The potential impacts of Brexit for farmers and farmland wildlife in the UK

Report for

RSPB

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Data obtained from the four agricultural departments in the UK enabled analysis of numbers and areas of holdings by farm type, and their subsequent mapping. Farm Business Survey data obtained from the four departments and their partners was critical in understanding Farm Business Income dependencies and trends. Thank you to all those who collated and provided this data.

The feedback from the 13 experts who participated in our survey of expert opinion was invaluable in obtaining a range of perspectives in respect of different countries, sectors and areas of interest. Thank you to all those who kindly participated in the survey and to Dr James Jones who kindly reviewed this report.

Lastly, we would like to thank the members of the RSPB steering group who have been a great help in guiding the project and ensuring its objectives. These include Claire Feniuk (Project Manager), Jenna Hegarty, Tom Lancaster, Arfon Williams, Vicki Swales, John Martin, Tristan Orr-Bewick, Rob Cunningham, Adam Dutton and Ian Dillon. A particular thanks go to Claire Feniuk who drafted the country summaries and produced the maps.

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1 Executive Summary

1.1 Aim and approach

The aim of this project is to assess and map the potential impacts of Brexit on farms and farmland wildlife in the UK. It is intended that this report will be used to inform RSPB policy development and contribute to the evidence base to influence Government policy across the UK.

The study involved a literature review, survey of expert opinion, internal workshop, analysis of Farm Business Survey data, scenario development, quantitative and qualitative assessment of impacts by farm type, and generation of implications for future policy.

1.2 Baseline

Farm business data was collated to establish a baseline and to inform an assessment of potential impacts. Four farm types were selected for analysis - cereal farms, mixed farms, lowland grazing livestock farms and LFA grazing livestock farms. These account for a significant proportion of all holdings across the UK – 62% by number and 71% by area – and are also important for the provision of a wide range of public goods including biodiversity, landscape, cultural heritage, clean water, healthy soils, and carbon storage and sequestration.

Farm Business Income[1] (FBI) and the percentage of FBI attributable to Single Farm Payment (SFP) and Agri-Environment Scheme (AES) payments for the four farm types is shown in Table E1. The FBI figures reflect differences in average farm size, productivity and profitability across the countries. The FBI figures would be lower if unpaid labour was costed in to the calculation. All four farm types have a high dependency on public payments, with LFA grazing livestock farms particularly dependent. Without public payments, average FBI would be negative in most cases. The percentage of FBI attributable to public payments reflects, in part, the differences in the type and level of public payment available to farmers across the four countries; this percentage tends to reduce with increasing farm size and improved performance.

Table E1: Average Farm Business Income 2015 and Public Payments as a % of FBI

	England	**Wales**	**Scotland**	**Northern Ireland**
FBI				
Cereals	£45,021	No data	£16,231	£23,657
Mixed	£21,595	No data	£11,506	£37,138
Lowland grazing livestock	£18,471	£20,815	£25,613	£15,726
LFA cattle and sheep	£26,788	£20,047	£26,185	£14,745
SFP & AES as % of FBI				
Cereals	102%	No data	204%	118%
Mixed	152%	No data	338%	64%
Lowland grazing livestock	120%	87%	143%	162%
LFA cattle and sheep	160%	164%	200%	193%

Source: Defra/RBR, WG/IBERS, SG, DAERA (2016) Farm Business Survey and own analysis

[1] Farm Business Income (FBI) equals total output, plus scheme payments, less expenditure, plus profit/loss on sale of fixed assets. FBI, for sole traders and partnerships, represents the financial return to all unpaid labour (farmers, spouses, family workers etc.) and on all their capital invested in the farm business.

Farming is carried out on 70% of the total land area in the UK, and has a wide range of impacts on the environment. Farming can make a positive contribution in many ways including rich and varied agricultural landscapes and farmland habitats and species and, in upland areas, water and carbon storage. However key challenges remain including declining populations of farmland birds and other wildlife, farmland nitrogen and phosphorus affecting water quality, poor soil quality and greenhouse gas emissions.

1.3 Brexit scenarios

Two broad scenarios are considered for the purposes of assessing the potential impacts of Brexit on farms and the farm environment. Each scenario contains assumptions relating to: the level of support available through a new agricultural policy, relative to support currently provided through the Common Agricultural Policy (CAP); and the future trading relationship between the UK and the EU, either a Free Trade Agreement (FTA) or trade in accordance with World Trade Organisation (WTO) rules. We have additionally explored a best case and worst case situation in respect of Scenario 2. The scenarios are summarised in Table E2.

Table E2: Scenarios used for assessing the potential impacts of Brexit

	Scenario 1	**Scenario 2**	**Scenario 2 - Best Case**	**Scenario 2 - Worst Case**
Trading relationship	FTA with EU	WTO	WTO	WTO
	Some extra trade costs	Tariff barriers	Tariff barriers	Tariff barriers
Future funding levels	66% of CAP levels	33% of CAP levels	33% of CAP levels	33% of CAP levels
Output prices	No change	No change	+15%	-10%
Variable costs	No change	No change	+5%	+15%

1.4 Potential impacts of Brexit

The potential impacts of Brexit, based on the quantitative and qualitative assessment, are summarised below.

Uncertainty in the short and medium-long term

Brexit is creating considerable uncertainty in the farming sector in the UK. In the short term, some farmers are already adapting for a life with less support and different opportunities, while others are waiting until things become clearer before making changes. Anecdotal evidence suggests that a few are acting in an environmentally damaging way in anticipation of less regulation and funding. Brexit is therefore already having an impact now. In the medium to long term, uncertainty over future trading arrangements, policies, schemes etc. makes projections in terms of farm business and environmental impacts extremely challenging. This report can only give a sense of direction rather than an exact roadmap; the reality is likely to be somewhere between the range of impacts indicated under the two main scenarios.

Reduced Farm Business Income

Cutting public payments is likely to result in a significant reduction in average FBI for cereal, lowland and LFA grazing livestock and mixed farms, particularly under Scenario 2, see Table E3. While FBI for all four farm types would be adversely affected under Scenarios 1 and 2 (including the best and worst cases under Scenario 2), with one exception[2], there is more consistency (i.e. a narrower range), on the whole, in terms of the impacts on lowland and LFA grazing livestock farms. Scottish farm businesses appear particularly vulnerable to cuts in public payments, a reflection of the high proportion of FBI attributable to public payments in that country.

Table E3: Reduction in average FBI by farm type and scenario

	Scenario 1	**Scenario 2**	**Scenario 2 - Best Case**	**Scenario 2 - Worst Case**
Cereals	34-68%	68-136%	16-25%	144-290%
Mixed	21-113%	42-225%	(3)-61%	104-464%
Lowland grazing livestock	29-54%	58-108%	10-62%	124-183%
LFA grazing livestock	53-67%	107-134%	54-91%	174-206%

The “worst case” under Scenario 2 would result in average FBI being negative for all farm types across the UK. Conversely the “best case” under Scenario 2 would turn the situation around with FBI recovering to a positive figure, albeit some way short of the 2015 baseline in most cases.

The impacts of different trading arrangements on prices, costs and ultimately income, are difficult to predict given the complexities, particularly under Scenario 2. Some crop enterprises could expect to benefit (e.g. high quality milling wheat) whereas other enterprises (e.g. sheep and beef) could be adversely affected; significantly so in the case of lamb. Trade liberalisation, allowing more imports of cheaper food from third countries, would put downward pressure on prices and further worsen farm incomes especially in more protected sectors such as beef. Diversification income, an important part of the mix for many farms, could be affected if there is a downturn in the economy, which might be more likely under Scenario 2.

A variety of responses

Farm business responses to reduced income and a changed trading and support environment are expected to be varied, as might be expected with the diversity of farms across the UK. These responses are likely to occur under both scenarios, but the extent and depth of change will greatest under Scenario 2.

Many farm businesses can be expected to seek to try to maintain profitability by improving productivity and production, focusing on higher value crops and livestock products and, in some cases, intensifying production. Farmers are likely to seek to cut costs, for example by

[2] The model indicates a 3% increase in FBI for Northern Ireland mixed farms under Scenario 2 Best Case.

getting bigger to generate economies of scale, improving efficiency in the use of inputs, sharing labour and machinery and/or using contractors more. The ability of farm businesses to increase income will be limited by global commodity prices and domestic food and farm-gate prices, amongst other factors. Reduced public payments can be expected to result in large areas of farmland with little or no support, resulting in lower rents, less investment and less labour.

Brexit can be expected to influence farm businesses in combination with existing influences and challenges such as the need to control blackgrass, improve soil quality or tackle bovine TB, and new opportunities such as the use of big data and new technology. This could support the development of more resilient, sustainable systems in some cases.

Some farm businesses will choose an alternative path to one focused on improving productivity and production of commodities. In this sense, there could be a polarisation between production-oriented farms and other farms, although there are a number of different trajectories for the latter. Some may choose to produce for specialised markets or develop additional income through diversification. Others, especially in LFAs or other High Nature Value (HNV) areas, may choose to focus on delivering public goods, if there is support for such actions. Some may choose to reduce their farming activity and become part-time farmers; others may retire or give up farming altogether. The proportion of farms in each category can be expected to vary significantly across the country, and by farm type.

Further restructuring

It seems likely that Brexit will bring about accelerated restructuring in UK agriculture. More efficient, higher performing farm businesses can be expected to grow in terms of land area and livestock numbers. Fewer farm businesses can be expected to account for a higher proportion of land, stock and agricultural output.

The growth of contract farming, share farming and other collaborative arrangements seems inevitable, operating alongside traditional owner-occupied and tenanted systems. Less efficient producers can be expected to give up and those with significant borrowings will be under pressure to change more quickly.

Land use and environmental management

In lowland areas, significant shifts in land use are unlikely given the relatively productive nature of the land, although there is likely to be more interaction between arable and livestock enterprises and less productive areas can be expected to revert to permanent pasture and in places tree planting.

There is much more scope for change in upland areas where farming is typically marginal and has been dependent on public payments for many years. More productive land (such as in bye) can be expected to be put under greater pressure. In the hills, there could be a significant reduction in livestock numbers resulting in more extensive grazing, abandonment or conversion to forestry. The extent of land use change will depend on the availability and targeting of funds to support public goods and the commercial attractiveness of forestry.

Many farmers will be loath to reduce or give up their environmental management but there is a significant risk that they would be forced to, particularly under Scenario 2. Reductions in public payments would mean that whole farming systems become economically unviable, especially in the livestock sector, resulting in sub-optimal or no grazing management.

Conservation work to create or maintain habitats and other features would become expensive luxuries.

Environmental impacts

The environmental impacts of Brexit on farmland are likely to be mixed. More spring cropping, mixed farming systems, a focus on improving soil quality and more efficient use of inputs would be positive for biodiversity, water and soils. However loss of margins and field corners, and otherwise bringing more land back into productive use, would be negative due to loss of habitat and reduced protection of hedges, ditches and watercourses. More intensive management could result in increased risk of pollution and loss of species-rich grasslands. Less labour to maintain and enhance hedges, ditches etc. would also be negative.

In hill and other areas, less intensive/less active management on some land could be positive for a period. However a deterioration in the quality of valuable semi-natural grazing habitats and associated species could occur in the medium to long term. The conversion of hill areas to coniferous forestry could also be negative if valuable habitats are affected. If ongoing work to restore peatland or other upland habitats was halted due to reduced funding, this would be detrimental.

In terms of the farm environment challenges referred to in the baseline; while there could be positives, a reduction in public support combined with many farmers having no choice but to increase agricultural production (to recoup lost income) is likely to have an overall negative impact. This would apply particularly to biodiversity and water quality in and around productive farming areas.

Much will depend of course on the amount of support being targeted at agri-environmental measures. If this went up as a proportion of total support provided, then negative impacts could be ameliorated to an extent, and vice versa. If the current baseline of cross compliance and environmental legislation and regulations were weakened then worse environmental outcomes could be expected.

1.5 Country differences

There are significant differences in the implications of Brexit for farm incomes, farm management, land use and the environment in each of the four UK countries, driven by variations in the prevalence of different agricultural sectors, the extent of dependence on support payments, and differences in the inherent productivity of the land. Across all four countries though, the impacts on the environment are likely to be mixed and will depend hugely on the direction of future policy and shape of future support available to farmers.

1.6 Implications for policy

A number of points can be drawn from the key findings and challenges above to inform future policy.

Making a good transition

The current uncertainty over the impacts of Brexit, the extent of these impacts and the variation in farm business responses (as well as the knock-on effects of these responses on the farm environment) mean that a good transition is essential. There is an important role for

government /public policy to help shape and manage that transition, to make sure that 'public benefit' is maximised.

Public money delivering public benefit

There is a strong case that an overarching principle for future policy should be “public money for public goods where schemes deliver multiple public goods in an integrated way.

Maintaining support where it’s needed

Some farming systems support semi-natural habitats that are important for wildlife. Many such HNV farms are already economically marginal, heavily dependent on current farm support, and are particularly vulnerable to both potential cuts in support payments and changes to future trading arrangements.

How such economically marginal farms can continue to deliver public goods post-Brexit given their vulnerability is a major challenge for public policy. If direct payments were removed from such marginal farming systems, environmental payments would need to increase from current levels to maintain economic viability and support their continued management.

Without continued support of this kind, there is a high likelihood that many HNV farms could go out of business with very serious consequences for the environment and for the economic and social fabric of these areas.

Trade with the EU and the rest of the world

The potential loss of free trade with the EU may result in reduced farm profitability, leading to more intensive practices in some cases and others to go out of farming. While the environmental impacts would not all be negative, many would be. The liberalisation of trade with non-EU countries could reduce output prices and farm profitability further and would affect grazing livestock farms in particular.

Building on existing trends

Many farmers are already making changes to their businesses with a view to enhancing their long term sustainability and resilience, both in economic and environmental terms. There is a potential role for public policy to ensure that such positive changes continue and gain momentum through any transitional period, and in the long term post-Brexit. This could include:

- Maintaining support for environmentally-beneficial management.
- Building on existing trends in sustainable agronomy.
- Developing more sustainable business models for farms.
- Providing skills training.
- Encouraging and integrating Payment for Ecosystem Services (PES) schemes.

Maintaining regulatory standards

Regulatory standards play a vital role in safeguarding the farmed environment. It is acknowledged that the regulation and enforcement regime could be streamlined, but if the environmental risks associated with Brexit are to be minimised, the important environmental

protection and enhancement role currently played by cross compliance and EU regulations, designations and projects should continue.

Establishing a common framework for UK agricultural policies

There is a strong case for a common framework for UK agricultural policies. This would link to international trade and environmental agreements and create an 'even playing field' across the UK, driving high environmental standards. It is recognised however that a common framework would need to be carefully designed both politically and practically, in order for policy to be able to address local needs and priorities.

2 Introduction

2.1 Background

The UK's vote to leave the EU in June 2016 was a momentous event, one which is expected to affect farming more than most sectors of the economy.

Farm and countryside support, trade, movement of labour and regulation will all be affected by Brexit. New policies can be expected to be developed in England, Wales, Scotland and Northern Ireland.

The huge challenge to formulate new policies, programmes and schemes might be matched by the opportunities presented by a 'new start'. There may be opportunities for farming to become more market-oriented and sustainable, and for the enhancement of natural capital and the delivery of public goods, including biodiversity.

There are also risks, particularly for hill and upland farms (but also farms in other sectors) where direct payments and agri-environment payments comprise a relatively high proportion of farm income. For example, reductions in such support payments could be expected to affect farm business viability and influence decisions in terms of farming systems, enterprises, management practices and restructuring. These could then affect farmland habitats and species in the uplands and other High Nature Value (HNV) farming areas. Similarly, changes in the value of Sterling in relation to the Euro, or the imposition of additional tariffs on imports and/or exports, have the potential to alter the structure of the beef and sheep sectors; and to impact on foreign investments in food processing and retail that would have direct consequences for livestock and dairy. Here again, such changes could affect the use and management of farmland, with potential consequences for habitats and species.

2.2 Aim

The aim of this project is to assess and map the potential impacts of Brexit on farms and farmland wildlife and the wider environment.

It is intended that this report will be used to inform RSPB policy development and contribute to the evidence base to influence Government policy across the UK.

2.3 Approach

The project approach involved the following tasks:

- Inception meeting to discuss and agree the aim, scope and approach, consider scenarios, and collate relevant documents and data.
- A review of relevant literature relevant to the assessment of the potential impacts of Brexit on farms and the farmed environment (see Appendix 1 for references and Appendix 2 for additional bibliography).
- Collation and analysis of June Survey and Farm Business Survey data, and associated mapping.

- A survey of opinion involving face-to-face and telephone interviews with 13 experts in the agri-food trade, farming and land management, and the farmed environment (see Appendix 3 for the individuals interviewed).
- A workshop involving RSPB specialists from around the UK.
- Quantitative and qualitative assessments of the potential impacts of Brexit. The assessments cover potential impacts on Farm Business Income, farm businesses (by farm type) and farmland wildlife/environment, and key differences by country.
- The production of draft and final reports.

2.4 Structure of the report

The remainder of this report is split into three broad parts:

- Chapter 3 sets out a baseline in terms of current status and pressures on farm businesses and the farmed environment in the UK.
- Chapters 4 and 5 assess the potential impacts of Brexit on farms and the farmed environment under two broad scenarios using quantitative and qualitative analysis. Specific impacts within each of the four UK countries are then considered.
- Chapter 6 sets out the key findings and challenges from the research, and the implications for future policy.

