
Achieving
NET ZERO
Farming's 2040 goal
NFU
CYMRU

Introduction

NFU Cymru and the NFU have set the ambitious goal of reaching net zero greenhouse gas emissions (GHG) across the whole of agriculture in Wales and England by 2040. This is our contribution to Welsh Government's ambition of net zero by 2050.

Agriculture is uniquely placed to be part of the solution, as both an emissions source and a sink. As farmers we have a special responsibility to protect carbon reserves already in our soils and vegetation. But we must and we can do more. We know emissions from Welsh farms presently amount to 5.7 million tonnes of carbon dioxide (CO_2) equivalent a year – approximately 12 per cent of Welsh GHG emissions. But in stark contrast to the rest of the economy only 10 per cent of this is CO_2. Around 62 per cent is methane (CH_4) and 28% is nitrous dioxide (N_2O).

Our assessment is that we can only deliver net zero if we act across a range of internationally recognised inventories. Based on the latest scientific evidence, our approach has been discussed with the Committee on Climate Change, so we believe our aim is challenging, but attainable, given the right incentives.

There is no single answer to this problem. To achieve our aim we will need a range of measures that fall under three broad headings:

- Improving farming's productive efficiency;
- Improving land management and enhancing land use to capture more carbon;
- Boosting renewable energy and the wider bioeconomy.

At the same time as reducing our impact on the climate, we should not reduce our capacity to feed consumers with high quality, affordable Welsh food. Wales must not achieve its climate change ambitions by exporting Welsh production, or our greenhouse gas emissions, to other countries. The future challenges to our global food production system are now well documented. It is important to recognise that Wales is expected to become an area increasingly favoured for agricultural production moving forward, when compared to other regions across the world where climate change impacts are expected to be more severe and disruptive.

Wales's productive agricultural capacity should be maintained and enhanced and decarbonisation policies in Wales should not result in widespread land use change.

Our ambition for a net zero contribution to climate change across the whole of agricultural production by 2040 is a national aspiration, not an expectation that every farm can reach net zero. Every farm will start the journey to net zero from a different place and will need a unique action plan. The mechanism by which multiple changes in practice at farm level can be captured to demonstrate meaningful progress also requires careful consideration.

NFU Cymru believes that the agricultural sector is very much part of the solution to decarbonising the Welsh economy and achieving net zero. But we will only be able to achieve this with concerted support from governments in Cardiff Bay and Westminster, utilising the world class expertise of academic establishments like IBERS and Bangor University in partnership with industry and other key groups to act with us to deliver this challenging, but achievable, ambition.

John Davies
NFU Cymru President

The global challenge of tackling climate change

Climate change is arguably the greatest environmental challenge facing the world, with many countries now experiencing unprecedented and increasingly frequent extremes of weather. International action on this issue has been slow to take off, but progress is now being made in some areas of decarbonising the global economy as well as in adapting to a changing climate.

Britain's Climate Change Act of 2008 introduced the world's first long-term national framework to tackle climate change, setting a legally-binding target of an 80% reduction in GHG by 2050, against a 1990 baseline. After a few false starts, the comprehensive international Paris Agreement on climate change was approved in 2015, aiming to limit GHG emissions "as soon as possible" and keeping global temperature increase "well below" 2 degrees Celsius. The Paris Agreement also recognised the importance of "safeguarding food security and ending hunger, and the particular vulnerabilities of food production systems to the adverse impacts of climate change."

