



# Net Zero Wales | Module 5 - 3 | Agriculture, Horticulture & Animal Care



This module is about the relationship between humans and the land. It is about the complexity of our relationship with the land and everything that lives on and in the land including its water bodies and the non-living natural world. It is about the myriad of benefits that we all receive from the land, and what we do with it; both good and bad. But this module is also about the opportunities afforded us when we think about the land in different ways and how we can all learn to work and live in ways which support biodiversity, tackle the climate crisis and provide a high quality of life.

This module builds on the foundational knowledge which you will have gained through completion of module 1 -4.

## Learning Outcomes:

By the end of this module you will be able to:

1. Recognise the breadth and diversity of career opportunities in the land-based sector
2. Explain and summarise, through examples, the positive impacts of the land-based sector on humans, the economy, and biodiversity
3. Discuss, through examples, some of the negative impacts that the land-based sector can have on humans, the economy and biodiversity

4. Outline some of the responses from industry and/or the Welsh government to the climate and ecological emergencies
5. Describe and propose personal actions that you can take to help tackle the climate and ecological emergencies

*This module uses video content sourced from third party providers. All video content included has been evaluated and determined as appropriate for the module at the time of designing the module. The Welsh Government and module delivery partners are not responsible for any subsequent videos that may appear using the 'watch next' or playlist features on third party websites.*

#### **Introduction to the land-based sector**

**Why is the land-based sector so important?**

**What are the negative impacts of land-based sectors on climate change and biodiversity?**

**Key responses**

**From learning to action**

# Introduction to the land-based sector

---

## Learning Objectives

- To understand the importance of land for human survival, economy and wellbeing.
- To appreciate the breadth and diversity of careers in the land-based sector.

## The relationship between land and humans is extraordinary...

We rely upon the land, including its water bodies, for almost everything. It provides the basis for human livelihoods and well-being, from the air that we breathe, the water we drink, the food we eat, much of the clothes we wear and in some parts of the world the very buildings that people live in.

Neither our individual or societal identities and culture, nor the world's economy would exist without the multiple resources, services and systems provided by the land and biodiversity.

**The term 'land-based' traditionally relates to farming and industries connected to the land and environment, including for example:**

## Agriculture



Agriculture is vital to us as people, because farmers provide us with our food, clothing and biomass fuel. This is a highly technological and mechanised industry requiring a wide range of skills and employing technologists, scientists and engineers. The sector includes livestock, dairy and arable crops.

## Food



Agriculture and horticulture provide us with our food, including fruit, vegetables, pulses, grain, flour, meat and fish. They provide the foods required by the food industry for inclusion as ingredients for thousands of food and drink products.

## Aquaculture



This industry includes fish farming, seafood, breeding, Other areas include marine conservation and ecology and river management.

## Forestry



Forestry is the science and practice of planting, managing and harvesting forests for wood and timber, both on a small and large scale. Arboriculture is the cultivation and management of individual trees in a wide range of different environments.



## Horticulture



Horticulture covers a huge range of careers and includes the production of fruit, vegetables and ornamental crops. It covers the maintenance of sports turf, urban green spaces and historical gardens. Like agriculture, this sector requires technologists, scientists and engineers. Other areas covered include production horticulture, ornamental / amenity horticulture, nurseries, landscape architecture, grounds persons and greenkeeping.

## Equine



There are many jobs associated with horses and horse care. This may include equine health, veterinary medicine, equine management and breeding, riding and training, racing and mounted police.

But our relationship with the land has changed and continues to change; the land is in trouble, both it and we are at risk, and how we choose to use the land and the relationship we have with the land will shape the future of humankind. You have that choice.



Complete the content above before moving on.

# Why is the land-based sector so important?

---

## Learning Objective

- To recognise the many positive impacts of the land-based sector on humans, the economy, and biodiversity.



In Wales there are around **19,000** businesses in the land-based sector.

