ACROSS

1. Fuel that cannot be easily made or renewed. It is used up.
2. A blend of 20 percent biodiesel with 80 percent petroleum diesel.
3. Fuel that can be renewed or easily made.
4. A substance that is not toxic or poisonous.
5. A waste by-product of the biodiesel making process.
6. A discharge or something that is given off; generally used in regard to discharges into the air.
7. Fuels that result from the compression of ancient plant and animal life formed over millions of years.
8. A colorless, odorless, highly poisonous gas, CO, formed by incomplete combustion of a carbon or a carbonaceous material, such as gas.

DOWN

1. The process of removing glycerin from soybean oil.
2. Pure biodiesel fuel.
3. Any organic (plant or animal) material that is available on a renewable basis.
4. How a liquid is resistant to flow; thickness or thinness.
5. An environmentally safe, low polluting fuel for most diesel internal combustion and turbine engines.
6. A colorless, odorless noncombustible gas with the formula CO$_2$ that is present in the atmosphere.
7. Capable of being decomposed by the action of biological agents, especially bacteria.
The SOYBEAN JOURNEY

After a farmer harvests his soybeans, they need to be transported to get to the next step in their journey from pod to plate. There are three main ways that soybeans and soybean products are transported: on a barge down the river, on a semi-truck on the highway, and in a tanker or hopper car on a train. Read below about each method and the reasons they are used.

**RIVER TRANSPORTATION:**
Soybeans can be moved using very little fuel on a barge. Barges can hold a very large cargo. One barge can hold 1,500 tons of cargo. Barges take most of their cargo to Louisiana where there is a port to ship to other countries.

**HIGHWAY TRANSPORTATION:**
The majority of soybeans are transported via semi-trucks. Trucks can take soybeans and soybean products from the fields to grain elevators, processing plants, biodiesel plants, and other manufacturing plants. Trucks are the easiest and quickest way to transport goods. A truck can hold 26 tons of cargo.

**RAILROAD TRANSPORTATION:**
Trains can transport soybeans, soy oil, and soy biodiesel. Soy oil and biodiesel can be transported in a tanker car and soybeans in a hopper car. A hopper car can carry up to 224,500 lbs. of soybeans. A tanker car can hold 30,000 gallons of fuel or oil. Trains transport soybeans to river terminals or grain elevators to be delivered to buyers. A train can move one ton of soybeans 202 miles on one gallon.
There is a soybean cargo load that weighs 8,000 tons that needs to be moved from Rock Island, IL to a port in Louisiana to export to other countries. Using the transportation information sheet, explain which method of transportation you would choose to move this cargo and explain concrete reasons why you chose this method.

There is a soybean cargo weighing 25 tons that needs to be moved from the grain elevator in Rockford, IL to a biodiesel processing plant in Freeport, IL. The processed biodiesel, 15,000 gallons, then needs to be moved from the processing plant to a buyer in Nebraska. Using the transportation information sheet, explain which method, or methods, of transportation you would choose for the different parts of the journey. Use concrete reasoning to explain your choices.
Break up your class into three groups. Each group will be given a type of transportation to investigate. Students will use the pod to plate website at www.podtoplate.org to gather information about their topic. Each group will work together to gather and organize information. Discuss breaking up the project and assigning parts to group members with the class.

As a group they will present their findings to the class. You can incorporate technology into the presentation as much or as little as you want. Listed below are the requirements for each group presentation.

**RIVER TRANSPORTATION GROUP:**
Your job is to use the Pod to Plate website to investigate how soybeans are transported via a river. Your group will present your findings to the class.

Your presentation should include:

- A picture of a barge and a description that tells what a barge is made of, the size and the name of its parts.
- Explain why a barge is used for soybean transport.
- Explain how a barge is used to transport soybeans.
- Explain the locations where a barge takes the soybeans and what their purpose is at these locations.
Investigating the Methods of SOYBEAN TRANSPORTATION

HIGHWAY TRANSPORTATION GROUP:
Your job is to use the Pod to Plate website to investigate how soybeans are transported via the highway. Your group will present your findings to the class.

Your presentation should include:

- A picture of a semi-truck and a description that tells the size and the name of its parts.
- Explain why a semi-truck is used for soybean transport.
- Explain how a semi-truck is used to transport soybeans.
- Explain the locations where a semi-truck takes the soybeans and what their purpose is at these locations.

RAILROAD TRANSPORTATION GROUP:
Your job is to use the Pod to Plate website to investigate how soybeans are transported via the railroad. Your group will present your findings to the class.

Your presentation should include:

- A picture of the types of train cars used for soybeans and a description that tells the size and the name of their parts.
- Explain why a train is used for soybean transport.
- Explain how a train is used to transport soybeans.
- Explain the locations where a train takes the soybeans and what their purpose is at these locations.
From Biodiesel to SOAP!