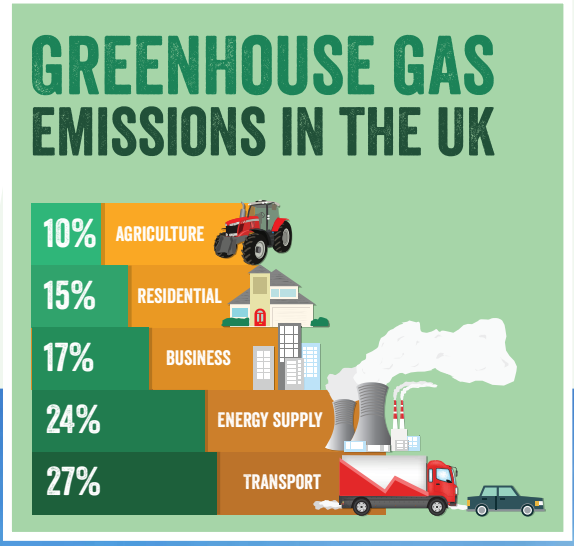
Three years later, the Intergovernmental Panel on Climate Change (IPCC) issued a scientific report on the potential impacts of global warming and how the rise in global temperature should be limited to 1.5C. It concluded that the risks and impacts of 2C average warming compared with 1.5C warming justify a much deeper and faster policy response, in terms of technological changes to energy and food production as well as human lifestyle.

In 2019, Britain became the first major world economy to legislate for net zero emissions, aiming to end the contribution of UK economic production activities to climate change over the next 30 years.

In Wales, the Environment (Wales) Act 2016 established the framework for reducing emissions of GHG. In April 2019, the Minister for Environment, Energy and Rural Affairs declared a climate emergency on behalf of Welsh Government. In response to 'Net Zero – The UK's contribution to stopping global warming' published by the UK Committee on Climate Change in May 2019, Welsh Government has declared its ambition to bring forward a target for Wales to achieve net zero emissions no later than 2050.

Many other countries and trading blocs are expected to follow suit, raising hopes that the worst effects of climate change can be avoided in the near future.

The current UK agricultural GHG inventory



Agricultural greenhouse gas emissions are very different from other sectors of the economy, such as electricity generation, transport and manufacturing. The principal greenhouse gas emitted by most industries is carbon dioxide (CO_2) from fossil fuel combustion, while for agricultural systems methane (CH_4) and nitrous oxide (N_20) are the main GHGs. Reducing these emissions is more difficult than cutting CO_2, since they result from complex and imperfectly understood natural soil and animal microbial processes, and depend upon human nature (changing farm practice at scale and speed), a changing climate and the limitations of measurement.

A supply of nitrogen from organic or inorganic sources is an absolute requirement for the growth of crops and pasture, and it is an unavoidable consequence of soil processes that a small amount of the nitrogen in an agricultural system will be emitted as nitrous oxide. Likewise, methane is produced by bacteria as cattle and sheep break down the cellulose in their diet, producing milk and meat for human consumption from large areas of grassland that are often unsuitable for arable farming.

British agricultural GHG emissions in 2017 were 46.5 million tonnes of CO_2 equivalent (10% of UK total GHG emissions), comprising methane (5.6% of UK total), nitrous oxide (3.1%) and CO_2 (1.2%). Agricultural emissions have decreased by 16% overall since 1990, but there has been only modest progress since 2011.

Despite the contribution of Welsh farms as carbon sinks and, in many cases as generators of renewable energy, it is important to recognise that these beneficial practices are accounted for separately to the inventory for agriculture.

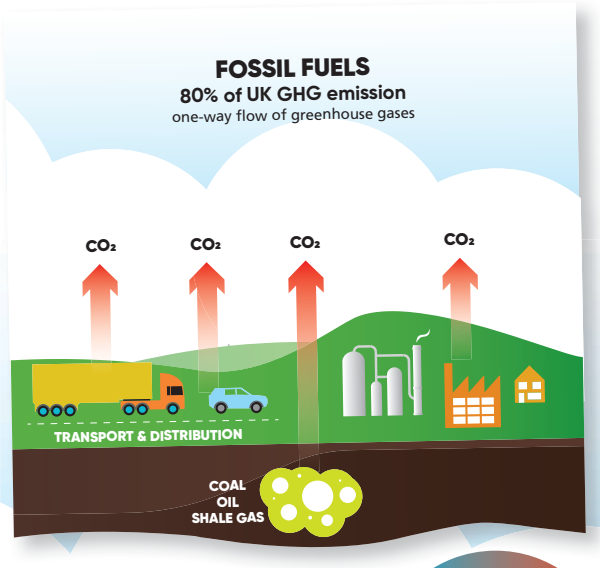
NFU Cymru has united with agricultural organisations to call on the IPCC to evaluate the more accurate global warming potential (GWP) metric of GWP*/GWP-we to measure the contribution of short-lived greenhouse gas to global warming.

