



# SIZZLING DISCOVERIES

Reader Series | TOPIC #2

Exploring the path of

# UPCYCLING



Imagine you're having a weekend adventure with friends, hunting for clothes at thrift stores for an upcoming party. You love discovering thrifted clothes and creating your own outfits. During your shopping spree, a friend points out that you're making sustainable fashion choices by upcycling previously worn items. This brings to mind what you learned in your recent science class about upcycling in the animal world, specifically how cattle and other ruminant animals play a vital role in our ecosystem.

Let's go on a journey to understand the significance of this process and how it positively impacts your daily life, thanks to these hardworking animals.

## VOCABULARY WORDS

Upcycling | Sustainability

Byproducts | Landfill

Ruminant | Rumen | Digest

# BEEF.

IT'S WHAT'S FOR DINNER.®

Funded by Beef Farmers and Ranchers



What is “**upcycling**”? When cattle graze, their **ruminant** digestive system transforms things that humans are unable to eat - like grass, other forages, and **byproducts** such as distillers’ grain, cottonseed, and beet pulp - into high quality protein and micronutrients for human consumption. When cattle upcycle, they take the parts of plants we can’t use that might otherwise end up in a **landfill**, and turn them into more valuable products.

*Complete the edPuzzle on the right to learn more about how cows contribute to sustainability across our nation.*



## BEEF SUSTAINABILITY: What Is Upcycling and What Does It Look Like?

Did you know? About 29% of U.S. land is like a special zone for animals. It’s called pasture and rangeland because regular crops can’t grow there. Imagine an area as big as Washington, Oregon, California, Idaho, Nevada, Utah, Arizona, Montana, Wyoming, and Colorado combined! This land is too rocky, steep, or dry for normal crops, but perfect for ruminant animals, like cattle, sheep, and goats.

These animals, especially cattle, make the most of the land that we have available. Whether grass-finished or grain-finished, cattle spend most of their lives on pasture, eating grass, and thus, upcycling. Around 90% of their diet is grass, forages, and plant leftovers, which are inedible for humans and would go to waste. But guess what? Through upcycling, these animals turn those plants into super-useful stuff, like high-quality protein and other products we can use.

Cattle are like nature’s recycling squad, turning land we can’t use for crops into things we can use. It’s not just about what’s on your plate; it’s about being smart with the resources we have available.

**Bones/Hooves/Horns**

- adhesives
- bandaids
- buttons
- charcoal
- china
- combs
- conditioner
- dice
- football helmet
- glass glue

**Manure**

- fertilizer
- nitrogen
- phosphorous
- methane gas

**Fat**

- antifreeze
- bio-diesel
- candles
- ceramics
- chalk
- chewing gum
- crayons
- creams & lotions
- deodorant

**Internal Organs/Blood**

- cake mixes
- dyes & inks
- fishing line
- imitation eggs
- instrument strings
- insulin
- medical sutures (stiches)
- medicines
- pasta
- sausage casings
- tennis racket strings

**Hide (Hair & Skin)**

- adhesives
- air filters
- baseball
- baseball mitt
- belts
- boots
- candles
- clothing
- dry wall
- felt
- football
- gelatin

**Other products:** lamination, pet food, photo film, piano keys, plant food, plastics, plywood, shampoo, tooth brushes, wallpaper, detergents, dish soap, fireworks, insulation, linoleum, lipstick, makeup, margarine, matches, oils & lubricants, paint, perfume, pesticides, plastics, rubber, shaving cream, soap, tires, toothpaste.

### DID YOU KNOW???

Cattle not only prevent A LOT of byproducts from ending up in landfills, they also upcycle in other ways. Beyond providing high-quality beef for you to purchase at the grocery store or enjoy at a restaurant, cattle also provide various by-products that you use every day.



Scan for the **Byproduct Handout!**

### POSSIBLE CAREER PATHS



- Rancher
- Environmental Scientist
- Animal Nutritionist
- Geneticist



**CURIOUS WHAT OTHER PRODUCTS CATTLE PROVIDE FOR HUMANS?**  
*Click the link to find out.*

## CATTLE ARE SUPER-DIGESTERS!

Cattle use their special stomach to digest grass in a way that humans can’t, and turn it into beef!



### HOW COWS EAT GRASS

Would you like to learn more about why cattle can digest things humans can’t? To do that, it’s important to understand more about their stomachs or rumen, especially before the upcoming lab on the next page. Complete the worksheet to gain a better understanding.

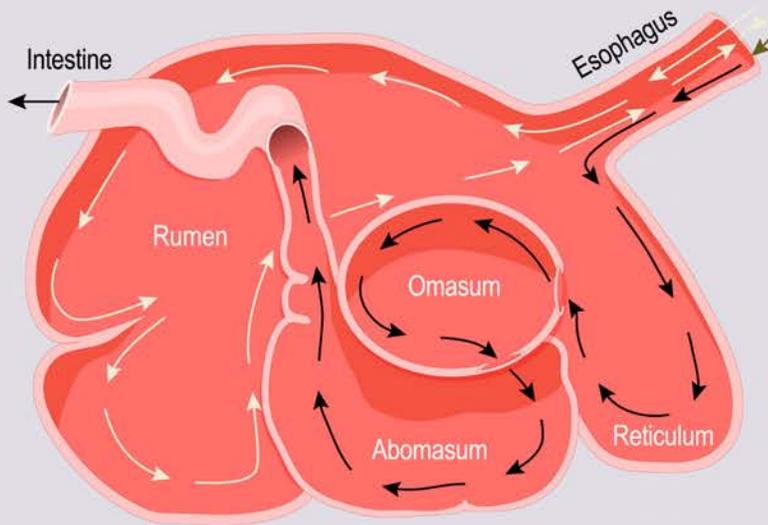


More than one-third of food is wasted in the U.S. If you want to make your food choices more sustainable, consider reducing your food waste.

EXPERIMENTAL KNOWLEDGE AN EXPLANATION  
**RESEARCH** EXPLORE  
WORK DOCUMENTATION  
PRACTICE STUDY AGEMENT SULTS DEVELOPMENT  
MARKETING INNOVATION INFORMATION

# The Science of Ruminant Stomachs

## RUMINANT DIGESTIVE SYSTEM



By this point, you've learned quite a bit about the special stomachs of cattle and how they differ from those of humans.

Now, it's time to apply this knowledge by creating your own ruminant stomach model using basic materials.

## Inside the Lab: Ruminant Stomachs

### MATERIALS

- Bottle, recyclable water bottles or soda bottles
- Balloon
- 3 tablespoons of white granulated sugar
- Packet of active dry yeast or dry quick rise yeast (2 ¼ teaspoons)
- Warm tap water

### PRE-LAB QUESTIONS

Be sure to complete the "How Cows Eat Grass" worksheet on page 3 to prepare for this lab.

1. Ruminant animals have bugs in their stomachs just like us. What are those "bugs" called?
2. What might happen if those bugs were not in their stomach?
3. Why do you think ruminant animals need four different parts for their stomach?
4. How are ruminant stomachs alike and different compared to the human stomach?

**Ready to continue with the lab?**

**Grab your lab sheets from your teacher and let's get going!**

This reader series is provided by:



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