



**United by our environment,
our food, our future**

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Foreword

Farming has played a key role in shaping the countryside we all enjoy today. Every sector – livestock, arable, horticulture, upland, lowland, organic, conventional and tenanted – and every type of farm continues to carry out a huge amount of work to protect and enhance the landscape, encourage wildlife, benefit soil and water, and reduce their impact on the climate. With agriculture occupying over 70% of the UK landmass, farm businesses play an irreplaceable role in looking after our cherished natural environment.

This NFU report looks at five key areas of the environment where farmers can, and do, play a key role in tackling the challenges we face – landscape, biodiversity, soil, water and air. It highlights and celebrates the NFU's greatest assets – our members, sharing their stories about the work they are doing to maintain and enhance our nation's vital natural assets while running productive farm businesses. It follows on from our 'UK – A Nation United By Food' document, published in September 2018.

Looking at this report, one thing is abundantly clear. These five key areas are interlinked and also underpin sustainable/productive food production. But this does not always appear to be taken into consideration when policy and regulation is being formulated. Often solutions are put forward in a piecemeal fashion to tackle a specific issue, such as flooding or air quality. But a solution for one issue can often have knock on (and sometimes negative) impacts on other elements, like biodiversity and the landscape.

Crucially, farmers as food producers have a unique perspective on the farmed environment because they see and manage the whole picture, delivering positive change in all of these areas. Farmers inherently are custodians of the countryside, and are well practiced at balancing its needs while producing safe, affordable, traceable food. It is something farmers have done for centuries and will continue to do long into the future.

More needs to be done to celebrate the good work farmers are doing to protect and enhance the farmed environment. Earlier this year I hosted the inaugural NFU Farm Nature Discovery event on my farm, where a group of expert wildlife recorders and botanists spent time surveying the wildlife. Events like this can really change how farmers and the public see the farmed environment. The variety of plants and wildlife that was recorded was a revelation to me in terms of the sheer number of different species of plants and wildlife and at the end of it I knew a lot more about my own farm and the wildlife that lives there.

The NFU invests tens of thousands of pounds in direct financial support and staff time each year into industry-led initiatives like Campaign for the Farmed Environment, Tried & Tested, and the Voluntary Initiative. We do this because we recognise that these initiatives can, and do, play a central role in driving forward work to maintain and enhance the farmed environment and will continue to play a key role in future.

This report aims to start a new conversation about our farmed environment, one that is recognised as the workshop of our nation's food producers, and to better measure our progress at making further improvements. As an industry farming has a history of embracing change and a desire to leave our farmed environment in a better condition for the next generation. We are all united by our environment, our food and our future and it is vital that we acknowledge and appreciate the huge amount of work farmers are doing, and will continue to do, towards safeguarding all three.



Minette Batters
NFU President

Introduction

Farming has already embarked on a long journey of improvement to its environmental footprint. This report marks an important staging post on that journey against which to measure future improvements in farming's efforts to maintain and enhance the farmed environment. The NFU will be commissioning more work so we can better understand our landscape, biodiversity, soil, water and air. While much good work has been done by farmers, as an industry we have ambitions to continue to make improvements in all areas, and we need the future environmental land management scheme and agricultural policy to reflect this ambition while keeping food production at the heart of everything farmers do.

Farming plays a significant role in protecting and enhancing the environment. During the past 30 years, there has been substantial engagement by farmers with voluntary environment schemes, with 70% of agricultural land in agri-environment schemes at their peak. We have begun to see a drop-off in the uptake of agri-environment schemes in recent years – largely driven by changes in policy, design and accessibility. This can be turned around with a future environmental policy that consists of a mix of incentive schemes, including an environmental land management scheme, complemented by new approaches to funding environmental delivery, such as Payments for Ecosystem Services, and industry-led action to improve environmental delivery. In addition, science, research and innovation have an important role to play in helping increase our resource efficiency and further reduce our environmental impact.

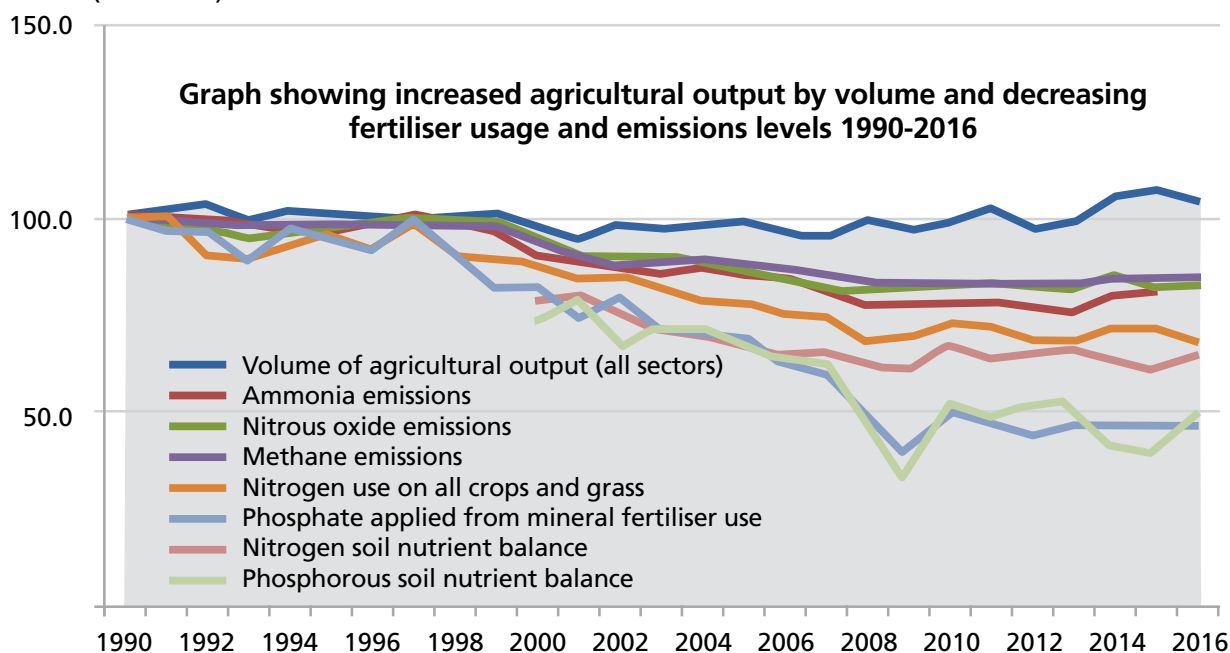
Continued improvements in productivity through more efficient and careful use of natural resources can reduce farming's emissions and environmental footprint, but this will only happen if farm businesses are given the policy support they need to survive and thrive. The bottom line is that farm businesses need to be productive and profitable to be able to continue to deliver the environmental benefits we all want to see.

This report tells us that:

- Farming has shaped our landscapes through continual management, creating a patchwork of unique environments across the uplands and lowlands;
- Farmers play a major role in the provision of public access to our landscapes and recognise the value and importance of engaging with the public and helping them learn more about the countryside and food production;
- Farming is integral to protecting, maintaining and enhancing our treasured habitats and wildlife, but also more common biodiversity, which is often overlooked and underplayed;
- Good management of soil underpins our food production system and helps deliver a number of public benefits. But soil is a complex system and good quality data is needed to help farmers benchmark progress;
- A clean reliable source of water is vital to all farms, but taking steps to manage flood risk and reduce agriculture's impact on water quality are also essential elements of the work that farmers do;
- Agriculture is unique when it comes to dealing with the challenges of improving air quality and reducing greenhouse gas emissions because it can remove carbon dioxide from the atmosphere and store it in soil and vegetation, and generate low carbon renewable energy;
- Industry-led initiatives like the Campaign for the Farmed Environment, Tried & Tested, the Greenhouse Gas Action Plan and the Voluntary Initiative have played, and will continue to play, a role in promoting good environmental practice on farm.



Index: (1990=100)



Economic growth should be possible while at the same time reducing resource use. From 1990 to 2016¹, the total volume of agricultural output (eg: crop yield; livestock production) increased. In the same period, a number of key agricultural emissions decreased, although the reduction appears to have plateaued since around 2007. We need to work together to re-energise this historic trend and ensure further decoupling of environmental pressures from food production.

A productive, profitable agricultural sector has wider public benefits too. British farmers and growers are an important part of rural economies, providing jobs and driving growth in diversified industries such as renewable energy and tourism. Any reduction in domestic food production would mean greater reliance on imports, resulting in the country exporting – and likely increasing – its environmental footprint as well as making us more vulnerable to the effects of climatic and market volatility.

Building on the NFU's existing work setting out our thinking on a future agricultural policy for the environment², we believe future policies need to recognise:

- Our landscapes are living, working, dynamic landscapes and management of them is only possible if it is economically sustainable;
- Food producers must be at the heart of future environmental policies because farmers are in the best position to manage land for future environmental benefit;
- A future environmental land management scheme needs to be voluntary, open to all farmers, simple to apply for and administer, and offer a fair reward;
- In the short-medium term we also need to see much needed improvements to the delivery of current agri-environment schemes to make these workable and attractive;
- Support for farm infrastructure projects, new technologies, and innovative tools is needed to

help improve productivity while reducing our environmental footprint;

- The environmental benefits that improvements in productivity deliver;
- There are still significant gaps in our knowledge about current farm practices and how these contribute to environmental improvement. We need better data on wider biodiversity delivery, like insects, and more data about the quality of our soils and emissions to air such as ammonia. Access to good data is a recurring theme throughout this report;
- Importance of promoting science, research and innovation in helping increase our resource efficiency and further reduce our environmental impact;
- Regulation, where it is deemed necessary, should be proportionate and targeted, not applied in a blanket fashion, especially if better and more cost-effective solutions to problems are available.

