Science lesson 5 – Student worksheet

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Learning aim:

To describe the consequences of human activity on the Earth's atmosphere and suggest solutions to reduce the impact.

Scenario:

Sam is a dairy farmer with 100 cattle spread out in 20 fields. Each field is 10 acres in size. Sam's farm produces milk for a large supermarket chain. Sam does not grow crops on his land even when the cows are in sheds during the cold winter months. In the last few years, Sam has been losing money as the supermarket have told him that they have started to buy from farms that are promoting themselves as 'sustainable', 'green' and 'environmentally friendly'.

Sam needs to make changes to his business to survive. He has printed off the data from the milking parlour computer which informs him how many pints per day his cows produce on average during the months of the year. Sam also asked for his costs versus profit information from his accountant and has researched some information on the internet. Sam has also emailed the National Farmers Collective for advice, and they have sent him a reply.

You are a business consultant working for a large accountancy firm. Sam has approached your company for advice on how to improve his business. You need to produce a 5-step sustainability plan to report to the supermarket. The report will potentially help save his farm from bankruptcy. Use all of the information provided on this worksheet to make notes in each of the sections of Sam's 5-stage plan. You will be feeding back later in the lesson.

You may want to think about:

1. What are the problems Sam is facing on his farm?
2. Should he grow crops?
3. Should he keep the cattle?

4. Should he do anything with his land in the winter when the cows are in the shed?
5. What could he say to the supermarket to show he is becoming more sustainable?
6. How carbon dioxide and methane levels are connected to his farm.
7. How he can reduce costs and so increase profit.
8. How do plants affect the concentration of carbon dioxide in the atmosphere?

Career spotlight:

Business consultants support companies and organisations to achieve their business goals and/or streamline and improve their operations to ensure they are as impactful as possible. They act as professional advisors in a particular area of the business, such as sales, IT, finance and marketing. Business consultants need to be organised, professional and strong team players. They also need to have sound literacy and numeracy skills and be good listeners.

5-step sustainability plan notes

1-What are Sam's problems?

2-Identify solutions

3-Explain how Sam could implement the solutions you have identified (what should he do?)

4-Explain to Sam why it is improving sustainability

5-Measure progress (how will you measure this and review it?)

National Farmers Collective email reply

Dear Sam,

We are sorry to hear that you are struggling with the farm. Please consider the following when you think about making changes:

1. The Department of Environment are offering money incentives to farms through the government's 'funding for farmers' scheme – where farmers can show they are trying to be more sustainable.
2. It is useful to increase the number of hedges and trees as this creates spaces for other animals e.g., birds and insets to live and therefore increases biodiversity. This is called agroforestry.
3. If you decide to grow crops, crop rotation (where the same crop is not grown in the same field each year) is a way of keeping the soil fertile, so it reduces fertiliser costs.
4. The recommended number of cattle is 1 cow per acre. It might be worth looking at how many cows you have per acre to see if you can free any land up for crops.
5. Have you heard of green cover? This is where you plant crops that grow in the winter which covers the soil and protects it. Examples include winter peas and beans and cabbage. Free seeds are available for this Under the Sustainable Farming Incentive. They are a great way of improving the soil and producing food.

6. Green sheds will soon be available that extract methane from the sheds the cows are kept in during the winter. The methane does not go into the air but is used to heat the shed - keeping the animals warm and so more energy goes into milk production.

Feel free to contact us again if you need any more advice.

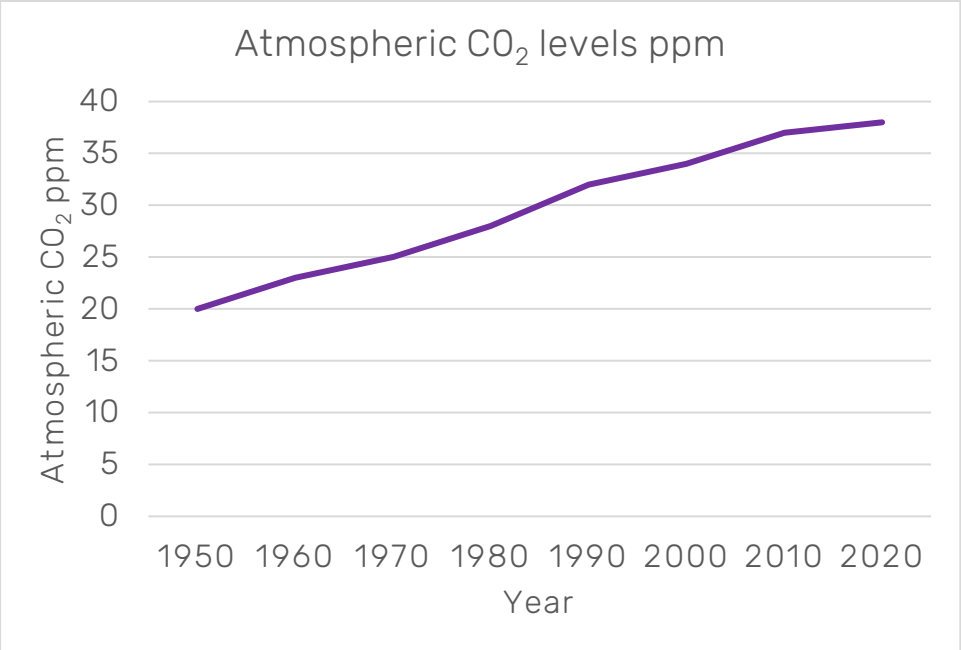
Wishing you luck in your endeavours.

