



Biofuels

Idea: Introduce this issue about biofuels by explaining the difference between renewable and nonrenewable resources. Discuss with the students that living things aren't just people and animals; plants also are living things and are considered renewable resources. Ask the students to brainstorm why renewable resources are beneficial to our environment.

Answers to renewable resources list:

- | | | |
|-----------|-------------|------------|
| Soybeans | Coal | Straw |
| Petroleum | Rocks | Corn |
| Grass | Corn Stalks | Water |
| Canola | Gold | Vegetables |

The above products come from plants, while petroleum, rocks, gold, coal and water can't be replenished.

Crops for Fuels

Idea: Have students look on the North Dakota Agricultural Statistics Service website at www.nass.usda.gov/nd/ to find how much corn, soybeans and canola is raised in the county in which they live. Draw bar charts to illustrate.



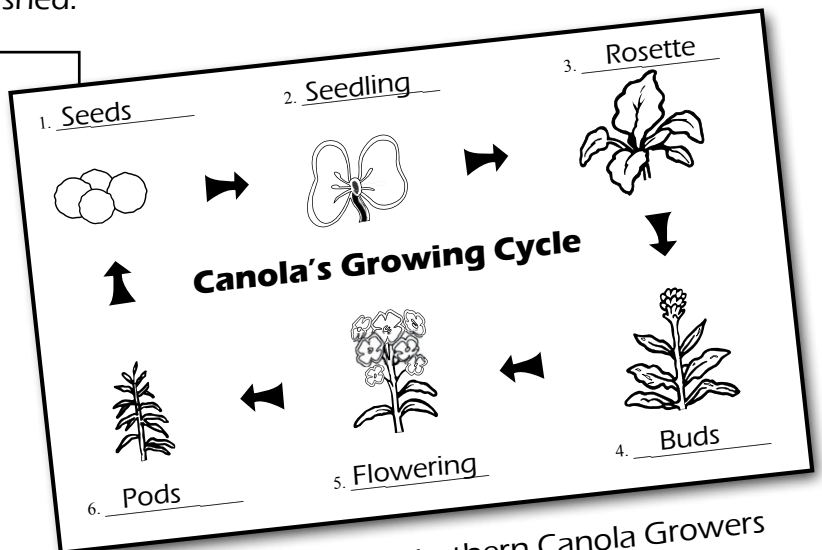
CANOLA



SOYBEANS



CORN



Idea: Check out the Northern Canola Growers Association's website with kids information at www.northerncanola.com/kids. For a copy of "Canola: North Dakota's Sunshine on the Prairie," contact scoleman@ndpci.com.

How Ethanol Is Made

- 11** The trucker hauls the ethanol to gas stations across the region.
- 3** The farmer harvests the corn.
- 12** Your mom and dad fill up their flexible-fuel vehicle with E85 at your local gas station.
- 7** Enzymes are added to the mash to convert it into a sugar.
- 1** The farmer buys corn seed from the elevator.
- 10** After fermentation, the mixture is put through distillation columns, where the ethanol is separated out.
- 6** Water is added to the flour to form a mash.
- 2** The farmer plants the seed.
- 8** The mash is put into a high-temperature cooker to help convert starches to sugar.
- 9** The mash is taken out of the cooker and transferred into a fermenter, where it stays for 40 to 50 hours.
- 4** The farmer hauls the corn to the ethanol plant.
- 5** The corn is ground into flour.