3 Current status and pressures

3.1 Farming overview

At June 2015, total agricultural area in the UK was 18.24 million hectares (ha), including 17.23 million ha on agricultural holdings and 1.20 million ha common rough grazing. The Utilised Agricultural Area (UAA)[3] was 17.15 million ha, covering 70% of the total land area (Defra *et a*l, 2016).

The total croppable area was 6.06 million ha. Cereals accounted for 3.10 million ha (51%), with wheat and barley being the predominant cereal crops at 1.83 million ha (30% of croppable area) and 1.10 million ha (18%) respectively. Oil seed rape was the third most extensive crop at 652,000 ha (11%). Uncropped arable land[4] accounted for 214 million ha (3.5%) and temporary grass under 5 years covered 1.17 million ha (19%). Over the period 2011-2015, the area of wheat and oil seed rape has reduced (-7% and -8% respectively relative to the 2011 figures) and the area of barley has increased (+14%).

Total permanent grassland accounted for 9.89 million ha and other land on agricultural holdings covered 1.29 million ha.

The total number of cattle and calves was 9.92 million, including 1.90 million dairy cows and 1.58 million beef cows. The total number of sheep and lambs was 33.34 million. Over the period 2011-2015, the dairy herd has increased (+6%) while the beef herd has decreased (-7%); the sheep breeding flock has also increased (+8%).

There were a total of 214,000 agricultural holdings in the UK, with an average area of 80 ha. There has been a 4% reduction in the number of holdings and a marginal increase in average area over the period 2011-2015. There is considerable variation across the UK in terms of numbers of holdings and average holding size, see Table 3-1.

Table 3-1: Number and average size of holdings, 2015

	England[5]	**Wales**	**Scotland**	**Northern Ireland**	**UK**
Total number of holdings (thousand)	102.5	34.8	52.3	24.9	214.5
Total area (thousand ha)	8,992	1,663	5,576	998	17,229
Average area (ha)	88	48	107	40	80

Source: Defra, DAERA, WAG, SG (2016) Agriculture in the United Kingdom 2015

[3] UAA includes all arable and horticultural crops, uncropped arable land, common rough grazing, temporary and permanent grassland and land used for outdoor pigs (it excludes woodland and other non-agricultural land).

[4] Includes all arable land not in production, including land managed in Good Agricultural and Environmental Condition, wild bird cover and game cover.

[5] Commercial holdings only

Total agricultural labour in the UK was 476,000 in 2015. While this total is unchanged from 2011, there has been a marginal reduction in farmers, business, partners and directors and a marginal increase in regular employees, salaried managers and casual workers. The median age of holders (farmers) was 59 in 2013, unchanged since 2010.

Total Income from Farming (TIFF) in 2015 was £3,769 million, considerably lower than in previous years (-25% relative to 2011) due to lower output prices for milk, cereals, eggs and meat.

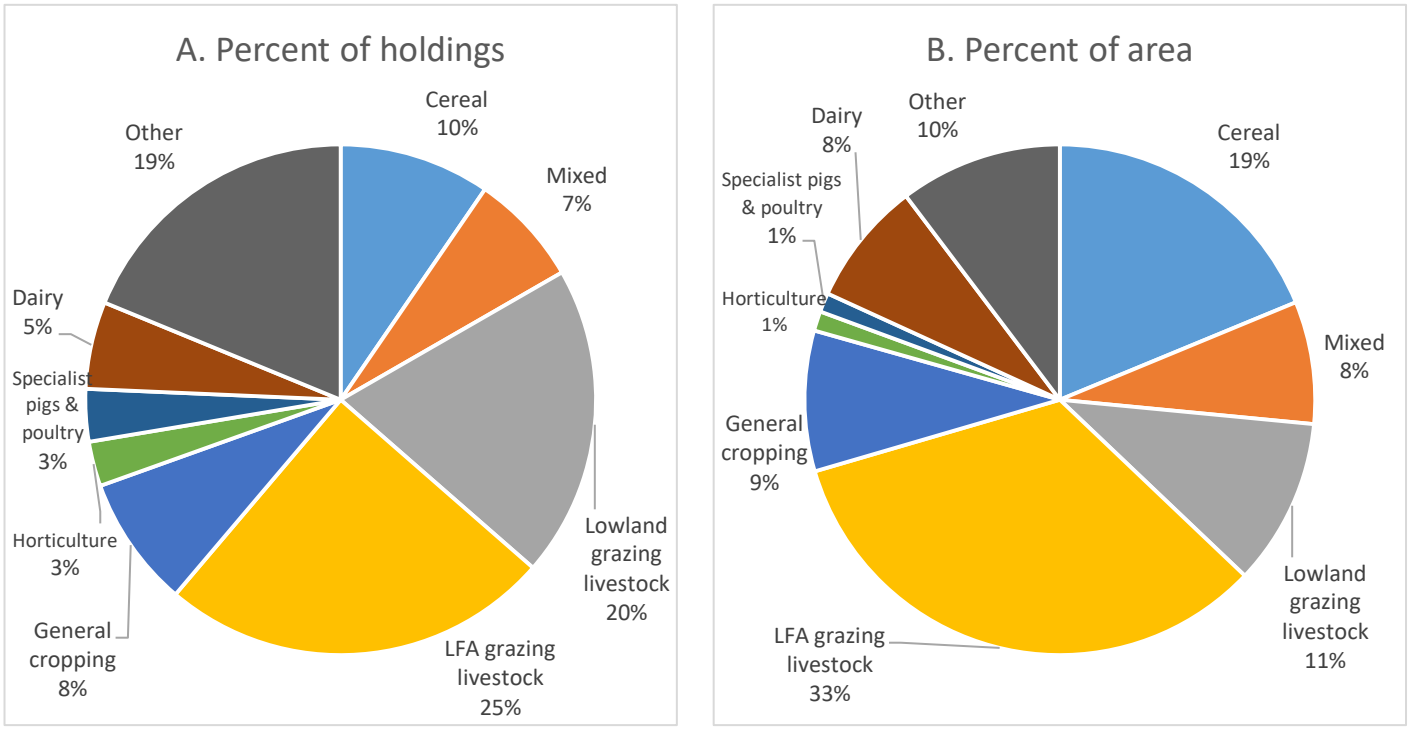
Public payments to farming in 2015 totalled £2,841 million, including £2,176 million Single/Basic Payment Scheme (BPS), £488 million Agri-environment Schemes (AES), £91 million Less Favoured Area (LFA) support schemes and £38 million coupled payments (Scotland only). Public payments accounted for 75% of TIFF.

3.2 Farm businesses

Farm business data has been collated to establish a baseline (see below) and inform an analysis of impacts (see Section 4). Physical data on the total number and area of holdings by farm type is available from the June Survey of Agriculture and Horticulture run by the Department for Environment, Food and Rural Affairs (Defra), the Scottish Government (SG), the Welsh Government (WG) and the Department of Agriculture, Environment and Rural Affairs (DAERA) in Northern Ireland. Physical and financial data is also available for a sample of farm businesses by farm type via the Farm Business Surveys (FBS) funded by the above governments and departments.

Four main farm types were selected as the basis for analysis - cereal farms, mixed farms, lowland grazing livestock farms and LFA grazing livestock farms. These account for a significant proportion of all holdings, 62% by number and 71% by area, see Figure 3-1. They are also important for the provision of a wide range of public goods including biodiversity, landscape, cultural heritage, clean water, healthy soils, and carbon storage and sequestration.

Figure 3-1: Number and area of farm holdings in the UK, by farm type, 2015



Source: Defra, WG, SG, DAERA (2016) June Agricultural Survey data

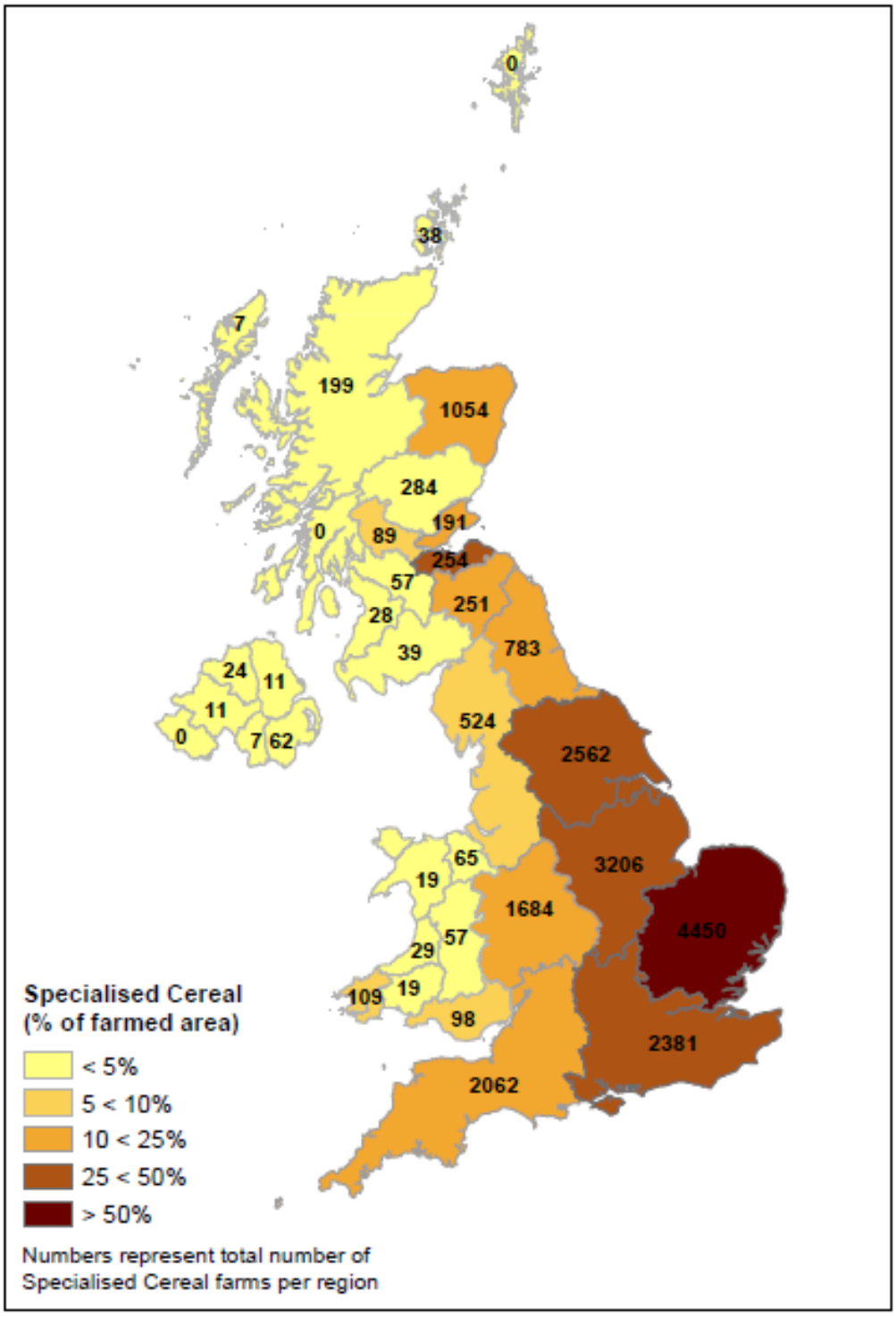
3.2.1 Cereal farms

There were a total of 20,825 cereal farms[6] in the UK in 2015. Cereal farms accounted for 10% of all holdings in the UK by number, although this ranged from 17% in England, to 5% in Scotland and 1% in Wales and Northern Ireland. By area, cereal farms accounted for 19% of total farmed area in the UK, ranging from 33% in England, to 5% in Scotland, 3% in Wales and 1% in Northern Ireland

Cereal farms are located across the UK but concentrated in certain regions including: the Eastern, East Midlands, Yorkshire & Humberside and South East regions of England; and Lothian and Fife in Scotland. The distribution of cereal farms, shown as a % of total farmed area, is shown in Figure 3-2.

[6] Cereal farms are defined as holdings on which cereals and other combinable crops account for more than two thirds of total standard output.

Figure 3-2: Cereal farms, % of total farmed area across the UK



Source: Defra, WG, SG, DAERA (2016) June Agricultural Survey data

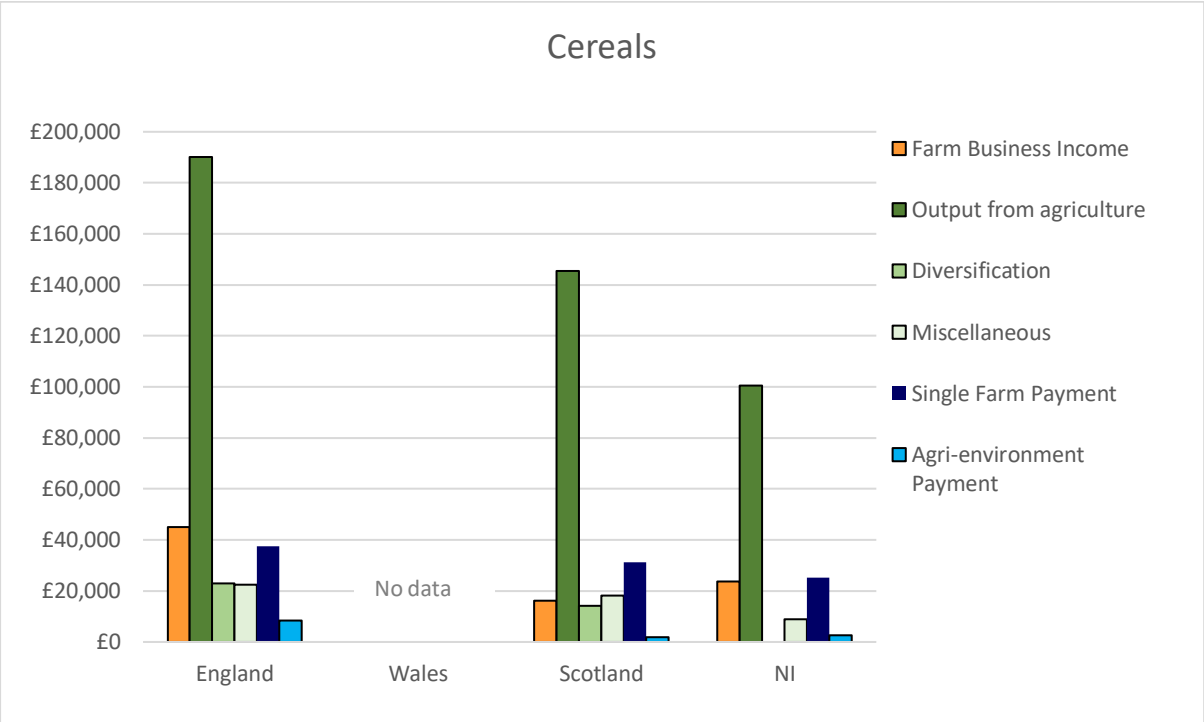
Average farm size of cereal farms across the UK, based on June Survey data, is 156ha. This ranges from 166ha in England to 112ha in Wales, 103ha in Scotland and 49ha in Northern Ireland[7].

[7] Data for Northern Ireland is taken from 2016 due to issues with availability of 2015 data.

Average Farm Business Income (FBI) for cereal farms by country, drawn from the FBS, is shown in Figure 3-3; no equivalent cereals farm data is available for Wales. FBI[8] is broadly equivalent to net profit (i.e. output less costs). Also shown in Figure 3-3 is total farm output split into its different elements: agriculture; diversification; miscellaneous (including contracting); single farm payment (i.e. Single/Basic Payment Scheme payments); and agri-environment (scheme) payments.

Average cereal farm FBI ranges from around £16,231 in Scotland to £45,021 in England. The differences in FBI, and total farm output, reflect differences in average farm size, productivity and profitability across the countries. The FBI figures would be lower if unpaid (farmer and family) labour was costed in to the calculation. Single farm payment (SFP) and agri-environment scheme (AES) payments as a percentage of FBI ranges from 102% in England to 118% in Northern Ireland to 204% in Scotland. AES represents a greater proportion of FBI in England (19%) compared to the other two countries (12% in Scotland and 11% in Northern Ireland). Diversification and miscellaneous income is also very important, especially in England and Scotland, accounting for 101% and 200% of FBI respectively.

Figure 3-3: Cereal farms FBI, 2015



Source: Defra/RBR, SG, DAERA (2016) Farm Business Survey and own analysis

[8] Farm Business Income (FBI) equals total output, plus scheme payments, less expenditure, plus profit/loss on sale of fixed assets. FBI, for sole traders and partnerships, represents the financial return to all unpaid labour (farmers, spouses, family workers etc.) and on all their capital invested in the farm business. FBI is the preferred measure for comparisons of farm type and is used when assessing the impact of new policies or regulations on the individual farm business.

