



SC Farm Bureau
Ag in the Classroom
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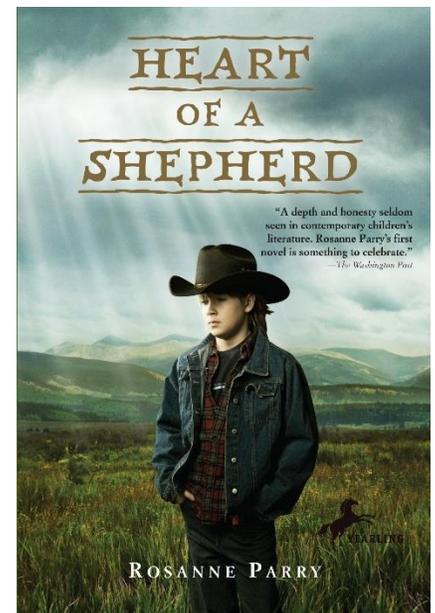
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July 2019 Book of the Month

Heart of a Shepherd

By: Rosanne Parry

Brother has never been the rancher that his father and the older boys are. When Brother's dad is shipped off to Iraq, along with the rest of his reserve unit, Brother must help his grandparents keep the ranch going. He's determined to maintain it just as his father left it, in the hope that doing so will ensure his father's safe return. The hardships Brother faces will not only change the ranch, but also reveal his true calling.¹



Did You Know? (Ag Facts)²

- When beef cattle are harvested, approximately 98% of the animal is used for meat or other byproducts such as leather, glue, soap, insulin, or gelatin.
- Disneyland in California sells over 4 million hamburgers each year.
- The United States and Brazil are the top beef producing countries in the world.
- Cattles and calves are raised in every county in South Carolina

Discussion Questions

- What surprised you about Brother's life on the ranch?
- What do you think "heart of a shepherd" means in the rest of Brother's life?
- What do you think happens after the story ends?

Lesson Plans Available Online at

scfb.org/book-of-the-month

Grade Level(s): 5-8

Purpose: Students will follow the farm to fork process of producing beef and learn how cattle and other ruminants convert grass into nutrient-rich foods such as milk and meat.

Vocabulary:

- **byproduct:** an incidental or secondary product made in the manufacture or synthesis of something else
- **calf:** the name for baby cattle
- **feedlot:** a type of farm operation where cattle are fed balanced feed rations in preparation for harvesting
- **forage:** bulky food such as grass or hay typically consumed by livestock
- **heifer:** female bovine that has not produced a calf
- **rangeland:** open country used for grazing or hunting animals
- **ruminant:** an animal with a four-compartment stomach
- **steer:** male bovine that has been castrated

Background Agricultural Connections ²

Beef From Farm to Fork

Beef cattle grow from young **calves** to mature **steers** or **heifers** in 14-18 months. Calves can be born any month of the year, but spring is the most common season. After a calf is born it will spend the first few months of its life side-by-side with its mother. The calf receives its nutrition from its mother's milk. As the calf grows, it will also begin to eat grass, hay, or other **forages**. When the calf reaches six to eight months of age, the calf will be weaned, or separated from its mother. The growing calf will continue to eat grass and other forages as it grows. Beef cattle typically spend the majority of their lives on private or public **rangelands** where their diet consists of grass and other forages. For most beef cattle, their final stage of growth takes place at a **feedlot** where their diet consists mostly of corn and hay which has higher nutrient density than most rangelands. This final stage of growth prepares the animal for harvesting. Once the animal is harvested, it is processed into various meat cuts, such as steak or roast, or processed into hamburger, a form of ground or chopped beef formed into the familiar patty of a hamburger or cheeseburger. The beef is then sold to consumers at a retail outlet, like a grocery store or a restaurant, completing the farm to fork journey.

