



# FARM BIOLOGY

**Farms are the first biotech labs.** Since ancient times, farmers have used *selective breeding* to make the foods we eat more widely available and nutritious. Today, scientific developments have enabled the transfer of specific genes from one organism to another. This process is called *genetic engineering*.

The chart below shows the impact of selective breeding and genetic engineering on modern farming, including examples that improve our food supply. Discuss the chart with your class and then use the space below and the back of the sheet to compare and contrast the two methods.



Matt Fry of Fair Hill Farms in Chestertown, Md., uses an app to track his cows' genetic history.

## Part 1

Selective Breeding	Genetic Engineering
Choose parents with traits you want. These will be passed on to the offspring.	Add the gene for the trait you want into the DNA of the organism so it can be passed on to the offspring.
<b>Examples</b>	<b>Examples</b>
<p><b>1.</b> Disease-resistant wheat is created by breeding hardy wheat plants with wheat plants that have a high yield. As a result, families have better access to nutritious grains for a lower cost.</p> <p><b>2.</b> The amount of protein in milk is improved by breeding dairy cows to bulls that have high levels of protein production.</p> <p><b>3.</b> Hardy snacking apples are created when a sweet variety of apple is grafted onto the trunk of a fungus-resistant variety. This gives the benefit of higher-producing sweet apple trees that are fungus-resistant. This means more fruit for more families.</p>	<p><b>1.</b> Scientists have engineered dairy cows to produce human antibodies for viruses such as influenza and ebola. This could allow for treatment of a large number of people in a short time frame.<sup>1</sup></p> <p><b>2.</b> Scientists have created a special type of soybean that produces oil with more “healthy” fat and no trans fat, which can raise cholesterol and increase risk of heart disease.</p> <p><b>3.</b> When scientists added the genes that produce Vitamin A in carrots to white rice DNA, they created “golden rice” — a food rich in Vitamin A for countries where Vitamin A deficiency causes childhood blindness.</p>
Similarities:	
Differences:	

**Part 2** Dairy farmers use many other types of biotechnology to improve food production. How does biotechnology on dairy farms support people’s nutritional needs? Write your answer on the back of this sheet.



AMERICAN DAIRY  
ASSOCIATION  
NORTH  
EAST



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1. <https://www.technologyreview.com/2016/10/04/107551/cows-engineered-with-human-genes-could-stop-our-next-disease-outbreak/>