Once soybean oil arrives at a soy biodiesel plant, it will undergo a process called **transesterification**. Transesterification is the process that will turn the soybean oil into fuel. This process removes a substance called glycerin from the soybean oil. Glycerin is a valuable by-product (a product made during the manufacture of something else) of soybean oil. Glycerin has thousands of uses. Glycerin is a powerful degreaser, which makes it wonderful for use in bar soap. (Note: Glycerin must be purified before it is made into soap.)

The yield of glycerin from the transesterification process is 20 percent. This means for every 100 liters of biodiesel you get 20 liters of glycerin. For every 20 liters of glycerin you can make 100 bars of soap! Use this information to help you solve the problems below.

**WORKSHEET QUESTIONS**

Matt has 300 liters of biodiesel. How much glycerin will be created?

How many bars of soap can Matt make with his glycerin?

Jessica made 200 bars of soap. How much glycerin did she have? How much biodiesel?
Using our Resources to HELP WORLD HUNGER

CLASS ACTIVITY:

The teacher will break up the students into groups of six. Each child is given a cup. The teacher will go around and add cereal pieces to five of the six students' cups. Tell the children who have cereal in their cup they can eat five pieces. No sharing allowed.

TEACHER LED CLASS DISCUSSION:

Teacher will ask the students with empty cups how they feel about the activity. How do the students with cereal pieces feel about eating in front of the students with no cereal?

Teacher will explain 1 in 6 people go hungry in this world and are malnourished due to the lack of food.

Ask the class if this statement is true or false:

There is enough food in the world to feed everyone. (Answer is true.)

Discuss why people still go hungry, even though the above statement is true. Issues to discuss would be lack of land/resources and lack of money.

We are lucky that here in the United States we have enough food sources to keep us healthy. There are many countries around the world that are not as fortunate. Honduras is one of those countries. About 50 percent of children 12 and under suffer from malnutrition in Honduras. An estimated 30 percent of the children in Honduras lack sufficient protein in their diets to reach their full mental and physical potential as they grow.

As a class, brainstorm ways we as Americans can help people of other countries. How can we help our “empty cup” students? (Share the cereal). Have students share their cereal pieces and then eat them while the teacher reads aloud the book *Beatrice's Goat* by Page McBrier.

*(Amazon.com Description: When her family's fat, sleek new goat arrives in her poor Ugandan village, little Beatrice hugs her close and whispers, “Mama says you are our lucky gift…” And indeed it is true. Soon the goat bears two kids and provides enough milk to both feed the family and sell for profit. Until the goat arrived, life was very hard for Beatrice and her five brothers and sisters. The family could not afford to send the children to school, and it was difficult to make ends meet. Magically this one small animal, one of 12 given the village, opens up a new world of health and prosperity. Before the year is out, Beatrice happily realizes her dream of becoming a schoolgirl and her delighted family moves into a sturdy new house.)*

*Based on the true account of one family who received aid from Heifer Project International, a charitable organization that donates livestock to poor communities around the world. In her afterword Hillary Rodham Clinton writes, “Beatrice's Goat is a heartwarming reminder that families, wherever they live, can change their lives for the better.”*
Using our Resources to HELP WORLD HUNGER

After reading the book, discuss how providing the goat to the family not only helped them nutritionally, but also how it helped them make a better life financially. Explain that there is another organization that works in a similar way, providing soybeans and soybean products to people in undernourished countries.

SHARE WITH STUDENTS:

Several U.S. state soybean groups created The World Initiative for Soy in Human Health (WISHH) Program in 2000. Their goal is to create long-lasting solutions for the protein needs of people in poor countries like Honduras, by making available U.S. soy products.

Either display the following website pages from the WISHH website or make an overhead transparency of the pages to display to the class:

http://www.wishh.org/index.html

http://www.wishh.org/nutrition/soycow_vitagoat.html

http://www.wishh.org/globaloutreach/outreachmap.html

Discuss the mission of WISHH. Discuss the benefits to the people in malnourished countries and also the benefits to U.S. farmers. Look through the needs of the different countries that WISHH helps. Discuss how the VitaGoat and SoyCow can not only feed people but give them jobs as well, much like Beatrice’s Goat in the story. Have students complete a writing assignment. They should write a paragraph of at least five sentences that explains the need for groups like WISHH and how the group helps both malnourished people and U.S. farmers.

IL Learning Standards Late Elementary Social Science 15A2a, 15B2a, 15D2a, 18B2b, 18C2 English Language Arts 1B2a, 1B2b, 1B2c, 1C2a, 1C2b, 1C2d, 3A2, 3B2b, 3B2d, 3C2a, 3C2b, 4A2a, 4A2b, 4B2b, 5A2b

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Using our Resources to HELP WORLD HUNGER

In class we’ve discussed the effects of having a lack of proper food sources. In your own words, explain what you have learned about world hunger. Describe how organizations such as WISHH help malnourished people not only by providing food, but also by bettering their lives. Also describe how organizations such as WISHH are beneficial to the U.S. farmer.