GWP100 – the accepted metric for describing the warming impact of GHG is acknowledged to have shortcomings when it comes to the temperature response of short-lived emissions such as methane.

GWP-we provides a more accurate measure of the behaviour of methane in the atmosphere and its net contribution to global warming. It is vital that the best scientific information and tools available are used to inform and build trust in the decisions taken by global and domestic policy makers.

Why agriculture is part of the solution to climate change

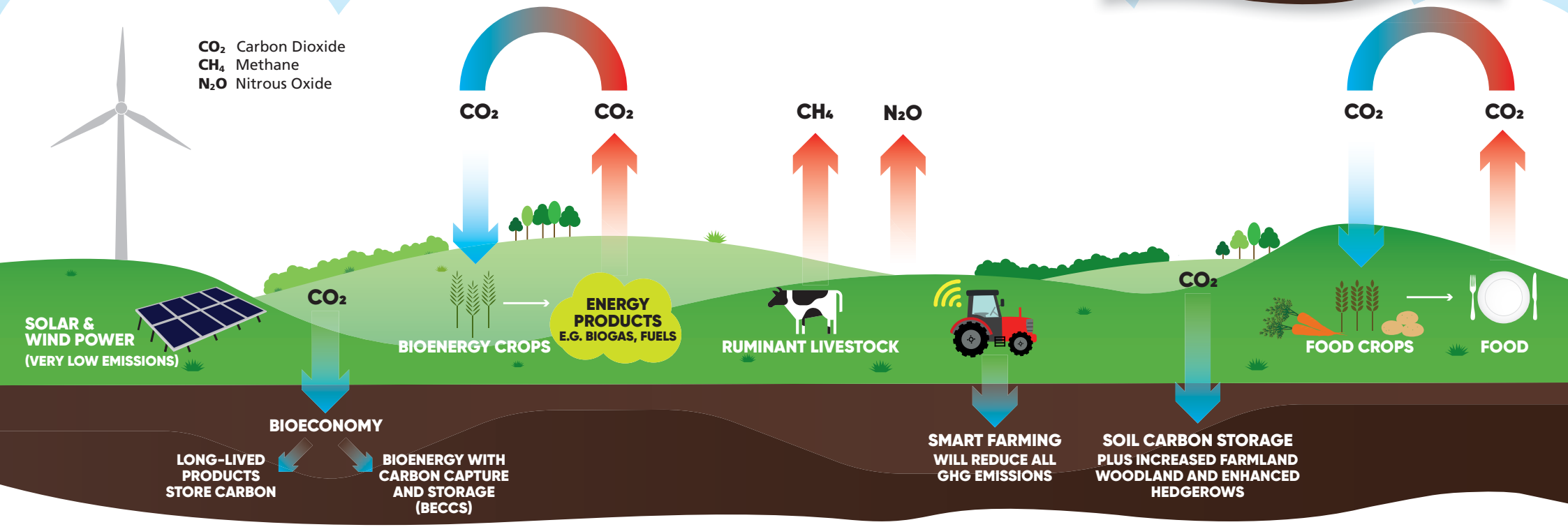
Agriculture, and the land-based economy, can play a key role in tackling climate change. It is uniquely placed to capture the major greenhouse gas – carbon dioxide (CO_2) – from the air and turn it, with the help of farmers, into a wide range of foods, fibres and fuels. By enhancing this ability to capture carbon we can use it to generate 'negative emissions' – actively removing CO_2 from the atmosphere and balancing agriculture's emissions of methane (CH_4) and nitrous oxide (N_2O) from food production.



