

6 – THE AGRICULTURAL AND INDUSTRIAL REVOLUTIONS

OVERVIEW

For some time, historians have hotly debated whether or not the Agricultural Revolution was truly a revolution. Although the speed at which new machines and agricultural techniques were developed was less than revolutionary, these developments revolutionized the way Europe farmed. New crops, new techniques, and new ways of organizing and managing the farmland allowed Europeans to grow more crops and livestock than they ever had before. The increase in food, combined with other factors, led to a population explosion in Europe, particularly in Britain. The Industrial Revolution, which occurred first in Britain, was revolutionary in the same way that the Agricultural Revolution was. Although the developments were at first somewhat slow, the consequences were quite dramatic. Society changed from agrarian to industrial in less than a century, and the population, which was booming, moved from the country into the cities. The combination of new agriculture and new industry carried first Britain and then the rest of Europe into the modern era.

THE AGRICULTURAL REVOLUTION

In the sixteenth century, more than three fourths of all Europeans made their living by way of agriculture. Farming was a difficult way to survive, as farmers had to deal with the often-uncooperative climate and inconsistently arable land. One of the biggest challenges facing European farmers was the low yield their land produced. (*Yield* refers to the amount of produce relative to the amount of seed planted.) The farmers needed new and innovative ways to increase the yield of their land with relatively little risk. Experimental techniques often had a high failure rate, so naturally, farmers were reluctant to try new, unproven methods of farming. Unfortunately for the earlier farmers, these low-risk innovations would not be available until the late sixteenth and seventeenth centuries. Because of the low yields, the reserves of grain ran low, and grain prices rose. In many parts of Europe during the sixteenth century, the grain reserves were completely exhausted. With grain reserves low or exhausted and the land yielding small amounts of produce, much of Europe faced famine conditions. The poor turned to famine foods such as nuts, roots, berries, and even bark as an alternative to grains. In these lean years, many people died, and many more got sick from weakness due to malnutrition. Europe desperately needed a change in its agriculture.

The most important change Europeans made in their farming techniques involved the management of their land. The traditional method of farming, which dated back to the Middle Ages, was the open field system. In the open field system, a village once owned a section of land, and that section was divided into strips. The individual farmers in the village cultivated particular strips. Even the large estates owned by the aristocratic landowners were divided in this manner. Occasionally, the land produced a very nice yield, but usually, the yield was quite meager. One of the main reasons the land produced modest crops was the depletion of the minerals in the soil by the constant presence of food crops. To remedy this, strips of land were left fallow, or unplanted. Across Europe, so much land was left fallow that the production of the land would have increased as much as 50 percent if the fallow land had been planted. The Dutch developed a method for rejuvenating soil and still maintaining high levels of yield. They planted crops in the fallow fields that actually replenished the soil's nutrients. At first, peas and beans were used, and then new crops, such as turnips, potatoes, and clover, were introduced. These crops were rotated every year or every few years to prevent soil exhaustion.

The impact of this new method can hardly be overemphasized. By eliminating fallow land, farmers increased the total amount of land that could be cultivated and improved the quality of the land on which they were planting crops. The better-quality soil meant a higher yield, and this, in turn, meant a larger amount of food was available for the farmer and his family. In some cases, rather than food, a fodder crop was planted in the field that was once left fallow. The fodder could support increased numbers of livestock, and more livestock meant more manure. More manure meant more fertilizer for farmland, and this cycle greatly increased the production of both crops and livestock.

In addition to pioneering new farming techniques during the sixteenth and seventeenth centuries, farmers in the Low Countries, or what is now Belgium and the Netherlands, began the development and employment of new and improved ways of building dikes and irrigation canals. The Dutch also invented methods of creating farmland by draining swamps, marshes, and wasteland. The Dutch engineers became so famous that English landowners employed them to drain English wastelands. One of the most famous of these Dutchmen was Cornelius Vermuyden who drained nearly 40,000 acres of English land in the seventeenth century. In

1701, Jethro Tull (1674-1741) invented a new drill that planted seeds in a row. No longer did farmers have to sow their seeds by casting them by hand and risking the loss of seed to birds. Tull believed it was very important for air and moisture to reach the roots of plants, and he developed a hoe to help with that task.

