

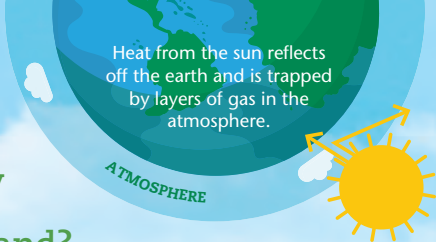
A collection of eight green circular icons arranged around the title. Clockwise from the top: a circular arrow with a leaf, a wind turbine and solar panels, two trees, a water drop, a cow, a clover, a group of sheep, and a circular arrow with a leaf.

Agriculture and climate change

Your essential fact pack



What's climate change and how will it affect Ireland?



Greenhouse gases (GHGs) are a collection of gases that act as a blanket around the earth. That's because heat from the sun reflects off the earth and is trapped by layers of gas in the atmosphere. Without this, the earth would be frozen, but increased amounts of GHGs in the atmosphere in recent decades are causing global temperature to rise, which causes climate change.

For Ireland this could mean:



Wetter winters

More intense storms and rainfall; increased likelihood and magnitude of river and coastal flooding.



Drier summers

Water shortages in summer, heat stress in animals.



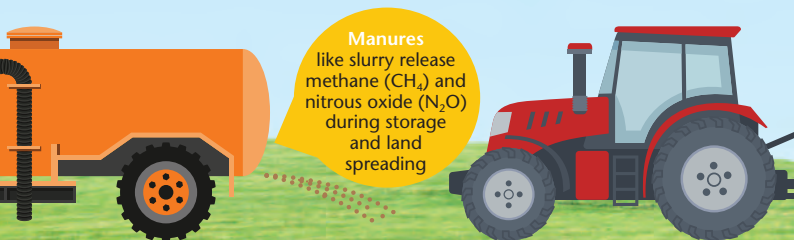
More frequent extreme weather events

Such as storms and droughts.



Increased risk of new pests and diseases of plants and animals

This may make it impractical to grow certain crops and increase some diseases and parasites.



Manures like slurry release methane (CH_4) and nitrous oxide (N_2O) during storage and land spreading

Emissions from agriculture in Ireland

The sources of GHG emissions are different in Ireland from other European countries. In most countries in Europe, the human population is greater than the cattle population, so emissions are much greater from human or industrial sources than from agriculture.

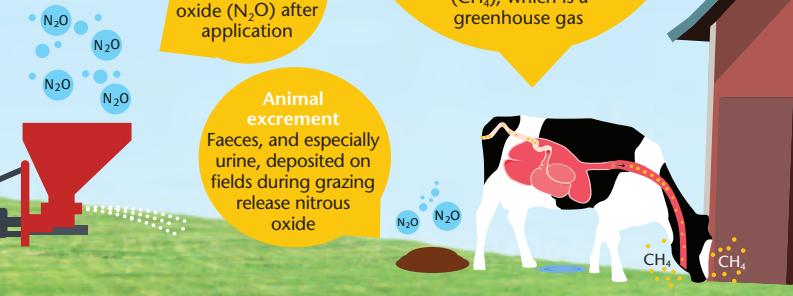
The estimated amount of carbon stored in mineral soils in Ireland under grass and tillage crops is equivalent to 30 years worth of emissions from the whole Irish economy

Diesel
for agricultural machinery emits carbon dioxide (CO_2), as does the generation of electricity used on farms and land management practices such as ploughing

Fertilisers
such as CAN release nitrous oxide (N_2O) after application

Animal excrement
Faeces, and especially urine, deposited on fields during grazing release nitrous oxide

Methane belched by cattle and sheep
Cows and sheep are ruminants. This means they digest food in a specially-adapted stomach called a rumen, one of four stomachs that ruminants have! The rumen is filled with bacteria and other microorganisms that help ruminants digest fibre but the process also produces methane (CH_4), which is a greenhouse gas

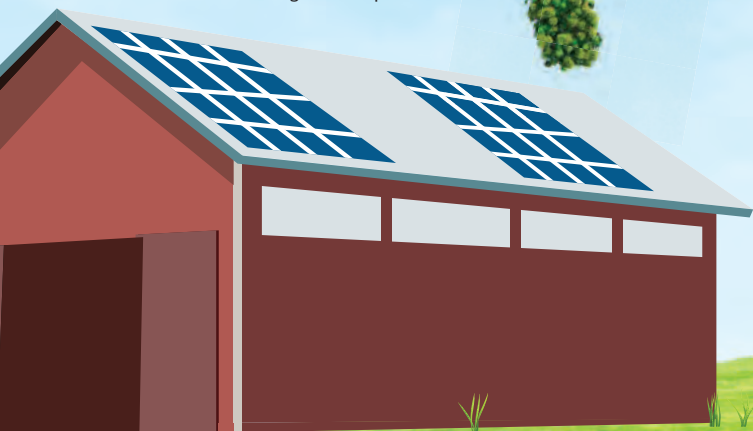



Why do we need to reduce GHG emissions?