Cattle Digestion

Along with animals such as goats, sheep, buffalo, deer, elk, giraffes, and camels, cattle have a four compartment stomach. The function of these four compartments allow cattle to physically and chemically digest food that cannot be utilized by humans or animals that only have a simple stomach with one compartment (monogastrics). The **ruminant** digestive system of cattle actually helps us use feed resources that would otherwise be discarded as waste. These waste products are known as **byproducts** or incidental products created by the manufacture of something else. An example is a potato peel. French fries are consumed regularly across our country. What happens to all the potato peels? The *Ore-Ida French Fry* processing plants in Oregon and Idaho send their potato peels to be consumed by cattle in feedlots. The cattle eat the potato peels and convert a waste product into beef, food rich in

zinc, iron, and protein. In summary, humans cannot digest the majority of what cattle eat. They turn something of little value to humans (like grass) into highly nutritious beef.

When properly managed, cattle can also improve the quality and health of the rangelands where they live and graze. Typically, rangelands are located in areas that are too rocky, steep, or otherwise inefficient for growing human food crops. Keeping this land in grass prevents soil erosion. Cattle also provide natural fertilizer for the land in the form of manure.

**Use this great discussion companion guide (from MI AITC) while reading *Heart of a Shepherd*

(<https://miagclassroom.org/edu/lesson/language/heart.pdf>)

Beef: From Farm to Fork ²

Materials:

- LCD projector or TV to display PowerPoint presentation
- *Beef Life Cycle Board Game*, 1 copy per student
- *Beef Life Cycle PowerPoint*

Procedures:

1. Explain to students that there are many processes in our life that follow a specific cycle from start to finish. Cattle, the source of our beef, go through a variety of steps from start to finish. This brief activity will explain and illustrate what cattle eat and where they live as they grow and mature.
2. Distribute the *Beef Life Cycle Board Game*, one per student.
3. Open the attached *Beef Life Cycle PowerPoint*.
4. Read through the instructions with the students and go through the PowerPoint as they take notes on their game board.
5. After finishing the worksheet, have students write a "\$2 summary" of the lesson on the back of their game board. Each word is worth 10 cents, and students must write until they reach \$2.
 - a. This summary activity can be scaffolded by giving students specific words related to the learning that they must include in their summaries. You may also increase to any amount of money to require additional length. Possible words to include in the summary include: beef life cycle, calves, ranch, feed yard, harvest, or supermarket

The Remarkable Ruminant ²

Materials:

- Example rangeland images to display
- A Cow's Digestive System video
- *Remarkable Ruminant* handout, 1 per student

Procedures:

1. Ask students, "How many people currently live on the earth?" Accept an answer of approximately 7 billion or go to the [World Population Clock](#) for a more precise answer. Follow up by asking students if the world population is expected to increase or decrease in coming years. (*increase*)
2. Conclude with students that it is, and will become, increasingly important to use our land wisely to provide homes, food, space, and resources for a growing population.
3. Ask, "Can we use ALL of our open space to grow crops for food?" Display the following [images](#) for illustration.



4. Ask students:
 - a. Is some land too dry or too wet for crop growth?
 - b. Is some soil too rocky or sandy to grow crops?
 - c. Could steep inclines or cold climates prohibit a farmer from growing crops successfully?
5. Ask students to think back to what they have learned so far. Could the land that is unsuitable for crop farming be used by cattle (or sheep) to produce food? (Yes!) Tell students that this is possible due to a unique digestive system. Show the video clip, [A Cow's Digestive System](#) (1:35 mins).
6. Distribute the *Remarkable Ruminant* handout to students. Instruct students to read the article on page 1 and highlight each example they find of ways cattle convert otherwise unusable resources into useable resources. Students will then complete pages 2 and 3 of the worksheet.