Tull's methods reduced the need to leave fields fallow because his new method permitted cultivation between the rows, thus increasing the amount of food that could be produced by a given plot of land. Tull also advocated the use of horses instead of oxen to pull plows.

Charles "Turnip" Townsend (1674-1738) also contributed to the agricultural revolution in England. He advocated the use of the turnip as a new crop in England and was said to have talked incessantly of the turnip, hence his nickname. Townsend experimented with turnips in crop rotation along with wheat, barley, and clover. These crops actually helped replenish the soil's nutrients, thus reducing the need to leave fields fallow. The introduction of the potato and maize, or corn, combined with the English agricultural developments greatly increased the amount of produce that was available for consumption.

Robert Bakewell (1725-1795), also an Englishman, developed new breeding techniques that led to greater milk and meat production. Advancements in animal husbandry led to an increased amount of meat that was available for consumption by the lower classes. This new, improved diet led to longer lifespans and better health for the people of Europe.

The next step taken by Europeans was the enclosure, or actual fencing off, of land. This practice was generally advocated by the large landowners, especially in Britain. Because Parliament primarily consisted of the landed nobility, Parliament passed a series of enclosure acts that fenced off much of Britain. The enclosure of the land was expensive because of the surveying and fencing that was involved. Although the large landowners absorbed much of the cost, many peasants were required to shoulder the financial burden as well. Many of the peasants could not afford their share. Some of the landless peasants were removed altogether from the land worked. These landless peasants became wage laborers on the new, larger, enclosed tracts of land. Therefore, contrary to what some historians once believed, enclosure did not always force people off the land completely. The enclosure of the land allowed large landowners to employ new and innovative farming techniques on a large scale. This, in turn, produced high yields on a large scale and made many landowners wealthier than they ever had been before.

THE POPULATION EXPLOSION

The population of Europe grew tremendously in the eighteenth century, and the population growth continued at a high rate until the twentieth century. The primary reason for the rapid increase in population was the decrease in the death rate. The decrease in the death rate occurred not only for adults but also for children. In addition, the newborn and infant mortality rate decreased during this time. Determining the cause or causes of the decreasing mortality rate has not been easy for historians to do, but they have narrowed the reasons to a few possibilities. First, the bubonic plague, or *Black Death*, virtually disappeared during the seventeenth and eighteenth centuries. Also, Europeans developed an inoculation against smallpox. No longer were Europeans at the mercy of these diseases that had ravaged the continent in the previous centuries. Across Europe, countries made dramatic improvements to their sewage and water systems. By cleaning up cities and creating more sanitary conditions, governments helped control the spread of such diseases as cholera. The importance of the increased food production, which was the result of the agricultural revolution, should not be overlooked. The addition of new and better foods to the European diet helped to improve the general health of the people. Vitamins and minerals from new vegetables and from meat bolstered their immune systems and helped them fight diseases. The large quantities of food helped protect against famine by providing reserves that could be stored. Finally, the nature of the warfare of the late seventeenth and eighteenth centuries changed. A more "gentlemanly" and "civilized" style of warfare reduced the number of casualties of war. While historians disagree about the extent to which each of these factors contributed to the population explosion, all of these factors were important.

PROTOINDUSTRIALIZATION

As the population of Europe increased during the eighteenth century, the population pressure also increased in Europe. This population pressure strained the economic resources and the economic opportunities that were available. One of the consequences of the increased population was a growing number of landless people who needed a means of survival. Many people also found themselves with the need to supplement their income. The agrarian economy could not support the increased population, and people looked for other means of economic stability. Many found the stability they sought in the cottage industry.

