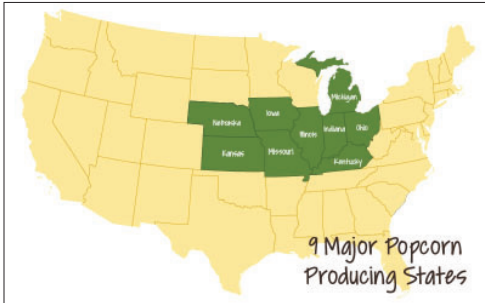


## Indiana...the Popcorn State

Do you enjoy popcorn at the movies or as a fun treat? Thank an Indiana farmer!



Indiana ranks #2 in the nation in popcorn production. In 2019, Indiana farmers planted 75,000 acres of popcorn.



Indiana produces more than 20% of the United States' popcorn supply. In a typical year, almost half of all cropland in Indiana is planted in corn.




Orville Redenbacher was born in Brazil, Indiana, and graduated from Purdue University. The New York Times described Redenbacher as “the agricultural visionary who all but single-handedly revolutionized the American popcorn industry.”



The average American eats 68 quarts of popcorn each year.

# Popcorn: FROM SEED TO SNACK


## Finally, Popcorn!



Humans consume popcorn as a versatile and nutritious snack. It's enjoyed both sweet and savory by fans around the world. One factor which makes it so popular is its nutritional value. One cup of air-popped popcorn contains 31 calories, 1 gram of protein, 6 grams of carbohydrate, 1 gram of fiber and just a trace of fat.


And, it's a favorite snack of consumers of all ages. Americans consume more than 18 billion quarts of popped popcorn each year, which equals approximately 56 quarts per man, woman and child.

## Ready to Pop




Popcorn needs heat to pop. Most popcorn will pop when the kernel's internal temperature reaches 400-460 degrees Fahrenheit. Bound within the endosperm, or starch, is moisture. When the kernel is heated, the moisture turns to steam. Because the pericarp, or hull, is hard and flinty, pressure builds up within the kernel. The starch inside the kernel becomes soft, like gelatin, and the moisture vaporizes until the pressure in the kernel reaches 135 pounds per square inch. The pressure increases until the pericarp/hull ruptures and the gelatinized starch granules puff out. The kernel literally turns inside out. The starch, or endosperm, is the white part of the popped kernel and the pericarp/hull is the darker, flaky bit at the center of the kernel.

## Processing Popcorn



Once the popcorn has dried to the optimum moisture level of 14%, it is cleaned to remove small pieces of the cob and other plant parts. Popcorn kernels are moved over a screen, which vibrates to separate the kernels from the other particles. Next, popcorn kernels go through a gravity separator, which eliminates lightweight particles such as small kernels. Once the kernels have been cleaned, they are polished, eliminating any final plant material still clinging to the kernel. The kernels are now ready to be packaged for microwave, bag, jar or bulk distribution.


## Harvest – The Fruit of the Labor!



Popcorn is mature when the stalk and leaves are brown and dry, the kernel is hard, and a "black layer," easily found by scratching away the tip of the kernel, is formed. This layer signals that the kernel is no longer requiring nutrition from the plant. Popcorn is usually harvested when the kernel has moisture content of 16%-20%. It is this moisture within the kernel which allows the popcorn kernel to pop when heated.

Popcorn is usually harvested with a combine. This is a machine which has a "corn head" which strips the ear from the stalk. The ear is then fed into the combine. The combine shells the kernels from the cob and ejects the cob out of the back of the machine. The kernels are loaded into a truck and transported to a storage bin. These bins have a perforated floor and air is forced through the floor to dry the corn to a 14% moisture level – the ideal level for popping corn. Sometimes the popcorn is harvested on the ear with a corn picker, which picks the corn on the cob without removing the kernels. The corn then dries on the cob and kernels are later removed from the ear.


## What is Popcorn?



Popcorn, like all six types of corn, is a cereal grain and originates from a wild grass. Its scientific name is *zea mays everta*, and it is the only type of corn to actually pop.


Popcorn is made up of three main components; endosperm, germ and the pericarp. The endosperm is made up of soft and hard starch granules. The endosperm is always white or yellow in color and is a carbohydrate. The function of the starch is to provide energy for the living part of the kernel, more commonly known as the "germ" or "embryo." The outer hull of the kernel is the pericarp, which is made of cellulose. The pericarp or hull is usually white or yellow in color, though the range of colors includes red, black and many colors in between.

## Breeding Popcorn Seed




Popcorn seeds are bred to produce desirable traits such as stalk strength, grain color and successful popping. Plant breeders select popcorn for genetic traits by using inbreeding. Inbreeding is taking the pollen from the tassel (male flower) from a single plant and using that pollen to fertilize the silk (female flower) of that same plant. Inbreeding leads to genetic segregation, whereby the plant breeder is able to identify, select and save the seed of desirable plants. The breeder then takes the seed and inbreeds it again, and continues to select for desirable traits. It takes eight years of inbreeding until the plant selection is stable and is no longer segregating. Finally, two inbreds are crossed together to produce a hybrid, which is then planted as popcorn seed.

## Popcorn Planting



Most of the world's popcorn is grown in the United States corn belt of Iowa, Illinois, Indiana, Kansas, Kentucky, Michigan, Missouri, Nebraska and Ohio. Each spring, farmers use a corn planter to place popcorn seeds about 1 1/2 inches deep and 6 inches apart in the soil. That's nearly 28,000 seeds per acre.

## The Growth of a Popcorn Plant



Popcorn seed will germinate in approximately seven days and emerges from the soil in 10 days. It is the moisture in the soil which dissolves important elements for the plant such as nitrogen, phosphate and potash. The popcorn roots absorb this nutrient rich moisture to "feed" the seed and cause it to germinate. When the sun shines on the new leaves, the green chlorophyll in the leaf contains water, which is combined with carbon dioxide in the air, creating sugar. The plant uses the sugar to build more leaves and roots, and eventually ears of popcorn. This process is called photosynthesis.

As the popcorn plant grows, the stalk will reach approximately eight feet in height and produce long, green leaves. Popcorn requires 18-24 inches of water during the growing season. As the plant grows, it begins to produce ears of corn, covered with a green husk. Feathery tassels form at the top of the plant and produce pollen, a yellowish powder. The ears form silks or long strands that "catch" pollen as the wind blows. This process is called pollination and allows the ears to produce kernels. Once the ears have kernels, the maturity process continues until the entire plant is dry and brown.