Passage 1: Biofuels: The Ultimate in Recycling

by Jeanne Miller

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Will there come a day when you can use the oil that your egg roll was fried in to power your car? How about the potato peels left over from making instant potatoes? . . .

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In fact, that day already has come. Facilities that convert organic matter, called *biomass,* into clean-burning fuels are more and more often choosing to use waste products from other processes to produce *biofuels*.

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Ethanol and biodiesel are the most common biofuels, and they provide environmentally friendly alternatives to gasoline and to petroleum diesel fuel. Best of all, using surplus materials to produce biofuels solves another big problem: what to do with all the waste we generate.

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Ethanol, an alcohol, is produced after yeast or microbes break down a plant's sugars and starches. Combined with gasoline, it adds oxygen to the car engine's combustion process, allowing the fuel to burn more cleanly. A company in Idaho makes ethanol using potato waste from a nearby potato processing plant. A cheese factory in California makes it from unused whey.[1] Almost anything that ever grew can be processed to make ethanol.

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Biodiesel, made from chemically altered plant oil or animal fat, is an alternative to petroleum diesel and will work in any diesel engine. When used as a substitute for petroleum, it reduces total air pollution by more than 50 percent and cancer-causing substances in the exhaust by 94 percent. About half of the biodiesel that's produced in this country is made from used vegetable oil.

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Most intriguing of all is the oil produced by a machine developed by Changing World Technologies that uses a thermal depolymerization process (TDP) to take materials apart at the molecular level. The machine was designed to turn almost any waste product into high-quality oil, pure minerals, and clean water. It applies heat and pressure, the same forces nature employed to turn ancient vegetation into fossil fuels.

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However, what took nature thousands or millions of years takes this machine a couple of hours. The company's Philadelphia plant has been operating for four years, taking in waste of all kinds: turkey innards, tires, city garbage, muck dredged up from the harbor, medical wastes. What comes out is light oil, gas, and minerals, all pure and harmless. A larger TDP plant in Carthage, MI, expects to turn 200 tons of daily turkey-processing waste from the Butterball factory just down the road into 10 tons of gas; 21,000 gallons of water; 11 tons of minerals; and 600 barrels of petroleum and other oil. More plants are planned.

8

Although producing biofuels generally costs more than pumping petroleum out of the Earth, the added cost is offset by many benefits. These alternative fuels provide energy without harming our environment and depleting our country's resources. They offer the added bonus of solving our solid waste problems. It's a good deal for Planet Earth!

[1]whey: watery part of milk after curds have formed and separated

Passage 2: Biofuels: Fuel for the Future or Foolishness?

by Betty J. Pfeiffer

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The United States is providing funds for the development and use of alternative fuels that will:

- provide energy that is sustainable (won't run out)
- reduce greenhouse gas (GHG) emissions
- reduce our dependence on foreign sources of energy.

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Ethanol produced from corn is receiving the most attention, and the most money, from the government—but ethanol accomplishes none of the three goals!

Unfriendly Ethanol

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The problem with corn ethanol is that it takes about the same amount of fossil fuel to produce an equal amount of ethanol. This leaves us with no net gain in the reduction of carbon emissions, or our use of fossil fuel. . . .

12

But there are more problems with corn ethanol.

13

Corn requires more fertilizer to grow strong and healthy than any other major crop. About 40 percent of all nitrogen fertilizer used for growing our crops is used for corn, and the fertilizer is almost all fossil energy.

14

In spite of over 1,000 uses we have for corn and corn byproducts, about 20 percent of corn grown in the United States is now used to produce ethanol, up from 6.5 percent in 2000. . . .

Beyond Ethanol

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Fortunately, many others are looking for different solutions. Dr. David Tilman has led a research group at the University of Minnesota (UMN) studying the use of prairie grasses as biofuel since 1994. The researchers have had exciting results!

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These grasses can be grown on land that is too poor to grow anything else, saving the good land to grow food crops. They are *perennials*, meaning they grow back each year without replanting, so the farmer doesn't have to till the field. Without tilling, all the carbon the plants store in their roots stays there, rather than going back into our atmosphere.

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This type of biomass is renewable (inexhaustible), almost without human effort. By growing mixtures of various plants together, energy yields were 238 percent greater than if just one type of grass was grown.

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The prairie grasses were made into fuel without using gasoline, oil, or coal.