The cottage industry centered on the relationship between capitalist merchants, or merchants with raw materials, and rural workers. In the cottage industry, or "putting out system," the merchant, who was usually from the city, provided the rural workers with raw

materials. The workers labored in their homes and worked the raw materials into a finished product. All the members of the family participated in the manufacture of goods. At the end of each week, the merchant picked up the finished product, dropped off the next week's raw materials, and paid the workers. The workers often produced textiles, housewares, or goods that might have been used on a daily basis. This system worked because the capitalists needed finished products but wanted cheap labor. In addition, by hiring rural workers, the capitalists avoided conflicts with the guilds in the cities. The workers needed the income and were willing to accept lower wages because they didn't have to travel into the cities to find work.

This system first appeared in Britain, but it eventually spread across Europe. Across the board, the textile industry employed the most workers of all the cottage industries. The "putting out system" worked well for many years. However, in the long run, the system proved in many cases to be inefficient, and the workers were sometimes unreliable. As the efficiency decreased, the merchant capitalists sought new and better ways to produce their goods. The cottage industry began to shift towards full-blown industrialization.

THE INDUSTRIAL REVOLUTION

Just as the cottage industry had done, the Industrial Revolution occurred first in Britain. Britain had abundant natural resources, including coal and iron, and a large body of eager workers. The ever-expanding colonial empire provided a growing market for new goods. In addition, an increasingly healthy economy allowed Britain to provide a strong domestic market for manufactured goods. The British government also allowed the economy to operate on its own and free from the rigid controls that other nations employed as a part of their economic policy. Due partly to an increase in food and a decrease in food prices, British people had more money to spend on goods that they had never before been able to afford. Therefore, the market for goods increased. The Industrial Revolution grew out of the pressure to produce more goods for an expanding market.

One of the greatest and fastest-growing markets was that of textiles. The people of Britain and those on the continent purchased wool and cotton fabrics at an unprecedented rate in the eighteenth century. To meet the growing demand for textiles, merchants searched for more efficient methods of production. What developed were new and better spinning wheels. In 1765, James Hargreaves invented a cotton spinning jenny, and about the same time, Richard Arkwright invented the water frame, a mill powered by water. With these innovations,

the textile industry took off. Textiles became cheaper, and the demand for textiles increased.

After the introduction of the jenny and the mill, textile production moved into factories. At first, people were hesitant about working in these factories, and labor shortages were prevalent. In response, factory owners turned to child labor. The children that worked in factories were there because their parents took them or because they lived in foundling institutions that exploited those in its care.

The earliest factories were placed along streams and rivers because they were powered by water. In order to move the factories to locations away from the rivers, owners needed a new way to power their operations. The answer to their problem was steam. James Watt (1736--1819) developed a number of devices that allowed steam to be used to power equipment. Watt's inventions increased the power of steam engines because they prevented great losses of steam from the engines' cylinders, thus harnessing the power of greater quantities of steam. In addition, other Watt inventions enabled the steam engines to turn wheels.

Traditionally, English refineries used charcoal to smelt iron, but by the eighteenth century, England had depleted many of its forests, the primary sources of charcoal. Therefore, England needed to find an alternative to charcoal for use in smelting iron. Englishman Abraham Darby (1677-1717) developed a method of smelting iron using coal instead of charcoal. This development allowed the mass production of iron that, in turn, greatly increased the speed of industrialization. Darby built the great Ironbridge in northwest England, the first successfully erected cast-iron bridge that demonstrated the potential of this new metal. His bridge paved the way for such architectural feats as the Crystal Palace, the structure made entirely of glass and steel that was erected for the Great Exposition in London in 1851. Henry Cort then created the puddling furnace that allowed refineries to remove large amounts of impurities from the iron, thereby creating cleaner, stronger iron. Cort also worked with large mills that produced iron in all shapes and sizes. In the seventy years after the development of steam and iron technology, Britain's iron production increased at a phenomenal rate.