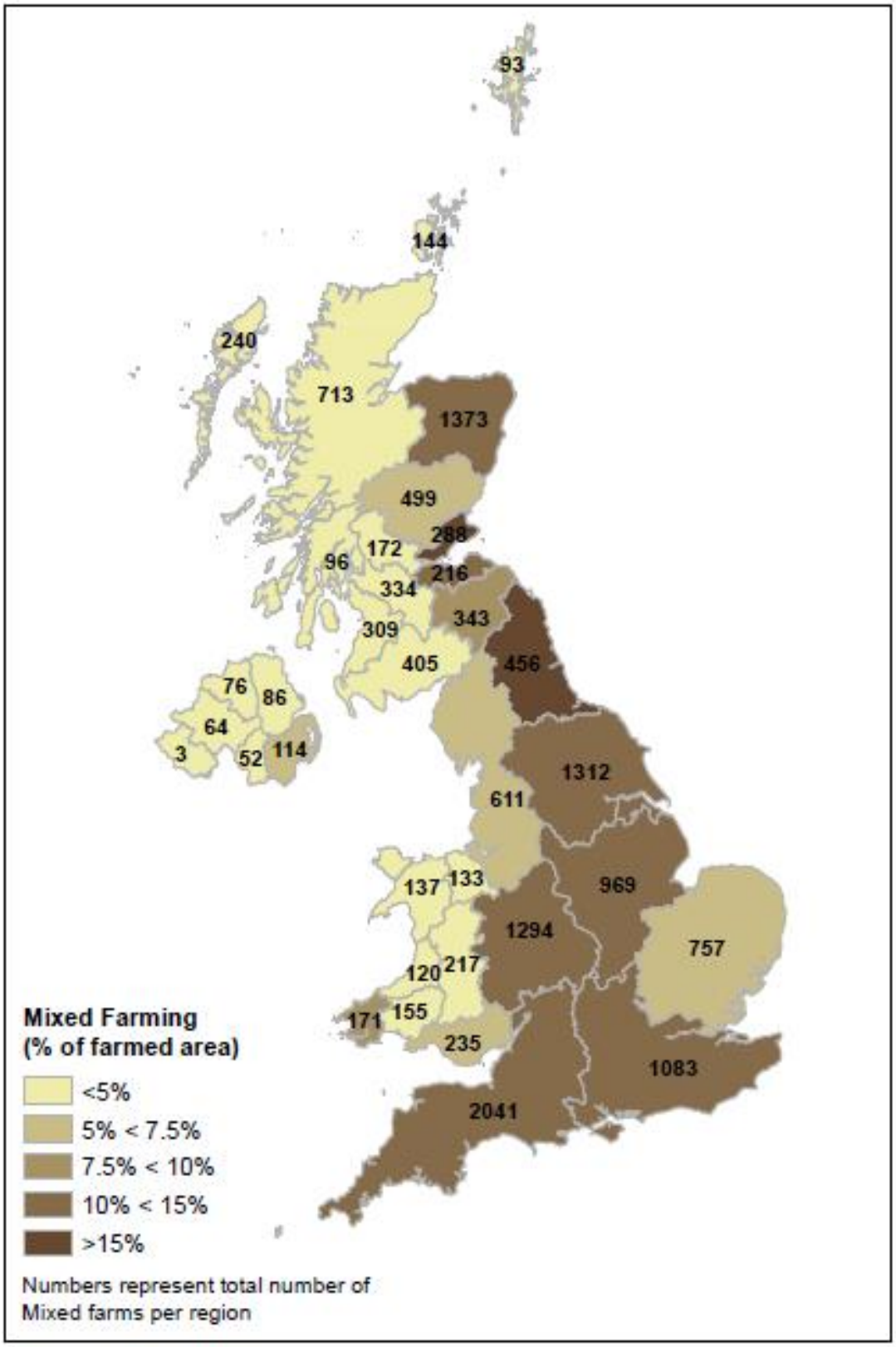
3.2.2 Mixed farms

There were a total of 15,504 mixed farms[9] in the UK in 2015. Mixed farms accounted for 7% of all holdings in the UK by number, although this ranged from 10% in Scotland, to 8% in England, 3% in Wales and 2% in Northern Ireland. By area, mixed farms accounted for 8% of total farmed area in the UK, ranging from 11% in England, to 5% in Scotland and 3% in Wales and Northern Ireland.

Mixed farms are located across the UK but concentrated in certain regions including Fife, Lothian, North East and Borders in Scotland; and Yorkshire and Humberside and North East in England. The distribution of mixed farms, shown as a % of total farmed area is shown in Figure 3-4.

[9] Mixed farms are defined as holdings for no specific enterprise or group of related enterprises accounts for more than two thirds of total standard output. It includes farms with a mixture of crops and livestock (and also mixed pig and poultry farms).

Figure 3-4: Mixed farms, % of total farmed area across the UK

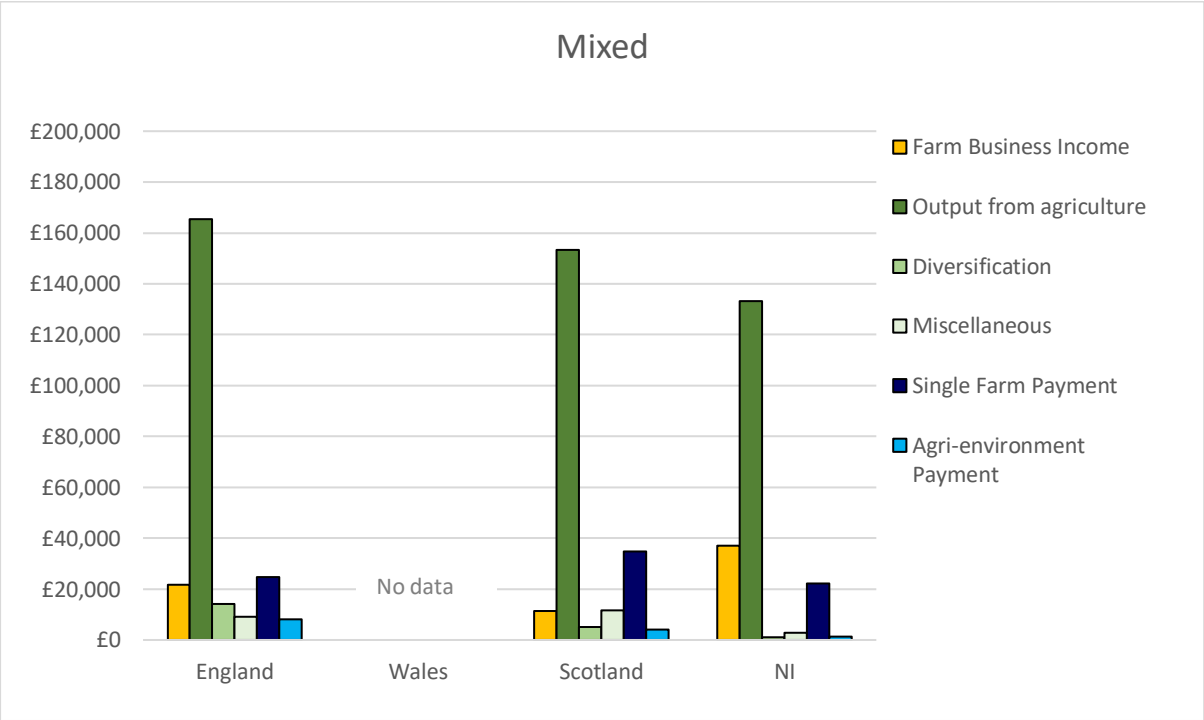


Source: Defra, WG, SG, DAERA (2016) June Agricultural Survey data

Average farm size of mixed farms across the UK, based on June Survey data, is 87ha. This ranges from 114ha in England to 59ha in Northern Ireland, 54ha in Scotland and 48ha in Wales.

Average FBI for mixed farms by country, drawn from the FBS, is shown in Figure 3-5; no equivalent mixed farm data is available for Wales. Average mixed farm FBI ranges from £11,506 in Scotland to £37,138 in Northern Ireland. These figures reflect differences in average farm sizes, productivity and profitability across the countries. SFP and AES payments as a percentage of FBI ranges from 64% in Northern Ireland to 152% in England and 338% in Scotland. AES represents 38% of FBI in England and 36% in Scotland, compared to just 4% in Northern Ireland. Diversification and miscellaneous income is important in England and Scotland in particular, accounting for 108% and 145% of FBI respectively.

Figure 3-5: Mixed farms FBI, 2015



Source: Defra/RBR, SG, DAERA (2016) Farm Business Survey and own analysis

3.2.3 Lowland grazing livestock farms

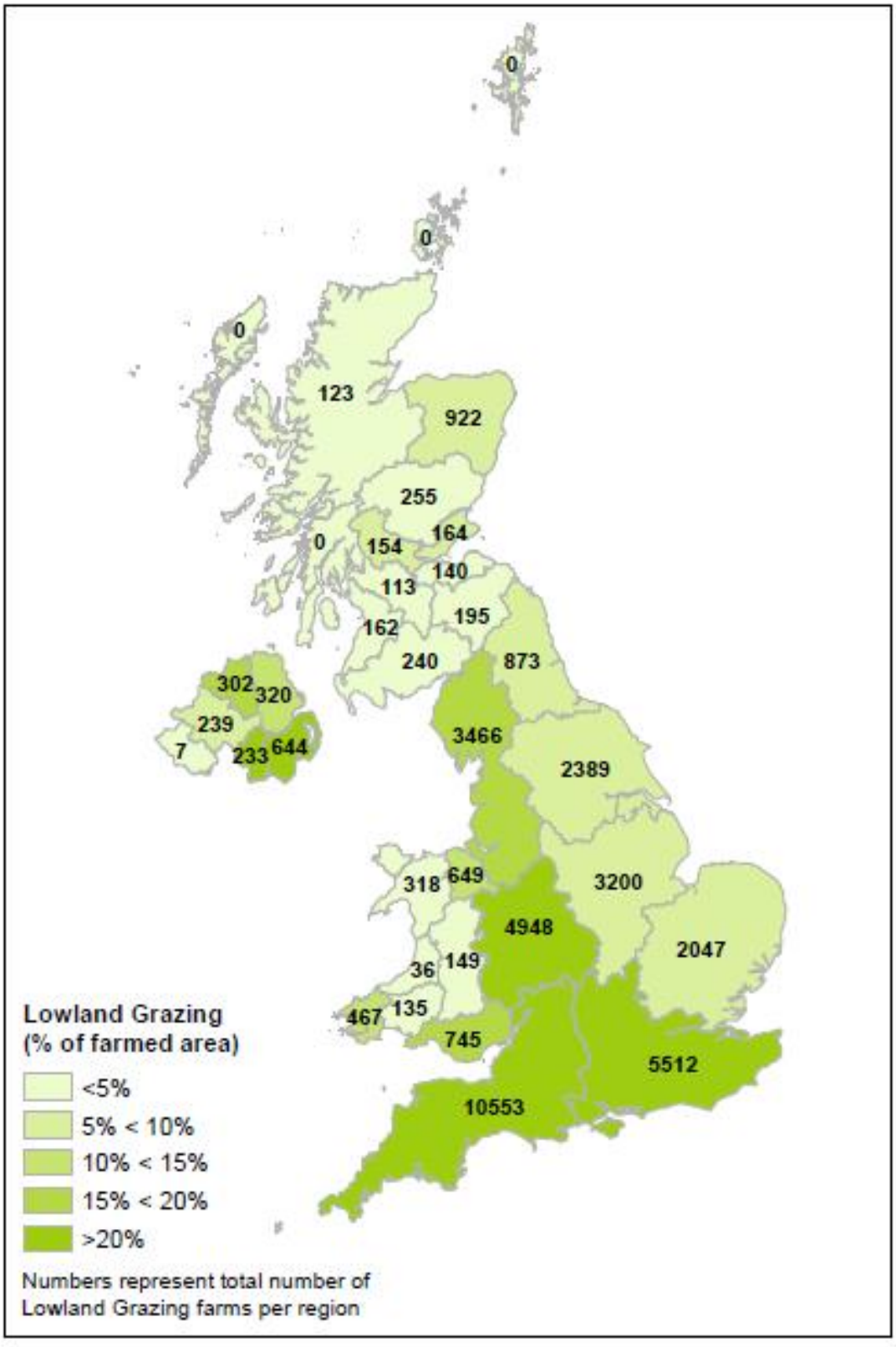
There were a total of 42,976 lowland grazing livestock farms[10] in the UK in 2015. Lowland grazing livestock farms accounted for 20% of all holdings in the UK by number, although this ranged from 32% in England to 20% in Northern Ireland, 7% in Wales and 5% in Scotland. By area, lowland grazing livestock farms accounted for 11% of total farmed area in the UK, ranging from 16% in England, to 15% in Northern Ireland, 7% in Wales and 2% in Scotland.

Lowland grazing livestock farms are located across the UK but concentrated in certain regions including South East, South West, West Midlands and North West regions of

[10] Holdings on which cattle, sheep and other grazing livestock account for more than two thirds of their total standard output except holdings classified as dairy. A holding is classified as lowland if less than 50 per cent of its total area is in the Less Favoured Area.

England, and Down, Londonderry and Armagh in Northern Ireland. The distribution of lowland grazing livestock farms, shown as a % of total farmed area is shown in Figure 3-6.

Figure 3-6: Lowland grazing livestock farms, % of total farmed area across the UK

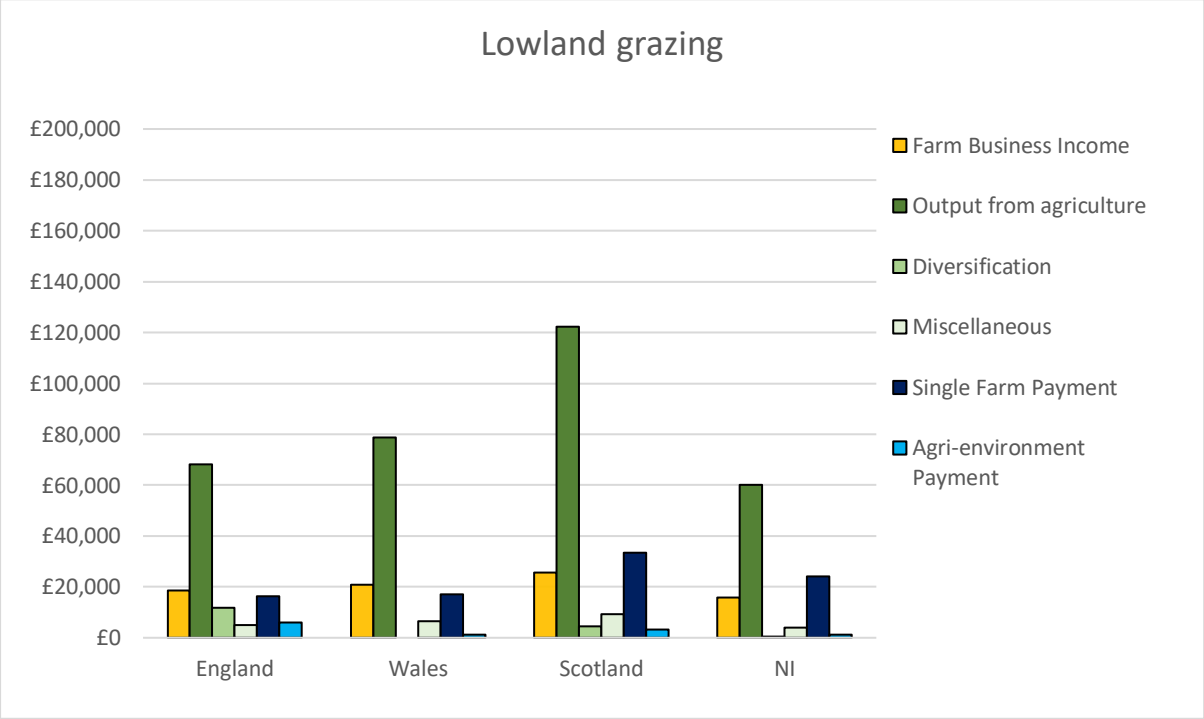


Source: Defra, WG, SG, DAERA (2016) June Agricultural Survey data

Average farm size of lowland grazing livestock farms across the UK, based on June Survey data, is 43ha. This ranges from 49ha in Scotland to 44ha in England, 43ha in Wales and 30ha in Northern Ireland. There is a large number of smaller grazing livestock farms in Northern Ireland.

Average FBI for lowland grazing livestock farms by country, drawn from the FBS, is shown in Figure 3-7. Average lowland grazing livestock farm FBI ranges from £15,726 in Northern Ireland to £25,613 in Scotland. These figures reflect differences in average farm sizes, productivity and profitability across the countries – the average farm size was 135ha in Scotland compared to 67ha in Northern Ireland. SFP and AES payments as a percentage of FBI ranges from 87% in Wales to 120% in England, 143% in Scotland and 162% in Northern Ireland. AES represents 32% of FBI in England compared to just 5% in Wales. Diversification and miscellaneous income ranges from 91% of FBI in England to 28% in Northern Ireland.

