

What if animal farming were not so bad for the environment?

What options exist, especially in terms of new technologies, for reducing the carbon footprint of the livestock industry, how effective might they be, and what could be done to encourage their implementation?

The livestock industry is responsible for around 14.5 % of global greenhouse gas emissions. The magnitude of this percentage is due to the emission of large amounts of methane and nitrous oxide, which both result in greater global warming than carbon dioxide per gram of gas released. The main cause of livestock methane emissions is the digestive process in ruminants, such as cattle and sheep. In these animals, food is fermented, generating methane which is burped out. Nitrous oxide is generated through the application of fertilisers for animal feed production. This is also the case with crops grown for human consumption, but, as most of the energy stored in crops is lost when they are fed to animals, emissions due to fertilisers are much greater per calorie of animal produce than of plant produce. Both gases are produced by the storage of manure and its application as a fertiliser. In addition, carbon dioxide is emitted through burning fossil fuels for purposes such as fertiliser production, operation of farm machinery and transport of goods.



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Potential impacts and developments

The EU is a major producer and consumer of animal products – around 30 % of European food calories come from animals. This amount is growing, with the EU's consumption of beef, pork and chicken projected to increase by 0.4 % per year from 2011 to 2021. It may be possible to address the greenhouse gas emissions resulting from this growing consumption by adopting new farming methods and developing new technologies, as the size of the carbon footprint is heavily dependent on the method of production.

There are several approaches to reducing greenhouse gas emissions that have already been adopted on some farms. By changing the feed given to cattle and other ruminants, or adding certain chemicals to the feed, the amount of methane produced during digestion can be substantially reduced. Research is ongoing in this area, but some such feeding methods are already being applied on some farms. As well as methane emissions decreasing, the conversion of feed into animal produce becomes more efficient – the energy that would be lost in methane emissions can be used in the animal for meat and milk production. In some livestock systems, there is also large potential for reducing the emissions from manure by changing how it is stored and, where it is used as a fertiliser, how it is applied to fields. Such manure management methods are already well-established on many farms, but they are not applied universally.

By improving the management of land used for grazing, the amount of carbon sequestered in soils can be significantly increased. Avoiding over- or under-consumption of forage, as well as having legumes in pastures, allows historical soil carbon losses to be reduced and even reversed. Rearing cattle on feedlots is less emissions-intensive than grazing systems because the diet results in lower digestive methane emissions and, for meat production, cows take less time to reach slaughter weight. However, large-scale feedlots are associated with increased water pollution from cattle effluent and fertilisers used in feed production, as well as increased potential for zoonotic disease transmission.

Some additional approaches may also have great potential for emissions reduction, but are still at early stages of development. The efficiency of farm animals could be improved and their methane emissions reduced through breeding or even genetic modification. Methane emissions from ruminants could be further reduced by directly manipulating their digestive bacteria. Sexed semen, which predetermines the gender of an animal's offspring and can thus improve a farm's efficiency, is already commercially available, but issues remain with high costs and low conception rates. Collecting the methane produced by cattle could potentially reduce emissions both directly and by providing an alternative energy source to fossil fuels.

A more dramatic possibility is in vitro meat, which is grown in a cell culture rather than in an animal. The first cultured beef burger was eaten in 2013, but the project cost €250 000, so a great deal of work remains to be done on making in vitro meat affordable. It has great potential for reducing the environmental impacts of meat production, in terms of both greenhouse gas emissions and other factors, such as biodiversity loss and water pollution, and it would likely reduce consumer exposure to dangerous chemicals, such as pesticides. However, consumers may be reluctant to eat meat that is produced in such an artificial way.

Anticipatory policy-making

If all farmers adopted the technologies and practices currently available to reduce environmental impacts, livestock greenhouse gas emissions would decrease by around 30 %. Some of these measures would benefit farmers by increasing production efficiency, so could be encouraged by raising awareness through investment in communication activities, demonstration farms or training programmes. However, many would be expensive to implement and so are unlikely to be encouraged by awareness-raising alone. Introducing a carbon footprint labelling scheme would help consumers to choose the products with the lowest impact on the environment. However, people generally consider price and health impacts to be more important in their food choices than carbon footprints. Farm measures that require new infrastructure could be supported through loans under the Common Agricultural Policy and its Pillar 2. New regulations could be introduced to require the livestock industry to reduce greenhouse gas emissions, as has been done in California. With such a policy, as is the case with animal welfare legislation, measures may need to be taken to protect the competitiveness of EU farmers – possible approaches include holding importing farms to the same standards, including environmental impact provisions in trade agreements, and promoting the issue at international events. As well as directly encouraging the livestock industry to reduce its carbon footprint, funding for research into new farming methods could be increased, allowing for the exploration of new possibilities for emissions reduction.

Many of the possible policy options would involve significant short-term costs to citizens, through either the EU budget or the prices of animal products. As only 29 % of people are aware that the livestock industry is a major contributor to global warming, it may be appropriate to raise public awareness of the issue – people are more likely to support public action on the livestock industry after exposure to information connecting it with global warming. Any such campaign should be simple, and information should come from experts and environmental groups, as these sources of information are most trusted in this context.

Without innovative new approaches to dramatically reduce the carbon footprint of the livestock industry, even if existing mitigation methods are adopted, projected increases in animal product consumption would likely be incompatible with greenhouse gas emission targets. Public consumption could be discouraged by taxing animal products according to their carbon footprint, as is being considered in Denmark – rates of up to 40 % on different foods could reduce emissions by more than the total generated by the aviation industry, while at the same time resulting in significant public health benefits. While there would be public resistance to such a policy, this resistance would likely be short-lived. A variation on this idea would be to reduce EU animal farming subsidies.

There is great potential for reducing the significant carbon footprint of the livestock industry through new technologies and farming methods. Public encouragement may be necessary to ensure the widespread adoption of these measures. However, even if this adoption is achieved, should research not lead to new approaches that have greater emissions mitigation potential, it might be necessary to discourage public consumption of animal products in order to meet targets for greenhouse gas emissions.

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