Enriching Activities

- Have students read the Huffington Post article, [Farm Animals Actually Eat People's Leftovers - And It's Good For the Planet](#). If desired, use a KWL chart to increase engagement. Discuss student findings.
- For a useful handout comparing the monogastric and ruminant digestive systems, see pages 6-7 of [A Stomach At Work](#), created by Michigan State University Extension. For a lab activity demonstrating how the monogastric stomach works, see pages 1-4.
- Have students watch the TedTalk, [How to Fight Desertification and Reverse Climate Change](#).
- **Digging Deeper into Byproduct Cattle Feeds:** In *Activity 3*, students learned about eight byproducts that can be fed to cattle. There are many more examples. Assign students to research other common cattle feeds that are otherwise waste if not used as livestock feed. Possible feeds include:

barley or hops hulls	cereal by-products	citrus pulp	culled vegetables
cotton seed husks	grasses	molasses	soy hulls
sugar beet pulp	Grape Peels	Corn Gluten	Corn Stalks

- **Mapping Out Commodities and ByProducts:** To help students understand the geographic limitations of using byproducts for feed, distribute the attached *Mapping Out Commodities and Byproducts* activity sheet to each student. Have students research where the list of food products are commonly grown in the United States. The [U.S. Department of Agriculture National Agricultural Statistics Service](#) and the [Interactive Map Project](#) are two helpful websites that can be used or students may conduct their own internet search. Students may research products individually, work in groups, or do a special report on just one product.
 - If time allows, encourage students to explore the maps to find out what food products or waste products are local to your state and may be fed to cattle.
 - Note that bakery waste will likely not be listed. Instruct students to think of a local grocery store or bakery and have them think about what the store does with bakery items that are not sold. This is considered bakery waste and stores either need to dispose of it in the trash or have farmers pick it up.
 - If students research the entire list, they will need to use both websites to find the food commodities

Suggested Companion Resources

- [Chew It Twice Poster](#) (Poster, Map, Infographic)
- [Why Can a Cow Eat Grass? Video](#) (Multimedia)
- [Amazing Grazing](#) (Book)
- [The Girl Who Thought in Pictures: The Story of Dr. Temple Grandin](#) (Book)
- [Ranch Starter Kit](#) (Kit)
- [Where Does Your Cheeseburger Come From?](#) (Poster, Map, Infographic)

Sources/Credits

1. Parry, R. (2009). *Heart of a Shepherd*. NYC: Random House.
2. Arizona Beef Council

Suggested SC Standards Met:

English/Language Arts:

- 5.RL.5.1 Quote accurately to analyze the meaning of and beyond the text to support inferences and conclusions.
- 5.RL.6.1 Determine and analyze the development of a theme within a text; summarize using key details.
- 5.RL.8 Analyze characters, settings, events, and ideas as they develop and interact within a particular context.

- 6.I.2.1 Transact with text in order to formulate logical questions based on evidence, generate explanations, propose and present conclusions, and consider multiple perspectives
- 6.RL.5.1 Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
- 6.RL.6.1 Determine a theme of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments
- 6.RL.8.1 Describe how a plot in a narrative or drama unfolds and how characters respond or change as the plot moves toward a resolution; determine the impact of contextual influences on setting, plot and characters.
- 7.I.2.1 Formulate logical questions based on evidence, generate explanations, propose and present original conclusions, and consider multiple perspectives.
- 7.RL.5.1 Cite multiple examples of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text
- 7.RL.8.1 Analyze how setting shapes the characters and/or plot and how particular elements of a narrative or drama interact; determine the impact of contextual influences on setting, plot, and characters.
- 8.RL.2.1 Formulate logical questions based on evidence, generate explanations, propose and present original conclusions, and consider multiple perspectives.
- 8.RL.5.1 Cite the evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
- 8.RL.8.1 Analyze how dialogue and/or incidents propel the action, reveal aspects of a character, or provoke a decision; determine the impact of contextual influences on setting, plot and characters.
- 8.RL.11.1 Analyze how the author’s development of perspectives of the characters and the reader create suspense or humor.

Science:

- 5.E.3B.4 Define problems caused by natural processes or human activities and test possible solutions to reduce the impact on landforms and the ocean shore zone.
- 5.L.4B.2 Develop and use models of food chains and food webs to describe the flow of energy in an ecosystem
- 6.L.4B.1 Analyze and interpret data related to the diversity of animals to support claims that all animals (vertebrates and invertebrates) share common characteristics
- 6.L.4B.2 Obtain and communicate information to explain how the structural adaptations and processes of animals allow for defense, movement, or resource obtainment.
- 7.EC.5B.2 Develop and use models (food webs and energy pyramids) to exemplify how the transfer of energy in an ecosystem supports the concept that energy is conserved.

