



Beyond Food

Mathematics and Science

Brief Description:

In addition to producing food, agriculture produces other necessities and a great many products beyond absolute necessities. Many of these products come from animals. They may be edible but most are inedible. The many ways animal products and by-products are used to provide or manufacture clothing, medicines, industrial products, cosmetics, household goods, sports equipment, and luxuries is amazing. Virtually every part of an animal is put to good use.

Objectives: Students will be able to:

1. Define the term by-product.
2. Identify products made from animals.
3. Recognize the importance of by-products.
4. Determine the circumference, area or volume of agricultural by-products.

Life Skills:

1. Decision Making and Problem Solving Skills
2. Acquiring Information

Time:

Activity 1: 15-20 minutes

Activity 2: 30-40 minutes

Activity 3: 30-45 minutes

Materials:

Activity 1

- Copies of *What Am I?* Activity sheet for each student
- Pencils/Pens

Activity 2

- Copies of *Ag Is More* activity sheet for each student
- Pencils/pens
- Calculators (optional)

Activity 3

- Six boxes - two marked *Animal By-Product*, two marked *Animal Product*, and two marked *Non-Animal By-Product/Product*.
- Game cards with names or pictures of products, by-products and non-products (two sets of these cards are needed. You may use the game cards provided or create your own from magazines, food products, or other resources.)
- Copies (2 sets) of *More Than Meat Game Cards* (if you do not create your own).
- Copies of *More Than Meat* word search.

Preparation:

- Make double-sided copies of *What Am I?* activity sheet.
- Copy and cut out two sets of *More Than Meat* game cards or develop two sets of identical game cards that contain examples of products, by-products and non animal products/by-products. Gather six boxes and prepare labels for each box.
- Copy the *More Than Meat* word search activity sheet and *Ag Is More* activity sheet, one for each student.

Background:

Agricultural Products and By-Products

Agriculture is primarily known for producing a wide variety of edible products. From hamburgers to fresh fruits and vegetables, Americans enjoy agricultural products every day on their dinner table. However, agriculture has another side; the business of producing non-edible goods, such as clothing and textiles.

Inedible Products from Animals

Humans need clothing and enjoy textile products from animals. Cattle, sheep, swine, goats, rabbits and poultry, as well as some non-domesticated animals like eels and sharks, provide many non-edible products for our society. The fiber products that we get from these animals include:

Down – feathers from birds, generally geese or ducks. Down is used for lining in jackets, comforters, pillows and mattresses. Down is a good insulator and it helps to block cold air and prevent it from reaching your skin.

Fur – a thick coat of soft hair that covers the body of a mammal. The fur is used to make the lining for certain clothing such as coats, gloves and slippers, as well as for decorative trim on such garments. This fiber also keeps in warmth, so it is used mainly during the winter.

Leather – dressed (or clean) hide of an animal, generally cattle hides although hogs, ostrich, alligator, snake and other animals are also used. The hair has been removed and the hide has been preserved. Many types of clothing and accessories are made from leather including jackets, skirts, shoes, wallets, purses, belts, hair accessories, gloves, watch bands and hats. Leather is also used to make furniture and car interiors.

Vocabulary:

- By-products
- Edible
- Inedible
- Products
- Processing



Mohair – hair from an Angora goat. This fiber product is used to make mohair sweaters and coats.

Wool – the thick, soft fiber covering which forms the coat of sheep. Clothing and accessories which are made from wool include sweaters, socks, coats, hats, gloves and mittens, underclothes, afghans and blankets. These articles are generally used during the winter since wool is a good insulator and is warm.



Minimizing Waste

In producing food for human consumption, we also get certain valuable by-products. A by-product is something that is produced from the leftovers of making something else. These by-products can be broken down into those that are edible and those that are inedible. Edible means something that is fit to be eaten. An inedible product, therefore, is something that is not fit to be eaten. Some inedible agriculture products from animals include: art brushes, film, rubber, cosmetics and clothing accessories.