Figure 3-7: Lowland grazing livestock farms FBI, 2015



Source: Defra/RBR, WG/IBERS, SG, DAERA (2016) Farm Business Survey and own analysis

3.2.4 LFA grazing livestock farms

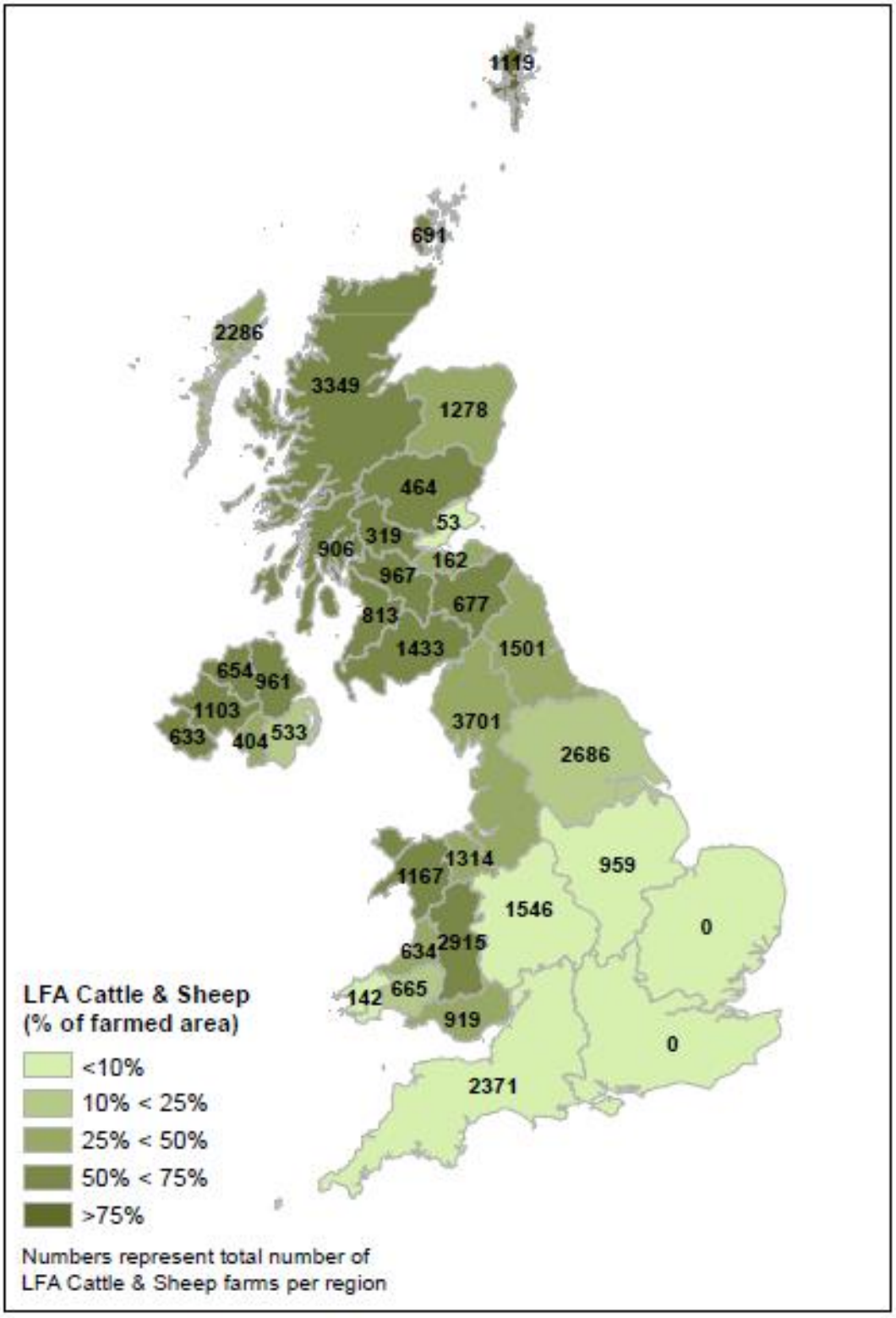
There was a total of 53,926 Less Favoured Area (LFA) grazing livestock farms[11] in the UK in 2015. LFA grazing livestock farms accounted for 25% of all holdings in the UK by number, although this ranged from 58% in Northern Ireland, to 33% in Wales, 28% in Scotland and 12% in England. By area, LFA grazing livestock farms accounted for 33% of total farmed

[11] Holdings on which cattle, sheep and other grazing livestock account for more than two thirds of their total standard output except holdings classified as dairy. A holding is classified as a Less Favoured Area (LFA) holding if 50 per cent or more of its total area is in the LFA. Of holdings classified as LFA, those whose LFA land is wholly or mainly (50 per cent or more) in the Severely Disadvantaged Area (SDA) are classified as SDA; those whose LFA land is wholly or mainly (more than 50 per cent) in the Disadvantaged Area (DA) are classified as DA.

area in the UK, ranging from 56% in Scotland, to 55% in Northern Ireland, 53% in Wales and 13% in England.

LFA grazing livestock farms are located across the UK, but particularly in Northern Ireland, Scotland, Wales and the North, West and South West of England. Regions with the highest concentration of LFA grazing livestock farms include Fermanagh (66%), Shetland (63%), Argyll & Bute (46%), Tyrone (46%), and Powys (43%). The distribution of LFA grazing livestock farms, shown as a % of total farmed area is shown in Figure 3-8.

Figure 3-8: LFA grazing livestock farms, % of total farmed area across the UK



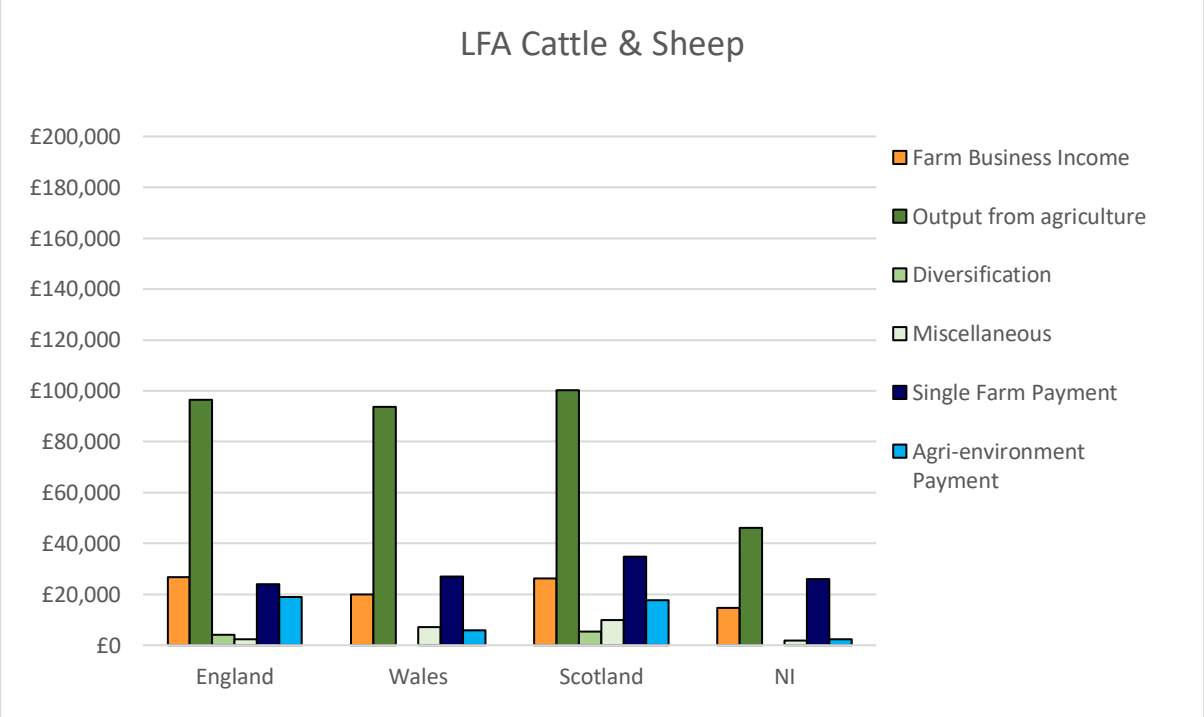
Source: Defra, WG, SG, DAERA (2016) June Agricultural Survey data

Average farm size of LFA grazing livestock farms across the UK, based on June Survey data, is 113ha. This ranges from 217ha in Scotland to 93ha in England, 88ha in Wales and 38ha in Northern Ireland.

Average FBI for LFA grazing livestock farms by country, drawn from the FBS, is shown in Figures 3-9 to 3-11. The FBS breaks down LFA grazing livestock farms into sub-categories including LFA cattle and sheep (i.e. mixed), LFA specialist sheep and LFA specialist cattle, although the number and names of the sub-categories vary from country to country.

Average LFA cattle and sheep farm FBI ranges from £14,745 in Northern Ireland to £20,047 in Wales to £26,185 in Scotland and £26,788 in England. These figures reflect differences in average farm sizes, productivity and profitability across the countries. SFP and AES payments as a percentage of FBI ranges from 160% in England and 164% in Wales to 193% in Northern Ireland and 200% in Scotland. AES represents 71% of FBI in England and 68% in Scotland, with less in Wales and, in particular, Northern Ireland. These farms also have more limited miscellaneous and diversification income relative to lowland farms, ranging from 58% of FBI in Scotland to 12% in Northern Ireland.

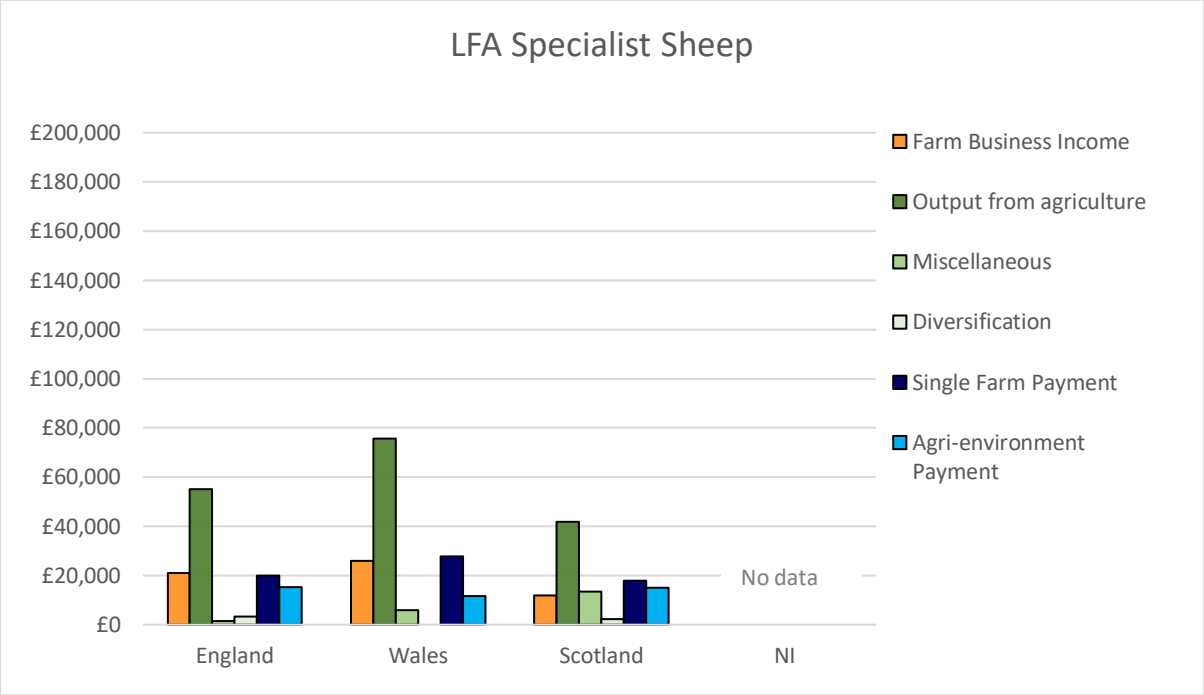
Figure 3-9: LFA cattle and sheep farms FBI, 2015



Source: Defra/RBR, WG/IBERS, SG, DAERA (2016) Farm Business Survey and own analysis

Average LFA specialist sheep farm FBI ranges from £11,772 in Scotland to £20,973 in England and £25,825 in Wales, see Figure 3-10; no equivalent data is available for Northern Ireland. These figures reflect differences in average farm sizes, productivity and profitability across the countries. SFP and AES payments as a percentage of FBI ranges from 153% in Wales, 168% in England and 280% in Scotland. AES represents 45% of FBI in Wales, 73% in England and 129% in Scotland.

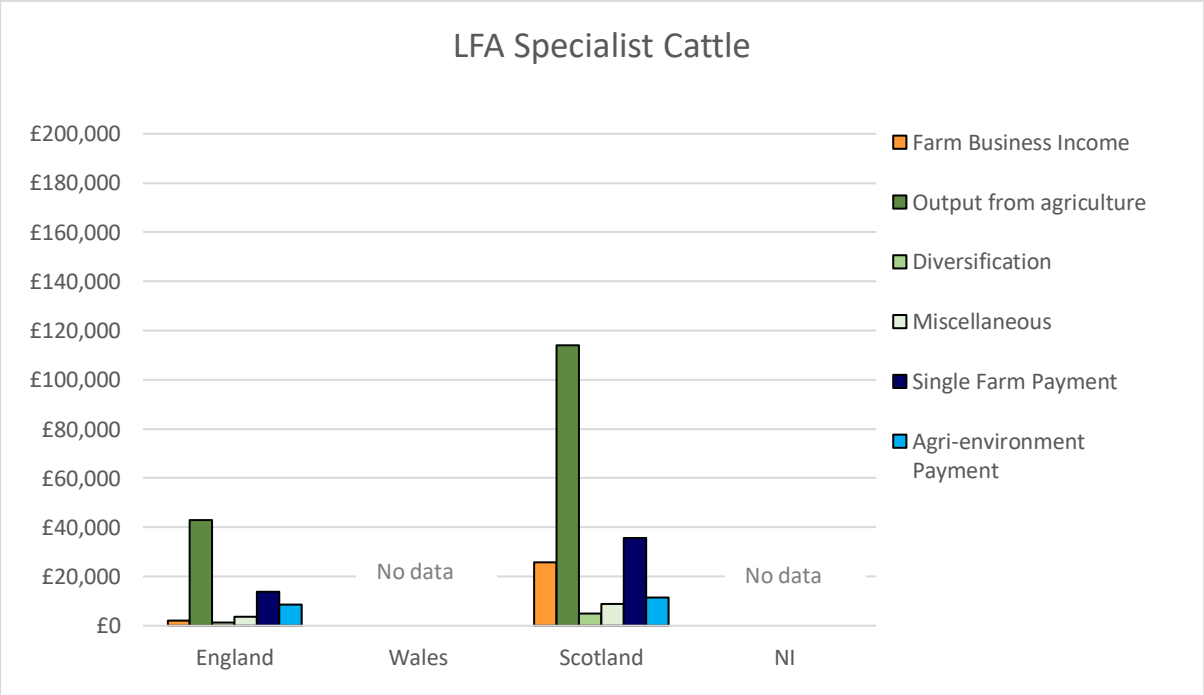
Figure 3-10: LFA specialist sheep farms FBI, 2015



Source: Defra/RBR, WG/IBERS, SG, DAERA (2016) Farm Business Survey and own analysis

Average LFA specialist cattle farm FBI ranges from a very low £1,971 in England to £25,678 in Scotland, see Figure 3-11; no equivalent data is available for Wales and Northern Ireland. These figures reflect differences in average farm sizes, productivity and profitability across the countries. SFP and AES payments as a percentage of FBI ranges from 184% in Scotland to 1,132% in England. AES represents 45% of FBI in Scotland and 430% in England.

Figure 3-11: LFA specialist cattle farms FBI, 2015



Source: Defra/RBR, WG/IBERS, SG, DAERA (2016) Farm Business Survey and own analysis

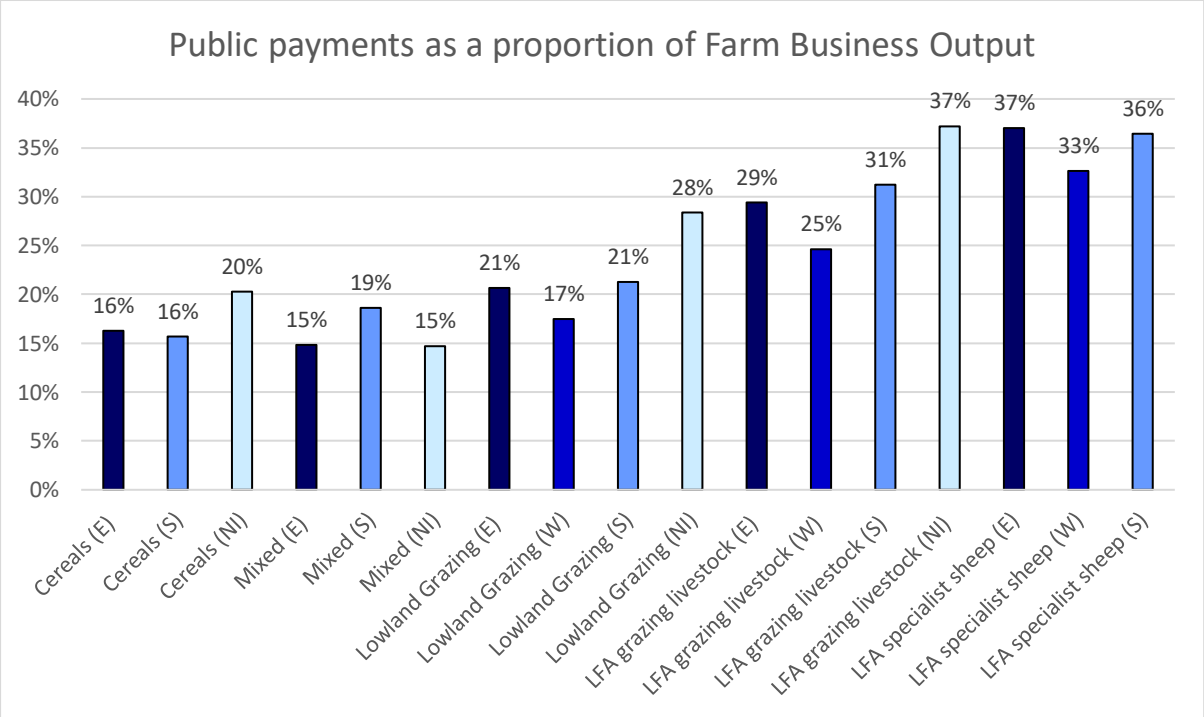
3.2.5 Public payments

Public payments can be expressed as a proportion of total Farm Business Output as well as FBI. Farm Business Output comprises gross income from agriculture, miscellaneous and diversification as well as SFP and AES payments.