Best wishes,
NFC

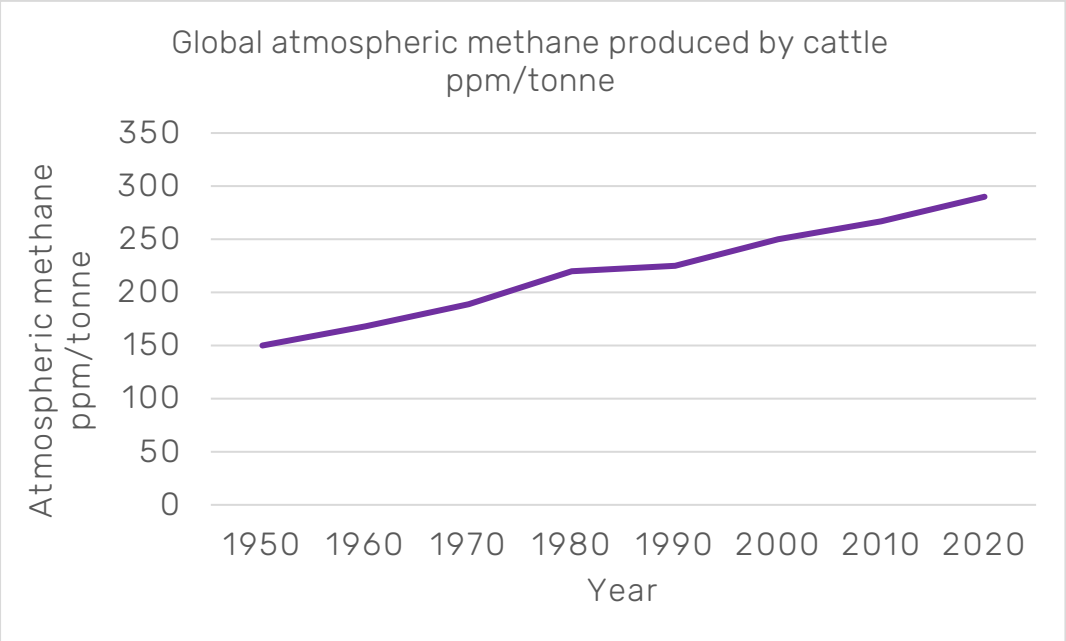
Sam's researched data from the internet

Sam researched carbon dioxide and methane levels data because he knows they are both greenhouse gases that are contributing to global warming.

