Cows, Worms, and Compost

Science: Soil

Materials
◆ "Chew it Twice" worksheet (one per student)

Background: Things We Can Learn from a Cow and Worm

We all know worms are decomposers—breaking down organic matter into useful plant nutrients—but cows as decomposers? Aren't cows consumers? Yes, they consume grass, but in a sense cattle are producers. Cattle and other livestock produce meat and other useful by-products. However, cattle are also one of Mother Nature's decomposers or recyclers. How? Twenty-five percent of food processing by-products are fed to cattle. Another larger percentage of food processing by-products are fed to hogs, chickens, turkeys, and fish. Sugar beet pulp (the by-product of sugar processing), almond hulls, fruit pits, cottonseeds, grape skins, meat and bone meal, citrus pulp, canola meal, dairy processing wastes, and bakery wastes, to name a few, all help produce nutritious, low-fat beef, poultry, and pork. Landfill problems are reduced because of livestock recyclers. Dr. T.W. Perry, retired professor of animal nutrition at Purdue University, describes cattle as the "best recyclers in the world." He explains, "basically, cattle can be fed any organic by-product that comes from the production of human food. In the Northwest, cattle are fed potato by-products; in the Midwest, they are fed corn and carrot by-products. Livestock help to make the most of our food production resources. Eighty-five percent of what cattle eat is material that people can't digest. In fact, half of the plant material resulting from food-crop production, such as corn stalks and wheat straw, would go to waste if cattle or other livestock didn't eat it. In addition to easing landfill and other waste problems, cattle are solar powered. The "solar collector" is the millions of acres of land in the U.S. that can't be used for growing food crops. About two-thirds of all agricultural land in the U.S. is classified as grazing land. The sun provides the energy for this natural resource to grow the grass that cows eat. Can cows eating grass (grazing) hurt the land? YES and NO. YES, cattle under poor management can be allowed to overgraze. Ranchers, as stewards of the land, along with state and federal agencies work together to manage grazing and ensure land that will be productive in the future. And NO, like mowing a lawn or pruning a tree, cattle grazing can promote plant vigor and diversity. Experts say that soil productivity, as well as water and air quality, is better maintained by well-managed grazing than by almost any other type of land use.

Cattle are ruminant animals. This means they have a four-compartment stomach that allows them to make nutritious foods out of grass, hay, and other plant by-products. As a cow eats, the food passes from the mouth, through the esophagus and into the rumen (roo mihn). Here the food is partly digested by tiny bacteria that live in the rumen.

Agriculture in the Classroom
UtahStateUniversity
COOPERATIVE EXTENSION

Time: 30 minutes

Grade Level: 3, 6

Science Grade 3
Standard 2–Students will understand that organisms depend on living and nonliving things within their environment.
Objective 1–Classify living and nonliving things in an environment.
Indicator a–Identify characteristics of living things (i.e. growth, movement, reproduction).

Science Grade 6
Standard 5–Students will understand that microorganisms range from simple to complex, are found almost everywhere, and are both helpful and harmful.
Objective 3–Identify positive and negative effects of microorganisms and how science has developed positive uses for some microorganisms and overcome the negative effects of others.
Indicator a–Describe in writing how microorganisms serve as decomposers in the environment.

The food is then passed to the reticulum (ruh tik yu lum), which is a membrane with "honeycombed" ridges. These ridges break the food down into smaller pieces. The cow regurgitates those pieces and chews them again. The partly digested food that comes back into the cow's mouth is called cud. The cow re-chews the food with its powerful back teeth to break it down even more. This is what the cow is doing when it "chews its cud." As the cow swallows, and saliva washes the cud back into the cow's system, the food now flows into the omasum (oh mah sum), the third section of stomach. During this process the food breaks down into vitamins and nutrients that the cow's body absorbs to meet its daily nutritional needs. The fourth compartment of a cow's stomach is the abomasum (a bo mah sum). The final digestive process takes place here. In the abomasum the cow's system gets all the remaining food value it needs from the food before passing to the intestines. The intestines store the unused food portions and continue to absorb some nutrients from them until there is enough to be removed as cow manure.

Earthworms, working below the ground as recyclers, also play a vital role in the formation, fertility, and structure of the soil. Worms literally eat their way through their surroundings; eating pieces of decayed leaves, animal remains, manure, twigs, roots, and soil mineral particles. Food stuff which is taken in through the mouth opening is grated in a gizzard, then moved by muscle contraction into a large intestine where it is digested. The remains that pass out are know as castings. Earthworms contribute to the formation of soil structure by their cast-forming activities. These casting are rich in plant nutrients and are an important contribution to soil fertility. Cattle and worms can teach us about our soil, and many other things.

Teacher Notes:

Ode to Cows and Worms

Just what is it we observe,
of how these species do conserve;
precious resources up above,
and underneath the earth we love.
Recycling things that we can't use,
these worms and cattle give us clues;
so let's admire these earth dwellers,
which live on land and in its cellars!

