

● ○ ○ EASY



5 – 10 YRS



1 HR

(soak oats for 4hrs before experiment)



1

Find out how dairy farming can contribute to climate change

2

Explore how to make your own oat milk

3

Learn how scientists are reducing greenhouse gas production in dairy farming

INNOVATION IN CHEMISTRY

# DAIRY FREE ALTERNATIVES TO MILK



# INTRODUCTION

**Dairy farming is a producer of methane gas, which contributes to climate change. As microorganisms break down plant material in the digestive systems of cows, methane gas is produced.**

Methane is a greenhouse gas. Where solar energy is reflected from shiny parts of the earth's surface such as: oceans, snow and ice and this would normally escape through earth's atmosphere and into space. Greenhouse gasses are chemicals in the atmosphere that trap solar energy in the form of heat. The trapped heat causes the air to warm, contributing to climate change.

An analysis by the UN's Food and Agricultural Organisation found that meat and dairy farming accounts for nearly 14.5% of all the world's greenhouse gas emissions.

Dairy free alternatives to milk are plant-based and can be made from things like oats, rice, almond and soya. They use less water and land than dairy milk and producing plant-based milk releases a fraction of the greenhouse gasses.

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References: Tackling Climate Change through Livestock:  
A global assessment of emissions and mitigation opportunities (fao.org)



# SAFETY

- Do not ingest anything from this science experiment.
- Do not try this experiment if you are allergic to gluten or oats.
- An adult must operate the blender.
- This experiment must be supervised by an adult at all times.



## DID YOU KNOW?

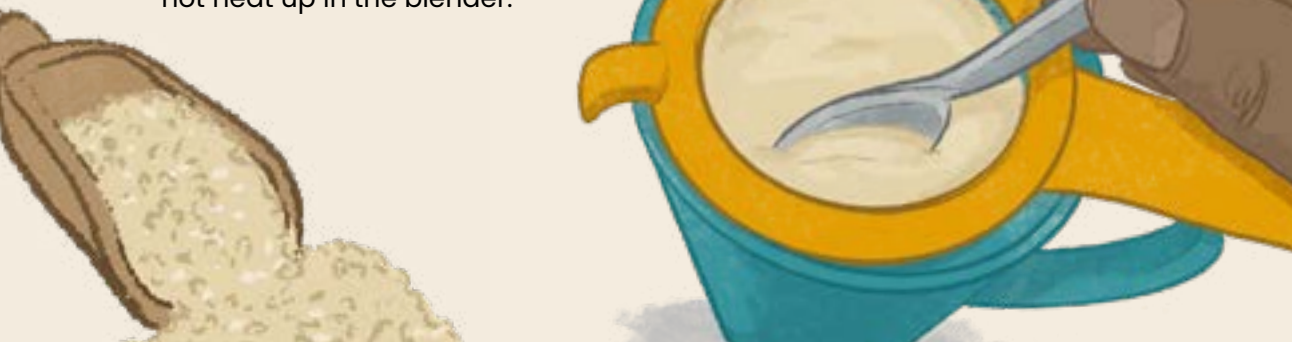
Manure from dairy farms can be used as a source of power. Manure can be collected in large air-tight tanks called anaerobic digestors. Special microorganisms (we call them anaerobic microbes) are able to break down the manure, releasing methane gas. The methane gas can be collected and piped to nearby buildings to burn to produce electricity and heat. Burning the methane prevents it being released into the atmosphere, but releases carbon dioxide instead which still contributes to climate change.

Cow manure also produces a gas called nitrous oxide as it breaks down, which is a very powerful greenhouse gas. It is 300 times more destructive than methane. Scientists have been experimenting with a special diet for dairy cows which is rich in flaxseed and seaweed and reduces the amount of methane and nitrous oxide produced. This would mean that dairy farming would contribute less to climate change.

# ACTIVITIES

## MAKING OATMILK INSTRUCTIONS

1. Measure 75g of oats into a large bowl. Fill the bowl with enough **COLD** tap water to cover the oats. Cover the top of the bowl with a clean tea towel and soak for 4 hrs.
2. Tip the oats into the sieve and rinse with cold tap water for a few seconds. Drain as much water from the oats as possible.
3. Tip the oats into the blender and add ½ teaspoon of table salt and 350ml **COLD** water. Get an adult to blend in short pulses for 2 minutes until smooth. Make sure to keep checking that the mixture does not heat up in the blender.
4. Place a tea strainer or fine sieve over a large jug, or mug. Tip the smooth oatmilk mixture from step 3 into the tea strainer. Do this gradually, a little at a time.
5. Using the teaspoon, gently scrape the sediment at the bottom of the tea strainer to help the mixture strain quicker. Repeat until the whole mixture has been strained and the oatmilk has been collected in the jug.



## YOU WILL NEED

- Porridge oats (or Gluten-free oats)
- Kitchen scales
- Large bowl
- Teatowel
- Teaspoon
- Table salt
- Measuring jug
- Tea strainer or fine sieve
- Large jug or mug
- Access to a blender



## WHAT'S HAPPENING?

Oats contain starch, which is a solid, white powder. Starch is a natural part of most plants, and can be found in fruits, vegetables and grains. Although the particles will not dissolve in cold water, they are very small and therefore the particles float around suspended in the water forming a white liquid. Starch can dissolve in hot water, forming a thick, sticky, clear mixture. To prevent the oat milk becoming thickened, **cold water** should be used for soaking and washing.

The salt helps to break up the cells of the oats to release the nutrients inside. The final oatmilk is rich in carbohydrates, which is a great energy source, as well as vitamin B12 and fibre that naturally occur in oats. Compared to dairy milk such as cow's milk, oatmilk is lower in fat, protein and sugar.

References: Effects on methane production, rumen fermentation, and milk production - ScienceDirect | Methane Emissions from Ruminants in Australia: (nih.gov) Using Seaweed Supplements To Significantly Reduce Livestock Methane Emissions (qub.ac.uk)