — which replaced draft animals. The revolution’s major impact was the reduction in the number of people needed to operate farms.

The Third Agricultural Revolution, also referred to as the “Green Revolution,” began around the mid-1900s and has three distinctive features: mechanization, biotechnology, and agribusiness. The first, mechanization, began replacing animal and human labor in the United States during the late nineteenth century. After World War II, mechanization spread to Europe and other parts of the world. Machines have gotten larger, more powerful, and more efficient ever since. The U.S. is the largest exporter of food in the world, yet less than 2 percent of the
population is involved in agriculture. Technology has everything to do with this.

The biotechnological phase began with chemical farming – the substitution of inorganic fertilizers and manufactured products for manure and humus to increase soil fertility. Chemicals were also used to control pests, and a wide variety of herbicides, pesticides, and fungicides have been produced in a never-ending effort to enhance the yields. The Green Revolution began in the mid 1940s when the United States sent some agriculturists into Mexico to see if they could apply some of the technology involving hybridization (crossbreeding of crops) developed in the United States that 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.

Biotechnology, more specifically, deals with the use of genetically engineered crops in agriculture and DNA manipulation in livestock in order to increase production. In the 1960s, scientists at a research institution crossed a dwarf Chinese variety of rice with an Indonesian variety and produced IR8. This “artificial” rice produced a larger “head” of grain, and had a stronger stem that did not collapse under the added weight. In 1982, IR36 was developed with genetic-based resistance against 15 pests, and a shorter growing cycle of 110 days – thus making it possible to produce three crops per year. 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 the higher yields, agronomists developed plants that were shorter so they used fewer nutrients to produce straw. The Green Revolution included the new plants, both higher yielding and some with different characteristics, irrigation, fertilizers, pesticides, and capital improvements. In general, we can think of this as a globalization of industrial agriculture or the development of a unified agricultural system that involves most of the populations of the earth.

As you can see, certain areas benefited greatly from the Green Revolution; Mexico, China, and India. The United States and Europe already had vast surpluses of food, so the impact wasn’t nearly as great. However, there are still regions in the world that have been largely unaffected by the benefits of the Green Revolution. Successful farmers were those who were able to implement the entire package – biotechnology, chemical fertilizers and pesticides, irrigation, and mechanical improvements. They gained significant amounts of wealth, while their neighbors who were unable to invest at this rate found their competitive edge in the economy worsening. The traditional focus on rice, wheat, and corn means that the Green Revolution has had only marginal impact throughout most of Africa. In this part of the world, agriculture is based on different crops, and lower soil fertility makes agriculture a less attractive prospect for external investment of capital.

The third feature of the Green Revolution is agribusiness – a general term for large-scale, mechanized industrial agriculture controlled by corporate interests. Agribusiness, and food processing in general, is the part that is achieving (or attracting) the most energy and investment. While the first two phases of the revolution are focused on inputs into the agricultural process, the third is focused on output. Farmers frequently talk about the third phase as "value added," and of course it's the third part that involves agriculturists in secondary and tertiary activities. 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 co-operatives and other marketing organizations. Agribusiness serves to connect local farms to a spatially extensive web of production and exchange. At the same time, it fosters the spatial concentration of agricultural activities. Both these trends are revealed in the production of poultry.

Early in the 20th century, poultry production (chickens and turkeys) was highly disaggregated in the U.S. – with many farmers raising a few chickens as part of a multifaceted farming operation. Today, chickens are produced by large companies operating hatcheries, feed mills, and processing plants. They supply chicks and feed to the farmers, or to the large corporations. Selective breeding has produced faster growing, bigger broilers housed in enormous “broiler houses (broilers are the chickens themselves) that are largely mechanized – they are essentially factories. The “farmers” maintain proper temperature and water supply. These broiler houses are concentrated around Arkansas, Georgia, the Piedmont areas of North Carolina, and the Shenandoah Valley of Virginia. Separate companies supply the feed, and guarantee them a price for
the broilers. The farmers are actually involved in manufacturing much more than they are in primary activities. They must talk with bank officers, oversee the repair of equipment, and negotiate with vendors as they tend their animals. Outside companies will collect market-ready birds and take them away for processing and marketing.

Chicken is the most widely consumed meat in the United States, and for much of the industrialized core. A century ago, chicken used to be reserved for Sunday suppers and special occasions. Today we eat about 100 times more chicken in a year than Americans did in the 1930s. So how did this all change? Health was one reason. Chicken is lower in fat and cholesterol than red meat. Price was another reason. There are two big reasons why chicken prices came down: economies of scale, and better site and situation.

Economies of scale apply in many aspects. Broiler raisers can lower their costs by “mass producing” chickens. The cost of a broiler factory will not go up whether they house 1,000, 10,000, or 30,000 chickens. In addition to housing considerations, attrition led to lower numbers; broiler farms that could no longer compete went out of business. Also, big corporate “farms” get more tax benefits than small farmers (like deducting business expenses). Large broiler “factories” can buy in bulk, getting cheaper feed, veterinary care, and young chicks. Finally, large-scale broiler “farmers” can afford technology to make production more efficient using computerized feeders, ventilation systems, and waste management systems (and replace expensive human labor). Many companies like Tyson, Purina, or Perdue are vertically integrated to reduce costs, and therefore increase profit. They are typically involved in the laying and hatching of eggs, supplying feed to the broiler raisers, providing veterinary care, transporting fully-grown broilers (which take 7-8 weeks to fully grow), slaughtering and packaging, and nationwide marketing.

Another reason for lower cost deals with site and situation. The local conditions (site) in southeastern U.S. is certainly warm enough for broilers, but too wet and warm for feed corn to grow well. Another southeastern site advantage is the lower cost of living, which enables the factory owners to pay less in terms of wages. The site conditions in the Midwest provide a good growing season for corn, but proves to be too cold for efficient broiler factories. The close proximity of these areas to each other (situation) allows for a certain level of complementarity between them. Good railroads and an excellent highway system allow transportation costs to remain relatively low. This situation also allows for fast shipping of corn from the Midwest to the South (where the broiler factories are), and fast shipping of the processed chicken from the South to the Midwest & the North (where the major markets are).

One of the most significant features of the third agricultural revolution has been the elimination of the difference between urban and rural life styles. In the more industrialized realms, we have witnessed mechanization, consolidation of smaller farms into larger corporate units, and increased crop specialization. Another remarkable trend is the expansion of organic agriculture – crops produced without the use of synthetic or industrially produced pesticides and fertilizers. Sales of organic food in the U.S., for example, went from under $200 million in 1980 to some $4 billion a year by the late 1990s. Crops receiving the most attention are coffee, tea, cocoa, nuts, oils, spices, as well as certain fruits and vegetables. The marketing and consumption of organic foods are heavily concentrated in the global economic core. Although the markets are expanding, the costs of organic production are likely to remain relatively high.