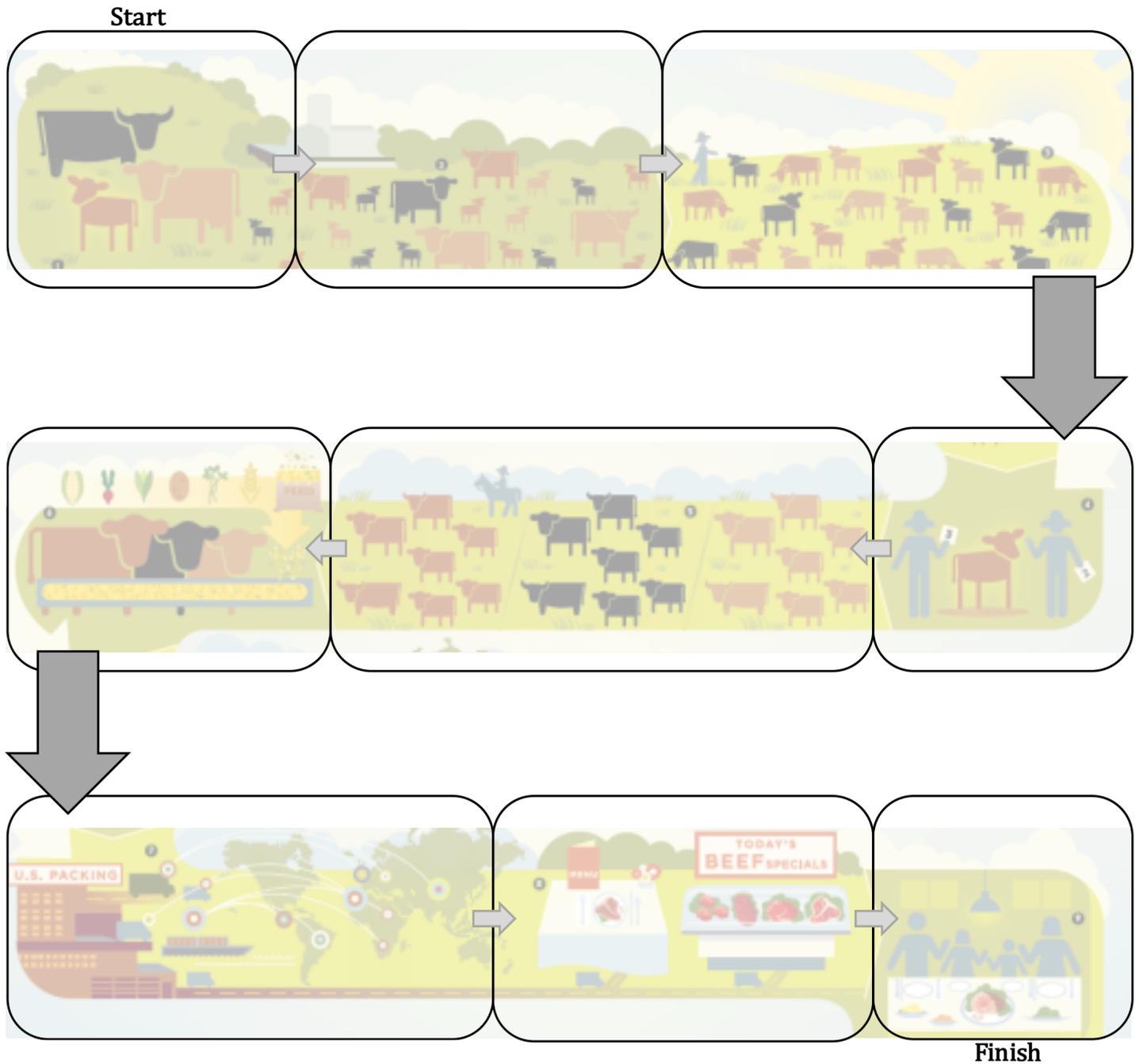
Social Studies (2020 standards):

- 7.5.1.PR Identify select North American physical systems and human characteristics of places.
- 7.5.2.ER Identify climate and vegetation regions and the spatial distributions and patterns of natural resources, including the impact of their location on human activities.