References:

1. Data sourced from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/741062/AUK-2017-18sep18.pdf and https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/

[file/759963/agriproductivity_statsnotice_29nov18.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/759963/agriproductivity_statsnotice_29nov18.pdf)
2. <https://www.nfuonline.com/nfu-online/news/nfu-reports/domestic-agricultural-policy-delivering-for-the-farmed-environment/>



Today's Landscape

Farming has shaped our landscapes, creating a patchwork of different environments across the uplands and lowlands and boosting local and rural economies through recreation and tourism. Our countryside is distinctive: full of productive, working landscapes that are dynamic and constantly changing as a result of continuous management by farmers through the grazing of livestock, the growing of crops, and the management of boundaries.

The agricultural sector manages around 70% of the land in the country, producing high quality, safe and affordable food while playing an integral part in protecting, maintaining and enhancing the countryside. Farmed landscapes are a central feature of England's ten National Parks and 34 Areas of Outstanding Natural Beauty (AONB), which together cover around 25% of our land area¹.

Upland areas are often recognised for their iconic landscapes. These are created and maintained by farming and to keep them we need to have viable farm businesses in these areas. Livestock farming plays a significant economic role in the uplands, which are home to 44% of breeding ewes and 40% of beef cows² in England, and produce a quarter of England's and Wales' milk. There are many traditional lowland areas where farming plays a key role as well, like the Lincolnshire Wolds, Durham limestone plateau, Cheshire sandstone ridge, the Chilterns and Cotswolds.

National Parks and AONBs contain our high quality landscapes

England's ten National Parks and 34 Areas of Outstanding Natural Beauty (AONB) cover in total 25% of England's land area



Boundaries

Boundaries, like hedgerows, dry stone walls, ditches, and trees in the landscape support a vast array of wildlife, from insects and lichen through to birds. For farmers, they primarily provide boundaries to define field areas, provide shelter for animals, and retain stock within fields. The linear nature of boundaries also helps creatures move through the landscape as well as being valuable navigational features for birds and bats. The way hedges are managed varies in different parts of the country. For example, a typical traditional hedge in Cornwall is an earth bank topped with shrubs and these can be up to 800 years old. Hedge laying styles vary across the country as well – from Derbyshire (a strong, stock proof hedge is built by weaving the layed stems in front and behind the stakes) to Dorset (the finished hedge is a half barrel shape about two to three-and-a-half feet high).

Dry stone walls are found in both upland and lowland areas. The way they are built reflects local traditions. They provide bare rock for many species such as lichens and mosses, as well as homes for wildflowers. They can provide a range of microclimates, with south-facing walls providing warm, sunny positions for warmth-loving insects and basking (and hibernating) reptiles. Other nooks and crannies provide damp, sheltered areas for insects, while larger cavities can even provide nesting areas for songbirds and small mammals. They can also provide useful vantage points for birds of prey.

These networks of hedgerows and dry stone walls also pick out changes in topography, soils and underlying geology, and define current, and often past, patterns of agriculture and other land use. Together with woods, roads and settlements, they give character and distinctiveness to local landscapes.

Keeping these boundaries in good condition is paramount and agri-environment schemes supported the maintenance, management and restoration of 280,000 kilometres of hedgerows, stone walls and ditches between 2007 and 2014³. With many of these schemes now ending it is important that the benefits of this work are not lost.

Trees

Almost one-third of the 3.2 million hectares of the UK's forests and woodlands are on farmland⁴, but farmland trees are easily overlooked. Individual trees, trees in small woodlands, and trees in hedgerows contribute to the character of the local landscape and support a vast array of wildlife. For example, the ash – the third most common tree in England – is used by almost 1,000 species, including wood mice, liverworts, wrens, blue tits, bats, lichens, fungi and beetles.

It is important that trees and small woodlands are actively managed, whether for biodiversity or to produce wood. Around 47% of woodlands remain unmanaged or under-managed⁵. To retain landscape characteristics it is important this is addressed.

The management of landscape by farmers plays a key role in giving our countryside its distinctive appeal and appearance. Much of the countryside is farmed by families who have been there for generations and have a strong interest in sustainability to secure their livelihoods and the landscape for the future. Any discussions about rewilding areas need to consider this context and the possible impacts that could follow.

Historic landscape

Farmers also own and manage most of the nation's historic landscapes, buildings and archaeological sites. Over 75% of England's 19,854 Scheduled Monuments, such as underground prehistoric burial grounds, are within agricultural holdings. The local authority-produced Selected Heritage Inventory for Natural England (SHINE) database identifies a further 68,253 heritage assets, on farmland, including Neolithic and Bronze Age burial plots⁶, many of which will be of national importance.

Traditional farm buildings – both listed and unlisted – are, by far, the most numerous type of building in rural areas. These buildings contribute to the distinctiveness

of local areas for visitors and local people alike, for example, the oast houses of Kent and the windmills of the Fens, provide habitats for wildlife and offer a range of potential uses that benefit local economies and communities. Over 70% of traditional farmsteads in existence at the beginning of the 20th century have retained some or all of their historic form. In its 2005 publication 'Historic farm buildings: constructing the evidence base', English Heritage described traditional farm buildings as: "fundamental to [the countryside's] sense of place, its local distinctiveness and its historic interest. They also represent a major economic asset in terms of their capacity to accommodate new uses in buildings, which, by definition, are in keeping with local countryside character."

Agri-environment schemes have played a key role in both maintaining and restoring more than 14,000 traditional farm buildings and supporting the management and restoration of archaeological sites on farmland, with more than 355,000 hectares under positive management⁷.

The evidence suggests that traditional farmsteads are under increasing threat of becoming increasingly rundown and disused with the loss of historic character. When buildings that are distinctive, but are not maintained, it progresses to a more challenging situation where you are faced with trying to preserve distinctive and now rare buildings.

Access

Farmers also play a major role in the provision of public access to our landscapes contributing to our health and wellbeing and recognise the value and importance of engaging with the public and helping them learn more about the countryside and food production.

Farmland is the destination of 48% of visits to the natural environment in England – around 4.1 billion visits every year⁸ boosting rural and local economies. Farmers host and maintain a vast network of rights of way. In predominantly upland areas there are vast stretches of open access land, providing members of the public with a unique opportunity to experience the farmed environment. Since 2006, more than 1,600 farmers have taken part in LEAF (Linking Environment and Farming) Open Farm Sunday, welcoming over two million people onto their farms⁹. The value of educational visits to farmland across the UK is estimated at £1.86 million¹⁰. It is important that farmers continue to play a pivotal role in making the landscape accessible.

But providing this access comes with its own challenges, with fly tipping and livestock attacks by dogs two of the most prevalent problems. Fly-tipped waste is costly and time-consuming to remove, dangerous to human health, wildlife and livestock, and in some cases can pollute watercourses and contaminate land¹¹. Currently,

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when incidents of fly-tipping take place on private land it is the landowner's responsibility to remove the illegally dumped waste even though they have been the victim of a crime. It should not be the sole responsibility of the land owner to deal with the aftermath of fly-tipping and more consistency is needed in the way local authorities, the Environment Agency and the police engage with landowners on this issue.

The effects of attacks on livestock can be long-lasting and distressing. As well as the initial financial loss from lost animals, they can also have a serious and lengthy impact on a farming business due to the significant disruption caused. While a lack of evidence means the true extent of dog attacks on livestock is not known, Sheep Watch UK estimate 15,000 sheep are killed by dogs in the UK every year.

Figures from NFU Mutual showed that attacks on farm livestock by out of control dogs cost UK agriculture an estimated £1.6million in 2017¹², with claims figures showing a 67% cost increase for dog attacks on livestock from 2015 to 2017. The research also revealed that over 60% of dog owners let their dogs roam off the lead in the countryside and 7% of owners admitted their pets had chased livestock in the past. It is important that everyone takes pride in, and responsibility for, our countryside. A simple first step is to follow the Countryside Code while out enjoying our amazing landscapes.

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References:

1. <https://www.gov.uk/government/news/public-to-have-say-on-new-national-parks>
2. <https://www.nfuonline.com/farming-delivers-for-the-the-hills-and-uplands>
3. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/683972/future-farming-environment-evidence.pdf
4. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/683972/future-farming-environment-evidence.pdf
5. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/683972/future-farming-environment-evidence.pdf
6. <http://www.myshinedata.org.uk/>
7. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/683972/future-farming-environment-evidence.pdf
8. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/683972/future-farming-environment-evidence.pdf
9. <https://farmsunday.org/about-us>
10. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/683972/future-farming-environment-evidence.pdf
11. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/652958/Flytipping_201617_statistical_release_FINAL.pdf
12. <https://www.nfuonline.com/cross-sector/rural-affairs/access/access-news/shock-increase-in-livestock-worrying-as-cost-rises/>

What's needed for the future

Farmers will continue to play a pivotal role in maintaining and enhancing our landscapes for future generations and in providing access to the countryside so it can be enjoyed by everyone. To enable them to do this it is important that the work they do is recognised and supported by future policies. We need:

- Recognition that our landscapes are living, working, dynamic landscapes. The reality is whether you change use or preserve use, management is only possible if it is economically sustainable.
- Those managing our National Parks and Areas of Outstanding Natural Beauty to recognise the need for agricultural and local economies to remain viable and healthy.
- A future environmental land management scheme that continues to play a fundamental role in managing and improving landscape features such as stone walls or traditional farm buildings, and by supporting permissive access and educational access.
- Incentives to plant lone trees and small groups of trees to help meet Government ambitions to increase tree numbers while addressing how these new plantings fit with farming systems.
- An enabling planning policy which supports the retention of historic buildings through sensitive design and new use to ensure unused buildings do not decline through neglect.
- An approach that strikes a balance between using land to produce food and providing appropriate protection to the historic environment from agricultural activity.
- Recognition of the constraints of hill farming and its pivotal role in land management as a first step in securing sustainable and thriving farmed landscapes across the whole of England's hills and uplands. This can only be achieved through appropriate reward for food production, environmental management and public goods delivered.
- Ensuring farmers have a full understanding of the rights of way in existence on their land, and the reassurance this will not change without their permission and support, so they can make future business decisions.
- All parties (local authorities/police/landowners/ Environment Agency/public) working together in a consistent way across the country on the prevention, clean up and prosecution of fly tipping.
- People being mindful of livestock while walking their dogs in the countryside and adhering to the Countryside Code.