There are many valuable products that animals provide for humans. Some of these products we have used for years and probably didn't know that they came from animal products. It is difficult to find products that do not have some part of an animal in it. It is also difficult to find other materials to replace the animal products found in these goods. Often times products without animal materials are more expensive than those that do contain them. It is also important to remember that animals are not harvested for these products alone. The animals are harvested first for the meat and then the non-meat materials are used in other products. Everything from the blood (for pet foods), to the materials found in the horns and hooves (for gelatins), to the eyeballs (for research) is used to benefit society. Relatively little of the animal goes unused. The statement "Animals are harvested for the leather only" is not a true statement.

Introduction:

1. Animals produce more than just meat, milk, eggs and wool. Brainstorm with the students products that come from animals. Make a list on the board and title it “Products.”
2. Introduce the concept of by-products by asking these questions: How many of you have ever chewed gum? Roasted marshmallows? Worn perfume? Eaten yogurt? Played football? Whether you are aware of it or not, all of these have by-products of cattle in them. “So what exactly is a by-product?” you ask.



Products are the primary purpose for which a plant or animal is grown. Beef cattle are raised to produce beef, wheat is grown to produce wheat flour. Goods produced from what is left over from that primary production are considered by-products. The bones that are cut away from cuts of beef or the straw left when wheat is harvested were once considered waste products. Today, they are used to produce other goods that are equally useful. In other words, a by-product is something that is produced from the materials left after producing something else.

By-products may be edible or inedible. By-products may be used for medical reasons and research. This activity will help us become more aware of the by-products we get from animals, as well as, show us that no part of the animal is wasted. Many products that are used everyday contain animal by-products.

Activity One:

1. Pass out the *What Am I?* activity sheet. Allow students time to complete the riddles. For advanced classes, you may add other words to the word bank. Note: students who finish early can begin working on the *More Than Meat* word search.
2. Discuss the worksheet with the students. What surprised them the most as a by-product?
(Answers will vary.)
*What is a by-product? *(Secondary products made from the leftovers of producing primary products.)*
*What types of uses are there for animal by-products? *(Food, household and personal items, medicine and health, mechanical and chemical items.)*

Activity Two:

1. Select the *Ag Is More* activity sheet most appropriate for your students, either *Worksheet A* for younger students or *B* for older students.
2. If you selected *Ag Is More, Worksheet A*, review how to calculate area of a square or rectangle and convert various measurements.

If you selected *Ag Is More, Worksheet B*, review how to find the circumference and area of a circle, the volume of a cylinder, and the volume and surface area of a sphere.

3. Hand out copies of the appropriate *Ag Is More* activity sheets and calculators (if desired) to each student.
4. Instruct students to use the correct formula to determine the answers to *Ag Is More*.
5. Review the correct answers with students.

Formulas	$\pi = 3.14$
<u>Area of a square or rectangle</u>	
Length x width	
<u>Circle:</u>	
Area = πr^2	
Circumference = $2\pi r$	
<u>Cylinder:</u>	
Volume = $r^2\pi h$	
<u>Sphere:</u>	
Volume = $\frac{4}{3} \pi r^3$	
Surface Area = $4 \pi r^2$	



Activity Three:

1. Play *More Than Meat* relay.
 - A. Divide the group into two teams.
 - B. Set one of each of the three types of boxes in front of each team.
 - C. Set the stack of game cards by the boxes and give each team the same cards.
2. Explain the rules of the game.
 - A. The first person on each team walks quickly to the boxes, takes the first card in the stack and places it in the correct box (*Animal By-Product*, *Animal Product*, or *Not Animal Product/By-Product*).
 - B. When the first person taps the hand of the next person in line, on the return trip, the next person walks quickly to the boxes and places the second card in the correct box.
 - C. Continue until all cards have been placed in a box.
 - D. Students must decide, on their own, in which box to place the card.
 - E. When all the cards are placed in the boxes, the team with the most items in the correct boxes wins.
3. Go over the correct answers and identify from which animals these by-products are made, then discuss the importance of each product.

Evaluation Options:

1. Use the various activity sheets to evaluate understandings of the concepts.
2. Use the Pre-Test/Post-Test to determine change in knowledge.
3. Have the students make a list of all the by-products they can find that are used in their homes. Once the list is complete, have the students write an essay describing how different their lives would be without these by-products.