AGRICULTURE

10% of UK GHG emissions

circular, balanced flows of greenhouse gases



NFU Cymru's vision: our approach

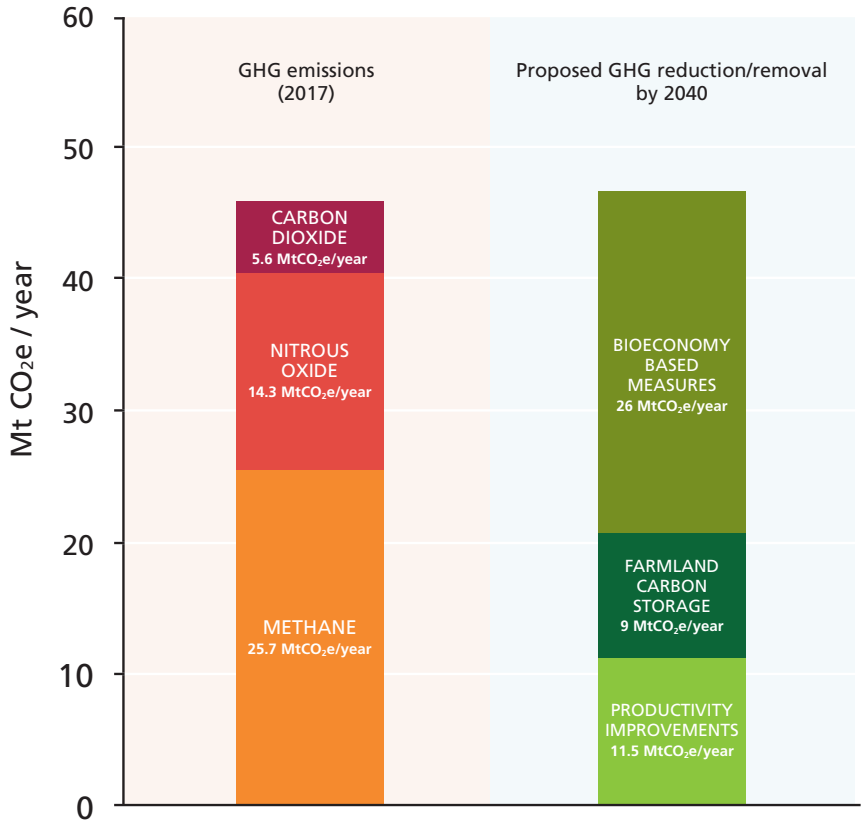
As a new agricultural policy for Wales is developed and we transition out of the Common Agricultural Policy, the time is right to set ourselves challenging goals, consistent with our high standards of production, welfare and environmental stewardship. There are clear environmental and economic imperatives for action. As an industry we must respond to growing scientific evidence of the impacts of climate change, and the experience of our farmers weathering extremes of cold, drought and flood in recent years.

Farm businesses can make an important contribution to building a zero-carbon economy for Wales and NFU Cymru recognises that we must set out how this can be best achieved alongside the many other expectations on farmers.

There are no 'silver bullet' solutions to tackling climate change and achieving net zero. We believe action to tackle climate change in UK agriculture requires a portfolio of different policies and practices focused on three key themes, or pillars:

- Improving farming's productive efficiency to reduce our greenhouse gas emissions – enabling farming to produce the same quantity of food, or more, with less inputs in smarter ways;
- Farmland carbon storage in soils and vegetation – improving land management and enhancing land use to capture more carbon, through more hedgerows, more farm woodland, and especially more carbon-rich soil;
- Boosting renewable energy and the bioeconomy to displace greenhouse gas emissions from fossil fuels and to create GHG removal through photosynthesis and carbon capture.

Our evidence suggests that, over the next 20 years, work under these three pillars across Wales and England could reduce, offset and counterbalance current agricultural emissions of 45.6 $MtCO_2e$/year.

