"CORN FOR ENERGY" FACT SHEET

1. We use energy to heat our homes and power our cars, buses, airplanes, and other kinds of transportation.

2. Plants (like corn) can be converted into BIOENERGY! They can be made into liquid, gaseous or solid fuels.

3. Ethanol is a fuel for cars that can be made from corn.

4. Blending ethanol in gasoline helps stretch the supply of fossil fuels, so that supply will last longer.
   - Blending 10 percent ethanol with gasoline is called E10. ALL car manufacturers warranty their engines to use E10!
   - Blending 85 percent ethanol with gasoline is called E85. Cars, vans, and pickups that are designed for E85 are increasingly available. They can operate on conventional gasoline.

USE CORN FOR ENERGY BECAUSE IT IS A RENEWABLE RESOURCE!

1. Corn is a renewable resource. That means we can grow more if we need more.

2. Fossil fuels are a diminishing resource. That means the world can run out of them. The faster that people use fossil fuels, the faster the world will run out.

USE CORN FOR ENERGY BECAUSE IT IS HEALTHIER. IT IS CLEANER FOR THE ENVIRONMENT!

1. When plants were fossilized billions of years ago (this is where the term fossil fuels comes from), the oxygen was squeezed out and foreign minerals like mercury and sulfur were squeezed in. Those minerals pollute the environment and endanger human health when fossil fuels are used.

2. Gasoline is a complex mixture of hundreds of hydrocarbons that are produced at a petroleum refinery.

3. Ethanol is a simple chemical. It is fermented from corn kernels, like wine is fermented from grapes.

   - To stop ethanol from being used as an alcoholic drink, a petroleum-derived chemical is added to it.
   - Do not confuse "ethanol" with "methanol" which is made from natural gas or coal.

4. If you add oxygen to fuel for cars, it helps the engine burn the fuel more completely. It doesn't need as much oxygen from the air to burn cleanly.
   - Ethanol is called an "oxygenate" because it contains 35 percent oxygen by weight.

5. About 100 major cities in the United States suffer from unhealthy levels of carbon monoxide and low-level ozone in the air around the city. Much of this pollution comes from auto exhaust. This pollution can damage your lungs.
   - Ethanol reduces the pollution caused by carbon monoxide exhaust by 17-33 percent.
   - Ethanol mixed with gasoline helps cities clean their air to meet the standards set in the Clean Air Act Amendments of 1990. In Denver, a law requiring a minimum of 1.5 percent oxygen content resulted in a 9 percent reduction of carbon monoxide in one year. The next year, the law required a 2 percent oxygen content, and the carbon monoxide levels in the air were reduced 12 percent.

6. Growing corn can help reduce the "greenhouse effect," or "global warming."
   - "Global warming" is the result of certain gasses trapping radiation in the atmosphere. Carbon dioxide (CO2) is the most common of these gasses, contributing about 50 percent of the problem.
   - Petroleum usage accounts for about 40 percent of all U.S. CO2 emissions.
   - Corn breathes in CO2, and removes it from the atmosphere. An acre of corn will use up about 25 metric tons of carbon in the form of CO2.
   - Ethanol does not add more carbon to the atmosphere. In fact, since ethanol is made from corn, it actually reduces CO2 in the air. Therefore, increased use of ethanol will partially offset the global warming effect of burning gasoline.

USE CORN FOR ENERGY BECAUSE IT IS GOOD FOR OUR NATIONAL SECURITY!

1. Corn is a resource grown in our own country.

2. About 50 percent of the oil used in the United States is imported from other countries. That makes our country dependent on other countries, like those in the Persian Gulf, for our fuel. The United States spends a lot of money for the military to protect those foreign sources of fuel.
   - The U.S. has only 4 percent of known world oil reserves, but consumes 33 percent of the total.
   - Foreign oil imports are the largest component of the United States' trade deficit.
   - If control of the Persian Gulf were lost, oil supplies in the U.S. would run out in 14 years.

USE CORN FOR ENERGY BECAUSE IT IS GOOD FOR THE ECONOMY!