Case Study

Thomas Binns

Livestock farmer, North West

"It was never a conscious decision to go into farming to produce a landscape. My desire and drive to have a business was to produce food. But the two things have become increasingly interwoven. We produce food and we're producing this iconic landscape as well to the benefit of everyone – for me as a farmer and for the public at large.

"In my case it was quite an easy step forward into combining environmental aspects of the farm that we have and the production capacity of the farm. It was a natural progression to enter into environment schemes because they fitted hand in glove with our business aspirations for the farm.

"Farmers have a genuine desire to try and make sure they leave the landscape and environment in a better condition for the next generation than it was in when they took it over. That's always been my aspiration, even though I'm a tenant farmer. My time on my farm will be limited, and I won't have the farm to physically pass on, but I want to make sure things are maintained and enhanced, and left in good condition for whoever follows me.

"There's a real challenge in terms of allowing people access to the countryside and maintaining a profitable farm business. I want people to be able to enjoy the iconic landscape that I call home. I'm keen for them to learn more about food production and farming and the balance that has to be struck between that and environmental management. When I stop and talk to people about the food we produce and the landscape that they're in they're very appreciative of the efforts that farming goes to in order to maintain their access to what is a beautiful part of the country.

"We do work to maintain and enhance the land we occupy. We're privileged to live in the area that we farm. Sometimes we take the environment we work in for granted, but a lot of people who visit this area complement us on how the landscape looks and how our farm looks. The acknowledgement that people see what we see and appreciate what we've done is a great boost. It's recognition that farming provides all this additional benefit alongside the farming activity.

"We're very fortunate to have many landscape features on our farm. We have valleys with streams in the bottom that are an important spawning ground for trout, as well as home to some rare native species of crayfish. We manage the banks of those water courses so we don't apply fertiliser and don't damage the



stream edges with cattle drinking from them. A lot of our streams are fenced off to protect the water course and the habitats around it.

"We also have around seven miles of dry stone walls, so it's a huge task to keep up to date with any repairs that may be needed, but it's important to keep those iconic hard features in place. Over the years we've probably put in around 11 kilometres of hedgerows which provide important habitats as well as landscape features. There's a lot of work and effort that goes into that which we wouldn't have been able to do if we hadn't had support from various environmental schemes over the years.

"I'm very fortunate that the landscape I live and work in, and contribute to in terms of its management, is mirrored by the neighbouring farms. Together, as a team, we manage and maintain the landscape to allow it to move and flex with the times. As policies change, and farming practices change, we can flex with those changes. It's hugely important that these areas are helped through the public purse because some of the work involved is quite costly. But I'm absolutely sure the public enjoy what they come and see in their thousands in the Pendle Hill landscape."



Today's Biodiversity

As well as producing high quality, safe, affordable food, the agricultural sector plays an integral part in protecting, maintaining and enhancing the countryside, providing habitats and food sources that underpin biodiversity across the country.

Farmers recognise the important contribution biodiversity can make towards productive, profitable farm businesses:

- Soil is estimated to be home to a quarter of all species on Earth¹;
- A range of crops rely on, or benefit from, pollination from bees, flies, and other insects;
- Beneficial creatures, which can include beetles, hoverflies and spiders, can help improve productivity by reducing the threat to crops from pests;
- Boundaries, trees and woodlands provide shade and shelter for livestock, particularly in extreme weather.

Much of the data that is currently collected on biodiversity focuses on specific species and habitats, particularly birds. Evidence collected on the impact of a type of habitat management tends to focus on one species, not all the species benefitting from that habitat. This means more common plant and animal life is often forgotten and leads to significant gaps in the data because information simply is not recorded. This lack of data means the role of more general farm management in providing for more common biodiversity gets underplayed, even though it is still important.

Using metrics to measure farmland biodiversity based on post-war baselines ignores the way farming systems have changed in response to government policies and makes comparisons virtually impossible. Changes have not happened because they are the whim of farmers, changes have been driven by policies and demands of the marketplace in which farm businesses operate.

Habitat

Many species and habitats are found on, or around, farmland. Wildlife uses the landscape features found on farmland, such as hedges, walls and trees, ponds, and the margins around them. These features contribute to wider biodiversity by providing habitats and food for a vast array of wildlife from insects and lichen through to birds.

Farming has played a role in the creation and maintenance of many habitats that are now valued for their biodiversity. Lowland meadows, upland hay meadows, arable field margins and hedgerows are all habitats which are dependent on farming. Farming also plays a role in creating and protecting other significant habitats – for example, the grazing of coastal and floodplain grazing marsh and lowland dry acid grassland. Many upland habitats need grazing to prevent them being overtaken by scrub and trees.

Most sites of special scientific interest (SSSIs), and protected sites, are found on farmland. Managing a protected site comes with constraints on the farming practices. Land managers work with Natural England to improve the condition of these sites and this is often done through agri-environment schemes.

10,000 football pitches of wildflower habitat

have been planted, creating homes for bees and food for insects



Scientists estimate that **one-quarter of species on planet Earth live in soils**



GWCT's Big Farmland Bird Count saw over 1,000 farmers record more than 121 different species on farm in 2018

It included 25 species from the Red List for Birds of Conservation Concern, with 5 appearing in the 25 most commonly seen species list: fieldfares, starlings, house sparrows, song thrushes and yellowhammers

Wildlife

Farmers understand the fundamental role pollinators play in the environment and in food production and do a lot to provide habitat and food for them. The farmed landscape provides pollen sources across the seasons, from hedges through to crops, and suitable habitat. In addition to the maintenance of boundary features and grass margins, farmers have planted 10,000 football pitches of wildflower habitat², creating homes and food for bees and other insects. The NFU also helped develop the National Pollinator Strategy – a ten-year plan to help pollinating insects survive and thrive – recognising the need to support pollinators. Insect pollination is estimated to be worth around £600 million per year³ to UK crops.

Birds are considered to provide a good indication of the broad health of the environment because they occupy a wide range of habitats. Sadly, the recognised dataset for farmland birds only counts 19 species found on farms, and this has shown a long-term decline since 1970. However, we know that many more species are found on farmland, as demonstrated by the Game & Wildlife Conservation Trust (GWCT) Big Farmland Bird Count 2018⁴ which saw more than 1,000 farmers record 121 different species of birds on farm, including 25 species from the Red List for Birds of Conservation Concern. Farmers play a significant role in providing food for farmland birds, with 23,000 hectares of plants providing food sources like seeds planted as part of agri-environment schemes between 2007 and 2014⁵.

Between 1999 and 2016, populations of bats in Defra's biodiversity indicators have increased by

28%

Grassland, hedgerows and indeed arable fields can all provide food, shelter and nesting habitat for birds.

There are many other species that live on or around farmland which are not always captured by official statistics or supported by national objectives. Barn owls are iconic farmland birds. Data received from 38 monitoring schemes showed that the number of nesting pairs of barn owls in the UK in 2017 was 17% above the average of the previous four years⁶. Bats also provide a good indication of the broad state of the environment. Between 1999 and 2016, populations of bats in Defra's biodiversity indicators increased by 28%⁷. Following improvements in water quality in England's rivers, the otter population has continually increased over the past 25 years and expanded across the country⁸.

It is estimated that insect pollination is worth approximately £600 million per year to UK crops

through increased yield in oilseed rape and the quality of fruit and vegetables

23,000 ha of food sources

for farmland birds planted in agri-environment schemes between 2007 and 2014

But there is a balance to be struck. The spread of invasive alien species, such as muntjac deer, grey squirrel or plants like giant hogweed and floating pennywort, is a growing challenge and agriculture is often in the front line in terms of picking up the costs and dealing with the impacts when these species establish themselves on farmland and along waterways. Effects caused by climate change, including changing weather patterns and increases in temperature, will also pose a challenge for biodiversity and habitats, with both beneficial but also unfavourable impacts possible.

Similarly, decisions on reintroducing species, particularly if they have been absent from this country for hundreds of years, need to be taken in the context of the impact they will have on local wildlife and biodiversity, as well as agricultural systems.

The fact that farming is one of the main ways of providing positive biodiversity is often ignored. Why? Because of the lack of data to prove otherwise. The GWCT Big Farmland Bird Count and Farm Nature Discovery provides an opportunity to build a more comprehensive picture of what we have today.

Environmental delivery

Farmers want to engage in environmental delivery. But schemes need to be simple, easily accessible and work within current farming systems. The current uptake of Countryside Stewardship is disappointingly poor, putting at risk many environmental improvements on farm which have been achieved in recent decades. Any new agri-environment scheme also needs to support broad environmental delivery that supports the wide range of species and habitats found in the farmed environment.

