

Simulation: How did the Three-Field System contribute to the Agricultural Revolution?

You are a medieval serf farming your plot of land – do your best to produce enough food or your family might starve this winter! (Remember, much of your food must be given to your lord!) Follow the directions below, then analyze your results.

Two-Field Rotation System Simulation (Pre-Agricultural Revolution)

Simulation background: You have a plot of land with an area of 60 acres. The growing season in Northern Europe allows you to plant two crops a year; one can be harvested before winter and one can be harvested in spring. However, planting two crops a year in the same field will deplete the soil's nutrients, so you split your field in half. One half is harvested before the winter, and the other half is left fallow (unplanted) so it can rest and regain nutrients. The next year you switch the side of the field that you harvest. Your field is the rectangle below. Each year of your harvest is represented with a different rectangle – but remember, each rectangle represents the *same field* over the course of three years.

Year 1	Year 2	Year 3

Simulation steps:

- a. Label your field's dimensions (6 acres by 10 acres). Do this for each year.
- b. Split your field in half by drawing a line. Do this for each year.
- c. Label each half with "WC" (for winter crop) and "F" (for fallow) for each year. Remember you must alternate the sides!
- d. Your winter crop is wheat. Label "wheat" on the side of the field it is planted each year. (This should be where you wrote "WC".)

Analysis:

1. How many acres of food are you harvesting each year? _____
2. You have to plow your planted area *once* per year and your fallow area *twice* a year (to keep the weeds down). How many acres of land do you have to plow each year?

3. What is the ratio of food harvested per acres plowed? _____
4. What is the basis of your diet? (What crops did you harvest each year?)

Three-Field Rotation System Simulation (Post-Agricultural Revolution)

Simulation background: You have a plot of land with an area of 60 acres. The growing season in Northwest Europe allows you to plant two crops a year; one can be harvested before winter and one can be harvested in spring. However, planting two crops a year in the same field will deplete the soil's nutrients, so you split your field in three parts. One third is harvested before the winter, the other third is harvested in the spring, and the last third is left fallow (unplanted) so it can rest and regain nutrients. Each year you rotate the third you are using. You can harvest both your winter crop and your spring crop each year.

Year 1	Year 2	Year 3

Simulation steps:

- a. Label your field's dimensions (6 acres by 10 acres). Do this for each year.
- b. Split your field in thirds by drawing two lines. Do this for each year.
- c. Label each third with "WC" (for winter crop), "SC" (for spring crop), or "F" (for fallow) for each year. Remember you must alternate the thirds!
- d. Your winter crop is what. Label "wheat" on the side of the field it is planted each year. (This should be where you wrote "WC".)
- e. Your winter crop is wheat and your spring crop is legumes (beans or peas). Label "wheat" and "legumes" where they are planted each year.
 - i. Fact: Another way of preventing soil exhaustion is to plant varying crops that take different nutrients from the soil. An advantage of planting legumes is that they take nitrogen out of the air rather than the soil, and when buried, actually replenish the soil with nitrogen. The greater variety of crops also provided people with a more balanced diet.

Analysis:

1. How many acres of food are you harvesting each year? _____
2. You have to plow your planted area *once* per year and your fallow area *twice* a year (to keep the weeds down). How many acres of land do you have to plow each year?

3. What is the ratio of food harvested per acres plowed? _____
4. What is the basis of your diet? (What crops did you harvest each year?)

Takeaway: What was the overall impact of the three-field system of farming? Which was the better method, and what were the advantages?

Developments of the Agricultural Revolution: The Heavy Plow

Read the excerpt below and examine the painting, then answer the questions.

A major development in farming was the *heavy plow* that could cut through the deep, wet, and heavy soils of Northern Europe much better than the light scratch plow. It had three basic parts: the *coulter* or heavy knife that cut through the soil vertically, the *plowshare* that cut through the soil horizontally, and the *mouldboard*, which turned the soil to one side. Some models had two wheels that acted as a fulcrum to keep the plow from getting stuck. There were two advantages to this kind of plow. First, it cut the soil so violently that there was no need for cross plowing as there was with the scratch plow. This saved time, which could be used for, among other things, clearing more land and producing more food. Second, the heavy plow created *furrows*, little ridges and valleys in each plowed row. In times of drought, water would drain into the valleys and ensure some crops would survive. In times of heavy rains, the crops on top of the ridges would not get flooded out. As a result, peasants could usually look forward to at least some crops to harvest even in bad years. The furrows the heavy plow created also meant that the fertile bottomlands by rivers could be farmed without their frequent floods doing too much damage. As with the three-field system and crop rotation, the heavy plow also fed into the feedback cycle of more food, population growth, etc.

The heavy plow had an impact on peasant society and land holding patterns. Being heavy, it required more horses to pull it compared to the oxen which pulled the scratch plow. Since few peasants could afford their own plows or horse teams, they would combine their horses and hook them to one plow. The heavy plow also created a more cooperative peasant society and caused small hamlets to combine into larger villages in order to share horse teams.

1. Give the definition and/or function of each of the following from the excerpt:

a. coulter:

b. plowshare:

c. mouldboard:

d. furrows



2. Why was the heavy plow a significant development for medieval Europe? Describe at least three impacts.

Developments of the Agricultural Revolution: The Plow Horse

Read the excerpt below and examine the medieval painting, then answer the questions.

Another development in farming was a new source of power, the plow horse. Several factors allowed the use of the horse in Western Europe. The invention of the horseshoe (c.900 C.E.) prevented the hooves of the horse from cracking in the cold wet soil. The horse collar let the horse pull from the chest rather than the neck. This increased the horse's pulling power from about 1000 pounds (with the yoke harness) to as much as 5000 pounds with the horse collar. Finally, cross breeding to make larger warhorses also provided the peasants with larger plow horses. Although it could not pull any more than an ox, the horse did have two advantages. It could pull up to fifty percent faster than the ox, and it could work one to two hours longer per day. The one drawback was that the horse ate a lot. Overall, despite eating more, the plow horse could increase farm production as much as 30 percent for those peasants who could afford horses. As with the three field system and heavy plow, this led into the feedback cycle of producing more food, population growth, and developing new lands for even more food production, etc.

There were some interesting side effects of the use of the horse. Being fifty percent faster than oxen, horses could bring food into a town from outlying villages fifty percent farther away without taking any more time than before with an ox team. Increasing the radius of the surrounding farmland supplying a town by fifty percent more than doubled the area of farmland and amount of agricultural produce available to support that town, and, subsequently, the potential size of the town itself.

1. Give the function and significance of each of the following from the excerpt:

a. horseshoe:

b. horse collar:



2. Why was the plow horse a significant development for medieval Europe? Describe the advantages, results, and side effects of its use.

Impact of the Agricultural Revolution

Read the excerpt below then answer the questions.

One of the most important consequences of the Agricultural Revolution was the migration of people from rural areas to the urban centers. Because there were now surplus crops in the country, not everyone had to grow crops for a living. Also, because the population of Europe was expanding at about 30% every century, not everyone wanted to live in the country. Many now moved to the city. Once in the city they had to find new ways to make a living and most of them began to learn a craft or skill, which led to a revival in trade in Europe. Ultimately, the Agricultural Revolution led to healthier and longer lives. It expanded the population, led to the growth of towns and cities and a dramatic increase in crafts, skills and trade in Europe.

- 1. “Demographics” refer to the specific characteristics of populations. What demographic changes did the Agricultural Revolution lead to? Why?**

- 2. Wrap it all up – Based on everything you have learned about the Agricultural Revolution, how “revolutionary” was it? Do you think it deserves the title of “revolution”? Why or why not?**