Graph 1



Graph 2

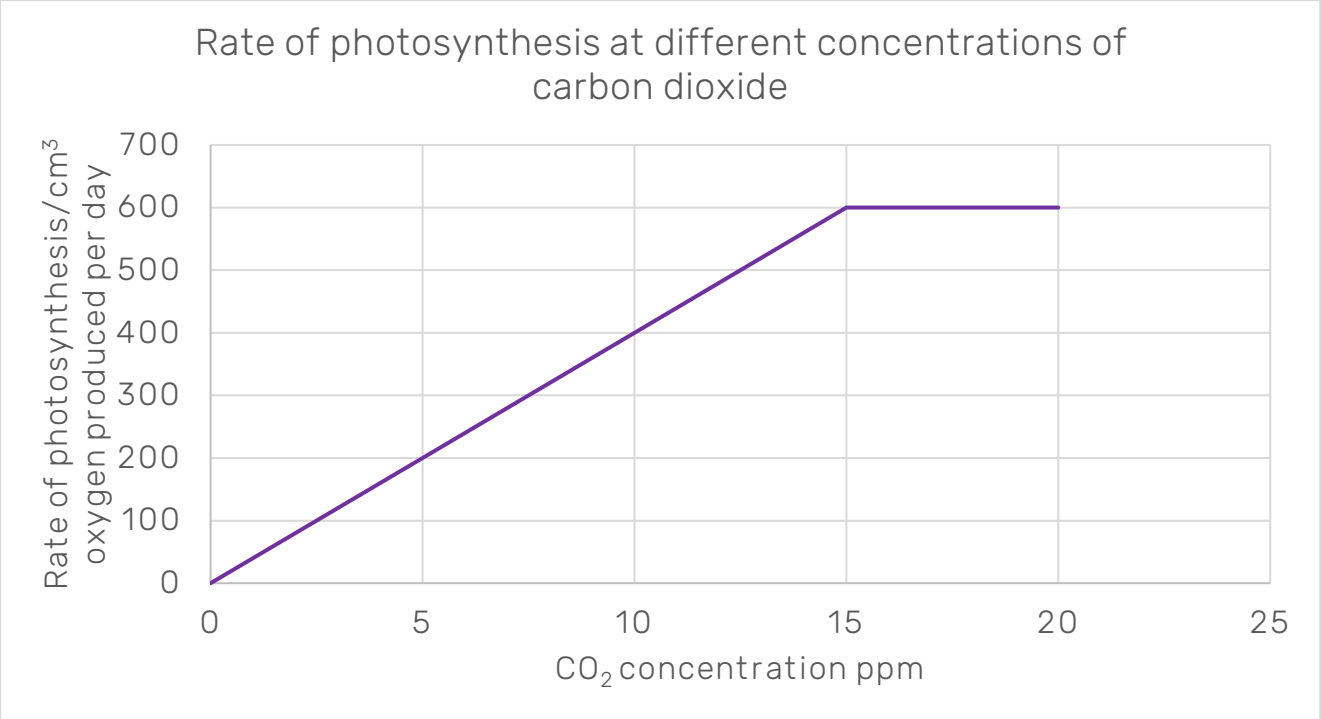


Further findings

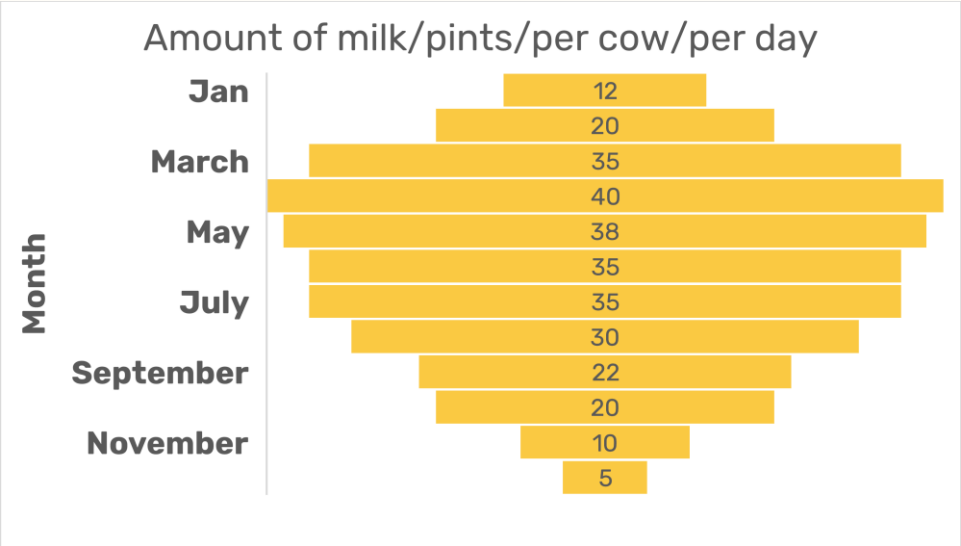
Sam found a graph on the internet about the impact of increased carbon dioxide, which makes plants photosynthesise faster, up to a point. He then researched photosynthesis and found out the information below.

Photosynthesis is how plants make food for themselves so they can grow. The food they make is glucose, a type of sugar but at the same time they make oxygen which they release into the atmosphere. To do this, they need carbon dioxide from the air, water from the soil, sunlight and chlorophyll - which is a green chemical found in the leaves. If one of these is missing or in short supply, photosynthesis will slow down. Carbon dioxide is a greenhouse gas.

Graph 3



Graph 4



Graph 5 – Data from Sam's accountant