Name _____

The Beef Life Cycle Board Game

Directions: Just like a board game has a “start” and “finish,” beef cattle also follow a path from start (farm) to finish (fork.) Take notes on the following game board to represent the process. You may title each square, draw picture(s), and provide a written description.



BEEF

HOW DOES BEEF GET FROM A CATTLE FARM TO OUR FORK?

WHAT IS THE BEEF LIFE CYCLE?



1-FARMS & RANCHES

- On farms and ranches, cows are bred and give birth to a calf each year.



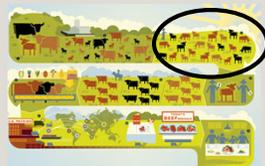
2-YOUNG CALVES

- For the first several months of their life, baby calves nurse on their mother's milk and begin eating grass and other forage.



3-WEANING

- The calves are weaned (separated) from their mother when they are about 8 months old and 500 pounds.
- The growing calves continue to eat grass and other forages that are not digestible for humans.



4-LIVESTOCK AUCTION

- Some calves will be sold at livestock auction markets by farmers and ranchers called "stockers" or "backgrounders." They raise the calves to the next stage of growth.
- Other calves, often heifers, are kept on the cow-calf farm as breeding animals.



5-STOCKERS & BACKGROUNDERS

- The cattle sold to the "stockers" and "backgrounders" graze cattle on all kinds of pasture until they grow to the next stage.
- Cattle gain weight by converting grass and forage into protein



6-FEEDYARD

- Cattle are sold or moved to a feed yard where they eat a carefully balanced, grain-based diet until they reach a final market size.



7-HARVEST

- Cattle are harvested in modern processing facilities or packing plants where skilled workers break down beef carcasses into popular beef cuts.



8-SUPERMARKETS & RESTAURANTS

- Beef from the packing plant is sent to supermarkets and restaurants around the world
 - 90% of the beef raised in the United States is consumed here
 - 10% of the beef raised in the United States is exported to other countries



9-BEEF ON YOUR TABLE

- You can enjoy healthy, nutritious beef by buying it from the supermarket or eating it at your favorite restaurant!
- Beef provides high quality protein and 10 essential nutrients



The Remarkable Ruminant

The Role of Cattle in the Miraculous Chain of Sun to Grass to Human Food.

Cattle production is really a study in efficient utilization of solar energy as well as a prime example of the incredible efficiencies of modern American agriculture.

The development and evolution of agricultural techniques and the application of modern technology have led to phenomenal gains in food productivity. America is unique in the world – less than 2% of the population feeds all of the nation’s population, produces substantial surpluses for export, and, at the same time, keeps food costs, as a percentage of disposable income, at the lowest level in the world.

The history of civilization and the development of modern agriculture include the evolution of ruminant (four-part stomach) animals as a major food source. Ruminant animals are unique because they can digest plant cell carbohydrates (cellulose), which humans can’t digest. Cattle, one of the ruminant species, have played a key role as energy converters and “nutrition reservoirs” in food production systems throughout the world.

Solar energy is basic to cattle production. The sun’s rays, striking millions of acres of pasture and range land, provide energy for grass and other forages to grow. Cattle then harvest this renewable resource, which would otherwise be of no food value to people, and convert it into flavorful, healthful food – beef. Beef is described by nutritionists as

nutrient-dense, providing consumers with large amounts of their daily requirements for protein, vitamin B-12, iron, zinc and other essential nutrients.

