

June 6

Dear Journal,

This morning before we headed out to the pasture, my Grandpa and I did some checking on the Internet, and we learned that a single dairy cow produces more than 5,000 lbs of dry **manure** every year! That's as much as our family's minivan weighs! While we walked toward the field where Lola and Lacey live, I asked Grandpa about the different ways that dairy cows help humans. He explained to me that one of the most valuable resources, besides the milk of course, is the cow's manure! It sounded really strange to me, but it made more sense as we watched the cows eating the grass from the field. I thought it was gross at first, but we checked out a few "cow pies" in the pasture, and I began to understand that cows' waste contains a lot of good ingredients.

I watched Grandpa use a tractor to move all the manure in the corral, making a pile outside. Grandpa also let me help take the temperature of the pile using a three foot-long thermometer! He said that the manure needs to be kept at a really high temperature for several days, to make sure any **pathogens** are killed. Pathogens are germs that can make people sick. If the temperature gets too low, Grandpa turns the pile and adds water. The moisture is necessary for the pile to "cook." This seems like a lot of work to put into a pile of manure, but Grandpa promised that we would benefit from all this hard work. This should get interesting!

**Based on the reading, answer the following questions:**

1. Why would it be important to use a three-foot long thermometer?
2. How do you think Grandpa and Lily will benefit from all their hard work with the manure?
3. How does this journal entry show that dairy cows are ultimate, efficient recyclers?

June 8

Dear Journal,

Today, I helped Grandma out in her garden. She taught me that Lola and Lacey, the dairy cows, often help her in the garden, too! I thought she was joking at first, but then she told me more. She said that a lot of farmers and gardeners use cows' **manure** to nourish their plants and crops. She said that when applied to soil, dairy manure increases the amount of **nutrients** for plants, and is perfect for garden use. More than 75% of the plant nutrients fed to cows, like Lola and Lacey, is released in their manure, so the stuff is an excellent **fertilizer**! Manure and composted plant materials add organic matter to the earth, which helps retain moisture; they also provide nutrients such as **nitrogen, potassium, and phosphorus**.

Later that day, we drove into town. She showed me that properly composted manure from dairy cows and other animals is often sold as bagged manure at garden centers and nurseries. People actually buy the manure of dairy cows to add nutrients to everything from acres of corn and orchards of almonds to school gardens and potted plants. I wonder if Lola and Lacey know how much they're helping farmers and gardeners?

**Based on the reading, answer the following questions:**

1. Why is it important to add manure to soil?
2. What do you think "composted manure" is?
3. How are dairy cows ultimate, efficient recyclers?

June 10

Dear Journal,

We started out this morning by eating an awesome breakfast, using a lot of items produced right here on the farm! We ate eggs from the chickens in the coop out back and had fresh strawberries straight from the garden—Yum! I'm sure some of the milk in the carton from the store even came from Lola and Lacey! Grandma and Grandpa explained that my two favorite dairy cows also consume food that is grown right here at Green Meadow Ranch. "But not the same things we eat," Grandma said. We headed outside, stopping at the tall rows of corn. "You see, after we harvest the corn for ourselves, we treat the cows to the stalks and husks to supplement their diet," she said. "The Smiths down the road often bring over their grain **by-products**."

I was unsure of what by-products were, so after dinner I did some reading. I learned that by-products are feed ingredients from sources that are normally waste products of other industries. I began to understand that, in a way, the cows of America clean up after us. They consume leftover food processing products that would otherwise be filling landfills. Our landfills would be stacked to the top with stuff that the cows enjoy eating! I can't believe how much I'm learning about dairy cows this summer, and I can't wait to tell my friends back home how awesome cows really are!

**Based on the reading, answer the following questions:**

1. What are by-products?
2. How does reusing food processing by-products positively affect our environment?
3. How are dairy cows ultimate, efficient recyclers?

June 15

Dear Journal,

The days have been jam-packed with all kinds of great stuff to do here on the farm. I'm really starting to like working outside and doing the chores, and I even started waking up early, early in the morning (before the sun comes out!) to help Grandpa milk Lola, Lacey, and all the other cows. It's pretty cool to think that the food they eat will affect the milk they produce. Grandpa says that the better the quality of the food these cows eat, the better the milk, butter, and cheese will be that comes from them. That's a good thing because I LOVE dairy and anything with milk! He also says that better quality food will also mean a more healthy **manure**. Before I came to the farm, I didn't really understand why we would care about the quality of cow manure. I mean, it's just poop! But now I get it—manure makes plants grow better, and better plants mean healthier food for us and eventually for the cows. The cycle keeps going and going. Cows really are one of the most **efficient recyclers** on earth!

Well, I'm gonna run back outside and make sure the cows have enough water. I think I might tell my mom when she comes to pick me up next week that I want to be a dairy farmer when I grow up! I'll write more later—bye for now!

**Based on the reading, answer the following questions:**

1. How does the quality of cattle feed affect the production of a dairy cow?
2. Why should we care about the quality of manure from cows?
3. How are dairy cows ultimate, efficient recyclers?

## Glossary

**by-product:** an incidental or secondary product made in the manufacture or synthesis of something else

**efficient:** achieving maximum productivity with minimum wasted effort or expense

**fertilizer:** any material of natural or synthetic origin that is applied to soil or plant tissues to supply one or more nutrients essential to plant growth

**manure:** animal waste used for fertilizing land

**nitrogen:** an essential macronutrient for plant function; a key component of amino acids, which form the building blocks of plant protein and enzymes

**nutrient:** a substance that provides nourishment essential for growth and the maintenance of life

**pathogen:** a bacterium, virus, or other microorganism that can cause disease

**phosphorus:** an essential macronutrient for plant function; a key component in the process of plants converting the sun's energy into food, fiber, and oil

**potassium:** an essential macronutrient for plant function; a key component for cell metabolism and making protein for the plant

**recycle:** convert waste into renewable material