The term carbon footprint is used to describe how much carbon goes into the air because of something done by people. Driving a car or taking a flight has a carbon footprint, as does the production of milk or meat or the growing of crops.

Ireland's carbon footprint for food is good. Farmers have made great progress in reducing the footprint in recent years by improving their efficiency through better animal breeding, grassland management and utilisation of animal manures. However, total emissions from agriculture are increasing. The reason is simple: we have a bigger cattle herd since the ending of milk quotas.

Ireland has the
lowest carbon
footprint of milk
in the EU





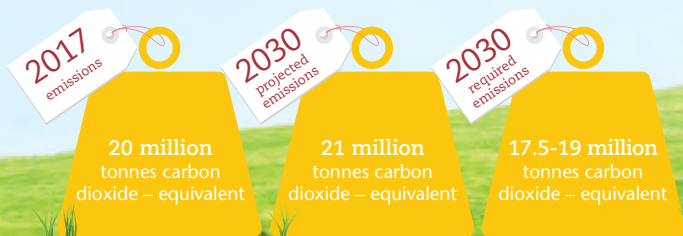
GHG reduction targets aim at reducing total emissions – rather than just reducing the carbon footprint.

Reducing the carbon footprint of activities is important, but if the amount of an activity increases at the same time (e.g., the number of cows), then it becomes harder to reduce total emissions.

Currently, agriculture in Ireland:

- accounts for 33% of our total greenhouse gas emissions;
- but has the lowest carbon footprint of milk in the EU (joint lowest with Austria);
- and the fifth lowest carbon footprint of beef in the EU; and,
- these are low because we mainly use grass to produce milk and meat.

The Irish Government's Climate Action Plan targets for agriculture are:



International obligations

Ireland has signed up to comply with international climate agreements such as the Kyoto Protocol, the Paris Agreement and the EU Effort Sharing Agreement. These agreements require total emissions to be reduced, not just a decrease in carbon footprints.

Opportunities

Making agriculture more environmentally sustainable is good for the clean, green image of Irish agriculture, which is an important factor that consumers consider when they choose to buy food from Ireland.

Globally, consumers want food that has a low environmental impact and this could create new markets. Ireland is already highly regarded by consumers for the environment in which we produce food.

Consumers want food that has a low environmental impact



How can farmers reduce GHG emissions?



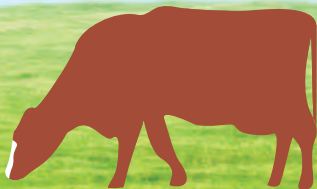
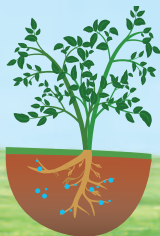
By optimising nitrogen fertiliser use

- Switching to 'protected urea' fertiliser – this is specially treated to help reduce the loss of nitrogen into the atmosphere (by up to 70%).
- Ensuring optimal soil fertility improves the uptake of fertilisers (use a soil test).
- Planting clover – this plant absorbs nitrogen from the air and returns it to the soil, reducing the need for chemical fertiliser application. A well-developed white clover pasture reduces nitrogen fertiliser needs and, therefore, reduces carbon footprint significantly.

A well-developed white clover pasture reduces nitrogen fertiliser needs and, therefore, reduces carbon footprint significantly

By better use of slurry

- Low-emission slurry spreading (LESS) technologies, such as trailing shoe slurry spreaders, dribble bars or injector systems can reduce GHG emissions.
- Spreading slurry early – application of slurry in the spring time reduces GHG emissions due to more appropriate weather conditions and less storage time of slurry.



How can farmers reduce GHG emissions?

By producing renewable energy and saving on energy use

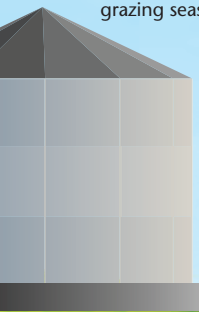
- Upgrading to new technologies could reduce electricity use on farms by up to 60% (and related carbon dioxide emissions). Technologies include plate coolers (for cooling milk), heat recovery systems, vacuum pumps and solar panels.
- Anaerobic digestion can create biogas/biomethane from grass, food waste, slurry and other farm wastes.

By using better farm management practices

- Improving animal genetics, lengthening the grazing season and using white clover in pastures.