At least 85% of the nutrients consumed by cattle come from grass, roughage, food processing by-products and other feedstuffs not edible by people. Of the 1.2 billion acres of agricultural land in the U.S., only one-third can be used for crop production. Utilization of the balance of this land for food production requires grazing by ruminant animals.

Grasslands and grazing livestock are naturally compatible. Ruminant animals, with their unique digestive system, evolved as consumers of grass and other leafy vegetation, and the plant life on our rangelands evolved under grazing by buffalo and other ruminant wildlife. Now, a good way to maintain and improve those grasslands, to the benefit of wildlife as well as livestock, is through scientific grazing management.

Solar energy is basic to cattle production...

Cattle are excellent natural recyclers of organic wastes from the production and processing of grains, fruits, vegetables, and other foods. Man can eat less than half the dry matter produced by crops. Most of the remaining roughage and other material are fed to cattle and other farm animals and thus do not present a disposal problem. Some 25% of all by-products from food processing are used as sources of protein and other nutrients for livestock. Thus, it can be seen, cattle enhance man’s ability to feed a growing population. Without

ruminants, the solar energy reaching the more than 800 million acres of range and pastureland would be of no food value to this country.

Cattle production isn’t just about solar energy use; it’s also about people, the farm and ranch families who oversee the incredible chain of sun to forage to cattle to food. The nation’s 1 million cattle producers own or manage more land in America than any other group. Cattle and calves are produced in more states and regions than any other farm commodity.

The cattle industry is the largest segment of agriculture, accounting for almost one-fourth of all farm markets. The annual sales of \$40 billion worth of cattle and calves are vital to thousands of rural communities, and those sales generate millions of jobs – from farm and ranches, to local stores, to processing plants, to supermarkets and restaurants.

Cattle production is a way of life as well as a business. The land sustains the cattle, and hence the cattleman and his family, is more than likely the same land that was owned and cared for by the cattleman’s father and grandfather. More than half of all cattle operations in the U.S. have been in the same family for more than 50 years, and more than 10% have been in the same family for more than 100 years.

Part of a cattleman’s legacy is a responsibility to care for the animals and resources which he inherits. His family’s livelihood, and the livelihoods of future generations, depends on it. Recognizing their obligation to be good stewards of the land, cattleman live by the saying, “We don’t inherit the land from our forefathers; we borrow it from our children.”



RUMINANTS RECYCLE AND CONSERVE

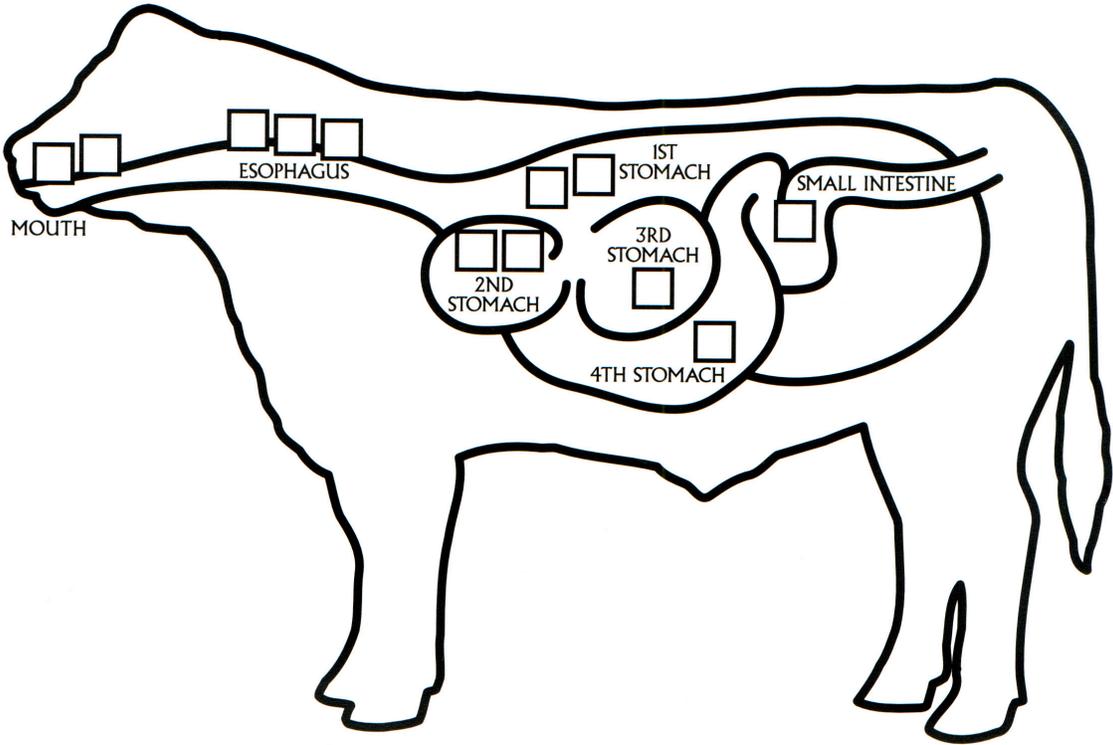
Cattle and other ruminants (e.g. sheep or deer) are nature’s models for food energy conservation. Ruminants have unique stomachs with four cavities that allow them to eat products that other animals find inedible.