1. Each 100 million bushels of corn used to produce ethanol creates 2,250 new jobs.

2. Ethanol adds 30 cents to the price a farmer receives for every bushel of corn. This helps the farm economy.

USE CORN FOR ENERGY BECAUSE IT IS EFFICIENT!

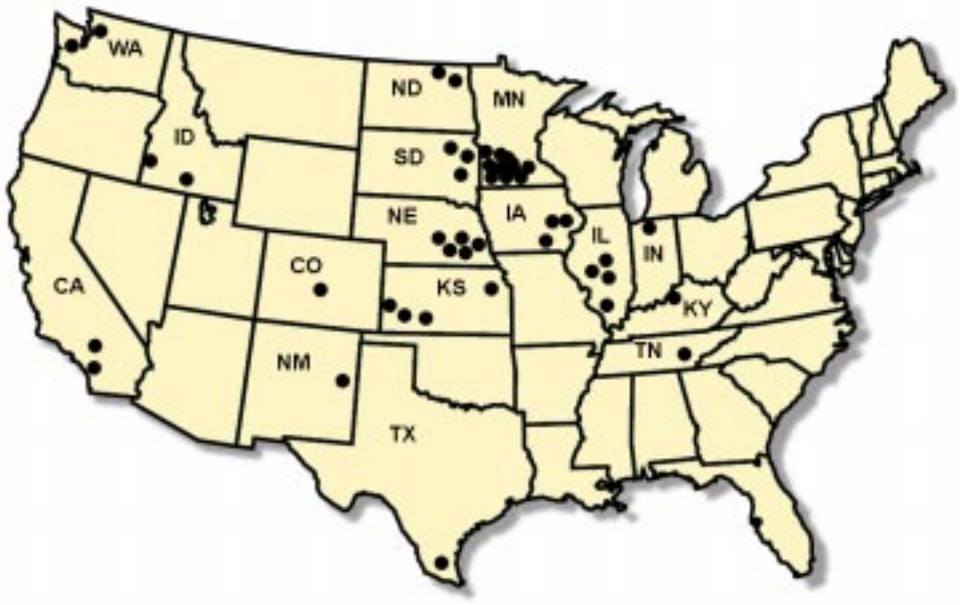
1. Production of ethanol is energy efficient. It yields over 25 percent more energy than is used in growing the

corn, harvesting it, and refining it into ethanol.

2. You can get both food and fuel from the same kernel of corn. Only the starch in corn is used to make ethanol. All the vitamins, minerals, protein, and fiber, along with some of the energy, can still be used to feed people and animals.

The State of Ethanol Use

Company	Feedstock	Location	Mil/Gal Per year	Company	Feedstock	Location	Mil/Gal Per Year
A.E. Stanley	corn	Louden, TN	45.0	J.R. Simplot	potato waste	Caldwell, ID Burley, ID	6.0
AGP	corn	Hastings, NE	45.0	Jonton Alcohol	corn	Edinburg, TX	1.1
Agri-Energy, LLC	corn	Luverne, MN	12.0	Kraft, Inc.	cheese whey	Melrose, MN	3.0
Alchem	corn	Grafton, ND	10.5	Kor Ethanol	wheat	White, SD	1.0
Al-Corn	corn	Claremont, MN	15.0	MMI/ETOH	brewery waste	Golden, CO	1.5
Archer Daniels Midland	corn	Cedar Rapids, IA Clinton, IA Walhalla, ND Decatur, IL Peoria, IL	750.0	Midwest Grain Products	corn/wheat starch	Pekin, IL Atchinson, KS	108.0
Broin Enterprises	corn	Scotland, SD	7.0	Minnesota Clean Fuels	waste sucrose	Dundas, MN	1.5
Cargill	corn	Blair, NE Eddyville, IA	100.0	Minnesota Corn Processors	corn	Columbus, NE Marshall, MN	110.0
Central Minnesota	corn	Little Falls, MN	15.0	Minnesota Energy	corn	Buffalo Lake, MN	12.0
Chief Ethanol	corn	Hastings, NE	30.0	Morris Ag Energy	corn	Morris, MN	8.0
Corn Plus	corn	Winnebago, MN	17.5	New Energy Corp.	corn	South Bend, IN	85.0
CVEC	corn	Benson, MN	17.0	Pabst Brewing	brewery waste	Olympia, WA	.7
ESE Alcohol	corn	Leoti, KS	1.1	Parallel Products	food and beverage waste	Rancho Cucamonga, CA Louisville, KY	10.0
Ethanol2000	corn	Bingham Lake, MN	15.0	Pro-Corn	corn	Preston, MN	10.0
Georgia-Pacific Corp.	paper waste	Bellingham, WA	3.5	Reeve Agri-Energy	corn/milo	Garden City, KS	10.0
Golden Cheese Co. of California	cheese whey	Corona, CA	2.8	Vienna Correctional	corn	Vienna, IL	.5
Heartland Corn Products	corn	Winthrop, MN	16.0	Williams Energy Services	corn	Pekin, IL	130.0
Heartland Grain Fuel	corn	Aberdeen, SD	8.0				
High Plains Corp.	milo/corn	York, NE Colwich, KS Portales, NM	68.0	Total U.S. Ethanol Production Capacity			1,677.0