The CFE has promoted good environmental practice on farm, promoting a joined up message on the best management practices endorsed by industry, environmental groups and government bodies. It offers advice to farmers on managing land to benefit the wider environment. In addition, it runs events for farmers demonstrating good management and, working with partners provides beneficial seed mixes. The NFU is a leading supporter and champion of CFE.

Many other industry initiatives also support biodiversity on farmland – for example, the Barn Owl Trust, GWCT and North Wessex Downs Farmland Bird Project provide free help and advice for farmers to create and manage habitat for farmland birds; there are various Woodland Trust initiatives to encourage tree planting; and Hedgelink provides bespoke advice on hedge management for specific species.

Farmers are also joining together in co-ordinated groups to achieve wider environmental enhancements. One such example is the Marlborough Downs Making Space for Nature initiative⁹, which started when a group of farmers joined together to enter Higher Level Stewardship (HLS). The concept of collaborative landscape-scale conservation shows what can be achieved when farmers work together, but it must be farmer-led.



1,500 species of insects



pollinate plants in the UK, including bumble bees, honey bees, solitary bees, hoverflies, wasps, flies, beetles, butterflies and moths¹⁰



Over 35,000 hectares are under positive management

Key practices conserve: field trees; boundary features; wet and rough grasslands; woodlands and orchards¹¹



The data received from 38 monitoring schemes shows that the number of nesting pairs of barn owls in the UK in 2017 was

17% above the average of the previous 4 years (2013 - 2016)

References:

1. http://ec.europa.eu/environment/archives/soil/pdf/soil_biodiversity_brochure_en.pdf
2. Adapted from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/439452/landenvmanagement-statsnotice-30jun15.pdf
3. <https://www.gov.uk/government/news/bees-needs-food-and-a-home>
4. <https://www.gwct.org.uk/farming/big-farmland-bird-count/>
5. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/683972/future-farming-environment-evidence.pdf
6. <https://www.barnowltrust.org.uk/wp/wp-content/uploads/State-of-the-UK-Barn-Owl-population-2017.pdf>
7. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/726851/England_biodiversity_indicators_2018_final.pdf
8. <https://ptes.org/get-informed/facts-figures/otter/>
9. <https://www.spacefornature.net/>
10. <https://www.gov.uk/government/news/bees-needs-food-and-a-home>
11. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/683972/future-farming-environment-evidence.pdf



What's needed for the future

Farmers will continue to play a pivotal role in improving biodiversity by providing and maintaining habitats and food sources for wildlife. To enable them to maintain and enhance this work it is important that the work they do is recognised in future policies. We need:

- Recognition that farmers will be in the best position to manage land for environmental benefit if they have profitable, competitive businesses and that food production and positive environmental benefits can be achieved side by side.
- A future environmental land management scheme that is simple and accessible for farmers and works within farming systems and that recognises the need to support broad environmental delivery that supports the wide range of species and habitats found in the farmed environment.
- The development and support of new private sector approaches to funding environmental delivery, such as net environmental gain.
- Improvements to the delivery of the Countryside Stewardship scheme, during the transition to a new environmental land management scheme, to increase overall uptake.
- The collection and provision of better data on wider biodiversity delivery, like insects, and better evidence on more general species and habitats found across the landscape to acknowledge the full range of work farmers do.
- The inclusion of options for improving biodiversity, such as wildflower margins, hedgerow management and management options for different habitats, in any future environmental land management scheme.
- Recognition and celebration of the work that farmers do to deliver the more common biodiversity.

Case Study

Saya Harvey

Arable farmer, East Midlands

"At Manor Farm, we farm in conjunction with wildlife and the environment because biodiversity is important for many of the natural processes that are so fundamental to farming. We have been in an agri-environment scheme since 1994 and, as different habitats have developed, we have seen an increase in bird species, invertebrate fauna and small mammals on the farm. Crop walking is also much more interesting when you spot a barn owl soaring or a family of long tailed tits bobbing along a hedgerow.

"The farm business is the number one priority for us because without an income there can be no biodiversity strategy. We farm the middle of the field to maximise yields and to generate that income. We have always followed the principles of integrated farm management to increase efficiency and to minimise any harmful effects on the environment. These measures include zero tillage cropping where appropriate, variable rate fertiliser application, and the use of economic thresholds for chemical application. The less productive land around headlands and on heavy ground is dedicated to wildlife but it is all part of the farm management plan.

"Twenty-five years after starting our first agri-environment scheme, we have 25% of the farm in some sort of wildlife habitat – 10% of this habitat is new woodland, mainly native but tailored to suit climate change predictions; 5% is in field margins around all the fields; 3% is in pollen and nectar or wild bird seed habitat and located in south facing corners or near mature trees; and 7% is in no-input grassland. This habitat creation is tailored around our farmland birds, including several tree sparrow colonies, grey partridge, skylark, starlings, song thrush and yellowhammer, to mention a few. The semi natural grassland also protects a Scheduled Ancient Monument. Agri-environment funding is crucially important in making this type of management a viable option for the business.

"The field margins play an important role in protecting watercourses since we are acutely aware of the water quality issues surrounding soil and pesticide runoff. We have recently increased the width of field margins from six metres to 12 metres, particularly at the bottom of slopes and alongside watercourses. This makes spraying much easier since we almost never need to calculate no-spray zones when applying pesticides. The other benefit is that we have created a network of broad wildlife corridors alongside the more important habitats on the farm.

"Since we established margins around the fields we have seen a decrease in the amount of insecticide used on the arable crops. Aphid control has been unnecessary during



the summer months for over 20 years and this is due to the presence of natural predators in our field margins and hedgerows. Pollinators do another important job with flowering crops like oilseed rape and field beans and we have several areas of pollen and nectar mix to help build populations of bumblebees. Habitat for pollinators is a priority for agri-environment funding as many native bumblebee species are becoming increasingly rare.

"Hedgerows are another very important wildlife habitat and landscape feature and we have planted approximately two-and-a-half kilometres of hedge on the farm over the past 30 years. We now manage our hedges by traditional laying and trimming, which results in tall, wide and thick canopies with berries in the winter but also nice tight thorns to protect nesting birds from predators.

"Other habitats on the farm include a 15-year-old woodland and several ponds that have been established where ancient field drainage has collapsed. The management objective is to create typical native woodland but, for now, the thinnings provide a fuel source for our wood-fuelled district heating system. Since planting the woodland, we have seen an increase in the number of bird species on the farm from 45 species to 60, including a pair of barn owls that have taken up residence in one of our barn owl boxes. A permissive right of way through the new woodland ensures that our whole community enjoys our farm, the wildlife and landscape."



Today's Soil

Healthy soil provides the foundation for life. It supports plant life, helping create the oxygen we breathe and cleansing the water we drink, as well as being the basis for food production. Good quality soil underpins Britain's whole farming system. It helps deliver a diverse range of public goods – helping enhance water quality, enabling carbon storage, increasing resilience to climate change, and mitigating against flooding. But, while there is lots of data about the quality of our water, there is a lack of specific data and information about our soils.

Farmers have an inherent interest in maintaining their land in good condition and in assuring its long-term fertility and productivity. Recent years have seen an increasing interest in, and wider adoption of, practices designed to maintain and enhance soil quality by farmers – things like the use of reduced tillage technology so soil is not overworked and damaged, cover cropping to reduce soil erosion and replenish nutrients essential for crop growth, and the use of low-impact machinery to reduce soil compaction, which can restrict root growth and make it more difficult for water to penetrate the soil.

But while all these steps are acknowledged as being beneficial to soil health there is very little in the way of up to date and spatially detailed data to support this knowledge. Good data is absolutely essential to benchmarking the current situation and measuring our progress towards improving our productivity, while reducing our environmental footprint.

Knowledge

Farmers are increasingly aware of the link between good soil management and increased productivity. Defra's 2018 Farm Practices Survey¹ showed that 74% of farms know the soil type for each of their fields and 35% keep track of the organic matter content of their soil. The more farmers know about their soils, the better placed they are to actively make strategic management decisions to maintain and improve the health of their soil, from informed choices about cultivation methods and crop rotations to decisions regarding the input of organic matter. The use of compost and digestate can help improve soil organic matter, reduce the use of manufactured fertilisers and means more material is recycled into the land.

Soil is an extremely complex system and there is still much to be researched and learned on a practical scale. Soil biology thrives when the chemical and physical conditions are correct. Soil chemical properties (like nutrient content and acidity/alkalinity) and physical properties are the most commonly measured elements. Biological parameters are more difficult to measure and understand. Soils are host to very

**The UK has more than
700 different soil types⁵**

**74% of holdings
know the soil type for each field
on the farm**

**95 % of our food is directly
or indirectly produced on
our soils⁶**

diverse and complex ecosystems – some species like earthworms are known for breaking down organic matter and reducing soil compaction, while nitrogen-fixing bacteria around the roots help fix this vital nutrient required for plant growth.

In the UK, approximately 64% of agricultural land² is permanent grassland and common rough grazing. This soil acts as a carbon storage area, mitigating against climate change and locking in greenhouse gases that would otherwise be released into the atmosphere.

Peatland also plays an important role in agriculture as well as acting as an important store of carbon. Lowland peatlands such as the Humberhead Levels, the Lyth Valley, the Somerset Levels and Moors, and the Fens support a wide range of crops such as cereals, grass for livestock and high-value field vegetables, potatoes, sugar beet, as well as bulbs and flowers. Upland peatland areas, such as the Pennines, North York Moors, parts of the Lake District, and in the uplands of the South West, are dominated by livestock farming.