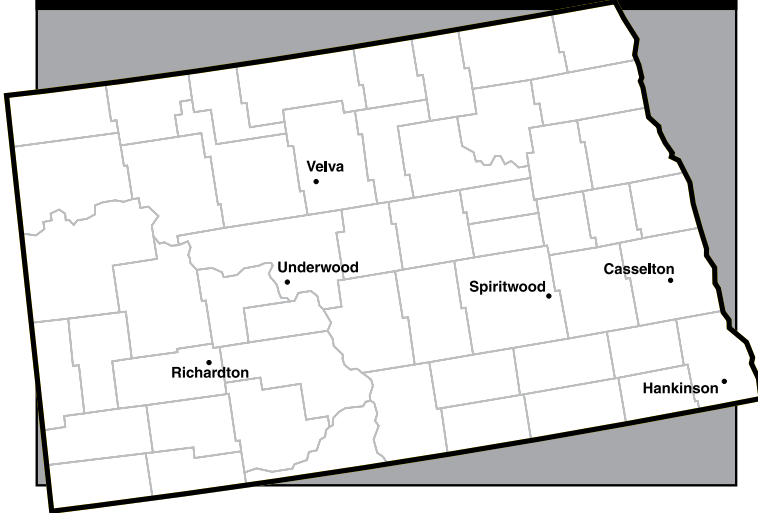
Idea: Split the students into small groups. Have each group draw one step in the corn to ethanol process. When they are done, help them determine in which order the pictures should go.



Gas vs. Diesel

When you pull up to the pump with adults, do you know if it is gas or diesel they are pumping into the tank? What's the difference? You may not think it matters, but if you accidentally put gas into a diesel vehicle, the engine will get so dry it will burn up. Gas is a more refined (pure) fuel than diesel. This means that most of the oil is taken out of gas, while the oil is left in the diesel fuel. You can't use gas in a diesel engine because gas doesn't have enough oil in the fuel to help the engine run. Diesel is a darker colored, thicker fuel, and gas is a clear, lightweight fuel. Most often, gas is run in smaller vehicles such as cars and lawnmowers, while diesel is used in larger vehicles such as trucks and tractors.

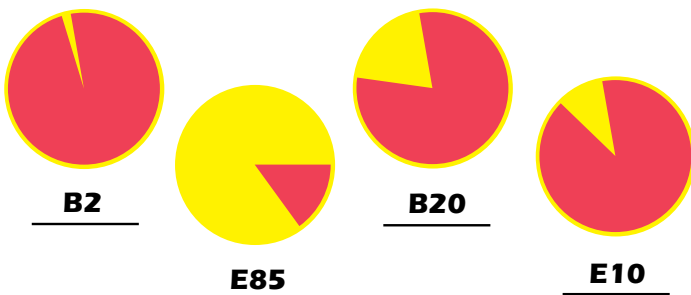
Biofuels in North Dakota



Math Challenges

1. $\$1.80/\text{gallon} \times 12 \text{ gallons} = \21.60
2. $\$2.09/\text{gallon} \times 12 \text{ gallons} = \25.08
3. $\$25.08 - \$21.60 = \$3.48$
4. $20\text{mpg} \times 12 \text{ gallons} = 240 \text{ miles}$
 $25\text{mpg} \times 12 \text{ gallons} = 300 \text{ miles}$
 $300 \text{ miles} - 240 \text{ miles} = 60 \text{ miles}$
5. $9 + 4 + 2 + 9 = 24$
 $100 - 24 = 76 \%$
6. $\$9.00 - \$3.00 = \$6.00/\text{bushel}$
7. $7.35 - 7.1 = .25 \text{ pounds}$
8. $1.5 \times 5 = 7.5 \text{ gallons}$
9. $2.8 \times 5 = 14 \text{ gallons}$

Biofuel Blends



Quiz Your Students' Biofuel Knowledge

- T F Biodiesel is a nonrenewable resource.
- F** Biodiesel is made from soybeans, canola, fats and oils that can be reproduced, rather than nonrenewable resources, such as petroleum and coal.
-
- T F Biodiesel is environment-friendly.
- T** Biodiesel has fewer harmful emissions than petroleum diesel. That means it keeps our air cleaner and is safer to breathe.
-
- T F Biodiesel and ethanol production will help the United States become less dependent on foreign countries.
- T** Today the U.S. imports more than half of its oil. By using biodiesel and ethanol, U.S. drivers can help reverse foreign oil dependence.
-
- T F Waste fats are used to make biodiesel.
- T** Biodiesel is an alternative fuel produced from vegetable oils, animal fats or oilseeds.
-
- T F Coal is a renewable resource.
- F** Coal is a nonrenewable resource because once it is used up, there is no more.
-
- T F Biodiesel and ethanol cannot be produced in North Dakota.
- F** North Dakota has the crops and some manufacturing capacity for biodiesel and ethanol.
-
- T F E85 usually costs less than gasoline.
- T** E85 does cost less than gasoline, but a vehicle will experience reduced fuel economy when using E85.