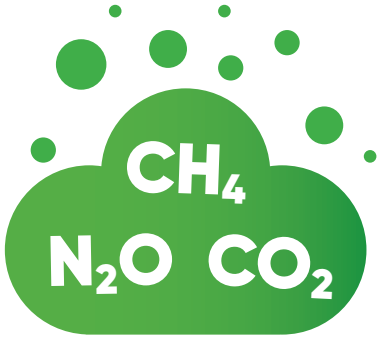


Current (2017) agricultural emissions balanced against potential GHG reduction through productivity measures and GHG removals by various methods (UK).

Pillar 1

Boosting productivity and reducing emissions

Estimated GHG savings: **11.5 $MtCO_2e$/year (UK)**



Productive efficiency measures
could deliver estimated GHG savings of
11.5 $MtCO_2e$/year

Improving farming's productive efficiency will enable farmers to produce the same quantity of food, or more, with less inputs, in smarter ways. This, in turn, will enable the sector to reduce its greenhouse gas emissions.

A variety of measures to boost productivity and reduce emissions, as identified by the Committee on Climate Change (CCC), plus others emerging from our current work on productivity will be required to achieve this. These measures include things like:

- The use of controlled release fertilisers and inhibitors to increase efficient use of nitrogen and reduce emissions;
- Feed additives to reduce methane emissions from ruminant livestock;
- Improving health in cattle and sheep to reduce methane emissions and boost growth rates;
- Precision farming for crops to deliver nutrients and crop protection more efficiently;
- Loosening compacted soils and preventing soil compaction in cropland and pasture, reducing the need for cultivation and minimising N_2O emissions;
- Anaerobic digestion to convert animal manures, crops and crop by-products into renewable energy;
- A wide range of energy efficiency measures to reduce usage of fuels and electricity;
- Gene editing for disease resistance to improve health and productivity of crops and livestock and reduce emissions.

To enable us to achieve these improvements in farming's productive efficiency, we need:

- Future agricultural policy to provide a long-term commitment to supporting the transition to net zero agriculture with a focus on productivity underpinned by measures to provide stability and address volatility beyond the control of individual farm businesses;
- Productivity measures to lower greenhouse gas intensity per unit of production including targeted investment, incentives to support widespread adoption of technical advances as well as advice and training;
- Improved data capture is needed so farmers get recognition for changes in on-farm practice and uptake of techniques to reduce GHG emissions.

Pillar 2
Farmland carbon storage

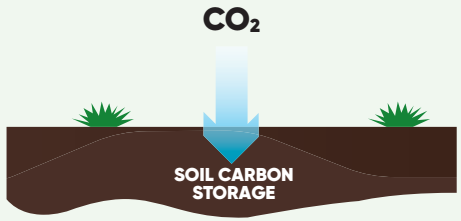
Estimated GHG savings: **9 $MtCO_2e$/year (UK)**

Farming is already responsible for a critical carbon resource in soils, wooded landscape and semi-natural habitats. The achievement of net zero should actively incentivise the conservation of this carbon resource as well as its enhancement. This conservation and enhancement can be achieved through improving and enhancing land management and land use to capture more carbon – by the provision of more hedgerows, more farm woodland and especially more carbon-rich soils.

- Enhanced soil carbon storage could deliver GHG savings of 5 $MtCO_2e$/year.
- Enhancing and increasing hedgerows could deliver GHG savings of up to 0.5 $MtCO_2e$/year.
- Increasing woodland planting on farms could deliver GHG savings of 0.7$MtCO_2e$/year.
- Peatland and wetland restoration might deliver GHG savings of up to 3$MtCO_2e$/year.

To enable us to enhance farmland carbon storage, we need:

- Future agricultural policy to fairly value and reward on-farm carbon sequestration in soils and grasslands;
- Future policy to include options for establishing and managing existing hedgerows through capital investment and ongoing carbon sequestration payments;
- Future policy to include options for the establishment and management of farm woodland and shelter belt planting.