Initiatives

Initiatives like the CFE, Tried & Tested and the Voluntary Initiative have played a key role in helping protect and improve soil health. Statistics from 2014 show 72,000 hectares³ of land were put into voluntary soil protection measures under CFE. These measures included in-field and watercourse buffer strips to protect against soil erosion, and winter cover crops using seed mixes with a diverse range of root lengths to reduce soil compaction and retain important nutrients. The NFU will continue to work with industry-led initiatives to emphasise the necessity of maintaining and improving soil health.

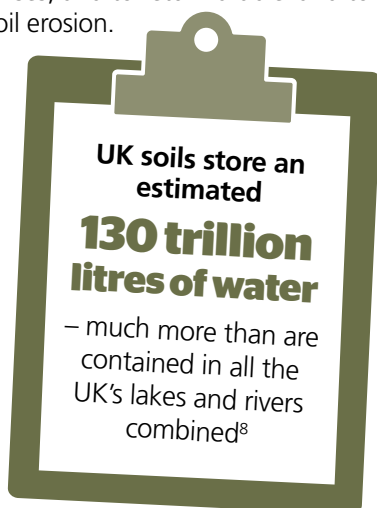
Other initiatives are also having a positive impact. Catchment Sensitive Farming (CSF) gives free training and advice to farmers in selected areas of England with the aim of improving the environmental performance of their farms, and includes soil condition and nutrient management among its training topics. LEAF Marque Farms' Integrated Farm Management is a site-specific farm business approach that uses the best of modern technology and traditional methods to help increase productivity while protecting valuable resources.

Regulation has also been used as a way to protect and enhance soil quality. The Farming Rules for Water, introduced in April 2018, contain rules aimed specifically at soils which require farmers to test their soils and then produce management plans to improve soil nutrient levels and meet crop needs. But regulation can, at times, be a blunt, inefficient and costly tool. It is possible for the same outcomes to be achieved through carefully targeted advice and information and voluntary action, alongside a greater emphasis on monitoring and research, with proportional and targeted regulation used when other more appropriate and cost-effective measures have failed to achieve results.

Collaboration

Water companies are also investing more in working with farmers to educate about, and incentivise, actions that help prevent soil erosion and soil loss to watercourses. One example is Wessex Water's EnTrade⁴ project, which invited farmers to bid for funding to grow cover crops over winter to reduce nitrogen leaching into watercourses, and to return arable land to grassland to prevent soil erosion.

A single hectare of soil has the potential to store and filter enough water for
1,000 people
for one year⁷



References:

1. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/710413/fps-ghg2017-statsnotice-24may18.pdf
2. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/741062/AUK-2017-18sep18.pdf
3. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/439452/landenvmanagement-statsnotice-30jun15.pdf
4. https://www.entrade.co.uk/Case_study/
5. <https://www.cranfield.ac.uk/case-studies/research-case-studies/national-soil-map>

72,000 hectares of land

were put into voluntary soil protection under CFE in 2014

Worm casts

are rich in recycled plant nutrients and help maintain soil fertility⁹

Renewable fertilisers

(compost and digestate)

can increase yields and reduce costs with no impact on crop quality¹⁰

A teaspoon of soil contains more living organisms than there are people living on earth¹¹



While progress is being made there is more work to do. Projects like CFE and CSF have an important role to play in providing farmers with the information they need to make further improvements in soil health and the NFU and its members will continue to be involved in these projects. The way land is cultivated needs to suit the soil and cropping type of each farm. The benefits of organic matter, as well as the encouragement of cover cropping and other organic matter inputs, also need to be more widely explained as does the effects of erosion on watercourses.

As this report shows, much has been, and is being, done by farmers to maintain and enhance soil quality, and more can be done with the appropriate support.

6. <http://www.fao.org/3/a-i4405e.pdf>

7. randd.defra.gov.uk/Document.aspx?Document=SP1601_9606_FRP.pdf

8. <https://www.theccc.org.uk/wp-content/uploads/2016/01/CCC-Written-Submission-to-Environmental-Audit-Committee-Inquiry-into-Soil-Health.pdf>

9. <https://www.dpi.nsw.gov.au/agriculture/soils/biology/earthworms>

10. <http://www.wrap.org.uk/content/digestate-and-compost-agriculture-dc-agri-reports>

11. <https://www.soilassociation.org/media/4673/living-soils-a-call-to-action-2015.pdf>

What's needed for the future

Industry-led initiatives like the Campaign for the Farmed Environment and the Voluntary Initiative, alongside projects like Catchment Sensitive Farming, have an important role to play in providing farmers with the knowledge they need to manage their soil better. To enable us to continue to be more efficient and to improve soil health, future policies can help, through:

- The collection of more reliable and robust data on soils that can be used at a farm level to help farmers make informed management decisions for their businesses. Incomparable data should not be used for national benchmarking as soil types are too diverse.
- Recognition for the good management practices farmers already undertake. This information could be collected via Defra's Farm Practices Survey.
- Ensuring any future policy on soil management is not oversimplified. A 'one size fits all' approach could be detrimental to soil health in some sectors and some areas of the country.
- Recognition by Government of CFE as an essential initiative to provide advice and support to farmers on soil health to ensure best practice is shared and farmers receive the skills and knowledge they need.
- The inclusion of options for improving soil health in any future environmental land management scheme, such as cover cropping, increasing soil organic matter, nutrient management planning, and reduced tillage if appropriate to the farming system.
- Grants for testing soil or a free soil testing programme as an incentive to farmers to carry out more soil testing.



Case Study

Poul Hovesen

Arable farm manager, East Anglia

"Healthy soils are the bedrock of my farm business. Healthy soils produce a healthy crop and healthy food. You have to invest in your soil if you are going to have a sustainable business and this means putting back what the crop takes out in terms of nutrients and organic matter, and only operating when conditions are right to avoid compaction and soil erosion.

"I have five key principles when it comes to maintaining and enhancing your soil:

- Know your soil – its structure, its resilience, its type;
- Take a long-term approach and don't be influenced by short-term market trends – short-term gain can lead to long-term pain;
- Use an integrated system – elements like crop rotation, cover crops and reduced tillage all have a role to play;
- Education – ensure your staff understand your soil and always have it at the front of their minds when making decisions;
- Work with scientists to understand the latest knowledge and thinking and how it can be applied to your business.

"It's important that you don't allow your soil to get into a poor condition. We operate an integrated system that prioritises cultivation straight after harvest to minimise the use of pesticides and to ensure crop residues are returned to the soil to help build organic matter.

"Getting the correct rotation for the soil you have is the key to keeping it healthy. We use a seven-year crop rotation on this farm which has been in place for nearly 20 years. We have selected crops to suit our variable soil types. Having a longer rotation helps build up nutrients in the soil but it also helps stop root disease problems developing, which can be an issue if you plant the same crops over and over again in a shorter rotation. Our rotation allows us to minimise the risk of this and use controls, like cover crops, to help tackle any problems that do occur. Doing this protects and enhances the soil and improves the quality of the crops.

"Cover crops play an important role by preventing erosion during the winter, enhancing drainage, and returning nutrients to the soil. They help boost the amount of organic matter. Especially with a spring crop, it is vitally important to build up soil quality but also protect the soil from winter erosion.

"We prefer to get something growing straight after harvest, instead of leaving the ground bare. Growing a cover crop between our cash crops helps absorb the energy from the sun and stores it in the soil. We help



stimulate this growth with organic manure, then we can graze it down which also has benefits as the animals leave their manure behind helping to further stimulate the soil. Then, as the cover crop dies off, the organic matter and nutrients are absorbed into the soil.

"We predominantly use a cover crop mix of oil radish, which is fast growing and has deep roots, and black oats, which have shallow roots. The black oats help with biological activity in the topsoil while the deeper roots of the oil radish help draw nutrients in and retain them, relieving compaction in the lower level, and increasing drainage.

"We use a system of reduced tillage. By opening up the soil just enough you get it to breathe, the soil releases its nutrients, and creates a good seed bed, which then helps the root development of the plant. By varying the cultivation technique, and the machinery we use, to suit the needs of the next crop we reduce problems like soil compaction or erosion.

"We regularly test our soil's nutrients and structure to check the condition of the soil. Healthy soil is less likely to leach nutrients into the water, it will be more resilient, and cheaper and easier to work. The biggest indicator of soil health is resilience and, as a result, how much it costs to work. As the condition of our soil has improved we've been able to spread our sugar beet crop over a wider area. Some of the land that we were never able to grow sugar beet in we can now crop successfully, because we aren't doing deep cultivations and the soil is far more resilient and healthier."

A clean, reliable source of water is vital to all farms. But water management is about more than ensuring farmers have enough water to meet their business needs. Flood risk management (taking steps to reduce the risk of flooding and managing flood water when flooding does occur) and water quality (taking steps to reduce agriculture's impact on water) are also essential elements of the work farmers do. By using water more efficiently, storing flood water on land and reducing run-off from land farmers help their communities to cope with extreme weather events. But farmers can only deliver these benefits, whilst producing high quality food, if their businesses are resilient to volatile weather and markets.

Flood risk management

Farmers carry out a range of work to help mitigate flood risk and farmland plays a key role in flood management, but this work is often not acknowledged and the impact of flooding events is not fully realised. In the winter of 2013-2014 some 45,000 hectares of agricultural land were flooded, including some coastal areas, at a cost of around £19 million to the sector¹. The flooding that took place in 2015-2016 is estimated to have cost the industry £7 million².

