



# LINKS TO AGRICULTURE



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## Corn To Plastic



Corn (known as MAIZE in Latin America) is one of nature's most amazing energy storing plants. A corn seed weighs about one-hundredth of an ounce, yet this tiny seed can produce a corn plant that will grow 7 to 10 feet tall and will produce between 600 and 1,000 seeds. The "seeds" are commonly known as kernels. The kernels are arranged in rows along the ear of corn. An ear of corn may have as few as eight or as many as 36 rows, but the number of rows is always even. The kernels may be used for a variety of things or may be saved to be planted for next year's crop.

Corn is the major feed grain for animals raised by farmers. Corn is also a major ingredient in many of the foods we eat such as cereals, snack foods, and sodas. Corn can be found in chewing gum, ice cream, marshmallows, pickles, and chocolate products too. Search your cupboards and refrigerators for even more foods made with corn.

### Corn By-Products

In addition to the many food products found in the grocery store, new products are continuously being developed from corn. A **by-product** is something other than food that comes from a plant or animal. Many amazing by-products come from corn. By-products from corn include items such as toothpaste, paper, soaps, vitamins, gelatin for drug capsules, body lotion, lipstick, fireworks, cleaners, and detergents.

### Biodegradable and Renewable Resources

Corn not only provides both animals and people with food, it also has been used to develop **biodegradable** products that protect our environment. In fact, researchers have invented a biodegradable plastic made from cornstarch. Plastics made from corn will break down and not take up valuable space in our landfills.

In addition to being biodegradable, corn products are also **renewable**. This means that corn can be grown again and again, year after year. The current source of most plastic is oil, not corn. This oil based plastic does not break down or disintegrate, so it takes up landfill space. Plastic made from oil is also non-renewable. Once the oil reserves are depleted, they will be gone forever because we can not make more oil.

Environmentally friendly packing peanuts are made with over 95% cornstarch. They are used to fill packages and have the benefits of being light weight, shock absorbing, and totally biodegradable. Another environmentally friendly by-product from corn is ethanol, a high performance fuel. It is safer for our environment because it burns cleaner and pollutes less than petroleum fuels. Since ethanol is made from a renewable resource, it can be replenished. Ethanol saves nonrenewable petroleum and makes us less dependent on oil from other countries. Researchers continue to discover new ways to use corn - a natural, biodegradable, renewable resource.





## What did You Learn?

1. What is a by-product?

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2. List three by-products of corn.

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3. What are the disadvantages of plastics made from oil?

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4. Why might plastic made from corn be a good substitute for plastics made from oil?

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5. What are the benefits of ethanol?

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## Farm Facts

◇ A pound of corn has approximately 1,300 kernels.

◇ There are more than 3,500 food uses of corn.

◇ Corn is grown on every continent except Antarctica.



◇ One acre of corn produces 300 gallons of ethanol.

◇ Ethanol reduces the demand for foreign oil by 100,000 barrels a day.

◇ Farmers in the United States grew more than 91.7 million acres of corn in 2019.



◇ In 2019, one-third of the corn produced in the United States was used to feed livestock. One-third was used to make ethanol fuel. The rest was used to make food and by-products for people.



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# Career Corner



**Biological Engineer** - Biological Engineers use Mother Nature as a tool in creating useful means that enhance everyday life. Bio-Engineers work to better the natural world through renewable resources and proper management of the environment.

### How Biological Engineers Benefit Agriculture:

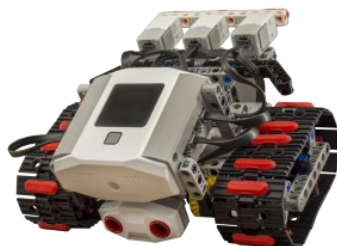
- They help manage agricultural run-off
- Design tractors and harvesters

### Biological Engineers Study:

- Physics
- Math



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## Ooey, Goey Glop!



Using only cornstarch and water, this amazing mixture behaves like a solid and a liquid at the same time. By the end of the activity, you will have your hands on, in, and all over this wonderful solid-liquid-like mess.



1. Measure 3/4 cup of cornstarch into a container.
2. If you want your **glop** to be colored, add several drops of food color to ¼ cup of water.
3. Then gradually add the water to the cornstarch.
4. Stir well (this will take some time and energy).
5. Add small amounts of more water or cornstarch until you get a mixture which '**splits**' when you quickly scrape your finger through it AND THEN '**melts**' back together again. (See disposal message at bottom of the page)
6. Pour it onto a plate. Notice its unusual consistency. Stir it around with your finger, first slowly and then as fast as you can. Skim you finger across the top of the glop. What do you notice? Slap the liquid glop as hard as you can. What happens? Does it splash? Why does the glop behave in this manner? What causes it to feel like something solid when you squeeze it, yet it flows like syrup as it drips off your finger?

### How does it work?

How does glop act like a solid some times and a liquid at other times? Actually, glop is an example of what is called a Non-Newtonian fluid - a fluid that defies Isaac Newton's law of viscosity. All fluids have a property known as viscosity. It is the measurable thickness or resistance to flow in a fluid. Honey and ketchup are liquids that have a high viscosity or resistance to flow.

Newton stated that the viscosity of a fluid can be changed only by altering the fluid's temperature. For example, motor oil or honey flows more easily when you warm it up and becomes very thick when it gets cold. So, a Non-Newtonian fluid has the same dependence on temperature, but its viscosity can be changed by applying pressure. When you squeeze a handful of glop, its viscosity increases, so it acts like a solid for a split second. When you release pressure, the glop behaves just like a liquid.

**IMPORTANT Disposal Message:** You must **NOT** pour this mixture down the drain. **It will clog the pipes and the drain.** Pour the mixture into the garbage.



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