

Udderly Efficient Cattle By-Products!

Since 1993, California has been the nation's leading dairy state in milk production, with the most recent recorded amount of 39.8 billion pounds of milk produced in 2017. That is over 4 million gallons of milk! In addition to milk, dairy cattle farmers can also profit from marketing a by-product produced from dairy cattle: **manure**. With innovative technology, dairy farmers can reuse this somewhat smelly by-product - creating less waste and generating renewable energy.

From Cow to Curd - How Whey is Made

When making cheese, the first thing needed is milk. Milk is collected from cows and sent to a milk processing facility. The milk is then **pasteurized**, and the cheesemaker adds enzymes to create cheese flavor and texture. When making cheese, a liquid by-product is produced that is high in protein, called whey. Whey is considered a by-product from the cheese making process and is sold as a protein supplement. Try making Mozzarella cheese and collect the whey with your class by completing the Say Cheese Ag-Bite activity found at LearnAboutAg.org/resources/bites

No Oxygen Required - Making Biogas from Food Scraps!

Renewable energy can be created from manure, but did you know that it can also be created from food scraps? Scan the QR code to follow along in an experiment creating your own **biogas**. Cattle produce thousands of pounds of manure a year that can be transformed into by-products such as **biofuel**, soil amendments, **fertilizers**, and even building materials. Biofuel can be collected through the anaerobic digestion process. In the dairy industry, the anaerobic digestion process is the use of microbes to break down organic matter when oxygen is not present, generating biogas as the organic matter is decomposing. This biogas is collected and used as a renewable energy resource. **Standard: NGSS: 3-5.ETS1.1**

Buttered up By-Products!

To make butter at home, the first dairy product needed is heavy whipping cream. Heavy whipping cream is placed into a sealable container, filling only half of the available space. The cream is shaken vigorously, creating energy to repel the fat globules, causing the liquid to separate from the solid in the container. The solid piece is the butter, and the liquid is a by-product called buttermilk. Try making butter with your class!

Did you know?

California is the top producer of butter and ice cream and number two for yogurt and cheese in the United States.

History of Milk

Use this QR code to learn more about the historical findings of milk and milk by-products.

Dairy Division

- If an average cow produces 22,916 pounds of milk in one year, how much is she producing daily?
- Considering these averages, how many cows will it take to produce 100,000 pounds?
- If a gallon of milk weighs 8.6 pounds; how much does a quart weigh? Hint: There are 4 quarts in 1 gallon!
- A milk tanker can transport 12,000 gallons in one trip; how many pounds of milk are in 1 tank?

Standards: CC Math: 4.O.A.A.2, 4.MD.A.1, 5.NS.B.2, 5.MD.A.1