

The Biofuels Story - Script

Instructions: Post the pictures as you tell students the story. You can tell the story in your own words, read the story from the script, or have the students read the script aloud.

1. Once upon a time in the land of corn, there lived people who like to move things. They moved themselves around town and across the country in cars and planes. They moved the things they bought and ate in trucks, planes, and ships.
2. All of these vehicles needed fuel.
3. Initially the fuels for these vehicles such as gasoline were made from fossil fuels - petroleum or crude oil that came from underground.
4. When the fuels were burned in the engines of the vehicles, one of the substances produced was carbon dioxide. And that turned out to be a problem.
5. The CO₂ ended up in the atmosphere where it acted as a greenhouse gas. Trapping heat and contributing to global climate change.
6. But what if we could use the carbon from carbon dioxide already in the atmosphere to make fuel? That way we would be recycling carbon dioxide in and out of the atmosphere rather than adding new carbon dioxide produced from burning fossil fuels.
7. It turns out we already know how to do that. With the help of plants. Plants can take carbon dioxide from the atmosphere and turn it into plant material through the process of photosynthesis. People can turn the plant material into ethanol, which can be mixed with gasoline and used in cars.
8. In the US, the land of corn, the plant of choice is corn. We use corn kernels to make ethanol.
9. The kernels of corn are made primarily of starch.
10. Starch is a polymer of sugar.
11. We use heat and the enzyme, amylase to break the starch polymer down to individual sugar molecules.
12. Then we use yeast to ferment the sugar producing ethanol and carbon dioxide.
13. We distill the fermentation mix to get ethanol that is pure enough to use in fuels.
14. Today in the US most gasoline contains 10-15% ethanol made from corn. Sounds good, right?

15. But there is still a problem. Corn is the basis for much of the human food chain. We don't have the capacity to grow enough corn for food and fuel. Approximately 30% of U.S. corn grain is converted into fuel.
16. But what if we could make ethanol from other plants or other parts of plants that we don't use for food?
17. For example, what if we could use corn stover – the cob, leaves, and stalk from corn plants?
18. Like most plant material, the main component of stover is cellulose. Like starch, cellulose is a polymer of sugar, so both starch and cellulose can be sources of sugar for fermentation.
19. Unfortunately the cellulose is bound to other molecules in the cell walls and can't be reached by most enzymes and hard to access.
20. To expose the cellulose, the plant material is heated with ammonia under pressure. When the pressure is released, the ammonia evaporates off and can be reused. The result is to explode the cell wall.
21. Then the plant material can be treated with enzymes
22. that break down the cellulose into individual sugar molecules
23. Then we use yeast to ferment the sugar producing ethanol and carbon dioxide.
24. We distill the fermentation mix to get ethanol that is pure enough to use in fuels.
25. So this process of making ethanol from plant material is the hope for the future of Corn Land. It is still too expensive a process to be widely used, but scientist and engineers at the Great Lakes Bioenergy Research Center are working on making the process more efficient.
26. In addition to corn stover, scientists and engineers are exploring using a wide range of non-food plants to make biofuels more sustainably.
27. Perennial crops like switchgrass, prairies or poplar trees, grow back year after year without replanting. They can also on poor soils not suitable for food crops like corn.
28. The plant material from these crops is similar in chemical composition to corn stover and can be converted to biofuel through the same steps.
29. The goal is to produce ethanol in a sustainable, cost-effective way, so that vehicles can be fueled with biofuels and we can avoid the use of fossil fuels and slow the increase in carbon dioxide levels in the atmosphere.