1. How many states produce ethanol? _____*(Answer: 16)*

2. Which company produces the most ethanol? _____*(Answer: ADM)*

3. How much more ethanol plants does South Dakota have than Wisconsin? *(Answer: 3)*

4. How many ethanol plants are there in the US? *(Answer: 49)*

5. What can be used to make ethanol? *(Answer: corn, paper waste, chees whey/milo, potato waste, wheat, brewery waste, waste sucrose, beverage waste)*

RECIPES FOR CORN THAT BOUNCE AND STRETCH!

Recipe One: "Oobleck"

1. Place 4 teaspoons of cornstarch in a shallow dish.
2. Add 2 teaspoons of water.
3. Stir slowly, then stir quickly, then slowly, to observe the behavior of this product.

Teacher's note: This recipe results in a material that acts like a solid if it is stirred quickly, and like a liquid if stirred slowly. This is because amylopectin, — the polymer found in cornstarch — is a branched polymer, with chains branching off each other, not a single straight line like the chain of beads. When stirring quickly the molecules cannot rearrange themselves quickly enough to let the spoon go through easily. The branched nature of the polymer slows down the rearrangement. Think of this analogy: It's not too difficult to walk or run through a crowded hallway. But if all the people in the hallway are holding their arms straight out, it will be much more difficult to run than to walk. The ratio of water to starch is critical. If there is too much water, the starch will always flow easily, but if there is not enough water, the mixture will never flow easily.

Recipe Two: "Homemade Plastic"

1. Place 2 tablespoons of cornstarch in a re-sealable plastic bag.
2. Add 2 tablespoons of water.
3. Add 4-5 drops of corn or other vegetable oil.
4. For additional effect you may add 2-3 drops of food coloring.
5. Zip the bag closed and knead the bag for several minutes to mix.
6. Unzip a small opening in the top (to vent) and place in a microwave oven on high for 30-40 seconds.
7. Remove the bag and open as soon as it is cool to the touch.
8. Roll into a ball, and enjoy…

Recipe Three: "Goop for a Group"

Combine:
1 ½ cups cornstarch
2 cups baking soda (1 lb. Box)
1 ¼ cups water

Mix well. Do not cook! Add tempera or food coloring to water if color is desired.
Teacher's note: Watch the fascination on student's faces as they watch the ball they have just made become a glob oozing through their fingers!

POLYMERS

Here is a list of familiar things that are made of polymers. Circle the ones you consider "plastic." How many do you think could be made using cornstarch? *(Answer: all of them!)*

Teflon™

Gum

Telephone

Sandwich Bag

Milk Jug

Laundry Basket

Tupperware™

Food Wrap

Shower Curtain

Silly Putty™

Carpet

Styrofoam™ Cups

Jell-O™

Disposable Diapers

Calculator Keys

Garbage Bags

Basketball

Toothbrush

Rain Coat

Squeeze bottles