The relative importance of public payments to total Farm Business Output, grouped firstly by farm type and then by country, is shown in Fig 3-12. This shows that support payments as a percentage of total Farm Business Output are as follows:

- Cereals farms – ranges from 16% (England, Scotland) to 20% (Northern Ireland)
- Mixed farms – ranges from 15% (England, Northern Ireland) to 19% (Scotland)
- Lowland grazing livestock farms – ranges from 17% (Wales) to 28% (Northern Ireland)
- LFA grazing livestock farms – ranges from 25% (Wales, LFA grazing livestock) to 37% (Northern Ireland LFA grazing livestock; England, LFA specialist sheep).
    - Of the different LFA sub-categories, specialist sheep farms appear to have the highest proportion of income coming from public payments (33%-37%).

Figure 3-12: Public payments as a proportion of Farm Business Output



Source: Defra/RBR, WG/IBERS, SG, DAERA (2016) Farm Business Survey and own analysis

It is worth noting that there are significant differences between the types and levels of public payment available to farmers across the four countries, both through Pillar 1 (direct payments) and Pillar 2 (rural development, including agri-environment schemes). This reflects the large degree of flexibility afforded to Member States and their regions in the Common Agricultural Policy (CAP) 2014-2020. A full exploration of these differences lies outside the scope of this report, but a summary of some key differences including the range of BPS and LFA/Areas of Natural Constraint (ANC) payment rates payable in 2015, is outlined in Table 3-2.

Table 3-2: Differences in CAP implementation and payments

	England	Wales	Scotland	Northern Ireland
Pillar 1				
Direct payments – basis of payment, payment regions	100% area payments, 3 payment regions	5 year transition from historic payments to area payments, 1 payment region	5 year transition from historic payments to area payment, 3 payment regions	7 year transition from hybrid payments (2015-2021) to area payments, 1 payment region
Direct payments – BPS 2015 payment rates[12]	£47.58- £181.37/ha (SDA moorland – non-SDA)	£68.16-£117.30/ha (low-high value, excl redistributive payment)	£16.38-£148.96/ha (Region 3-Region1)	£241.63/ha (average)
Direct payments – voluntary coupled support	No	No	Yes, coupled support payments in beef and sheep sector	No
Pillar 2				
LFA / ANC scheme	No	No	Yes, LFA Support Scheme	Yes, LFA Compensatory Allowance (2015), ANC Scheme (2016-2018)
LFA/ANC 2015 payment rates	-	-	£34.12-£71.35/ha	£42.35-£56.47/ha
Agri-Environment-Climate Scheme	Yes	Yes	Yes	Yes
Transfer of money from Pillar 1 (direct payments) to Pillar 2 (rural development)	12% (2014-2019)	15% (2014-2020)	9.5% (2015-20)	0%

Source: derived from Allen,M. et al (2014); ABC (2016)

Key statistics on agri-environment scheme coverage, total payments and average payments per hectare are set out in Table 3-3.

Table 3-3: Agri-environment scheme coverage and payments, 2015

	England	Wales	Scotland	Northern Ireland	UK
Agri-environment scheme coverage (thousand ha)	6,476	978	1,116	305	8,875
Total agri-environment scheme payments (£m)	410	43	35	26	514
Average agri-environment scheme payment (£/ha)	63	44	31	85	58

Source: Defra, DAERA, WAG, SG (2016) Agriculture in the United Kingdom 2015

3.2.6 Variations in Farm Business Income

The FBI figures reported in 3.2.1-3.2.4 above are averages for 2015. While these are useful as a baseline and for considering potential impacts under Brexit, it is also worth being aware of differences in FBI year-to-year and how FBI varies with farm performance and farm size. These variations are illustrated below.

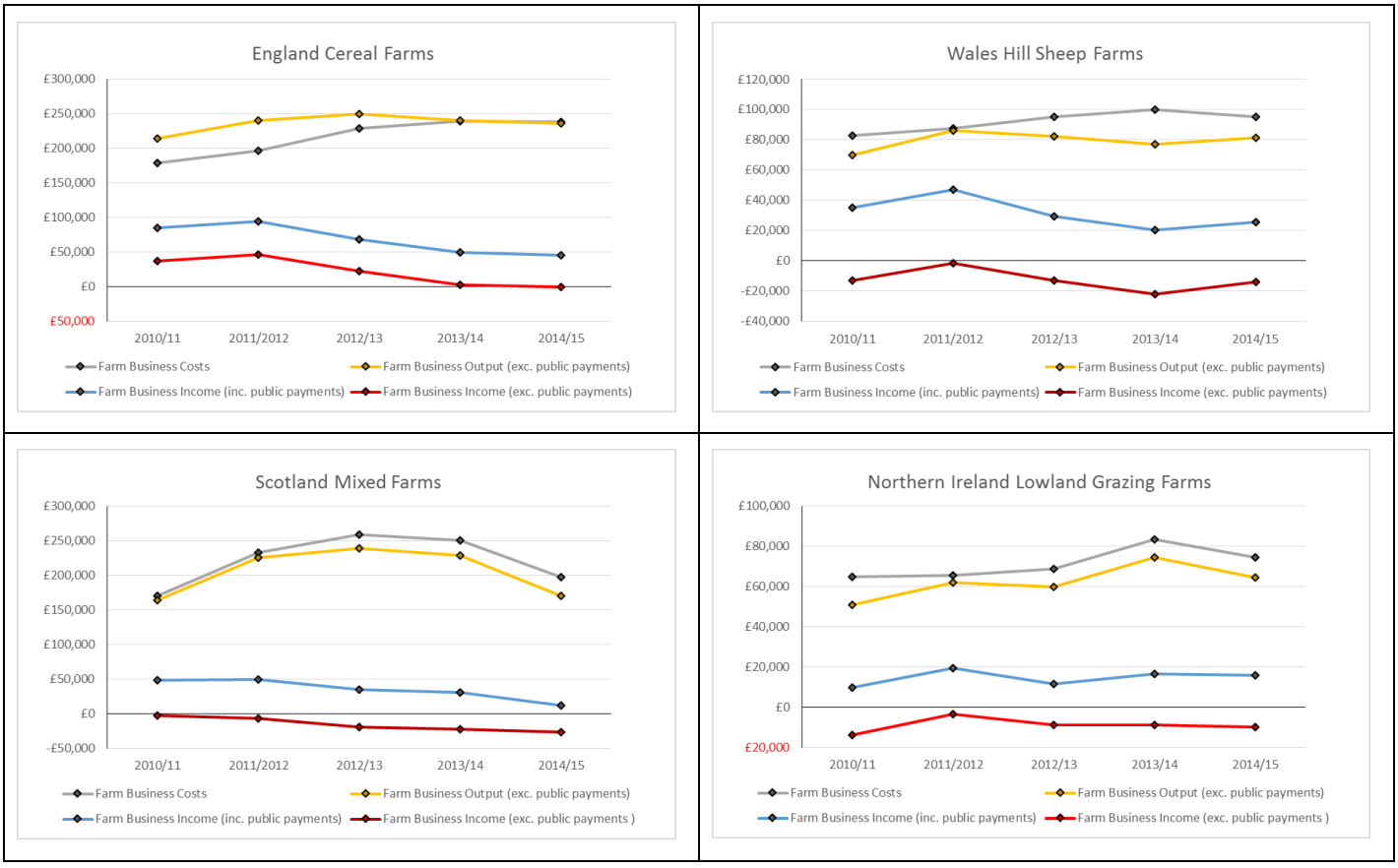
[12] Based on exchange rate of €1: £0.73129.

Year-to-year

FBI data (average per farm) for the past five years is provided for a selection of different farm types - England cereal farms, Wales hill sheep farms, Scotland mixed farms and Northern Ireland lowland grazing livestock farms, see Figure 3-13.

There has been a reduction in FBI over the period across three of the four farm types selected. Northern Ireland lowland grazing livestock farms experienced an increase in FBI over the five year period, principally due to increased agricultural output; there were variations year-to-year however. The reduction in FBI experienced by the other farm types shown is due to a combination of factors including increasing variable and fixed costs not compensated for by growths in output from agriculture or output from miscellaneous/diversification sources and lower levels of public payments (linked to a weakening of the €:£ exchange rate in 2014/15). FBI without public payments is negative over the whole period for three of the four farm types, with the exception of England cereal farms.

Figure 3-13: FBI data for past five years for selection of farm types



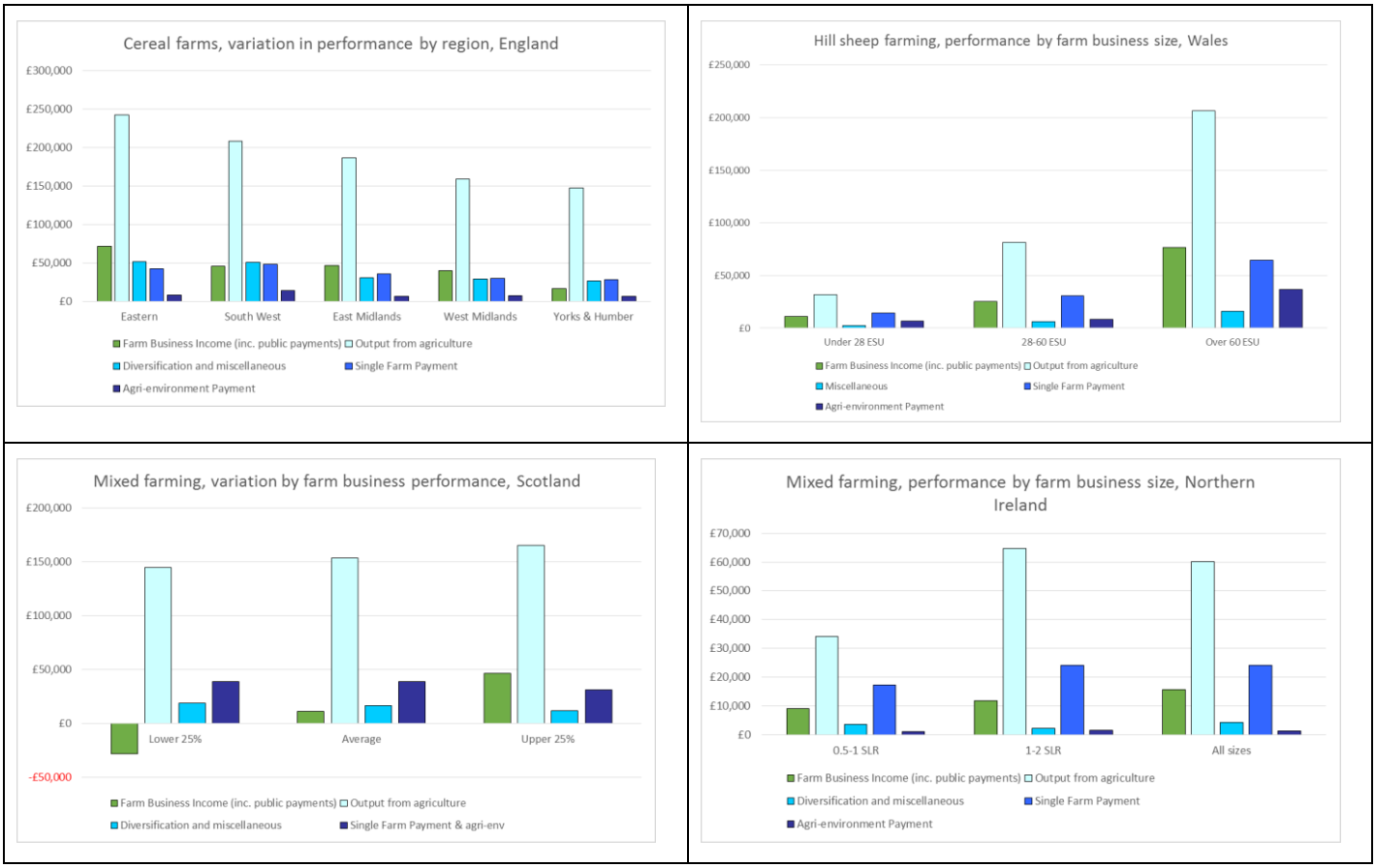
Source: Defra/RBR, WG/IBERS, SG, DAERA (2016) Farm Business Survey and own analysis

Farm performance and farm size

The Farm Business Surveys across the UK have different approaches to capturing variations by farm performance and farm size: Scotland records FBI for upper and lower quartiles; Wales and Northern Ireland measure FBI by variations in farm size (using different units); and England does not record variations by farm performance or size, but regional FBI data is available as a proxy. These variations in FBI for the farm types used previously are illustrated in Figure 3-14.

The England cereals farm data shows higher performing farms in the Eastern and South West regions; these variations reflect factors including farm size and productivity. The Wales hill sheep farming data illustrates increasing FBI per farm with increasing size (measured by European Size Unit (ESU), with one ESU equating to a gross margin of €1,200) and increasing FBI per effective hectare, with higher stocking and economies of scale. The Scotland mixed farm data shows marked variation in farm business performance on a relatively static farm business output; in this case it is not technical efficiency that is driving performance but control of fixed costs. Northern Ireland lowland grazing livestock farms show less significant differences in performance by farm business size (based on Standard Labour Requirements (SLR)).

Figure 3-14: Variations in farm business performance for selection of farm types



Source: Defra/RBR, WG/IBERS, SG, DAERA (2016) Farm Business Survey and own analysis

3.3 Farm environment

Farming is carried out on 70% of total land area in the UK, and accordingly has a wide range of impacts on the environment. Farming makes a positive contribution in many ways but there are also challenges which need to be addressed; now and in the future. This section outlines the main environmental public goods delivered by farming and the key challenges ahead (after Jones *et al*., 2015).

3.3.1 Agricultural landscapes

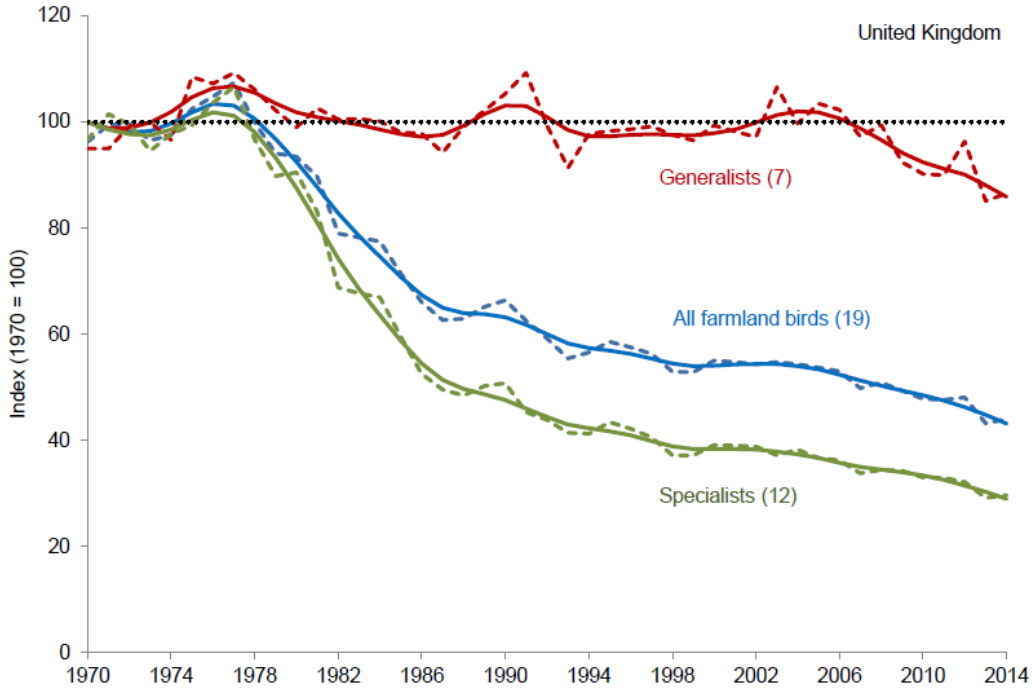
The UK has a rich and varied landscape, linked to differing physical conditions and farming systems. The landscape of the UK is predominantly an agricultural landscape, the product of many hundreds, sometimes thousands of years of human activity and management through farming. While landscape character is improving in many areas, some areas are classified as neglected or diverging; these tend to be concentrated in central and southern England (Defra, 2012a).