These businesses live hand-in-hand with 216 Wildlife Trust nature reserves, 11 RSPB sanctuaries, 4,122 sq km of National Park, an 870-mile Wales Coast Path, mountains, valleys, ancient woodland, lakes and rivers, wide open spaces and much more including protected areas and sites of special scientific interest (SSSIs).

The land-based sector is an economically active industry through its expenditure and economic multipliers but there are a myriad of other benefits in terms of our physical and mental wellbeing and spirituality.



If we are all able to continue to benefit from the land, to look after the economy, protect our environment and provide nutritious food, then those working in the land based sectors and those that benefit from their products and services must work together to protect the land and ourselves; both it and we are at risk from the effects of climate change and biodiversity loss and how we choose to use the land, the relationship we have with the land will shape the future of humankind. We all have that choice.

## Jobs

It is estimated that there are around 421,000 jobs in agriculture and horticulture alone in the UK, according to the Office for National Statistics; with around 38,000 in Wales. The

## Produce conversion

In January 2020, Wales' food and drink industry had a turnover of £7.47 billion.

## Agricultural economy and

Agriculture alone contributes around £457 million to the Welsh economy, that's about 4%

land

of employment. Of the 2.1 million hectares of land in Wales, 1.86 million hectares are used for

Tourism

There is a direct link between land and tourism. Although the data below relates to overall tourism, this is a key contributor and driver of the economy in Wales. There are over

Supply chain and customers - better business through better business practice, procurement and diversification

The land-based sector has an opportunity to shape and be part of a better future whilst reducing business and environmental risk. The sector is both a consumer of products and services

What do you think are the benefits of taking a proactive approach to improving land management practices?

- Reduce air and water pollution
- Demonstrate good land management practice
- Preserve fish and wildlife

## True or False...

Agriculture alone accounts for about 88-90% of the land in Wales.

---

- True
- False

SUBMIT



The land-based sector has an opportunity to shape and be part of a better future whilst reducing business and environmental risk.

---

True

False

SUBMIT

The land-based sector does not support the tourism sector.

---

True

False

SUBMIT



Complete the content above before moving on.

# What are the negative impacts of land-based sectors on climate change and biodiversity?

---


## Learning Objective

- To understand some of the negative impacts that the land-based sector can have on humans, the economy and biodiversity.

---

**The UK Climate Risk Independent Assessment identifies several key actions needed to tackle the impacts of negative land management practises on climate change and biodiversity loss.**





[Independent Assessment of UK Climate Risk \(CCRA3\)](#) by Climate Change Committee (CCC) is licensed under [CC BY](#).

**In order to make the best decisions and take the best actions we can use science-based targets...**

What are science based targets?

Science-based targets provide a clearly-defined pathway to reduce greenhouse gas (GHG) emissions, helping prevent the worst impacts of climate change.

Targets are considered 'science-based' if they are

How do we know if the target is right?

in line with what the latest climate science deems necessary to meet the goals of the Paris Agreement – limiting

## So what are some of the key negative impacts of the land-based sector?

### Carbon dioxide (CO<sub>2</sub>eq)

In Wales, emissions from livestock alone account for 54% of agricultural emissions. This includes CO<sub>2</sub>eq from energy use and machinery as well as energy-intensive artificial fertiliser production, nitrous oxide from fertilisers, manure, and methane from ruminants.

But CO<sub>2</sub>eq emissions come from all other land-based industries too particularly where there are examples of poor land management practices. For example from tree, hedgerow, shrub and wildflower meadow clearance, and indirectly from procurement of products and services which support the sector and from the impacts of recreation and tourism.

**i** Did you know that wild flower meadows are one of the rarest habitats in the UK and that we have lost 97% of our wild flower meadows since the 1930s? Losing our wildflowers has a real impact on the food we eat. When wildflower meadows vanish, so do pollinators, as well as other insects, and animals that eat insects such as birds, hedgehogs and bats.

