43.

Squelch the Belch 1

- A guided research activity

Introduction

Worldwide, burping livestock produce huge amounts of methane, a greenhouse gas that, molecule for molecule, is much worse than carbon dioxide. About 18% of global emissions come from ruminant animals such as sheep and cattle, but in New Zealand, agriculture accounts for a whopping 48% of our total. There are many different aspects to the problem — here are just some of the ones that you might investigate:

The source of the problem

Why is methane an important greenhouse gas?

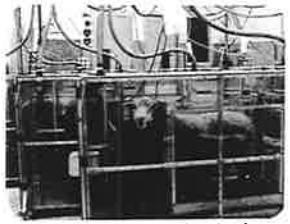
- ➢ We hear a lot about carbon dioxide and its importance as a greenhouse gas. How does methane compare to carbon dioxide when it comes to trapping heat energy?
- ➢ What evidence is there about the links between the concentration of methane in the atmosphere and past climate changes?
- ➢ What are the different ways in which methane is produced?
- ➢ How have human activities caused an increase in the amount of methane in the atmosphere?
- ➢ New Zealand's greenhouse gas emissions increased by nearly 25% between 1990 and 2005. What are the main reasons for this?

How do sheep produce methane?

- ➢ New Zealand has about 40 million sheep, 9 million cattle and 1 million deer. These animals are all ruminants. How do ruminants digest their food?
- ➢ Why do ruminant animals produce methane gas?
- ➢ In 2003 there was massive protest from New Zealand farmers against the so-called 'fart tax' which would have funded research into reducing methane emissions. Why would 'belching tax' have been a more accurate description?

How can we measure methane?

- ➢ How do scientists measure the amount of methane produced by a sheep?
- ➢ How much methane do New Zealand sheep produce each year?



Sheep in a respiration chamber for measurement of methane emissions
AgResearch

What can be done to reduce methane emissions from sheep?

- ➢ Describe some of the research that has been done to try and find out the effect on the sheep of reducing the number of methane-producing microbes in its gut.
- ➢ Explain how each of the following could result in a change in the amount of methane being produced by New Zealand sheep:
  - Breeding more digestible pastures
  - Changing the sheep's diet
  - Dosing sheep with chemicals such as garlic extract
  - Finding genetic markers to identify low methane producing sheep
  - Researching an enzyme that destroys the cell walls of methanogen bacteria
  - Vaccinating sheep against methanogen bacteria
  - Adding a genetically modified bacteria to the sheep's rumen
  - Feeding sheep with bacteria from a kangaroo's stomach

For an overview of New Zealand research, see the website of The Pastoral Greenhouse Gas Research Consortium:
www.pggrc.co.nz

Is methane the only problem?

- ➢ Sheep farming also increases the amount of a gas called nitrous oxide that is released to the atmosphere. Why does this happen?
- ➢ How does nitrous oxide compare as a greenhouse gas to carbon dioxide?
- ➢ What can farmers do to reduce the amount of nitrous oxide produced?

NIWA/AgResearch sheep in the paddock having their breath samples analysed to determine their rates of methane emission
Courtesy: Keith Lassey