Soils, especially those under grasslands, also store huge amounts of carbon



By planting forestry, woodlands and hedgerows

Forests, trees and hedges help reduce climate change effects by absorbing carbon dioxide from the atmosphere.

Ireland has one of the lowest levels of forest cover (12%) in Europe and there is a lot of potential to improve this.

- Increasing the level of commercial forestry, which produces timber.
- Planting trees on farms (agro-forestry) improves farm drainage, provides shade for farm animals, and protects habitats and watercourses.
- Amenity forestry provides places for walking and other activities.
- Hedges store a lot of carbon and enhance biodiversity.



Harvesting the trees when they are mature locks the carbon into the wood and wood products. Replanting the trees then begins the cycle of carbon storage again immediately.

Ireland has one of the lowest levels of forest cover (12%) in Europe

Ammonia, which is in both chemical and organic fertilisers, while not a direct GHG, is an air pollutant that can have significant effects on both human health and the environment. When ammonia is redeposited on soil it then leads to nitrous oxide (a greenhouse gas) emissions. Ammonia can be reduced using similar methods to those for reducing GHGs, such as better slurry management, including how slurry is treated during storage. Protected urea is a fertiliser type that emits very little nitrous oxide or ammonia.

Future role of science

Science has provided some solutions to reducing greenhouse gas emissions and is working on additional solutions for the future.

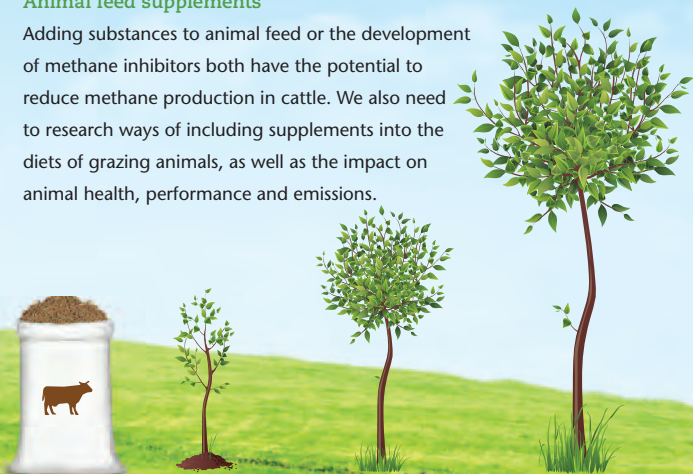
Carbon sequestration

Carbon sequestration means the removal of carbon dioxide from the atmosphere, storing it in a helpful, natural way, e.g., trees take in carbon dioxide and give out oxygen. Soils, especially those under grasslands, also store huge amounts of carbon.

Removing carbon dioxide from the atmosphere has a large potential to help us offset GHG emissions in Ireland. This potential can be mostly achieved by planting trees but also by management of grasslands, water table height for peat soils, and tillage. We need more research on these actions.

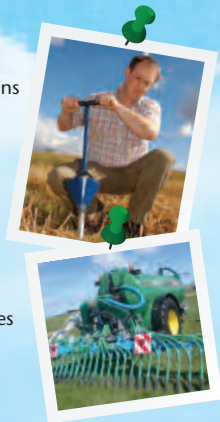
Animal feed supplements

Adding substances to animal feed or the development of methane inhibitors both have the potential to reduce methane production in cattle. We also need to research ways of including supplements into the diets of grazing animals, as well as the impact on animal health, performance and emissions.



Managing soil

Soils in Ireland are naturally acidic and require applications of lime to neutralise this acidity and restore a more favourable pH for better nutrient release from the soil to promote better crop growth, nutrient release and soil quality. Better nutrient utilisation could reduce GHG emissions by reducing input of synthetic fertilisers. We need to know more about the impacts of soil pH management, for example, on soil microbial communities and better quantify the benefits of improving soil pH.



Slurry additives

Treating manures and slurries using compounds such as alum, ferric chloride or polyaluminium chloride has been shown to reduce losses of phosphorus, reduce ammonia emissions from land spreading, and reduce methane and ammonia emissions during storage. There is a need to evaluate the performance of a variety of new and emerging additives not only in terms of reducing emissions but also their safety and impacts on soil health, grassland productivity and any long-term effects.



7 Steps to Improving Farm Sustainability

7. Using the ASSAP advisors to help improve water quality



6. Incorporating forestry and hedgerows on farm



5. Improved energy efficiency and renewable energy



4. Reducing losses from slurry



3. Changing to protected urea



2. Substituting clover for chemical fertiliser



1. Improved EBI and extending the grazing season



www.teagasc.ie/environment/climate-change/



AGRICULTURE AND FOOD DEVELOPMENT AUTHORITY