But not all CO<sub>2</sub>e<sub>q</sub> comes directly from land-based activities. For example, around one third of CO<sub>2</sub>e<sub>q</sub> comes directly from the farm, whilst two thirds of emissions occur after produce has left the farm through transport, packaging, processing, delivery to shops and ultimately to the consumer. We must also consider that food waste also produces greenhouse gases in addition to the waste of all of the resources that were used to produce the food.

**i** Did you know that the UK throws away around 9.5 million tonnes of food waste in a single year – even though 8.4 million people in the UK are in food poverty?



### **Intensive agriculture**

The production of high crop yields such as meat, eggs, milk, fish, vegetables and cereals are highly demanded by consumers. In order to produce large amounts of affordable food, farmers use high inputs of fertilisers, pesticides, insecticides, growth

hormones and herbicides. Land is often used to grow one type of crop to increase economies of scale and keep costs low; this is called mono-crop or mono-culture.

When these chemicals are used they not only destroy their intended targets such as pests, weeds and parasites but also kill beneficial insects which contributes to biodiversity loss. This can include aquatic life when these chemicals enter water courses. Fertiliser nutrients in particular are the main cause of eutrophication in most of the world's water bodies such as oceans, lakes, and rivers.

**i** **Eutrophication occurs when a water body such as a river or stream becomes over-rich in plant nutrients and as a consequence it becomes overgrown in algae and other aquatic plants which die and decompose. This process significantly reduces the availability of oxygen and the water body can become lifeless.**

### Horticulture practice

Emissions of CO<sub>2</sub>e<sub>q</sub> in horticulture come from lawn preparation and close-mowing, using peat-based composts, turning the soil over, use of water and the use of plastic containers.

**i** **According to the IUCN UK Committee Peatland Programme, the UK has nearly 3 million hectares of peatlands (12% of the UK land area) and is one of the world's top ten countries for peatland area; however, around 80% has been damaged from drainage, burning, agriculture, and forestry. This causes the release of around 10 million tonnes of greenhouse gases. But UK peatland provides a store of at least 3000 million tonnes of carbon, which is twenty times as much carbon as that stored in the whole of the UK's forest biomass.**



Soil



The ability of soil to hold water and nutrients is powered by carbon. The more productive soils are, the more efficient they are in allowing the movement of nutrients and water along with good aeration. Therefore changes to soil condition will change the amount of carbon that can be sequestered, the availability of nutrients and the hydrology of a catchment area, potentially increasing flood risk. Rich soil humus consists of around 60% carbon and supports a rich abundance of life

**i Soil is an extraordinarily diverse habitat and home to about a quarter of all known species. Around 1.5 kilograms of living organisms live beneath one square metre of healthy soil, including microorganisms such as bacteria, protists, fungi, threadworms, earthworms, springtails, mites and insect larvae. By eating living and dead animal and plant material, they transform it into nutrients – and without these nutrients, new life could not evolve. Without soil organisms, no plants could grow and no people could live.**

### **Forestry and woodlands**

When forest cover is removed through deforestation or clearance for agriculture, biodiversity is severely impacted. Wildlife can lose their shelter, food sources and migration routes, soils are disturbed and may be lost and carbon is released into the atmosphere.

**i The Office for National Statistics (ONS) 2020 report states that woodlands occupy 13% of the land area of the UK with 3.2 million hectares. Around 10% of the land of Wales is forest.**



### Voluntary schemes

In the past decade, policy to reduce emissions from agriculture in Wales has been dominated by a voluntary approach, focused on supplying advice and information. The sector has received money provided under agri-environmental schemes covered under the European Union's (EU) Common Agricultural Policy for funding many activities, including afforestation. Agriculture emissions have not fallen under the voluntary approach, while tree planting rates have remained low.

## Knowledge Check

What kind of targets can we use to make the best decisions and actions to tackle both the climate and ecological emergencies.