Enhanced soil carbon storage
could deliver GHG savings of
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Enhancing and increasing hedgerows
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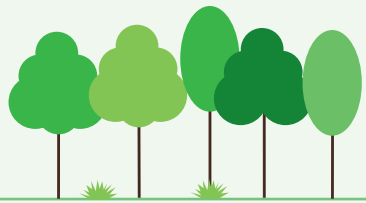
Increasing farmland woodland
could deliver GHG savings of
0.7 $MtCO_2e$/year



Pillar 3

Coupling bioenergy to carbon capture, utilisation and storage

Estimated GHG savings: **Up to 26 $MtCO_2e$/year (UK)**

Boosting renewable energy and the bioeconomy could deliver estimated GHG savings of up to **26 $MtCO_2e$/year**

Boosting renewable energy and the bioeconomy to displace greenhouse gas emissions from fossil fuels and to create GHG removal through photosynthesis and carbon capture is a key part of the NFU Cymru/NFU ambition for achieving net zero.

- Bioenergy with carbon capture and storage (BECCS) – the process of producing energy from organic matter and capturing and storing the carbon produced – could deliver GHG savings of up to 22 $MtCO_2e$/year.
- Bio-based materials in construction and industry could deliver GHG savings of 0.5 $MtCO_2e$/year.
- Displacement of fossil fuel use by land-based renewables could deliver GHG savings of up to 3 $MtCO_2e$/year.
- In the longer term, it is possible that the application of biochar – powdered charcoal – to soil and accelerated mineral weathering could deliver GHG savings of up to 2.5 $MtCO_2e$/year and 1 $MtCO_2e$/year respectively. These processes will require further evaluation and approval before use.

To enable us to boost renewable energy and the bioeconomy, we need:

- Policy measures to facilitate further uptake addressing current barriers and a route to market for small to large scale renewable energy projects, with credits allowed for avoided GHG emissions.
- Implementation of the industry-led Bioenergy Strategy, a clear carbon price trajectory and multiple demonstration projects at different scales
- Implementation of the UK Bioeconomy Strategy as well as support from the Welsh Government for novel building and insultation materials like sheep's wool.
- Welsh Government must also support R&D in innovative technologies such as the application of biochar.

Partnership working – with government, with industry, with academics

The policy measures needed to enable Welsh farming to make its contribution to meeting our net zero aspiration will require a partnership approach. Uptake by farm businesses will have to be accompanied by concerted support across governments in Cardiff Bay and Westminster, agencies and other stakeholders to act with us and help us deliver on this ambition.

For example, boosting productivity across all farm sectors needs a range of policy measures and the future agricultural policy for Wales should support a transition to net zero agriculture with a focus in this area.

Enhancing carbon storage in soils and vegetation will require collaborative working and recognition by NGOs and government of the multiple agri-environment benefits that could be layered together with carbon storage in response to a realistic carbon reward price.

The UK also needs to develop a strong domestic bioenergy base in the short term, alongside other land-based renewables, in order to build up its longer-term potential for greenhouse gas removal in the future, through a variety of bioenergy pathways as well as the wider bioeconomy.

By working together as an industry, across all farming sectors, choosing from a broad range of policy measures will enable widespread uptake from individual farm businesses of actions on net zero.

