Animal Science

Graze Like a Cow

Science, Math

Grade Level: 6-12

Time: 45-60 minutes

Standards:
Science
- 1.1.2
- 1.1.3

Math
- 1.4.2

Materials
Per Class:
- Large area of grass that is left to grow for a while (~1' tall, can be found in ditches or ask maintenance to skip one or two mowings in an area)
- Large area of shorter grass (~4-6" tall, can use the regular mowed playground)
- 2 paper bags (1 labeled short/overgrazed and 1 labeled tall/ health)
- Clock with second hand or stopwatch
- Scale

Per Student:
- Copy of student handout

Overview
Students will learn the biology of how a cow digests the grasses they eat, compare quality of forage (overgrazed versus healthy), and the effects of the animal's environment to its production.

Objectives
1. Student will learn how a cow digests the grasses and plants they eat.
2. Students will simulate "eating" like a cow using their hands and compare amount of forage gathered in overgrazed situations compared to healthy grass situations.
3. Students will determine the effects of rangeland health on the production (milk, beef, etc.) of a cow.

Instant Experts
Exploring Kansas Natural Resources Educator's Guide. Unit 2 – Prairies (13-32). Kansas Foundation for Agriculture in the Classroom. *To order, visit www.ksagclassroom.org.*

Background Information
Cows are ruminant animals because they have more than one stomach compartment. A cow's stomach has four parts; the rumen, the reticulum, the omasum, and the abomasum. The rumen is a fermentation vat. Fermentation is a chemical reaction where sugars are broken down into alcohols. This is a similar process the beer industry uses to produce beer. Fermentation gives cows the unique ability to access the nutrients, carbohydrates and proteins available in plant cells. Human do not have this ability. The rumen is the largest part of the stomach and can hold up to 50 gallons of partially digested food. Cows will chew on cud, which is regurgitated food.

They re-chew it about 50 times and then re-swallow it. This adds moisture and helps to physically break down the plants and grasses the cow eats. The rumen houses good bacteria that help the cow digest and break down its food into protein. This is a very important process because human's digestion systems cannot break down plants and grasses to access the protein available. However, we can access the protein available in beef produced by animals that consume plants.

The second part of a cow's stomach is the reticulum. The food is further softened in this portion of the stomach. This portion of the stomach removes any type of foreign objects, such as fence wire, bolts, etc., from the cows digesting food.

The third visit the cow's digested food will make is to the omasum. The omasum filters through the food and regulates water absorption and reduction. The digesting food will then be sent to the cow's abomasum.

The abomasum is the part that most resembles a human stomach. Here digestion will be completed, nutrients will be completely broken down and will enter into the small intestine where they will be absorbed into the blood stream. The unused material will be sent into the excretory system and will become a cow pie – which acts as a fertilizer form plants!

Cows will eat approximately 3% of their body weight in dry grasses and forbs every day to maintain production (growth or milk production). That means a cow weighing 1200 pounds need 36 pounds of dry grass and forbs to maintain themselves on a given day. Since the grass in rangeland is made up of approximately 70% moisture they actually need 120 pounds of grass and forbs to maintain production!

Information from Exploring Kansas Natural Resources Educator's Guide. Unit 2 – Prairies (13-32). Kansas Foundation for Agriculture in the Classroom. *To order, visit www.ksagclassroom.org.*

Instructional Format

1. Share background information with students.
2. Upon completing the lesson, students will complete student handout.

Procedures

1. Talk about grassland and the cow's digestion system using the instant expert.
2. Discuss how a cow eats:
    - To simulate a cow's mouth have the students make peace signs with their hands (ring and pinky finger held down by their thumb), the thumb will resemble the hard upper toothless gum of the cow. Then have the students bring their pointer and middle fingers together, this will simulate the cow's tongue. To "graze" have the students gather grass with their tongue (pointer and middle fingers) and grasp and tear it against their gum (thumb).

- Students will use their other hand as their rumen. Have students "graze" with their dominant hand and then transfer that grass to their non-dominant hand. Once their rumen is full they must put their grass in the appropriate paper bag.
- Because a cow rests after grazing times, students should stand beside the paper bag for 15 seconds (determine time you think your students will wait) before going out to graze again. Either time them, or supply stop watches/clock with a minute hand for them to time themselves.

3. Students should be given 1-2 minutes to graze in each type of grassland. Have students put all their "eaten" grass in the appropriate labeled bags. Determine time based on how many students there are compared to area to be grazed.
4. Mass each bag and record for the class.
5. Have students calculate needed values on their data table and answer conclusion questions.

Resources

Exploring Kansas Natural Resources Educator's Guide. Unit 2 – Prairies (13-32). Kansas Foundation for Agriculture in the Classroom. *To order, visit www.ksagclassroom.org.*

Kraft, David and Spencer, Douglas, USDA-NRCS.

National Range & Pasture Handbook – Chapter 6,
ftp://ftp-fc.sc.egov.usda.gov/GLTI/technical/publications/nrph/nrph-ch6.pdf

Why Can a Cow Eat Grass?, *http://www.oznet.ksu.edu/library/4h_y2/4H715.pdf*

Want More? Extensions

Provide a massed square bale for students to visualize the amount of dry material a cow needs. Contact a local butcher to see if they can reserve a cow's stomach for your class to view. Invite local Extension or NRCS employees to discuss cattle production and/or rangeland management.

This lesson plan was created by Sarah Spencer.

Name:

Graze Like a Cow
Student Instructions

Purpose

To understand the digestive processes of a cow and to determine how different grasses meet the needs of cows.

Procedures

1. Follow the instructions given by your teacher to "graze like a cow."
2. Record the data for the healthy and overgrazed grass sacks.
3. Grass is made up of 70% moisture. Moisture although necessary for plant growth and development is of little nutritional value to a cow. The nutritional value for a cow is found in the dry matter of the grass. Approximately 30% of green grass is dry matter. To calculate the Mass of Dry Matter, multiply the mass of your sack X 30%.
4. A cow will eat 3% of its body weight in DRY MATTER grass and forbs EVERY DAY! That means a 1200 pound cow will need to eat 36 pounds of dry matter grass. Because the composition of grass is 70% moisture and 30% dry matter, a cow would have to consume 120 pounds of grass to maintain production EVERY DAY!!!

Data

Sack	Mass	Mass of Dry Matter	Amount of Grass Required for a 1200 lb. Cow
Healthy Grass (taller grass)			
Overgrazed Grass (shorter grass)			

Conclusion Questions

1. How many parts are there in a cow's stomach? List them and describe their function.

2. What happens when a cow is not given enough grass? How would this affect the rancher that is raising the cow for beef? How would this affect the dairyman that is raising the cow for milk production?