The development of steam engines led to steam-powered cars and wagons. At first, these vehicles traveled on flat surfaces or along roads constructed of wooden planks. The friction created by the heavy cars on the roads reduced the efficiency of the steam power, so in 1816, the steam-powered engines began running on rails. By reducing friction, rails had been used to allow horses and people to pull cars with relative ease. The new combination of rails and steam power seemed to

hold unlimited potential. In 1825, George Stephenson rocketed from Liverpool to Manchester at a blistering 16 miles per hour on his new locomotive. The rail road, now called a railroad, unleashed the industrial beast within Britain. During the next fifty years, Britain and the rest of Europe lay railroad lines at a furious pace. These railroad lines connected all of the major cities and industrial sites and increased the speed and efficiency at which goods and passengers could be transported. The rails also reduced the cost of transporting goods, thereby boosting the economy of 311 who employed the new system.

CONSEQUENCES OF THE INDUSTRIAL REVOLUTION

The Industrial Revolution resulted first and foremost in the increased production and increased availability of goods. Manufactured goods were cheaper than the goods of pre-Industrial Europe, and, therefore, more people were able to afford them. A large market and able, willing consumers meant increased wealth for the entrepreneurs who produced these articles. The increased consumption also led to an increase in the number of available jobs. Because cities tended to grow up around the industrial area, the jobs were in the cities. Eager to work, entire families flocked to the cities by the thousands. The workers, especially the women and children, endured deplorable conditions in the factories, including extended hours with little or no breaks and dangerous machinery. As if that weren't bad enough, conditions where the workers lived were even worse. The houses and apartments were crowded, and the conditions were incredibly unsanitary. Human waste of ten leaked into basements and into the streets because of poor sewage and water systems. The streets were crowded with people who unwittingly carried and spread germs everywhere they went. These conditions led to cholera outbreaks as well as other diseases that were related to unsanitary conditions.

Some people embraced the new technology despite the poor living and working conditions that accompanied industrialization. Others, however, despised the new technology and the new problems it caused. Many people lost their jobs and were simply replaced by machines. One group, known as the *Luddites*, firmly believed that the new machines would take their jobs from them and of ten tried to destroy the machines in the factories. Another group of opponents of the new factories protested in an entirely different way. The *Romantics*, including such poets as William Blake (1757-1827) and William Wordsworth (1770-1850), wrote of the destruction of the countryside and the terrible conditions of the workers.

When laborers decided they could not deal with the new problems on their own, they began to join together as societies. These societies were the forerunners of unions. In the mid-nineteenth century, workers organized unions that lobbied for better wages and better working conditions. In 1834, after an earlier attempt at forming a union failed, Robert Owen (1771-1858) helped organize the Grand National Consolidated Trades. Eventually, laborers from many different fields were forming labor unions all over Europe. Many Europeans embraced the new unions, while others believed unions did not go far enough to help the workers. For those who sought a better solution than unions, socialism appeared to be the answer. *Socialism* was a political and economic system that encouraged the nationalization of resources, capital, and industry. The most influential of the socialists was Karl Marx (1818-1883). Marx believed that the history of society was a history full of class struggles. He believed that the capitalists were exploiting the workers of the world, the *proletariat*. Marx, along with Friedrich Engels (1820-1895), published *The Communist Manifesto*, a document in which their socialist ideas were explained. Marx argued that the workers would rise up and overthrow the capitalists in a violent struggle. Eventually, society would develop into one of communism, a classless society with no private property. Marx wanted to unite the workers of the world by creating socialist parties. In the late nineteenth century, the First International and the Second International were created as parties to unite socialists everywhere. Socialism grew into a powerful force across Europe, and its effects are still evident around the world today.

THE MAJOR PLAYERS

Thomas Malthus (1766-1834) – Thomas Malthus was born in England in 1766 where he attended Cambridge as a young man. He was one of the leading British economists of his time, although his outlook was not as optimistic as the outlooks of most other economists. In 1798, Malthus published *An Essay on the Principle of Population*. Malthus believed that the population increases faster than the food supply needed to sustain the population. Whenever there is a large gain in food production, he argued, the population soon increases and offsets the gain. According to the same principles, if the population grows too quickly, famine and disease keep the population in check. This pessimistic view of society contradicted the rather optimistic outlook of most nineteenth-century British economists. Malthus' ideas greatly influenced David Ricardo.