Group Activity Ideas

- Biofuel Newscast – Have the students write and conduct interviews of a farmer, a biofuel manufacturer and a person who uses biofuel in his/her vehicle.
- Write a commercial to convince people to use biofuels.
- Have the students design brochures to teach their peers and parents about biofuels.
- Have each group of students make a poster about the information they learned from this biofuels Ag Mag and present to the class.
- Have the students color and cut out a picture of their favorite car. Set up a pretend gas station with a pump that has regular gas, E85 fuel, diesel and biodiesel. Let students purchase whichever fuel they want, but they all have to purchase the same number of gallons. After they have filled their car with gas, have them calculate how much money it cost to fill their tank.

Common Core English Language Arts Standards for Reading Informational Text

Gr. 3, Standard 1: Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

Gr.3, Standard 2: Determine the main idea of a text; recount the key details and explain how they support the main idea.

Gr.3, Standard 3: Describe the historical events, scientific ideas, or steps in procedures using words to show the sequence.

Gr. 4, Standard 1: Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.

Gr. 4, Standard 2: Determine the main idea of a text and explain how it is supported by key details; summarize the text.

Gr. 4, Standard 4: Determine the meaning of general academic words or phrases in a text relevant to a Grade 4 topic.

Gr.4, Standard 7: Interpret information presented visually and explain how the information contributes to an understanding of the text in which it appears.

Gr. 5, Standard 1: Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.

Gr. 5, Standard 2: Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.

Common Core English Language Arts Literacy Standards for Writing for “Group Activity Ideas” on Teacher’s Guide page 4

W.4.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

W.4.4 Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.

W.4.7 Conduct short research projects and build knowledge through investigation of different aspects of a topic.

W.4.9 Draw evidence from literary or informational text to support analysis, reflection, and research.

ND Math Standards and Benchmarks

4.4. OA Operations and Algebraic Thinking:

Use the four operations with whole numbers to solve problems.

4.4. NBT Number and Operations in Base Ten:

Fluently add and subtract multi-digit whole numbers using the standard algorithm.

4.5. NBT Number and Operations in Base Ten:

Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations.

4.4. MD.5a Geometric Measurement: An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through $1/360$ of a circle is called a “one-degree angle,” and can be used to measure angles.

ND Math Standard and Benchmark for activity in Teacher’s Guide p.1 entitled, “Crops for Fuel”

3.3 MD Measurement and Data: Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs.

Science Standards and Benchmarks

Standard 3: Students understand the basic concepts and principals of physical science, 4.3.2. Properties of Matter: Explain the relationship between the mass of an object and the sum of its parts.

Standard 3: Students understand the basic concepts and principles of physical science, 5.3.1. Properties of Matter: Identify physical properties of substances before and after they are combined.

Standard 4: Students understand the basic concepts and principals of life science, 3.4.2. Life Cycles: Describe the life cycles of plants and animals (e.g., birds, mammals, grasses, trees, insects, flowers).

Standard 6: Students understand the relations between science and technology, 4.6.1. Technological Design: Evaluate the effects of technology on people and the environment (e.g., new construction, oil drilling, electric cars).

Standard 6: Students understand the relations between science and technology, 5.6.1. Technological Design: Use technology to design a solution to a problem.

Standard 7: Students understand relations between science and personal, social, and environmental issues, 4.7.2. Science and Social Issues: Identify ways in which science and technology have greatly improved human lives (e.g., food quality and quantity, transportation, health, sanitation, communication).

Standard 7: Students understand relations between science and personal, social, and environmental issues, 5.7.2. Science and Social Issues: Explain ways humans benefit from Earth’s resources (e.g., air, water, soil, food, fuel, building materials).

