



3: Meat, Livestock, Grass, Soil and Carbon

Food and climate – a complex issue

What we eat has a huge influence on CO₂ emissions and the climate. Almost a quarter of global greenhouse gas emissions comes from agriculture, according to the United Nations. Humanity's appetite for meat and dairy has increased hugely over recent decades, and the mass of animals raised for food or slaughter on Earth now outweighs wild animals by a factor of 15 to 1.

With livestock being one of the main contributors, there is a strong case for eating a lot less meat and dairy produce to help protect the planet. However, it is simplistic to conclude that meat is bad for the planet. The carbon footprint of meat and dairy, like other foods, varies with how it is produced and where it comes from. And livestock farming is closely bound up with other environmental issues, notably the protection of soil, and the conservation of biodiversity.

Cutting all meat consumption is not a simple answer to saving the planet. Instead, we should look at the sustainability of all foods, both plant and animal-based, and make a more careful choice about what we should eat to be healthy and sustainable, on the basis of *how* these foods are produced. In other words, 'it's not the cow - it's the how, the where and the why'.

Crucially, if we try and re-adapt our diets to reflect more closely what can be produced sustainably in the countries where we live, we will create more future resilience while also reducing our climate impact.

Soils and climate

We all ultimately rely on soil for our food, though most of us tend to take it for granted. We also rely on soil for storing carbon: soils are the world's biggest terrestrial carbon store, containing more carbon than is found in the atmosphere and all of the world's vegetation combined.

However, globally soils are leaking carbon to the atmosphere through mismanagement from intensive crop production and overgrazing. In many cases the root cause is the demand to supply developed countries with cheap and out of season produce in countries thousands of miles away. This forces pastoralists onto the poorest land where the soils are thinnest and lack resilience.

In the UK, soil degradation is often caused by poor farming practices (working soils during wet weather, leaving fields bare over the winter months, harvesting maize too late into the autumn). The reliance on artificial fertilisers can have the effect of degrading soil structure, because of a gradual loss of organic matter, combined with heavy machinery and other poor practice.

By returning to a more 'regenerative' mixed farming approach, with fertility-building grass and legumes integrated with crop rotations, there is the opportunity to improve soil health and store significant quantities of carbon. For this reason, farming methods which improve soil health need to become a central part of our climate strategy.

Permanent grassland has much higher soil carbon levels than arable land, due to the lack of soil disturbance and a greater level of carbon sequestered by the sward and associated soil micro-organisms. This also applies when arable land is rotated with temporary grass leys, which result in significantly higher soil carbon levels than are found in continuously-cultivated arable soils.

For these reasons, it is crucial to avoid ploughing up grasslands and converting them to continuous crop production, as this releases significant amounts of carbon. It also means we should incorporate temporary grass leys through a return to mixed farming systems. This would also deliver a host of other benefits, such as improved water storage capacity which helps prevent flooding and improve resilience to drought.

When degraded pasture is placed under better grazing and grassland management, soil carbon levels can increase significantly over the course of a few decades. Increased plant species diversity can also increase soil carbon levels under permanent grassland.

What type of livestock systems are worst and best for the climate?

Not all livestock production is the same. Intensive, industrial livestock systems contribute more to climate change, biodiversity decline and human health issues, than extensive, pasture-fed livestock farming.

When animals are fed on crops that humans could otherwise eat (rather than just on grass), their production uses much more land than when they simply eat grass. Pasture-based livestock systems however, can provide a number of other benefits, for biodiversity, animal welfare, and soil conservation. Livestock grazing also enables food to be generated from land which cannot be used for growing crops.

Global figures for the carbon footprint of meat, which are often quoted in the media, are misleading because the footprint of meat produced in different parts of the world varies enormously. In the UK, two-thirds of farmland is under grass, which grows particularly well in our temperate, high-rainfall climate. This is one of the key reasons why the carbon footprint of British beef is only half the global average, and that of organic beef in the UK only about a third of the global average.

In contrast, the carbon footprint of Brazilian beef from former rainforest land is about 30 times higher than the average for beef produced in the UK. This is due to the destruction of rainforest and other virgin land associated with some of the production in Brazil, and the associated carbon losses, plus the fact that the productivity of Brazilian grass on former rain forest land is less than half the productivity of British grasslands.

What about methane?

Cows and sheep are ruminants, with specialised stomachs containing bacteria which can digest tough, fibrous foods like grass. Their digestive process causes them to belch out methane, which is a greenhouse gas up to 30 times more powerful than CO₂. Methane emissions from the UK's cattle and sheep account for about 5% of UK greenhouse gas emissions, but their actual impact on global warming is much smaller than that suggests, because methane is short-lived in the atmosphere, staying there for around 12 years.

Weaning ourselves off nitrogen

Our current food systems are hugely dependent on nitrogen, with global use of nitrogen fertiliser having grown exponentially during the past century. Artificial nitrogen fertiliser has provided a straightforward and cost-effective method for farmers to boost productivity, fuelling agricultural intensification and the expansion of food production worldwide. As a result of these gains, governments have turned a blind eye to the significant negative impacts of the use of nitrogen fertiliser, choosing instead to prioritise the short-term goal of increasing the production of commodity crops.

Nitrogen fertilisers contribute to soil degradation, freshwater, marine and air pollution, and loss of biodiversity. They are also a major source of CO₂ emissions in themselves, because they are manufactured using fossil fuels. The recent increase in fuel prices has caused a huge increase in the cost of nitrogen fertilisers, and partly for this reason there is growing interest in the farming community in alternatives. The

use of forage legumes increases the soil's natural nitrogen levels and helps to reduce the use of artificial fertilisers, significantly lessening the amount of nitrogen in the atmosphere.

So - what should we eat?

Overall meat (*and* dairy) consumption badly needs to be reduced. But we must differentiate between which types of meat and dairy farming are damaging for the planet and which actually contribute to sustainable farming systems.

Some argue that white meat (chicken and pork) are better for the climate than beef, but the carbon footprint of these meats, where they are reared in intensive units, is largely offshore because they are fed on imported feed.

We should therefore significantly reduce consumption of intensively produced pork and poultry, plus imported or largely grain-fed beef or lamb. By contrast, locally-reared, mostly pasture-based meat and dairy have a positive place in sustainable, climate-friendly farming systems and in a healthy diet.

We should also cut out the shocking waste of food – up to a third is wasted in some parts of the world – and thereby reduce the demand for more food production from our already-stretched land and soils.

Most importantly though, the sustainability of all foods should be considered – not just meat. Many plant-derived foods have a significant negative impact through being grown with chemicals, transported from far away countries or through requiring a lot of water or non-renewable resources such as fossil fuels in order to produce them. Intensive production of crops can cause grave destruction to soils, waterways and wildlife habitats, as well as emitting huge amounts of carbon. When choosing what to eat, it is important to consider *where* and *how* it has been grown. Buying locally, seasonally or direct from producers is often a good way to ensure you know the true story of the food you are eating.

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