The NFU's Flooding Manifesto outlined our vision of what action needs to be taken on flooding. We need a strategic approach to flood risk management which recognises the importance of food and farming to the wider economy. Nearly 60%³ of our most productive and versatile agricultural land is situated on floodplains. It is important that if farmland is allowed to flood to protect urban communities further downstream, that this is done by design rather than default, and that the full value of this land in terms of food production, environmental benefits and infrastructure protection is acknowledged and fairly compensated.

The work farmers do, which includes desilting and vegetation management, helps increase the resilience of their land, as well as reducing the risk of flooding to local communities. A financial value needs to be placed on the work that farmers do and they need to be fairly rewarded. Nationally, no one has a full appreciation of the scale and range of environmental activities farmers are involved in that help with flood mitigation, and more research is required to get a clearer picture. Actions such as soil management, cover cropping and farmyard water management are already widespread, but need to be formally captured.

More than 50 Countryside Stewardship options provide flood risk management benefit⁴ and hundreds of

£70m investment in farm infrastructure

was made by farmers between 2011-2014 as a result of Catchment Sensitive Farming's work to minimise pollution¹⁴

1.2 million hectares of land

and 14,000 farmers, actively engaged with Catchment Sensitive Farming¹⁵

successful natural flood management (NFM) schemes have already been recorded or are currently being implemented^{5,6,7}. Wider uptake of these schemes by farmers requires greater action by policy makers and government to address the concerns of farming.

These include liability, insurance and maintenance requirements which farmers need to address before they get involved, alongside ensuring they are adequately rewarded for the flood mitigation service provided.

It is also recognised that greater farmer and land management involvement in key groups such as Regional Flood and Coastal Committees and Internal Drainage Boards is required. Farmers hold a thorough understanding of how rivers respond to high rainfall events. Agricultural representation in these groups is vital. It leads to greater participation in schemes that provide multiple benefits, such as water storage reservoirs that can mitigate downstream flood risk, provide a valuable water resource and can reduce sediment loads in water systems.

Water resources

Food and drink is the UK's largest manufacturing sector, contributing more than £100 billion to our national economy. Water is an essential ingredient in growing and processing the high quality food we all need.

All agri-businesses require access to a reliable supply of water all year round for a wider range of activities, including livestock drinking, supplementary irrigation, vegetable washing, food preparation, production, and cleaning. For example, high-value fruit and vegetable crops need water to meet demands for yield, quality and appearance. Protected crops, crops grown in containers, and newly-planted landscape plants need a continual water supply. Increasing demand for water arising from population growth, coupled with climate change and events like the 2018 drought, already threaten farmers' access to secure water supplies and their ability to grow high quality food at affordable prices.

Farmers rely on a combination of rainfall, mains water and abstracted water to meet their business needs. Our water footprint for food production is much smaller when compared to many countries we import food from⁸. While farmers use less than 2% of the total water abstracted in the UK, meaning water allocation for food production is minor compared to the public supply and energy sectors, this water is often taken in the driest areas, in the driest years and driest months when resources are most under pressure.

Farmers are already efficient users of water but more can still be done to increase their 'crop per drop' performance and improve their resilience to water supply disruptions through contingency planning.

Abstracted water for fruit and vegetable production is highly regulated. Growers measure their water use and, though new technology and monitoring techniques, they can exactly match water application to crop needs. Many farmers have built reservoirs to collect and store surplus river water for use during periods of dry weather and lower river flows.

47,000 hectares of buffer strips

protecting water courses and features¹⁶

In 2017,

18,269 sprayers

used were certified under the National Sprayer Testing Scheme

Of the UK's total water footprint,

75% is attributed to 'external' sources, or imported goods¹⁷

With British farms currently producing only 61% of the country's food there is an increasing focus on the impacts of food imports, not least the environmental impact of the water used to grow imported food. The global nature of food supply means that the length and resilience of supply chains is coming under greater scrutiny. There are persuasive reasons to increase the production of home-grown food to replace products from overseas that have a higher water footprint. If relatively sustainable agricultural and horticultural businesses in the UK cannot access the water they need and are therefore unable to produce the safe, affordable home-grown food that people want, then

more food will be imported from countries where water could be under even greater stress because of climate change and other impacts.

Water quality

Over the past 25-30 years, farmers have been able to reduce the negative impact they have on water quality through a variety of measures, which includes the increased use of precision technology and nutrient management planning and ensuring nutrients are applied during the right conditions and with the right quantity to meet, but not exceed crop needs.

The efficient use of nutrients plays a major part in improving water quality. Provisional estimates for 2017⁹ shows a 19% fall in the amount of nitrogen per hectare since 2000 and a 37% fall for phosphorus over the same period.

Farmers also use expert agronomic advice to ensure they plan nutrient applications as accurately as possible. 74% of England's farmed area is covered by a nutrient management plan, and 89% of that area has advice input from a professional agronomist or fertiliser adviser¹⁰.

Industry organisations have worked together to create initiatives such as Tried & Tested, which offers farmers free nutrient management planning advice to help reduce diffuse water pollution, and the Voluntary Initiative (VI) which promotes the responsible use of pesticides to protect water and the wider environment.

Integrated pest management and responsible use of pesticides is common practice on UK farms. 16,820 farmers across the UK, covering an area of approximately 4.4 million hectares¹¹, use an Integrated Pest Management Plan created by the VI, to protect their crops. In 2017 there were 21,818 members of the National Register of Sprayer Operators (NRoSO)¹². Sprayer operators have to undergo training and pass a test which ensures they are competent in spraying accurately to ensure minimum impact on the environment. Also, 18,269 sprayers were certified under the 'National Sprayer Testing Scheme'¹³ which involves an annual MOT test for the sprayer to ensure it is calibrated and working effectively.

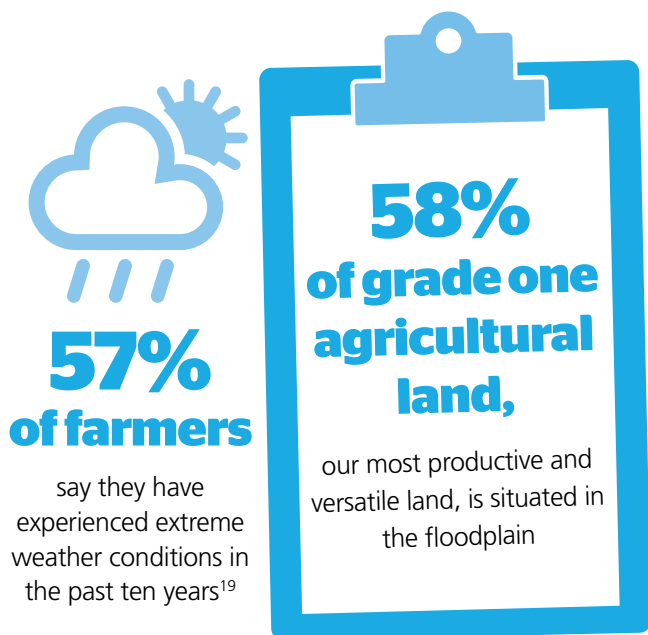


16,820 farmers across the UK

use an Integrated Pest Management Plan covering an area approximately 4.4 million hectares.

Steps like creating buffer strips, and soil and land management techniques (including cover crops and minimum and no tillage systems) all assist in reducing run-off rates and protecting watercourses.

Although significant improvements have been made, tackling water pollution caused by agriculture continues to be a key driver for the sector. The agricultural industry is committed to continuing to make improvements and the NFU will continue to support industry-led initiatives such as CFE, Tried & Tested, and the VI to help achieve this.



Agricultural use amounts to only 1% of England's water usage¹⁸



In 2017 there were

21,818 members

of the National Register of Sprayer Operators

74% of England's farmed area is covered by a nutrient management plan²⁰

References:

1. <https://www.nfuonline.com/news/latest-news/nfu-launches-flooding-manifesto/>
2. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/672087/Estimating_the_economic_costs_of_the_winter_floods_2015_to_2016.pdf
3. <http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=2&ProjectID=16952>
4. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/570105/cs-flood-reduction-infographic.pdf
5. <https://www.gov.uk/government/publications/working-with-natural-processes-to-reduce-flood-risk>
6. http://www.yorkshiredales.org.uk/_data/assets/pdf_file/0003/1010991/11301_flood_management_guide_WEBx.pdf
7. <https://catchmentbasedapproach.org/wp-content/uploads/2018/08/NFMMMap.pdf>
8. <https://waterfootprint.org/media/downloads/Report50-NationalWaterFootprints-Vol1.pdf>
9. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/740600/soilnutrientbalances-UK-14sep18.pdf
10. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/710413/fps-ghg2017-statsnotice-24may18.pdf
11. <https://voluntaryinitiative.org.uk/media/2144/voluntary-initiative-annual-report-2016-17.pdf>
12. <https://voluntaryinitiative.org.uk/media/2144/voluntary-initiative-annual-report-2016-17.pdf>
13. <https://voluntaryinitiative.org.uk/media/2144/voluntary-initiative-annual-report-2016-17.pdf>
14. <http://publications.naturalengland.org.uk/publication/6510716011937792?category=6919090>
15. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/683972/future-farming-environment-evidence.pdf
16. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/683972/future-farming-environment-evidence.pdf
17. <https://waterfootprint.org/media/downloads/Report50-NationalWaterFootprints-Vol1.pdf>
18. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/587296/fbs-wateruse-statsnotice-31jan16.pdf
19. <https://www.nfuonline.com/assets/92430>
20. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/710413/fps-ghg2017-statsnotice-24may18.pdf

What's needed for the future

Farmers will continue to work to reduce the risk, and deal with the consequences of flooding, to use water even more efficiently, and to reduce farming's impact on water quality through adoption of best practice and industry-led initiatives. To enable them to do this, it is important that the work they do is recognised and acknowledged and that future policies help them to continue to do it, through:

Flood risk management:

- An environmental land management scheme that truly recognises and values the flood risk management service that natural flood management schemes provide to downstream communities, and supports farmers who choose to get involved in these schemes.
- A domestic agricultural policy that supports volatility measures, including those designed to help cope with extremes in future weather conditions, such as investment in water management infrastructure like reservoirs and drainage.
- Placing greater value on agricultural land in flood risk appraisals which recognises the importance of having a resilient food and farming sector.
- Policy that prevents the development of new housing and infrastructure schemes which exacerbate flooding onto farmland both up and downstream.
- The creation of partnerships to raise funds for river and coastal maintenance work to help flood risk management, tapping into private sector funding sources which also benefit from these works. The NFU and the wider industry is willing to be involved in supporting the creation of such groups when matched with resource from other key organisations, including the Environment Agency and Internal Drainage Boards.