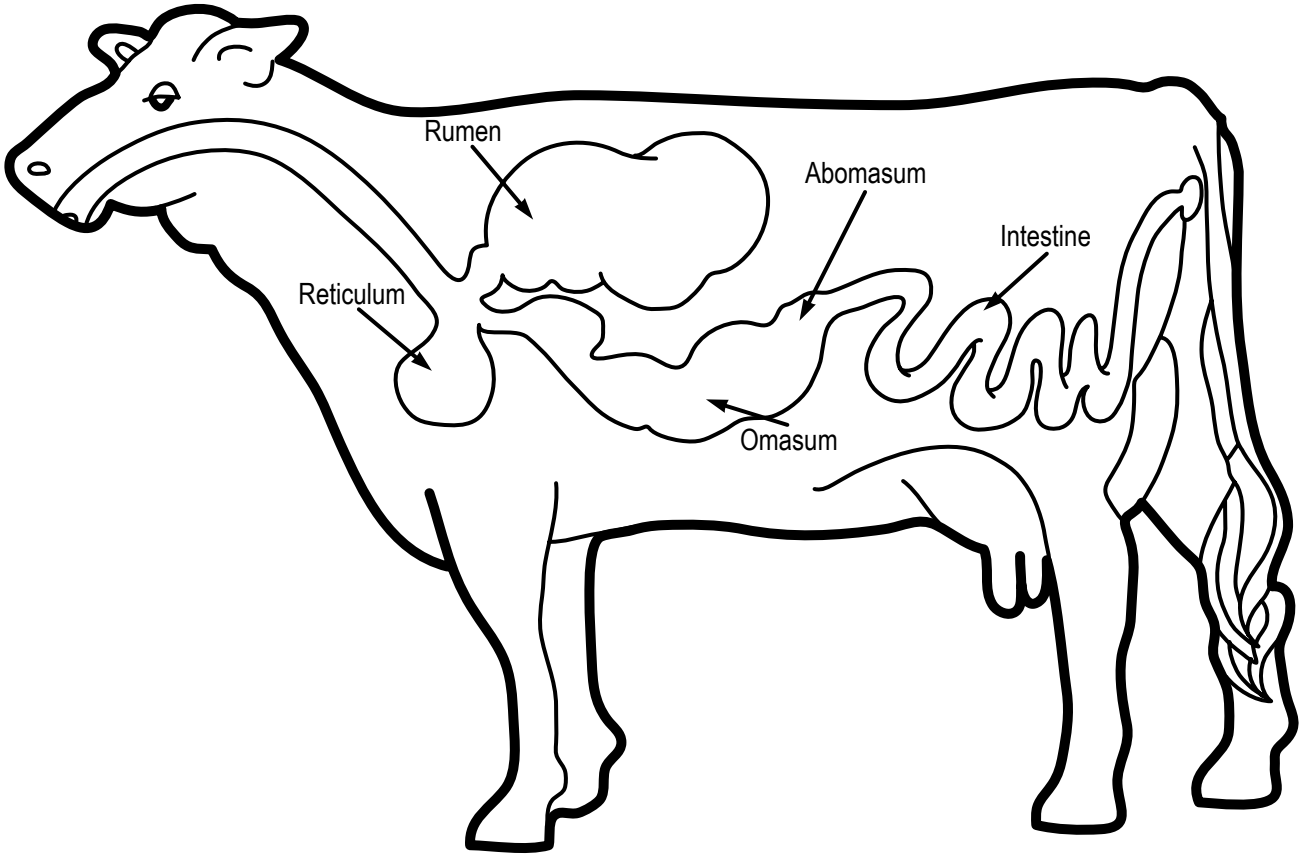
Activity Procedures

Share the background information with your class. Then have each student complete a copy of the "Chew It Twice" worksheet.

Chew it Twice

Name _____

Listen as your teacher explains the path food takes on its way through the cow. Follow the path with your finger. Then follow the directions below to show the path of the cow's food.



1. Use a green crayon to trace from the mouth to the rumen to the reticulum.
2. Use a yellow crayon to trace the path back to the mouth.
3. Use a brown crayon to trace from the mouth to the omasum to the abomasum to the intestine.

Did You Know...
Consumer Agriculture Facts

American agriculture has seen a 14 percent increase in production over the past 12 years with 8 percent fewer acres, providing more land for wildlife.

In 1987 only 5 newspapers used soy ink—now more than 3,000 do.

Plastics derived from starches are fully biodegradable and are decreasing our need for petroleum.

Waste animal fats are being turned into clean burning biodiesel fuel for buses and trucks.

Road de-icers are being made from corn instead of salt. They reduce rust on bridges and cars, as well as salt pollution of our fresh water supply.