Directions

Read the information below and then follow the path of food as it moves through the ruminant stomach by writing the step numbers in the boxes on the diagram below. Some of the numbers will be used more than once.

RUMINANT STOMACH

- 1. Teeth tear and chew food in mouth
- 2. Food travels down esophagus
- 3. Cud (swallowed food) mixes and softens in stomachs 1 and 2
- 4. Cud returns to mouth for more chewing by rear molars
- 5. Cud passes through stomachs 1,2,3, and 4 as it is digested and nutrients absorbed
- 6. Waste materials pass through intestines and exit body as manure



FIND OUT

1. What other animals are ruminants? List as many as you can.

MORE ABOUT RUMINANTS

Directions: Examine the information on this page and underline information that is new to you.

Almost half of the land in the United States is classified as pasture and range land. Most of that land cannot be used for farming or growing because it is too high, too rough, too dry, or too wet. Grass from these lands contains cellulose, which is indigestible by humans. Because they are ruminants, cattle can eat grasses and convert them to beef and dairy products that humans *can* eat.

Cattle producers are responsible for managing cattle and land in ways that will protect the environment. This is in the producer’s best interests, since caring for the land will allow the land to care for the cattle on which they depend.

- Cattle eat:**
- almond hulls
 - barley or hops hulls
 - cereal by-products
 - citrus pulp
 - corn and other grains
 - corn gluten
 - corn stalks
 - cotton seed husks
 - culled vegetables
 - grasses
 - molasses
 - potato peels
 - soy hulls
 - sugar beet pulp
 - shrubs
 - weeds

About 85% of nutrients consumed by cattle come from sources not suitable as food for humans. Many beef cattle go from grazing lands to feedlots. Feedlots help keep supplies of beef constant, making beef available year-round and keeping prices stable. Cattle producers also use their animals as recyclers by feeding them food-processing by-products that would otherwise be shipped to landfills. More than half of the by-products of fruit, vegetable and grain processing go into livestock feed. Foods from cattle provide high-quality protein, calcium, and vitamins such as iron, zinc, and B-vitamins that humans need to maintain a healthy diet. Equally important are the other products from cattle that humans use every day; these products are called by-products.

- Products from cattle and cattle byproducts:**
- butter
 - cheese
 - hamburgers
 - hot dogs
 - ice cream
 - milk
 - roast beef
 - steaks
 - cosmetics
 - glue
 - leather: shoes, gloves, coats
 - some medicines
 - soap
 - sports equipment
 - pet foods
 - fertilizer

PROCESSING INFORMATION

Explain in your own words how cattle are nature’s model for environmental conservation.

APPLICATION

List items you can conserve. Place a check mark next to those you currently conserve or recycle. Circle those items you plan to start conserving. Write an explanation next to those things you don’t plan to reuse, recycle, or reduce.