Robert Owen (1771-1858) – Robert Owen was born in Wales in 1771. Owen successfully

experimented with improving worker productivity by improving their working conditions. Based on the results of this experiment, Owen concluded that mankind could be improved if the living conditions were improved. He believed that the quality of an individual's character was directly related to the quality of that individual's surroundings. In another grand experiment, Owen purchased land in Illinois and Indiana where he established a commune called New Harmony. Unfortunately for Owen, the commune failed and cost him most of his life savings. A Utopian socialist, Owen helped found the first British union in 1833. Although the union ultimately failed, Owen is considered the father of the international cooperative movement.

David Ricardo (1772-1823) – British economist David Ricardo left home at the age of 14 and made his fortune before he turned 30. In 1809, he wrote *The High Price of Bullion, a Proof of the Depredation of Bank Notes* in which he advocated a currency backed by a precious metal. In 1817, Ricardo published *Principles of Economy and Taxation* in which he advocated freedom of competition. Influenced by Malthus, Ricardo believed that a growing population would lead to a shortage of productive land. He said that wages are determined by food prices, which are determined by the cost of production, which is determined by the amount of labor required to produce the food. In other words, labor determines value. This principle played a major role in the development of Marxism. During the final years of his life, David Ricardo served as a member of Parliament.

Karl Marx (1818-1883) – Karl Marx was born in Germany in 1818. He attended several colleges in Germany before he became editor of the German newspaper *Rheinische Zeitung* in Cologne. In 1843, he resigned as editor because his criticism of the current political situation was too radical and controversial. He left Germany and went to Paris. Once again, he was too radical and controversial, and he was instructed to leave Paris in 1845. Marx left Paris and settled in Belgium. Marx began the Communist Correspondence Committees in several European cities and later formed the Communist League. Marx, along with Friedrich Engels, worked on a statement of principles and beliefs for the Communist League and as a result produced the *Communist Manifesto*. They based the *Manifesto* on a materialist view of history, a view also known as *historical materialism*. The *Manifesto* said that the dominant economic system of each historical era, or epoch, determines the social and political history of that era. The *Manifesto* also said that the history of society is the history of class struggles between the exploiting class and the exploited class. The *Manifesto* went on to say that the

current (1848) exploiting class, the capitalists, would be overthrown in a violent revolution by the exploited class, the workers. Eventually, according to the *Manifesto*, a classless society would emerge.

In 1848, the year of the many revolutions in Europe, Belgium expelled Marx for fear of his revolutionary influence, and Marx returned to Germany. After being arrested and later acquitted for inciting insurrection, Marx went to London, where he spent the rest of his life. In London, Marx wrote the great work *Das Kapital*, a multi-volume history of the economy of capitalist society, some of which was published posthumously. It was in *Das Kapital* that Marx explained how capitalists exploited the working class. Eventually, the Communist League dissolved, and Marx helped form the First International in 1864. In 1871, he wrote *The Civil War in France*, an examination of the 1871 Paris Commune. For Marx, the Paris Commune served as a validation of his theories. Marx and his ideas proved to be far more influential after his death than during his lifetime. His systematic socialism is now known as *Marxism*, or *scientific socialism*. Marx's ideas were adopted by Lenin and were at the heart of Bolshevism.

Friedrich Engels (1820-1895) – Friedrich Engels was born to a Protestant family in Germany in 1820. He was strongly influenced by the writings of German poet Heinrich Heine, German philosopher G. W. F. Hegel, and German socialist Moses Hess. Engels believed that history could be explained as an economic history and that the current social situation in Europe was a result of private property. Furthermore, a class struggle could eliminate private property and would lead to a classless society. Engels met Marx in 1842, and the two realized that they shared the same views. Together, they produced the *Communist Manifesto* in 1848. He and Marx collaborated on projects, and he provided Marx with financial support while they were in England. He was a member of the First International but did not participate in the Second International. In addition to his work on the *Manifesto*, Engels wrote *Socialism: Utopian and Scientific* (1892), *Origin of the Family, Private Property and the State* (1884), and *Dialectics of Nature*, which was published posthumously in 1925.