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As an added bonus, the grassland biofuel is carbon negative because the plants sequester[2] more carbon dioxide in their roots than is released during the production of the biofuel.

[2]sequester: to seize or separate

1. How does the author of Passage 1 show that biofuels help with waste management?
    a. She names some of the things biofuels can be made from.
    b. She describes the impact of companies that make biofuels.4She describes how machines produce biofuels in efficient ways.
    c. She explains how biofuels reduce toxic chemicals in the environment.

2. What is the meaning of the word organic as used in paragraph 2 of passage 1?
    a. Not produced in a factory
    b. Coming from living things
    c. Making energy naturally
    d. Chemical-free

3. The following question has two parts. First, answer part A. Then, answer part B.

    Part A
    What is the position of the author of Passage 1 regarding the use of biofuels?
    a. Newer biofuels have the ability to generate more power than traditional biofuels.
    b. Biofuels provide solutions to issues of waste management and limited energy.
    c. Nearly any biological material or waste product can produce biofuels.
    d. Biofuel production mimics a natural process with faster results.

    Part B
    Which detail from Passage 1 supports the response in Part A?
    e. "A company in Idaho makes ethanol using potato waste from a nearby potato processing plant. A cheese factory in California makes it from unused whey." (paragraph 4)
    f. "When used as a substitute for petroleum, it reduces total air pollution by more than 50 percent and cancer-causing substances in the exhaust by 94 percent." (paragraph 5)
    g. "Most intriguing of all is the oil produced by a machine developed by Changing World Technologies that uses a thermal depolymerization process (TDP) to take materials apart at the molecular level." (paragraph 6)
    h. "Although producing biofuels generally costs more than pumping petroleum out of the Earth, the added cost is offset by many benefits." (paragraph 8)

4. This question has two parts. First, answer part A. Then, answer part B.

    Part A
    Select the meaning of the word thermal in paragraph 6 of Passage 1.
    a. Having to do with biological matter
    b. Having to do with waste management
    c. Having to do with heat or temperature
    d. Having to do with breaking down matter

Part B

Select the phrase from the passage that **best** supports your answer in Part A?

Most intriguing of all is the oil produced by a machine developed by Changing World Technologies that uses a thermal depolymerization process (TDP) to take materials apart at the molecular level. The machine was designed to turn almost any waste product into high-quality oil, pure minerals, and clean water. It applies heat and pressure, the same forces nature employed to turn ancient vegetation into fossil fuels.

5. How does the author of Passage 1 respond to the negative view of biofuels?
    a. By showing that positive outcomes justify any costs
    b. By pointing out that the argument is unsupported
    c. By emphasizing the lack of other options
    d. By presenting only one side of the issue

6. How does the author of Passage 2 lead the reader to think negatively about corn ethanol production?
    a. By listing the guidelines for government-approved alternative fuels
    b. By focusing on how the use of corn ethanol affect individual consumers
    c. By implying that government support for corn ethanol is politically motivated
    d. By providing data about the environmentally unfriendly aspects of ethanol production

7. In Passage 2, the author argues that corn ethanol production takes the focus away from important food production. Select the sentence below that supports this claim.

    11 The problem with corn ethanol is that it takes about the same amount of fossil fuel to produce an equal amount of ethanol. This leaves us with no net gain in the reduction of carbon emissions, or our use of fossil fuel. . . .

    12 But there are more problems with corn ethanol.

    13 Corn requires more fertilizer to grow strong and healthy than any other major crop. About 40 percent of all nitrogen fertilizer used for growing our crops is used for corn, and the fertilizer is almost all fossil energy.

    14 In spite of over 1,000 uses we have for corn and corn byproducts, about 20 percent of corn grown in the United States is now used to produce ethanol, up from 6.5 percent in 2000. . . .

8. Read the following sentence from Passage 2.

    "This type of biomass is renewable (inexhaustible), almost without human effort." (paragraph 17)

    Explain why the phrase "almost without human effort" is an important point in the author's argument.

9. Fill out the table to indicate which passage makes each inference listed. Some inferences may apply to both passages.

	Passage 1	Passage 2	Both
Ethanol can be produces from a number of sources.			
Some biofuels present more advantages than others.			
Cost is not the only thing to consider when choosing biofuels.			
Current biofuel technology is not poised to replace current sources.			