3.3.2 Biodiversity

There is a wide range of habitats and species associated with agricultural landscapes. Examples of this variety include intensive arable landscapes, lowland pastoral areas (with improved, semi-improved and unimproved grasslands), coastal landscapes (including wet grassland, managed reedbeds and grazed saltmarsh) and significant areas of upland (including upland heathland, grasslands and blanket bog) which provide a range of ecosystem services.

Key biodiversity challenges include the reduction in the populations of many farmland species and the area of priority habitats. The key biodiversity indicator in the UK is the Farmland Bird Index, which comprises seven farmland generalist species and twelve farmland specialist species (those which are restricted to, or highly dependent on, farmland habitats). Bird populations are considered to be a good indicator of the general state of wildlife as they have a wide habitat distribution and are near the top of the food chain. The Farmland Bird Index showed a 54% reduction over the period 1970-2014, with particular declines in the populations of farmland specialist species (a 70% reduction), see Figure 3-15. Most of the decline in farmland bird populations occurred between the late 1970s and early 1990s and was largely due to the intensification and specialisation of farming, and related changes in farm practices, driven at least in part by the CAP. While some agricultural practices still have negative impacts, the situation is complex with other pressures such as climate change, disease and land development also contributing.

Figure 3-15: Populations of farmland birds in the UK, 1970-2014



Source: BTO, Defra, JNCC, RSPB

Butterfly numbers on farmland have also declined, by 41% since 1976 although there have been wide fluctuations from year-to-year. This indicator is based on changes in the populations of 21 widespread butterfly species on less intensively managed areas within the farmed landscape. The populations of six widespread bat populations have increased, however, by 23% since 2000; this may be partly due to more effective conservation measures and milder winters (Hayhow et al., 2016).

More generally, data shows that the majority of species for which trends are available have declined on both enclosed farmland and in upland areas over the past 50 years. On enclosed farmland, 52% of species have declined due to intensive management of farmland, changing farm practices, increased chemical inputs and loss of habitat. In upland areas, 55% of species have declined due to a combination of more intensive management, expansion of forest cover, air pollution and climate change. Other species have stabilised or increased in number (Hayhow et al., 2016).

Evidence from England for the 12 UK Biodiversity Action Plan priority habitats which are predominantly agricultural, two are increasing in extent, five are stable, four are declining and one is unknown (DEFRA, 2013a).

3.3.3 Water quality

Agriculture and land management in the UK influences water quality, both positively and negatively. The extensive management of upland areas contributes to the maintenance and improvement of water quality, which is important given that 70% of the UK's water supply is sourced from upland areas (JNCC, 2003). However poor management can result in problems in terms of siltation, pathogens and discolouration. In areas used for cropping and intensive livestock enterprises (e.g. dairying and some beef production) excessive fertiliser, manure and pesticide applications can also adversely affect the quality of water. The

impacts are dependent not only on land use and management, but also on soil types, pathways and the nature and sensitivity of the water bodies.

Improving water quality is a key challenge in the UK and one which has been attracting increasing focus due to the implementation of the EC Water Framework Directive. A high level of nitrogen and phosphorus in agricultural soils increases the risk of their transportation to water bodies through rainfall events, soil erosion and leaching, and can result in high nutrient concentrations, eutrophication and poor water quality.

Recent trends in farmland nitrogen and phosphorus have been encouraging in the UK. The soil nitrogen balance has declined by 19% over 2000-2014, principally due to a reduction in the application of mineral fertilisers and manure (due to lower livestock numbers). The phosphorus balance has also declined by 42% over 2000-2014, for similar reasons as nitrogen (Defra, 2015). Despite these trends, it is estimated that agriculture is still a major source of pollution in the UK accounting for around 60% of total discharges of nitrogen in surface water and coastal waters, and 20% of total discharges of phosphorus in surface water and 30% in coastal water (OECD, 2013).

Use of pesticides has decreased in parallel, with a 46% reduction in pesticide applications (kg) over 2000-2015 across Great Britain (FERA, 2016), although pollution from pesticides such as metaldehyde remains a significant issue. The decrease in pesticide use over this period was most likely associated with changes in cropping patterns, technical and legal changes, adoption of environmentally beneficial practices and weather.

3.3.4 Water quantity

Agriculture generally has a limited impact on water quantity in the UK given the relatively high rainfall and low agricultural demand. There are exceptions however, with arable farming competing for increasingly scarce water resources in some areas. Potatoes, sugar beet and vegetables, in particular, are dependent on irrigation. Lower rainfall in recent years, together with increasing demand from a range of users, is requiring farmers to be more efficient in the use of water, and is encouraging investment in rainwater harvesting and reservoirs to collect and store water during the winter months for use during the summer.

In the UK, the majority of agricultural abstraction and irrigation takes place in the South East and East of England. Such abstraction can be locally important, putting pressure on overall water quantity and aquatic habitats. While the total amount of water withdrawn for agriculture reduced by 4% over 1990/92 to 2006/8, there was an increase in agriculture's share of total freshwater withdrawals in the UK from 12% to 15% over 1990/92-2006/8 (OECD, 2013).

3.3.5 Soil quality

Soil quality is a particular issue for arable, mixed and intensive grassland farming in the UK. Well managed farms, with good cultivation and crop rotation practices, can enhance soil quality in terms of improved soil structure and organic matter. On the other hand, inappropriate cropping, cultivations and input use and other poor management can lead to problems in terms of soil erosion, compaction and even contamination; with the impacts dependent on factors including soil type, slope and rainfall. There is increasing attention on improving soil management in the UK, not only for its own sake and its productive value, but also for its contribution to biodiversity, water quality and reducing greenhouse gas emissions.

Soil losses from cultivated and other land are generally relatively low in the UK. However, soil erosion (principally water erosion rather than wind erosion) can occur in some localities, with about 17% of the UK (OECD, 2013), and 25% of England and Wales being at moderate to very high risk; this is predominantly arable and rough grazing land (OECD, 2008). Soil loss can exceed 100 tonnes/hectare in some places. The main causes of soil erosion are related to land left uncovered over winter, the use of heavy machinery and areas subject to high livestock pressure. Soil organic matter has decreased by an average of 0.5% over 1979/81-1995 (EA, 2004). Soil quality has been a focus of agri-environment and related schemes in the UK in recent years.

There is limited data on carbon storage. However data for England shows a decline in arable and horticulture soil carbon storage over 1978-2007 (DEFRA, 2013b). Soils are the largest terrestrial store of carbon; globally soils contain about twice as much carbon as the atmosphere and about three times the carbon stored in vegetation. Losses of soil carbon, partly through soil erosion and loss of soil organic matter (OECD, 2008), contribute to greenhouse gas emissions in the form of carbon dioxide.

3.3.6 Air quality

Air quality can be adversely affected by odours and ammonia emissions from livestock housing and the storage and spreading of manure and slurry. It can also be negatively impacted by the burning of crop residues, waste materials and, in upland areas, grass and heather (Cooper et al., 2009).

Ammonia is the key pollutant associated with agriculture, and ammonia emissions have decreased by 24% over 1990-2014, due to reductions in cattle numbers and more efficient fertiliser use. While agriculture remains the main source of ammonia as an atmospheric pollutant, its share has reduced over the same period from 93% in 1990 to 83% in 2014 (Defra *et al.*, 2016).

3.3.7 Climate change

Although agriculture is a net contributor of greenhouse gas emissions, a wide range of agricultural practices can reduce greenhouse gas emissions and promote carbon storage. Reducing greenhouse gas emissions and enhancing carbon storage are key areas of focus for farm advice and are encouraged through agri-environment and farm assurance schemes.

Greenhouse gas emissions from agriculture in the UK have decreased in recent years. Emissions of the two key agricultural greenhouse gases – nitrous oxide and methane – have decreased by 15% and 16% respectively over 1990-2014 (Defra *et al.*, 2016). The reduction in nitrous oxide is consistent with trends in fertiliser usage over the period, while the reduction in methane has been due to decreasing livestock numbers, particularly cattle. However, with total greenhouse gas emissions across the country also falling, agriculture's share has increased from 7.5% to 10% over 1990/2-2014. Agriculture accounted for approximately three quarters of total nitrous oxide emissions and half of all methane emissions in 2014 (Defra *et al.*, 2016). In contrast, in the same year, agriculture only accounted for about 1% of total carbon dioxide emissions in the UK.

3.3.8 Resilience to flooding and fire

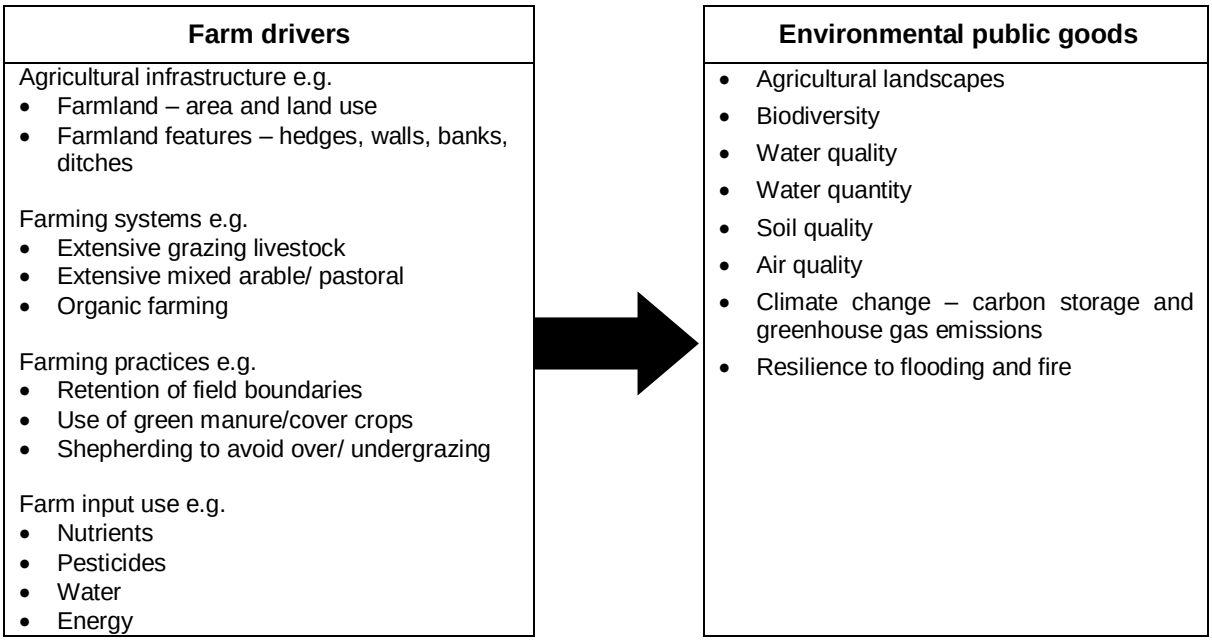
Agriculture and land management has an important role in flood prevention. In upland areas good grazing management can contribute to improved soil permeability, water storage and a reduction in the speed of run-off. In lowland areas, run-off can be reduced through good land

use, cropping and management practices. With more frequent, extreme rainfall events in recent years, the role of agriculture in reducing flood risk to people and property is becoming increasingly important and is a cost effective alternative to engineered flood defences. Grazing management and cutting in the uplands can make an important contribution to reducing the risk of wildfires, with associated benefits for biodiversity and water quality.

3.3.9 Provision of environmental public goods

A simple summary showing the different ways in which farm businesses can influence the provision of environmental public goods associated with farmland is set out in Figure 3-16. This is relevant in understanding how the potential impacts of Brexit on farms could consequently affect the environment.

Figure 3-16: Farm drivers and environmental public goods



3.3.10 Farm environmental performance

There is only limited data on the link between improving economic performance and environmental performance, which is potentially important in the context of Brexit.

Recent research undertaken by Defra, focused on England, suggests that economic performance of cereal (Defra, 2011) and grazing livestock (Defra, 2012b) farm businesses is positively correlated with agri-environment scheme involvement. While agricultural output and efficiency goes down, this is more than compensated by agri-environment scheme payments, with the most demanding schemes giving the biggest advantage, particularly with grazing livestock farms.

A positive correlation between economic and environmental farm performance was also found in a study focused on Swiss dairy farms. When they improve their economic performance, these farms also tend to improve their (global) environmental performance and vice versa (Jan et al, 2012). The strength of this positive relationship varied substantially from one environmental parameter to another.

In summary, whilst limited, the available evidence does tend to suggest a positive correlation between economic performance and environmental performance, for some farms at least.

4 Potential impacts of Brexit

4.1 Introduction

This brief introduction sets out the method used for the quantitative and qualitative assessments, describes the scenarios used (plus caveats and supporting rationale), and summarises the assumptions made.

4.1.1 Methodology

The methodology used in assessing the potential impacts of Brexit included:

1. Development of scenarios and assumptions (see Sections 4.1.2 and 4.1.3 below).
2. Quantitative modelling of the impacts of Brexit on FBI by farm type, within each scenario.
3. Qualitative assessment of the wider impacts of Brexit on farm businesses and the environment, by farm type and scenario.

The quantitative modelling of potential impacts of Brexit on FBI was undertaken using a spreadsheet model, with baseline data drawn from the Farm Business Surveys for 2015 (see Section 3.2). This modelling incorporated two different levels of reduction in support payments, and in the case of Scenario 2, estimates of 'best case' and 'worst case' positions covering changes in output prices and variable costs linked to the trading arrangements under that scenario. It is important to note that the modelling was static as opposed to dynamic. In other words, it focused on the immediate impact of Brexit on FBI within each of the scenarios; it did not model the responses to these impacts of farm businesses and others in the supply chain. Potential farm business responses and changes are however explored in the qualitative assessment.

The qualitative assessment of the wider impacts on farm businesses and the farm environment was based on a review of relevant literature, a survey of expert opinion, and our own analysis. The assessment starts with an introductory commentary on the trade, price and income context for each farm type; this takes account of the UK export and import situation for different agricultural commodities as summarised in Appendix 4. This commentary builds on the quantitative modelling in terms of potential income effects, especially under Scenario 2. The assessment then continues to explore farm business responses in terms of farm management, restructuring, land use and scheme participation before ending with an assessment of the potential environmental impacts. This latter assessment focuses on biodiversity, water and carbon/soils – the areas arguably comprising the greatest challenges (see Section 3.3).

4.1.2 Scenarios

It is important to note that the scenarios used within the modelling and assessment are not policy options or policy proposals. Rather, they are intended to reflect the broad span of potential outcomes both of Brexit and of future agricultural policy and to provide insight into how these might impact on farm business performance and the farm environment. The assessment explores the implications of these scenarios in order to understand what the potential land management, land use and environmental outcomes may be. It is intended that such an assessment can be used to inform the development of future policy, including a consideration of how public policy can maximise benefit and minimise harm.

Two broad scenarios are considered for the purposes of assessing the potential impacts of Brexit on farms and the farm environment in the UK. Each scenario contains assumptions relating to both future funding levels (relative to that currently available through the CAP) and the future trading relationship between the UK and the EU:

- **Scenario 1** – represents a situation wherein total support payments are reduced by 33% and a Free Trade Agreement (FTA) or equivalent, including agricultural and related products, is reached between the UK and the EU.
- **Scenario 2** – represents a situation wherein total support payments are reduced by 66% and there is no trade agreement with the EU; with trade being conducted between the UK and the EU under World Trade Organisation (WTO) rules.

In respect of reductions in total support payments, the two scenarios mirror those used by Andersons Farm Business Consultants in recent months (Andersons, 2016 and 2017). The Government committed in Autumn 2016 to maintaining the same level of Pillar 1 support up to 2020 and to abide by agri-environment scheme agreements that run beyond that date to the end of their term. In their general election manifesto, the Conservative Party then committed to the same funding total for farm support up until the end of the next parliament, in 2022. Beyond that, there is no certainty. Most commentators expect there to be cuts in support, in line with the stance taken by the UK Government over the years and spelt out in HM Treasury's Vision for the CAP published in 2005 (HMT/Defra, 2005). Defra seems less keen on maintaining Pillar 1 type direct payments than the agricultural departments in the devolved countries (OFC, 2017); a new agri-environment scheme appears likely however.

With regard to trade, there is considerable uncertainty regarding the nature of future trading relations with the EU. Theresa May's Lancaster House speech on 17th January 2017 indicated that the UK would not seek to remain in the European Single Market thereby committing the country to a 'Hard Brexit'. The Government's Brexit White Paper (HMG, 2017a) published on 2nd February 2017 stated that the Government would prioritise "securing the freest and most frictionless trade possible in goods and services between the UK and the EU… with a new strategic partnership with the EU, including an ambitious and comprehensive Free Trade Agreement and a new customs agreement"; there is however no guarantee that this can be achieved. New uncertainty followed the general election result about whether a 'Hard Brexit' will be pursued, or whether the approach will be softened to an extent. More recently, the Prime Minister's Florence speech on 22 September 2017 called for a two year transitional period with similar trade rules as present. Given the continuing uncertainty, the two scenarios consider both ends of the spectrum in terms of potential trading relationships.