Water resources:

- Ensuring that farmers have a fair share of available water to grow our food, with improved security of supply at times of water scarcity.

- Further promotion of farm reservoirs through a reduction in red tape (licensing, planning) combined with financial and fiscal measures (capital tax allowances, grants) to support investment.
- Multi-sector co-operation (especially with water companies) at catchment scale to sustainably manage, share and trade water.
- Encouraging innovation and flexibility in the abstraction licensing regime so that regulated access is fit for purpose and businesses can thrive whilst the environment is protected.

Water quality:

- The development and support of new approaches to funding improvements to water quality, such as Payments for Ecosystem Services, through the private sector.
- Continued funding for Catchment Sensitive Farming (CSF) to help farmers achieve further environmental improvements.
- The inclusion of options for improving water quality in any future environmental land management scheme, such as buffer strips on margins in fields to prevent run-off, fencing of water courses, use of a lined biobed/biofilter, and separation of clean and dirty water in dairy systems.
- Added financial support for infrastructure projects like slurry storage, new technologies like low emission spreading equipment, and innovative tools such as nutrient management planning software.
- Reviewing the regulatory framework around water to ensure a more holistic and practical approach to help deliver improved environmental outcomes.
- Any additional regulation must be spatially explicit and proportionate and have the dual objectives of boosting agricultural productivity and increasing environmental sustainability.
- Increased support from Government for industry-led initiatives like the Voluntary Initiative.



CaseStudy

Martin Emmett Nursery grower, South East

"We've tried to take a holistic approach to water management, starting with the capture of rainfall from the glasshouse roofs right through to monitoring the supplies that run through our water capture system. We also collect the water that we've used and recirculate and reuse it. We're doing what we can to take full responsibility for our water – both its quality and the quantity we have available. This is about business resilience but it's also about trying to maintain a high standard of environmental management.

"We purchased this site 18 years ago as a greenfield site. We wanted to start off with a masterplan that gave full long-term security to the business and part of that was the security of our water supply. We're actually in one of the areas of the country that benefits from a good water supply but the area is over licensed in terms of abstraction and we know also that some of the water from this area is being exported to a neighbouring area. So to give us the assurance of long-term security we decided that we wanted to integrate a reservoir project into the site.

"It's not just about the business, it's about the locality. The area has a problem with flooding and this very comprehensive and extensive attenuation system is effectively alleviating a potentially significant flood risk to the area as a whole.

"The water that's in the reservoir is a mix of water we've used previously and rainwater we've collected from the site and that basically goes through our irrigation system. Our systems aren't precision irrigation systems but because we're collecting all the water again we know we've got an efficient system overall. Most of our systems are overhead irrigation systems watering areas of crop.

"We have all our beds on a 'V'-shaped profile whereby all the water that isn't absorbed by the plants runs to the centre of the beds. In the centre of each bed is a series of French drains. These drains lead into a network of linear reservoirs and they all feed to a common point near the reservoir and we pump the water up to the reservoir from there. A certain amount of water still flows out of our site to a watercourse, but the majority we collect and pump back into the reservoir.

"This system means we are taking full responsibility for the water we're using. A lot of the water we're using we've already used and recycled. It means that we have to be very careful in terms of what we put into



the water – any pesticide residues, management of nutrients. It gives us that full cycle and control of our water quality.

"We monitor the water we put into the reservoir. We actually measure the amount going in, we monitor the level of the reservoir, and we monitor the quality of the water that goes into our collection systems before it comes into the reservoir. After we've filtered it and treated it we monitor the quality of the water that goes out of the system as well. At any one time we need to know what sort of water capacity we've got.

"We have an area of wetland habitat which we created as part of this project and this effectively acts as a sump to the system, so when we've got a surplus of water coming off because of heavy rainfall it goes into this wetland habitat where we can pre-store the water before we pump it into the main reservoir. It's quite a stable habitat and we also put in two islands which are good nesting habitats for birds.

"It's a long-term project but we wanted to have this degree of ownership over our environmental management. In the longer term we're confident that we are always going to have a serviceable water supply for this site. And I think businesses as a whole need to ask themselves if they can say that."

Air is the least visible elements of our environment. We face two major challenges – improving air quality and mitigating the impacts of climate change through the reduction of greenhouse gas (GHG) emissions. Earlier this year saw the consultation on the draft of the Government's Clean Air Strategy, designed to cut air pollution and save lives. Agriculture can, and does, have a key role to play in dealing with these challenges, as well as taking advantage of the opportunities they present. Agricultural emissions like methane, nitrous oxide and ammonia are governed by biological processes and are not as easily controlled as industrial processes. At the same time, agriculture is well placed to provide green energy sources, displacing the use of fossil fuels.

Nitrogen is a critical nutrient for good healthy crops and will continue to be needed to ensure that we meet the food needs of our growing population in Europe. Farmers and land managers are becoming increasingly more efficient at minimising their nitrogen use whilst achieving increased yields. More efficient use of nitrogen has led to significant reductions in the past 25 to 30 years, with the amount of nitrogen found in soil falling by 34% since 1990.

Ammonia

Manures, slurries and inorganic fertilisers are key sources of nitrogen. Most agricultural soils do not contain enough naturally occurring nitrogen to meet crop needs, so supplementary applications using manure or manufactured fertiliser are vital. However, they are significant sources of ammonia.

Ammonia is released when organic manures and fertilisers come into contact with air. It is therefore unsurprising that agriculture accounts for 88% of UK ammonia emissions¹.

It is estimated that the majority of ammonia loss occurs at certain stages in the agricultural process:

- 27% comes from livestock housing – although the lack of data on the use of ammonia abatement technology means this could be an overestimation;
- 9% comes from manure storage;
- 25% comes from manure application;
- 23% comes from fertiliser application².

But while ammonia emissions are an inevitable consequence of farming there are ways they can be managed so the loss into the air is minimised and the nitrogen content for crop growth is maximised:

- Emissions from livestock can be reduced through diet. In 2018, 73% of holdings with livestock used information including nutritional advice for formulating their diets³;
- Emissions from livestock housing and manure

Defra farm practice survey 2018⁹

58% of farmers took action to reduce greenhouse gas emissions

Of these:

83%

did it as they considered it made good business practice

68%

did it through concern for the environment.

53%

did it to improve profitability

storage can be reduced through infrastructure improvements such as slatted flooring systems for dairy and acid air scrubbers for poultry. However, in many cases the cost of these improvements will severely outweigh any potential business gains. The volatility of farm incomes has made investing in the replacement of old and inefficient infrastructure difficult. Grant support for ammonia abatement technology along with the right advice could significantly reduce emissions from housing and storing of manures;

- Emissions from spreading manure and fertiliser can be reduced through more efficient application methods, such as using low emission spreading equipment. However, there are challenges. Low emission spreading technology is much slower and more costly than more traditional methods. While some grant funding has been made available for farmers wishing to invest in low emission equipment, it can still be prohibitively expensive, especially for smaller farms. The British Survey of Fertiliser Practice 2016 stated that only 20% of farms with cattle slurry used low emission spreaders.

The NFU has worked closely with Defra to create the national Code of Good Agricultural Practice (COGAP) for Reducing Ammonia Emissions, and will continue to promote the code to ensure as many farmers as possible are aware of it and implement it. Farmer-led initiatives like CFE and Tried & Tested have supported

farmers with guidance on nutrient management and the NFU will continue to support and promote these initiatives to ensure further farmer involvement.

Government initiatives like Catchment Sensitive Farming have also helped farmers reduce ammonia emissions through advice on efficient use of manure and fertilisers, with the primary aim of protecting watercourses. This year's announcement that CSF will now be focusing advice on mitigating ammonia emissions as well, will help to achieve further improvements.

Investment in infrastructure and technology to enable further improvements to be made is also crucial. More support is needed to enable farmers to take further action through the use of things like low emission spreading equipment.

Climate change

Agriculture is unique in climate change terms. It produces greenhouse gases but it is the only sector which is currently capable of removing carbon dioxide from the atmosphere by storing carbon in soil and vegetation. Farming is also on the front line of climate change impacts, being particularly vulnerable to extreme weather conditions.