Standard 8: History and Nature of Science, 3.8.1. Identify ways people of all ages, genders, and backgrounds use science in their careers and in daily life (e.g., children check temperature conditions to decide what to wear, farmer uses genetic grains, hikers use GPS, depth-finder in boat, hearing-aides for disabilities).

Standard 8: History and Nature of Science, 4.8.1. Identify a variety of careers in the field of science.

ND Social Studies Standards and Benchmarks

Standard 1: Students use social studies skills and resources, Benchmark 4.1.4 Interpret current events using print and electronic media (e.g., newspaper, children’s news magazines, television, internet).

Standard 2: Students understand important historical events, Benchmark 4.2.10 Explain the significance of agriculture in North Dakota history

Standard 2: Students understand important historical events, Benchmark 4.2.11 Describe the effects of changes in industry, agriculture, and technology in North Dakota (e.g., energy production, transportation, farming methods).

Standard 3: Economic Concepts, Benchmark 3.3.3 Explain the differences among natural and human resources, and how they are used locally.

Standard 3: Economic Concepts, Benchmark 4.3.2 Identify ways that natural resources (e.g. soil, people, trees) contribute to the economy of the local community and of North Dakota.

Standard 3: Economic Concepts, Benchmark 4.3.4 Identify principal exports of North Dakota (e.g., crops, energy, livestock).

Standard 5: Students understand and apply concepts of geography, Benchmark 4.5.5 Identify different patterns of land use in North Dakota (land use in urban and rural areas, agriculture, manufacturing).

North Dakota Agriculture in the Classroom Activities

This **Ag Mag** is just one of the North Dakota Agriculture in the Classroom Council projects. Each issue of the Ag Mag focuses on an agricultural commodity or topic and includes fun activities, bold graphics, interesting information and challenging problems. Send feedback and suggestions for future Ag Mag issues to:

Becky Koch
NDSU Agriculture Communication
(701) 231-7875
becky.koch@ndsu.edu

Another council teacher resource is **Project Food, Land & People** (FLP). Using the national FLP curriculum, N.D. Ag in the Classroom provides 600-level credit workshops for teachers to instruct them in integrating hands-on lessons that promote the development of critical thinking skills so students can better understand the interrelationships among the environment, agriculture and people of the world. Teachers are encouraged to adapt their lessons to include North Dakota products and resources.

Project Food, Land & People's 55 lessons include:

- Amazing Grazing
- Cows or Condos?
- By the Way
- Seed Surprises
- Schoolground Caretakers
- Could It Be Something They Ate?
- What Piece of the Pie?
- and many more.

For information, contact:

Jill Vigesaa
N.D. Farm Bureau Foundation
(701) 799-5488
jill.vigesaa@gmail.com

The N.D. Geographic Alliance conducts a two-day **Agricultural Tour for Teachers**. The tour includes farm and field visits, tours of agricultural processing plants to see what happens to products following the farm production cycle, and discussions with people involved in the global marketing of North Dakota farm products.

For information, contact:

Marilyn Weiser
North Dakota Geographic Alliance
(701) 858-3063
marilyn.weiser@gmail.com

Educators may apply for **mini-grants for up to \$500** for use in programs that promote agricultural literacy. The Agriculture in the Classroom Council, working with the N.D. FFA Foundation, offers these funds for agriculture-related projects, units and lessons used for school-age children. The mini-grants fund hands-on activities that develop and enrich understanding of agriculture as the source of food and/or fiber in our society. Individuals or groups such as teachers, 4-H leaders, commodity groups and others interested in teaching young people about the importance of North Dakota agriculture are welcome to apply.

Examples of programs that may be funded: farm safety programs, agricultural festivals, an elementary classroom visiting a nearby farm and ag career awareness day. Grant funds can be used for printing, curriculum, guest speakers, materials, food, supplies, etc. More ideas and an application are at **www.ndaginclassroom.org**.

For information, contact:

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Kirk Olson – McKenzie County Farm Bureau

Nicole Wardner – NDSU Extension Service, Sheridan County

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