---

Science-based targets

Economy-based targets

Profit-based targets

SUBMIT

Wildflower meadows are one of the rarest habitats in the UK and we have lost 97% of our wild flower meadows.

---

True

False

SUBMIT

Which of the following are negative impacts from the land-based sector

---

- Fertilisers
- Insecticides
- Use of equipment and machinery
- Transport
- Packaging of goods
- All of the above

SUBMIT

Peatlands are poor soils with low biodiversity value which do not store much carbon dioxide

---

True

False

SUBMIT

What is the term to describe the impact when a water body such as a river or stream becomes over-rich in plant nutrients thereby reducing the availability of oxygen.

---

Biodiversity

Decomposition

Eutrophication

SUBMIT



Complete the content above before moving on.

# Key responses

---

## Learning Outcome

- To appreciate the mechanisms which enable businesses in the land-based sector to become more resilient whilst tackling the climate and ecological crises.

## **Adapting and mitigating against both the climate and ecological emergencies are challenging.**

However the opportunities for new and better relationships with the land to support improved ways of working and living are immense.

In Wales the UK Climate Change Act requires Welsh Ministers to produce reports on the Welsh Government's objectives, actions and future priorities regarding the impacts of climate change.

The Environment (Wales) Act 2016 provides a framework to manage Wales' natural resources, while the Well-being of Future Generations (Wales) Act 2015 aims to improve the social, economic, environmental and cultural well-being of Wales.

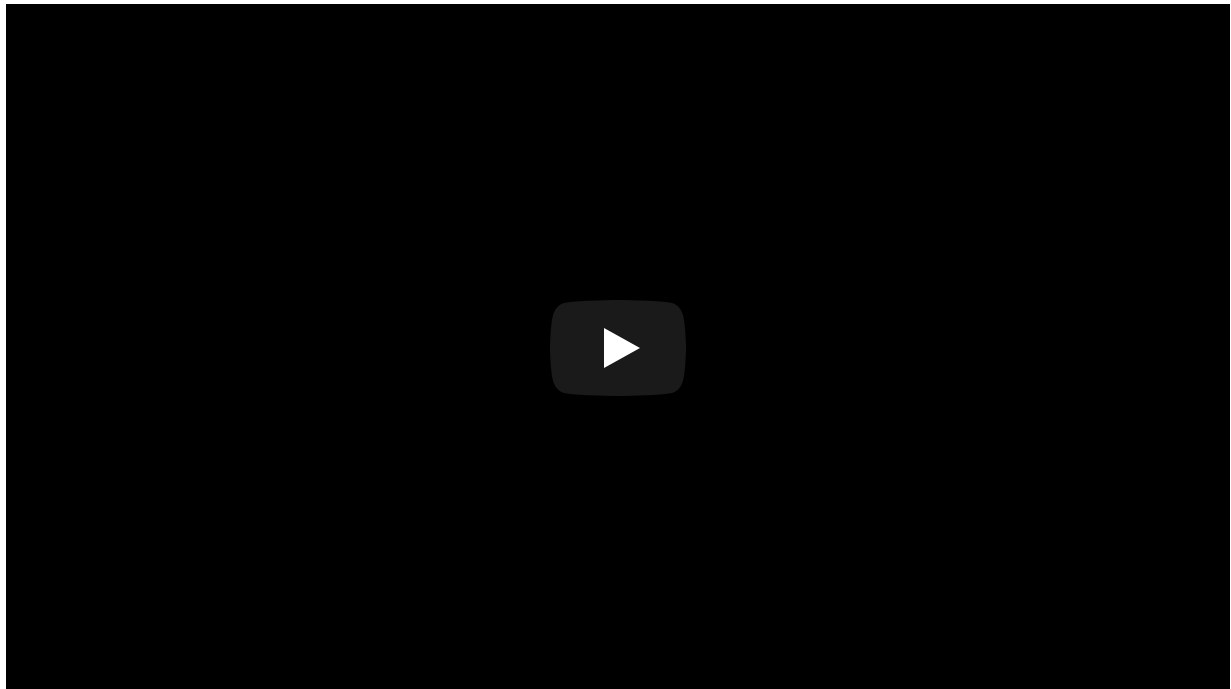
Both Acts include parts which are important to tackling the climate and ecological crises.