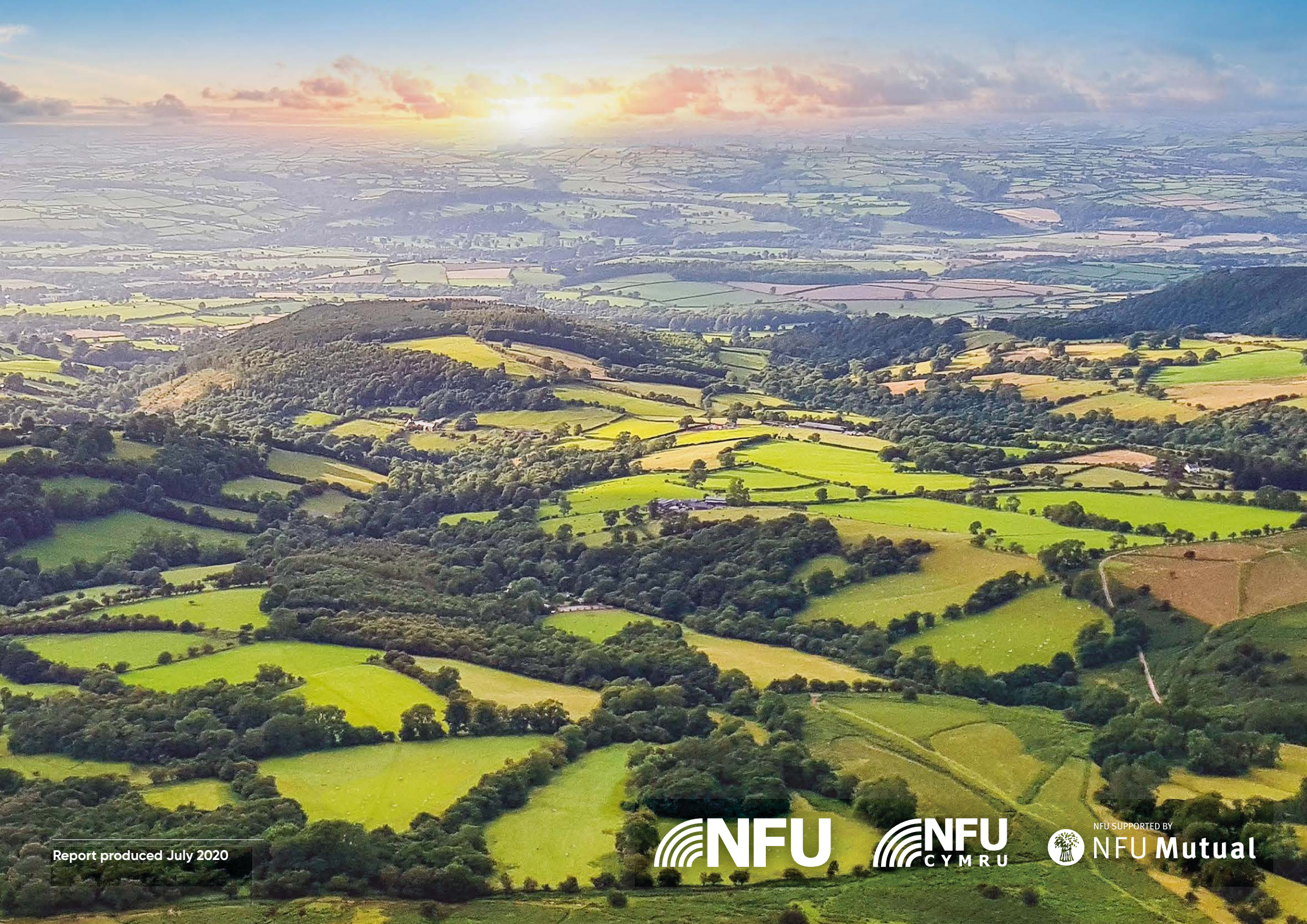
Measurement, reporting and next steps

Systems for farmers in Wales to track and be rewarded for the public good/ environmental benefit of reducing or offsetting GHG emissions have yet to be developed. These may need to be based upon both physical audits (actually measuring and recording changes in farm practice) as well as expected results predicted by modelling. It is quite likely that monitoring and verification of certain measures, such as enlarged or extended hedgerows, will be easier than others, such as soil carbon.

However, "proxy indicators" of changed management practice which are likely to increase soil carbon storage could be coupled to models that are supported by actual field testing, carried out on a network of 'climate-friendly' demonstration farms, which would represent different farming systems across a range of soils and natural environments.

For net zero agriculture to become a reality in Wales, future agricultural policy will need to include a range measures and actions that deliver, incentivise and reward production efficiency and carbon sequestration activity on Welsh farms.

There is an urgent need now to pilot our ambitions with support from government and other stakeholders, bringing net zero to life for farmers who are critical to its success.



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