When modelling the potential impacts of Brexit on FBI, we have additionally explored notional 'best case' and 'worst case' situations under Scenario 2, as indicated in Section 4.1.1 above. The best case assumes a 15% increase in output prices and a 5% increase in variable costs. The worst case is based on a 10% decrease in output prices and a 15% increase in variable costs. These figures are averages based on industry projections (including estimates of commodity price changes not linked to Brexit) and comments on the potential impacts of changing to a trading relationship based on WTO rules. They are not differentiated by farm type although in practice significant differences could be expected across different commodities, not least due to the variation in WTO tariffs applying (see Appendix 4). For example, the export of lamb, associated with both LFA and lowland grazing

livestock farms, could be particularly badly affected under Scenario 2, with worse outcomes than those indicated under the 'worst case'. This study excludes more detailed sector-by-sector modelling. However the implications for trade, price and income by farm type and key sector are analysed in the subsequent commentary.

Scenarios 1 and 2, and the best and worst case assumptions for Scenario 2 used in the modelling, are summarised in Table 4-1.

Table 4-1: Scenarios used for assessing the potential impacts of Brexit

	Scenario 1	**Scenario 2**	**Scenario 2 - Best Case**	**Scenario 2 - Worst Case**
Trading relationship	FTA with EU	WTO	WTO	WTO
Future funding levels	66% of CAP levels	33% of CAP levels	33% of CAP levels	33% of CAP levels
Output prices	No change[13]	No change[13]	+15%	-10%
Variable costs	No change[13]	No change[13]	+5%	+15%

In summary, two relatively simple scenarios are used in order to explore the range of potential impacts, however it is acknowledged that there are other important factors which could exacerbate or mitigate the outcomes.

4.1.3 Assumptions

For the purposes of the scenario-based modelling and assessment of impacts, it is assumed that:

- Reductions in support are applied to the total amount of support (Pillars I and II combined).
- The allocation of support is based on the current distribution between UK countries.
- The UK's trading relationship with the rest of the world remains 'as is'. If trade liberalisation occurs, as is being mooted in some quarters, there would be significant additional impacts for farming, and certain sectors in particular; these are explored in the qualitative assessment.

The on-farm environmental impacts of Brexit are heavily dependent on the framework of environmental legislation, regulations and schemes in place. These provide a baseline level of protection, with scheme payments and conditions influencing land and environmental management. For the purposes of the qualitative assessment it is assumed that:

- Existing regulations and enforcement remain in place (in line with what is currently proposed under the Great Repeal Bill White Paper, at least in the short term (HMG, 2017b)).
- Cross compliance, or an equivalent, remains in place linked to future support payments.

[13] 'No change' means no output price and variable cost changes have been included in the modelling of impacts on FBI within our static analysis.

- Greening measures no longer apply.
- Similar environmental priorities are targeted by future policy as by the CAP presently, subject to the availability of resources.

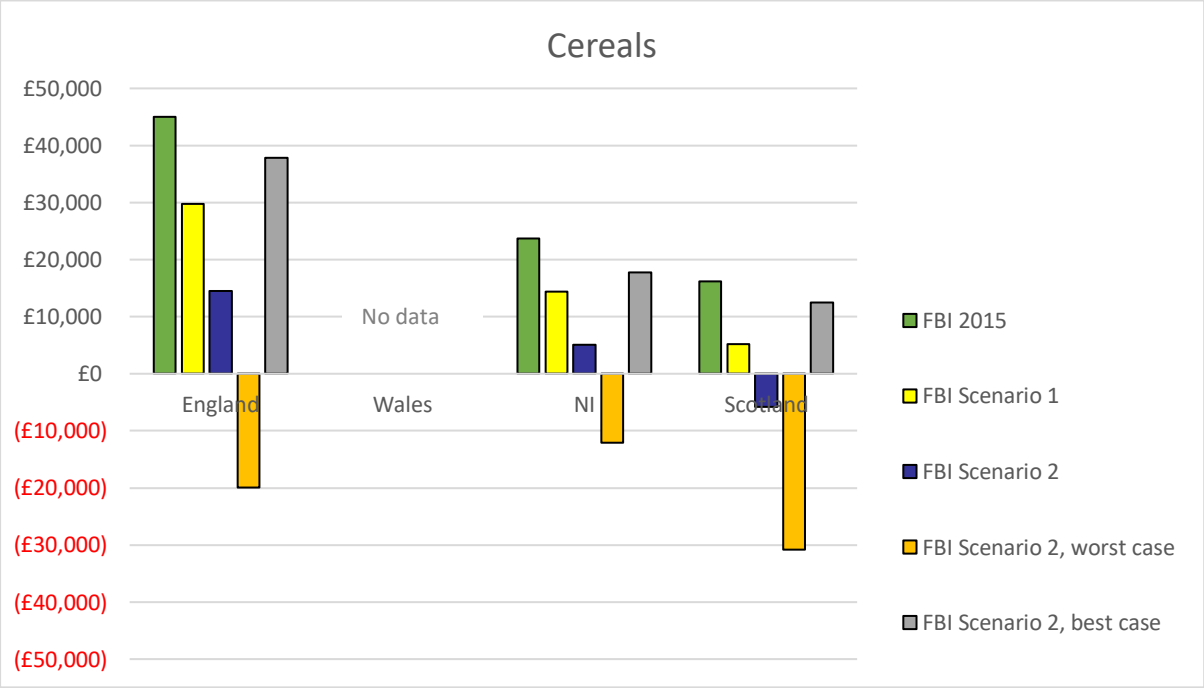
4.2 Cereal farms

4.2.1 Projected static changes to FBI

The direct impacts of the different Brexit scenarios on average cereal farm FBI – using the 2015 baseline – are set out in Figure 4-1.

Scenario 1 would reduce FBI significantly by between 34% and 68%, with the most significant impact in Scotland where cereal farm FBI is lower and more heavily dependent on subsidy. Scenario 2 would reduce cereal farm FBI by between 69% and 136% compared to baseline, pushing FBI into the negative in Scotland (-£5,850). Under the worst case, average cereal farm FBI across all three countries would be negative, with Scotland and England most badly affected. Under the best case, however, FBI would recover to between 75% and 84% of baseline levels, thanks to output rising faster than costs; in other words changes in trade and prices could make up much of the loss of support under Scenario 2. It is worth noting that global price volatility would potentially reduce or exacerbate the impacts.

Figure 4-1: Cereal farms FBI – impact of Brexit by scenario



Source: Defra/RBR, SG, DAERA (2016) Farm Business Survey and own analysis

4.2.2 Analysis of implications for trade, prices and income

Scenario 1, including a FTA with the EU, is not expected to result in significant changes in trade and prices, other than effects arising from a weakening of Sterling against the Euro and additional trade costs relating to customs checks etc.

The introduction of WTO tariffs under Scenario 2, however, can be expected to affect commodity prices. Where the UK is a net exporter (e.g. Biscuit wheat sold to Spain and

Portugal), then farm-gate prices can be expected to be depressed. Where the UK is a net importer (e.g. high quality milling wheat from Germany or Canada) then farm-gate prices can be expected to increase, assuming reciprocal tariffs imposed by the UK. This broad principle is in line with recent projections (Baker et al., 2017). In eight of the past ten years, wheat and barley exports have exceeded imports (e.g. 4.8 m tonnes to 1.8 m tonnes in 2015/16) suggesting a greater downward pressure on prices, although the balance of trade varies from year to year. An overall reduction in wheat prices of 10% is estimated, although this could vary by type of wheat. The UK is a net exporter of oil seed rape, mainly to the EU. However, there are no tariffs on oil seed rape, so prices are not expected to change. Peas and beans have a low tariff, so prices are not expected to change much there either (Andersons, 2016 & 2017). An increased focus on producing for the domestic market could result in greater volatility in output prices due to local factors such as weather etc.

The prices of crop inputs including fertilisers and crop protection products, which are generally imported, can be expected to rise under Scenario 2 due to tariffs. Fuel and machinery prices are also likely to increase. Fertiliser and fuel prices are linked to energy prices and could be expected to increase in any case.

Diversification income could be affected by a downturn in the UK economy, which could be more likely under Scenario 2, with associated lower consumer spending, lower rents and lower enterprise income. However, it should be noted that returns on renewable energy investments would be protected by existing Feed-In Tariff contracts.

Overall the changes in prices and costs indicated above, together with a significant reduction in public payments, can be expected to result in lower FBI and profitability for cereals farms in Scenario 2, as modelled in Section 4.2.1. Elements of trade liberalisation, for example reduced import quotas or tariffs, would accentuate the downward trend.

4.2.3 Farm management and restructuring

Under Scenario 1, current trends in farm management and restructuring - for example reducing variable and fixed costs, improving efficiency etc. - can be expected to continue, but not go as far as those that might occur under Scenario 2, see below.

Lower FBI as envisaged under Scenario 2 is likely to result in farmers focusing on more profitable crops, including higher value cereals such as milling wheat, with potentially less oilseeds and protein crops. Maize cropping can be expected to continue where this is used as a feed crop for Anaerobic Digestion (AD) plants, which will be supported by FIT payments. After leaving the EU it is feasible that the UK could begin to adopt GM crops.

Existing issues, such as the need to control Blackgrass and improve soil quality and fertility, are likely to result in longer (more sustainable) crop rotations, more spring cropping, more cover crops, more fallow and more livestock (sheep and cattle) in the rotation. These changes are already happening but can be expected to continue under Scenario 2.

Increased input prices are likely to result in continued improvements in efficiency in use of fertilisers and sprays, as has been happening in recent years on many farms with the introduction of precision farming etc. Against this many farmers will still focus on yield and production as opposed to net profit and will err on the safe side in terms of fertiliser usage. The shift to minimum tillage and no tillage systems, which conserve soils and save costs, can be expected to continue.

Less or no direct payments could mean large areas of farmland without any support. It would also result in less cross-subsidisation of the type which has occurred in recent years with BPS payments being capitalised in rent, machinery and labour. This is likely to mean lower rents, less investment in new machinery and lower volumes of labour purchased.

More farm businesses can be expected to turn to contractors to undertake field operations to reduce fixed costs and improve profitability, and an increasing amount of land is likely to be farmed under contract farming arrangements. This does not necessarily equate with more block cropping, a risk with the removal of greening requirements, due to the structure of farms over which contractors often operate. More collaboration between farmers can be expected; this would include more sharing of machinery and labour, and land-swaps between arable and livestock farmers which would be easier to arrange with more flexible cross compliance. More collaboration along the supply chain can also be expected to help reduce exposure to volatile prices.

There is likely to be a separation between more efficient farms and less efficient farms. The former, whether managed in hand or contracted, are likely to get bigger, taking advantage of lower rents. The focus will be on more productive land with more of this becoming better managed. Less efficient farmers can be expected to rent out land or, as a last resort, sell land. Lower rent and land prices are likely to provide opportunities for new entrants and niche producers.

Tenanted/rented farms and those farms which are more heavily borrowed can be expected to be under pressure to change more quickly.

4.2.4 Land use and scheme participation

In terms of land use, some less productive arable land might be converted to permanent pasture. Similarly difficult land on headlands can be expected to stay in place, supporting cropped areas, even after the end of ELS/CS options. However more productive land in schemes is likely to be brought back into rotation on expiry of existing agreements (in the absence of attractive successor schemes).

It is worth noting that the likely impacts of withdrawing subsidies, both alone and in combination with trade liberalisation, were assessed in a study in 2008 (ADAS/SAC, 2008), which was cited in the recent House of Commons Environmental Audit Committee report (HOCEAC, 2017). The report concluded that the withdrawal of (all) subsidies and trade liberalisation could result in 9% of cropped land coming out of production. With the scenarios assessed in this study, it seems unlikely that the area of cropped land would reduce in this way; a view shared by the experts interviewed and others (e.g. Baldock, 2016).

In recent years, farmers have developed their knowledge of environmental management and are proud of their achievements under ELS and HLS, including the creation of new habitats. Some voluntary stewardship can be expected to continue where this links in with farm management, sporting activities or personal interest.

Expert opinion: ***"The management of fallow land may become increasingly important"***

4.2.5 Environmental impacts

The projected environmental impacts of the Brexit scenarios on cereal farms are set out in Table 4-2 below. The type of potential environmental impacts outlined apply to both scenarios, however the scale, intensity and distribution of the changes can be expected to be greater under Scenario 2.

Table 4-2: Cereal farms – potential environmental impacts

	Positive	Negative
Biodiversity	+ More spring cropping, cover crops, fallow, grazing – good for farmland birds + Improved soil quality – beneficial for soil biota, insects, birds etc. + More efficient use of inputs, per unit of production – reduced impact on farmland habitats and species	– Productive land brought back into cropping and potentially larger field sizes - less space for farmland birds, mammals and rare arable plants – Loss of margins, buffer strips, field corners etc. with no greening and fewer agri-environment scheme agreements and voluntary measures – loss of habitat and protection of hedges and ditches – Less labour, impacting on optimal management of hedgerows, ditches, margins etc. – Greater use of contractors, may be issues with timeliness of operations
Water	+ Smarter use of fertilisers, sprays etc. – less nitrogen, phosphates and pesticides reaching watercourses	– Larger productive area so wider application, and fewer margins and buffer strips – potentially greater risk of nutrients and pesticides reaching watercourses
Carbon/soils	+ Greater focus on soils, and more varied/longer rotations – improvement in soil structure, more soil organic matter / soil carbon. + Reduced field operations through minimum tillage, and more efficient, reduced use of inputs – better for soils and lower greenhouse gas emissions.	

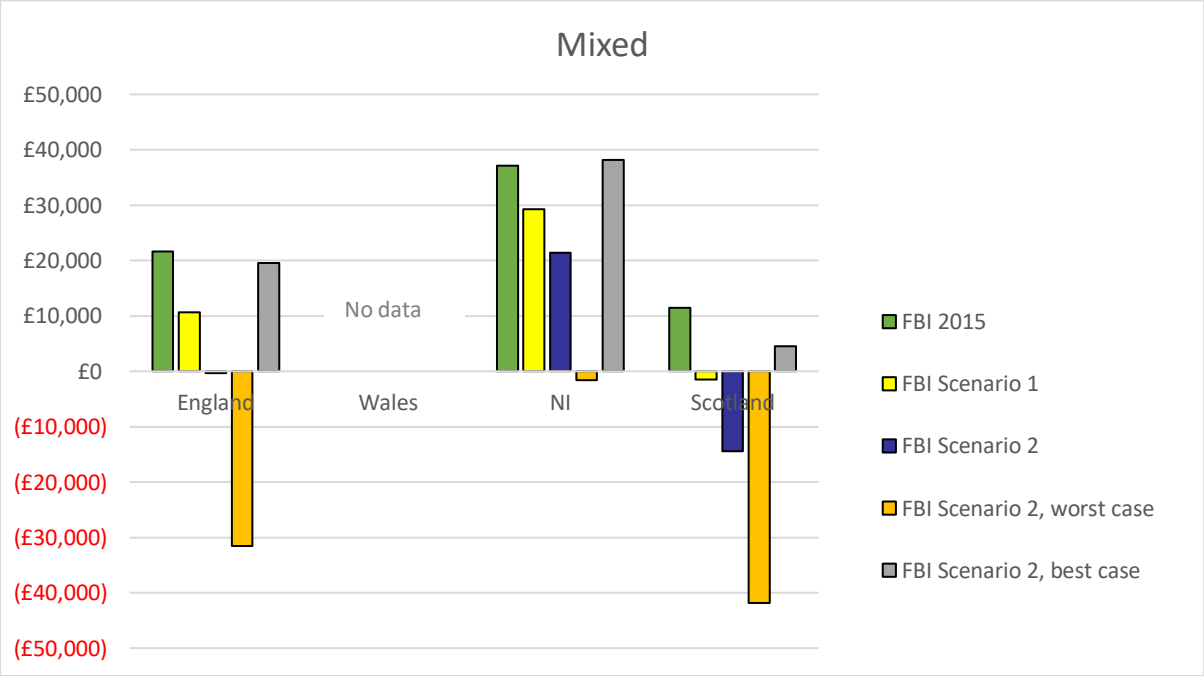
4.3 Mixed farms

4.3.1 Projected static changes to FBI

The direct impacts of the different Brexit scenarios on average mixed farm FBI are set out in Figure 4-2.

Scenario 1 would reduce FBI significantly by between 21% and 113%, with Northern Ireland mixed farms being least affected and Scotland mixed farms being most affected, where a low FBI would be converted to a negative figure due to high dependency on support. Scenario 2 would reduce mixed farm FBI by between 42% and 225% compared to the baseline, pushing FBI into the negative in both England (just) and Scotland. Northern Ireland mixed farms would remain profitable. These farms have lower costs, particularly fixed costs, as a proportion of total output and hence have a higher FBI. They are, as a result, less dependent on public payments and would not be as badly affected by reductions in support payments as mixed farms in England and Scotland. Under the worst case scenario, average mixed farm FBI across all three countries would be negative, with Scotland and England most badly affected, experiencing a shift from a £12-22,000 profit to a £32-42,000 loss. Under the best case scenario, FBI would recover to between 39% and 103% of baseline levels, with Northern Ireland farms doing marginally better than under the baseline. As with cereal farms, global price volatility would affect these impacts.

Figure 4-2: Mixed farms FBI – impact of Brexit by scenario



Source: Defra/RBR, SG, DAERA (2016) Farm Business Survey and own analysis

4.3.2 Analysis of implications for trade, prices and income

Sections 4.3.2-4.3.5 cover mixed farms, but also dairy farms which are important to consider in terms of potential impacts on the farmed environment.