**In February 2021 the Welsh Government laid out three further sets of regulations. These:**

- amended the 2050 emissions target to net-zero emissions;
- increased the 2030 target to 63% (from 45%) and the 2040 target to 89% (from 67%), and
- set the third carbon budget (2026-2030).

**Some of the key objectives of the Welsh Government Adaptation Plan include:**

- reducing the use of pesticides
- growing more woodland to improve air quality, reduce erosion and protect soil, slow down floods and support our ecosystems.
- creating more open spaces like parks, playing fields, allotments, private gardens, grasslands, ponds and woodland creating an environment that is good for people's wellbeing as well as the climate.





## **Fact File**

**Around 25-30% of global greenhouse gas emissions can be attributed to agriculture, forestry and other land uses making this sector a key player in achieving global net zero emissions while protecting our food supply, enhancing and conserving biodiversity and other land resources and providing rich experiences for tourism and recreation.**

## **Business risk and resilience**

For businesses to become resilient, to adapt and mitigate against climate change and to enhance biodiversity, it is important to take a more integrated ecosystem-based or nature-based approach.

Businesses can take advantage of the Welsh Government Woodland Investment Grant or finances available under several themes under the [Glastir Scheme](#) or Rural Grants and Payments opportunities.

## **Business Risk**

The land-based sector can help transform the system and help deliver a transition to a more sustainable way of living and working. But in order to do this they will need:

Slide 1

**Support to gain the knowledge and ability to understand carbon management and what that means to their industry.**

Slide 2

**How to record and report and capture carbon data relating to carbon in the land and surrounding greenscape including any woodlands and hedgerows.**

**How to utilise technology and digital tools for data collection and storage.**

**Support in understanding risk and economic benefits.**

**Clear advice and support in understanding the mechanisms for support and reward for their businesses.**

**The benefits of transparency in reporting and the impact that that has on consumer confidence and behaviour.**



**Support and advice in methods to scale-up for businesses that want to invest in a carbon positive land-based sector.**



Complete the content above before moving on.

# From learning to action

---

## Learning Objective

- To propose personal actions that you can take to help tackle the climate and ecological emergencies.

---

# So, it's over to you.

You have the opportunity to make an extraordinary contribution to tackling the climate and ecological emergencies. You have the power to change the land-based sector through your career path. You have the power to be a changemaker who touches the lives of people all around you and makes the world a much better place for all.

Click below to download your pledge card...



**netzero\_pledge.pdf**

682 KB



Take a few minutes to reflect on what you have learned and how it made you feel - write down a few brief notes.  
Now write your personal pledge/statement ....what action(s) will you take? Try and be specific.

Here are a few pointers:

- Identify personal purchasing decisions and the impacts (positive and/or negative) that this may have on the environment and people
- Identify and take actions that help halt and reverse the loss of nature
- Help inform others of what you have learned and encourage them to take action
- Gain a deeper understanding of the opportunities available through a greener career.

I'm sure that you have your own ideas.

## Useful links and resources:

- [UK Climate Risk Independent Assessment \(CCRA3\)](#)
- [Net Zero Climate Land Use and Agriculture](#)
- [IPCC Special Report on Climate Change and Land](#)
- [Food systems impacts on biodiversity loss](#)
- [Forum for the Future - global challenges](#)
- [The opportunities of agri-carbon markets: policy and practice.](#)
- [UK Climate Projections \(UKCP\)](#)
- [Our World in Data - Land Use](#)
- [Horticulture Wales](#)
- [Prosperity for All: A Climate Conscious Wales](#)

COMPLETE MODULE