Agriculture is now responsible for 10% of the UK's greenhouse gas (GHG) emissions, with methane (57%) and nitrous oxide (32%) the main sources⁴. Methane is mainly produced by livestock, particularly cattle, and nitrous oxide emissions come from the use of fertilisers on agricultural soils. Greenhouse gas emissions from UK farming decreased by 16% from 1990 to 2008⁵. But since 2008, there has been little change in absolute agricultural emissions.

Since 2011, the Greenhouse Gas Action Plan⁶ for agriculture in England (GHGAP) has supported farmers and growers in tackling climate change without compromising domestic food production. The GHGAP recognised that we cannot export our emissions and food production to other parts of the world and that opportunity lies in improving productivity for the benefit of farm businesses, the farmed environment, and for society. At its inception, the GHGAP had planned for an uptake of anaerobic digestion (1000 on-farm AD plants by 2020) to contribute one-fifth of the emissions reductions expected by both government and its independent advisers, the Committee on Climate Change. However, farmers have been let down by insufficient policy support from several government departments and inadequate access to grid networks which has hampered progress.

Continued improvements in productivity, through marginal gains in management of crops, livestock, soils and energy, supported by infrastructure investments, will lead to reductions in greenhouse gas emissions and ensure the farming sector makes a realistic contribution to climate targets. Over the medium to long term we

The actions farmers took to reduce greenhouse gas emissions included:

87%

recycling of waste materials from the farm (e.g. tyres, plastics)

69%

improving nitrogen fertiliser application accuracy

75%

improving energy efficiency (e.g. reducing electricity use, using reduced tillage)

38%

increasing use of clover in grassland

27%

improving nitrogen feed efficiency, livestock diets

27%

increasing use of legumes in arable rotation

50%

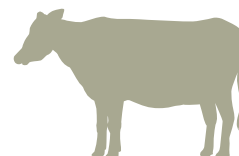
improving efficiency in manure and slurry management and application

will need to further transform the sector to meet the dual challenges of reducing its greenhouse gas footprint while adapting to climate change.

The UK's first Climate Change Risk Assessment⁷ recognised agricultural systems as being vulnerable to changes in climate and among the first to feel the effects. In the short term, for example, warmer temperatures may present some opportunities to improve yields and introduce new crops, but these benefits may be limited by low water availability. Farmers are capable of adapting their own businesses to a gradual change in climate given the right tools and knowledge, as long as profitability underpins long-term investment.

The average greenhouse gas footprint of beef produced in Western Europe is

1.5 times smaller than the global average¹⁰



Renewable energy

Farming has, however, made a significant contribution towards decarbonisation of its operations and of the UK economy through renewable energy production. Nearly 40% of farmers and growers have already invested in some form of renewable energy production for their own supply or for export to other users⁸. Solar power remains the most popular technology, followed by medium-sized installations of biomass boilers and wind turbines. Such diversifications offer farm businesses stable and predictable financial returns which, in turn, help improve business resilience. Over the past ten years the government's various renewable energy schemes have driven the growth of small and medium-sized renewable energy projects across the UK as well as larger projects paying land rents to farmers.

Transport biofuels

Transport biofuels produced from certified sustainable arable crops, for example under the Assured Combinable Crops Scheme in the UK, offer one of the very few scalable and cost-efficient solutions at present to decarbonising the European transport sector. In addition to its significant contribution to reducing emissions, the biofuel market is a valuable outlet for UK arable production, often putting a floor in volatile commodity markets, providing stability and security to those supplying it, as well as producing a good source of high protein animal feed.

References:

1. https://consult.defra.gov.uk/environmental-quality/clean-air-strategy-consultation/user_uploads/clean-air-strategy-2018-consultation.pdf
2. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/729646/code-good-agricultural-practice-ammonia.pdf
3. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/710413/fps-ghg2017-statsnotice-24may18.pdf
4. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/680473/2016_Final_Emissions_statistics.pdf
5. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/680473/2016_Final_Emissions_statistics.pdf
6. <http://www.cfeonline.org.uk/home/about-us/greenhouse-gas-action-plan/>

Agriculture is now responsible for 10% of the UK's GHG emissions with methane (57%) and nitrous oxide (32%) the main sources

Methane is the result of enteric fermentation from livestock, particularly cattle and nitrous oxide emissions come from the use of organic and inorganic fertilisers on agricultural soils

The National Atmospheric Emissions Inventory reports a 6.4% reduction in ammonia emissions between 2000 and 2016¹¹

7. <https://www.gov.uk/government/publications/uk-climate-change-risk-assessment-2017>
8. <https://www.nfuonline.com/cross-sector/farm-business/energy-and-renewables/energy-and-renewables-news/another-year-of-farm-renewables-growth/>
9. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/710413/fps-ghg2017-statsnotice-24may18.pdf
10. <http://www.fao.org/3/a-i3437e.pdf>
11. <http://naei.beis.gov.uk/>



What's needed for the future

Improving air quality and mitigating the impacts of climate change are two of the biggest challenges we face. Farmers are taking steps to reduce the amount of emissions generated by the industry and are well placed to provide green energy sources. To enable more work to be done on both these elements, future policies can help through:

- Improving data so farmers get recognition for changes in on-farm practice and uptake of techniques. This is in everyone's interest. The NFU has supported and welcomes continued efforts across the industry and by Defra to improve the collection of data related to both ammonia and greenhouse gas emissions through inventories. Work is already under way to evaluate current on-farm practices which could feed into this.
- An ambitious productivity programme to lower greenhouse gas intensity and ammonia emissions by providing targeted investment, supporting research and development, and incentivising the adoption of technical advances coupled with training, uptake of new techniques, advice and encouraging collaboration.
- Ensuring further progress to reduce emissions is manageable and affordable so farmers who want to continue to be more efficient and continue to adopt good practice are able to.
- The provision of grant funding opportunities for investment in infrastructure and new techniques, such as slurry stores or slurry bags and covering yards, to enable further significant reductions in ammonia emissions to be made.
- The inclusion of options for improving air quality in any future environmental land management scheme, such as nutrient management planning and use of urea inhibitors, if spreading urea.
- The reporting and annual monitoring of air pollution on natural habitats in conjunction with a robust and representative monitoring network and thorough modelling to accurately pinpoint the source of pollution, taking into account all contributing sectors as well as agriculture.
- Support the biofuel and agriculture industry by raising the renewable Transport Fuels obligation from the correct level of 4.75% to 10% by 2020, setting a biofuel crop cap at no lower than 7% and developing ambitious transport specific targets up to 2030.
- Carefully targeted advice and information in order for farmers to have the confidence to take action to reduce emissions but still remain profitable and productive.
- A 'route to market' that enables farmers to deploy both small-medium and large-scale solar and wind power projects, which are now the lowest cost types of new electricity production.
- More explicit support for on-farm anaerobic digestion that recognises its multiple environmental benefits (avoided methane emissions, improved nutrient management, protection of water resources) in the form of tax allowances and agri-environmental payments.



Case Study

Joel Beckett

Dairy farmer, West Midlands

"I think all farmers are keen to do whatever they can on their farms to minimise their environmental impact while maintaining productive farm businesses. As a dairy farm, one of the things we thought we could look at is how we handle the slurry the cows produce in a way that benefits the business and also the wider environment.

"We've installed a 44 kilowatt anaerobic digestion system. We decided to do it because it would make the best use of the slurry which we already had and it would also create all the electricity that we needed for the farm and the business, and a surplus as well.

"We scrape the sheds the cows are in twice a day. That slurry goes into a reception pit and is then pumped, eight times a day, in to the anaerobic digester. The system regulates itself and checks its own levels to make sure it is correctly balanced. The gas produced is enough to run both the engines connected to the anaerobic digester for 24 hours a day and these, in turn, power two generators which produce electricity for the farm and also power to go back into the national grid. On the farm we have our farmhouse and the dairy which we run for four hours twice a day. We also use a lot of hot water for cleaning and other things which also comes from the anaerobic digester.

"Now we've got our own source of sustainably-produced electricity, we're using less energy produced by conventional sources. The solid digestate that remains after the gas had been removed is valuable as well as fertiliser because it's got a higher availability of nitrogen within it than the slurry had previously. We spread it periodically on the fields and it's more useful to the crop when we apply it.

"Another diversification we installed about eight years ago was a 36 kilowatt system of solar panels, which is on top of the one of the cow sheds. The electricity this produces is fed directly into the national grid and produces an additional income stream for the farm business.

"We've also introduced a new system to spread the manure on the fields which is more efficient and more environmentally friendly. It makes better use of the slurry we have because it's applied in a more targeted way and it helps reduce ammonia emissions into the atmosphere because it's being applied closer to the ground.

"All the crops we grow on the farm go towards feed for the cows. We grow a lot of maize. After we harvest it we



reseed the field with grass over the winter which has two benefits for us – it helps to protect the soil from erosion and it also produces an extra cut of silage for feed. We also grow lucerne which is a source of home-grown protein and is also nitrogen-fixing so we don't have to use as much fertiliser or manure to help it grow. And then we grow quite a lot of grass. Some of that is permanent pasture and some is in rotation with the arable crops.

"We work closely with a nutritionist to ensure we make the best use of what we're feeding the cows. We keep a close eye on the components of the milk to help us understand whether we're making the best use of the feed, because we don't want anything wasted that goes through the cow.

"We also have a variety of measures in place to help boost biodiversity on the farm. On the arable land we have varying widths of margins around the fields, from two metre to up to six metre strips, and some wild bird seed strips as well. We established some of these through various stewardship schemes over the years. Now some of the stewardship schemes aren't as relevant to us so we do them purely out of our own interest and our desire to try and farm as sustainably as possible."





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