Scenario 1 is not expected to result in significant changes in trade, prices and hence farm income, other than effects arising from a weakening of Sterling against the Euro and additional trade costs relating to customs checks etc.

Under Scenario 2, the introduction of WTO tariffs can be expected to affect mixed and dairy farms to different degrees.

Mixed farms

The impact on mixed farms depends on the mix of enterprises present. Assuming a mixed arable and livestock farm, then the farm business could be expected to be under pressure from both reduced cereal prices and reduced beef and sheep prices, as described elsewhere in this report. In addition, input prices could be expected to rise due to import tariffs under Scenario 2. Overall the changes in prices and costs indicated above, together with a significant reduction in public payments, upon which many mixed farms are dependent, can be expected to result in lower FBI and profitability for mixed farms in Scenario 2, as modelled in Section 4.3.1. Trade liberalisation could reduce profitability further.

Dairy farms

The UK is net importer of dairy products, although there is a significant flow of trade in both ways, much of it with the EU. Around 73% of exports by value, and 90% of exports by volume, go to EU countries; these include milk, cream, UHT products, cheese and milk powder. 99% of imports come from other EU countries; these include cheese, butter, dairy spreads, buttermilk and yoghurts. Ireland is a key trading partner; liquid milk is exported across the border from Northern Ireland. The imposition of WTO tariffs under Scenario 2 can be expected to have a downward pressure on the volume and value of exported dairy products and to increase the price of imported dairy products. It is difficult to forecast farm-gate milk price changes due to the many different sub-markets for milk products and projections/models vary with their results: these include a possible reduction of 10% by 2025/26 (Andersons, 2017) and an increase of 30% by 2025 (Davis et al. 2017). In the short term tariff barriers could firm-up prices. Tariffs could be expected to stimulate more UK dairy processing over time, reducing the present large trade deficit. With a greater focus on the domestic market, more price volatility might be expected due to weather effects etc. Dairy farms, as other farms, could expect to have higher input prices, but might benefit from lower concentrate-feed costs due to a reduction in feed wheat prices. Output and input price changes, together with significantly reduced public payments, could mean dairy farms experiencing a fall in FBI and profitability under Scenario 2.

4.3.3 Farm management and restructuring

Under Scenario 1, current trends in farm management and restructuring with both mixed and dairy farms - for example reducing variable and fixed costs, improving efficiency, better use of data etc. - can be expected to continue, but not go as far as those that might occur under Scenario 2, below.

Mixed farms

As with other farms, polarisation could be expected between those farm businesses seeking to increase production and productivity, and others who may seek other options including specialist added value production, diversification, part-time farming or giving up altogether.

Those mixed arable and livestock farms which decide to focus on production could be expected to employ the changes outlined under 4.2.3. In addition, they could be expected to utilise their own assets and resources better, in terms of home-produced feed, recycling of manure and nutrients, improving soil quality and productivity etc. They could be expected to

further reduce their reliance on purchased inputs and hence costs, and develop more resilient farming systems. They could also work with neighbouring arable farms to bring the benefits of livestock onto their farms.

Dairy farms

Dairy farms can be expected to focus on efficient and profitable systems.

For some, this could include moving back to block calving in spring or autumn; while giving a seasonal milk profile, this could be more efficient. More spring calving and greater reliance on grass, for freshly calved animals and for forage (the 'New Zealand' approach), could be expected; while this may result in a lower yield, input costs would also be lower.

Others will continue to rely on bringing feed to the cows, in large, mainly housed units.

Many dairy farms are likely to seek to increase production, increasing herd size and milk yield. In addition, they may focus on increasing output of the valuable solids in milk (butterfat, protein and lactose). Some dairy farms can be expected to expand, taking affordable land from other farms close by, to support production.

Dairy farms could be expected to become smarter in terms of nutrient management, reducing fertiliser inputs and utilising slurry for grass growth, as well as for AD plants.

With reduced FBI, there is likely to be an acceleration in the number of farms getting out of dairy. There may also be some farms which decide to move into the sector, from beef for example.

There is a possibility dairying could concentrate further in the best grass-growing regions (to the West of England, for example).

4.3.4 Land use and scheme participation

There is unlikely to be significant land use change in the mixed farm and dairy farm sectors. Mixed farms can be expected to continue a mosaic of arable and grassland. In the dairy sector, while grass-based production may become more popular, maize will continue to be an important crop for established units.

Some mixed farms will wish to continue benefiting from agri-environment scheme payments, where it fits in with their system. Many dairy farms, however, are likely to move away from agri-environment schemes following the end of existing agreements. Dairy farms are however likely to take advantage of Catchment Sensitive Farming (CSF) type grants where these are available and can bring combined economic and environmental benefits (including reducing the risks of pollution etc.).

4.3.5 Environmental impacts

The projected environmental impacts of the Brexit scenarios on mixed and dairy farms are set out in Table 4-3 below. The type of potential environmental impacts outlined apply to both scenarios, however the scale, intensity and distribution of the changes can be expected to be greater under Scenario 2.

Table 4-3: Mixed/dairy farms – potential environmental impacts

	Positive	Negative
Biodiversity	+ More spring cropping, cover crops, fallow, grazing – good for farmland birds + Improved soil quality – beneficial for soil biota, insects, birds etc. + More efficient use of inputs, per unit of production – reduced impact on farmland habitats and species	– More land given over to dairy, more intensively managed grassland (higher levels of fertilizer input, more frequent re-seeding) – less space for farmland flora and fauna – Loss of margins, buffer strips, field corners etc. with no greening and fewer agri-environment scheme agreements and voluntary measures – loss of habitat and protection of hedges and ditches – Less labour, impacting on optimal management of hedgerows, ditches, margins etc.
Water	+ Greater focus on grass forage on dairy farms, could reduce reliance on maize – potentially less soil and nutrients lost + Smarter use of fertilisers, sprays etc. – less nitrogen, phosphates and pesticides per unit of production.	– More dairy cows in certain locations, so more slurry application – increased pressure on soils and watercourses, and greater risk of pollution. – Fewer margins and buffer strips – potentially greater risk of nutrients and pesticides reaching watercourses
Carbon/soils	+ Greater focus on soils, and more varied/longer rotations – improvement in soil structure, more soil organic matter / soil carbon. + Reduced field operations through minimum tillage, and more efficient, reduced use of inputs – better for soils and lower greenhouse gas emissions.	– More dairy cows – increased emissions of greenhouse gases and ammonia

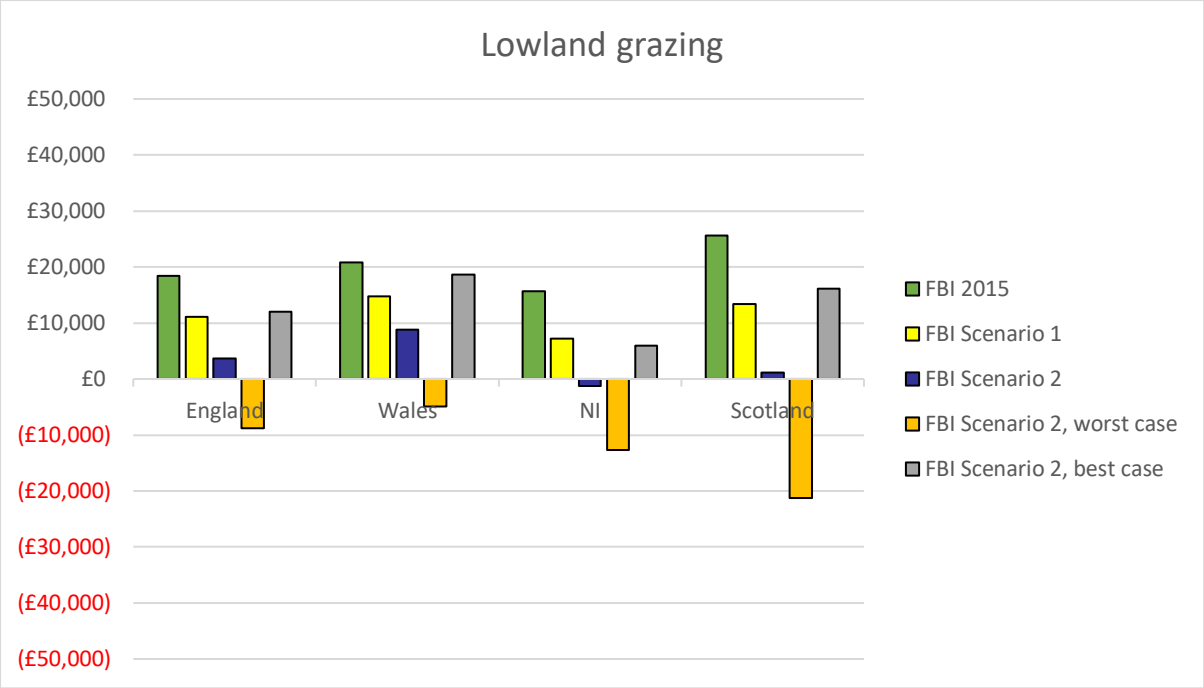
4.4 Lowland grazing livestock farms

4.4.1 Projected static changes to FBI

The direct impacts of the different Brexit scenarios on average lowland grazing livestock farm FBI are set out in Figure 4-3.

Scenario 1 would reduce FBI significantly by between 29% and 54%, with Wales lowland grazing livestock farms being least affected and Northern Ireland lowland grazing livestock farms being most affected; this reflects the relative dependency on support of lowland grazing livestock farms in Northern Ireland (in contrast to mixed farms in the same country). Scenario 2 would reduce lowland grazing livestock farm FBI by between 58% and 108% compared to the baseline, pushing FBI into the negative in Northern Ireland, and under £5,000 in England and Scotland. Under the worst case, average lowland grazing livestock farm FBI across all four countries would be negative, between -£5,000 in Wales and -£21,000 in Scotland. Under the best case, there would be a significant recovery in FBI to between 38% and 90% of baseline levels. Global price volatility would affect these impacts.

Figure 4-3: Lowland grazing livestock farms FBI – impact of Brexit by scenario



Source: Defra/RBR, WG/IBERS, SG, DAERA (2016) Farm Business Survey and own analysis

4.4.2 Analysis of implications for trade, prices and income

As with cereal and mixed farms above, Scenario 1 is not expected to result in significant changes in trade, prices and hence farm income, other than effects arising from a weakening of Sterling against the Euro and additional trade costs relating to customs checks etc.

Under Scenario 2, the introduction of WTO tariffs can be expected to affect beef and sheep trade significantly.

Beef

Beef prices would be affected by tariffs between the UK and EU. 15-17% of production is currently exported and 35% of consumption is imported, with this export and import trade taking place mainly with the EU. This trade includes the so-called 'carousel effect', whereby

carcasses are exported to the EU for processing with the resulting cuts then imported back into the UK; this arrangement stems from the loss of processing capacity in the UK during the BSE years. The imposition of significant tariffs both ways would mean this trade becomes uneconomic and would likely result in investment in domestic processing capacity. In the short term, the UK beef sector could benefit if supply tightens due to less (mainly Irish) imports and if exports are kept at home; beef prices could rise with the imposition of tariffs, as under Scenario 2 (Davis et al. 2017; BRC, 2017). However, there would be a ceiling to the beef price that consumers would tolerate before considering other protein options.

A bigger threat comes from imports from non-EU countries. Currently EU/UK prices are much higher than world prices so any trade liberalisation and resulting removal/reduction in tariffs would likely result in cheaper imports from countries such as Australia, USA and Brazil putting downward pressure on prices (Davis et al., 2017). The extent of this impact would partly depend on whether the UK Government lowered its standards to include beef from animals treated with growth hormones. This practice is widely used in major exporting countries and if permitted would increase imports and reduce prices further. Even if standards were not lowered, these countries could in any case adapt to customer demands in the UK with similar results.

Sheep

The sheep sector is particularly vulnerable to changes in trading arrangements. Around 33% of production is exported, the vast majority to the EU. Exports are particularly significant at peak season, when they ease downward price pressure (Hind, 2017). The imposition of tariffs on sheep and lamb carcases and cuts (equivalent to *ad valorem* tariffs of 45-51%) would be expected to reduce farm-gate prices by an estimated 17.5%, after taking into account adjustments in the supply chain (Andersons, 2016), or greater without such adjustment (Davis et al., 2017). Such tariffs would offset the benefits that the sheep sector has seen from the lower value of the pound. Alternative markets could be developed in China to ameliorate the reduction in prices but no trade deal is yet in place.

Imports of lamb account for around 33% of consumption, mainly from New Zealand and to a lesser extent Australia. These are mainly lamb legs, imported when the UK producers cannot support demand. If trade was liberalised, then the amount imported from these non-EU countries could potentially increase. It is worth noting that EU Tariff Rate Quotas (TRQs) are in place for lamb, so much depends on whether and the extent to which the UK Government adopts this arrangement. Any increase in TRQs could mean more imports, especially from Australia (which is at its TRQ limit presently), and vice versa. It is worth noting that price increases resulting from a protected market could in themselves lead to reductions in consumer demand.

In summary, the situation with the beef and sheep trade is complex. A significant reduction in lamb prices could be expected under Scenario 2, with trade liberalisation putting downward pressure on both beef and lamb prices. A greater focus on supplying the domestic market might be expected in both the beef and sheep sectors. Producers could adapt to an extent by spreading out lambing more (reducing seasonality) and developing products and tastes to encourage UK consumers to buy more sheep meat, such as distinct breeds, mutton and mutton dishes, and novel products, in addition to already-popular legs of lamb.

As with cereals farms, the prices of fertilisers, sprays and fuel can be expected to rise under Scenario 2 due to tariffs on imports. The cost of animal feed could benefit however from

lower cereal prices. Diversification income could be adversely affected by a downturn in the economy, although tourism income might improve as a result of the lower value of Sterling in relation to the Euro and the US Dollar; meaning that UK holidays are more attractive for UK residents and for foreign tourists alike.

Overall the changes in prices and costs indicated above, together with a significant reduction in public payments, upon which beef and sheep farms are highly dependent, can be expected to result in lower FBI and profitability for lowland grazing livestock farms in Scenario 2, as modelled in Section 4.4.1.

Trade liberalisation, if implemented, could be expected to reduce prices for all grazing livestock enterprises (beef, sheep and dairy), resulting in a significant negative impact on farm incomes in these sectors and a reduction in meat and milk production in the UK. Farm incomes would be most severely affected in Scotland under this scenario (Berkum et al, 2016).

4.4.3 Farm management and restructuring

Under Scenario 1, current trends in farm management and restructuring - for example scaling up, reducing variable and fixed costs, improving efficiency, better use of data etc. - can be expected to continue, but not go as far as those that might occur under Scenario 2, below.

Lower FBI as envisaged under Scenario 2 could result in a number of different trajectories for lowland beef and sheep farmers. Some may decide to focus on improving productivity, becoming more efficient and getting bigger to generate economies of scale. Some may decide to reduce their input and team up with younger farmers / new entrants via share farming agreements or similar. Some may simply reduce their farming activity; this could be the case for a proportion of farms in Northern Ireland for example, where there is a strong cultural tie to the land and a structure of small, part-time farms. Finally, some may choose to stop farming altogether, for example if they are of retirement age with no successors, or indebted. The result is a mosaic of approaches. The analysis below focuses on those continuing in production.

Beef

There is a range of different beef production systems in lowland areas, ranging from ‘low input’ suckler cow enterprises to ‘barley beef’ rearing and finishing units. There is also a big variation in performance, with many beef systems making a positive margin on a cash-only basis but not on a full investment basis (covering own labour, depreciation, return on owner-occupied land). Top producers, on the other hand, can make positive margins in most beef systems (AHDB, 2016).

It could be expected that top producers would look to build on their advantage, dependent on resources (people, machinery, cash) and additional resource availability (including land). Lower rents could encourage expansion. Other commercial producers could also be expected to seek to improve productivity where they can, improving physical performance and output, and reducing variable and fixed costs, per unit output. There would be greater focus on improving efficiency through knowledge and better use of data and technology.

Improved productivity could be expected to result in greater beef numbers, especially on better performing farms.

Expert opinion: *"Increased production could apply to (both) more commercial farms and smaller, part time farms"*

A reduction in feed wheat and barley prices, under Scenario 2, could be expected to boost the use of cereal-based concentrate feeds. On many farms, however, forage-based systems would continue by preference and due to farm suitability, economics and supply chain specifications.

Higher input costs would drive more efficient use of inputs including fertilisers and manures.

Sheep

There is likely to be polarisation between:

- those with greater sheep numbers, with a single genetic strain, producing for the global market; and
- those who specialise for added value markets.

Lowland sheep producers in the first category would seek to reduce costs, improve efficiencies and get bigger in terms of flock size and land area, with productive land being the focus. There is likely to be greater use of composite breeds which generate greater finished lamb production (kg/ha). Producers will make better use of data, building on the use of electronic identification (EID) and scanning, to identify and select for the most profitable lines of sheep.

There are also likely to be more flock masters – landless keepers with large numbers of sheep relying on short term keep or other arrangements. These can be expected to continue to work alongside cereal farmers, bringing sheep grazing into crop rotations in arable and mixed farming areas as part of a strategy to control blackgrass and improve soils.

Lowland sheep producers in the second category will also seek to improve productivity, including using EID etc., but will be focused on provenance, native breeds, short supply chains and end markets, to maintain good returns. These producers are likely to account for a minority of overall production.

Both

Diversification will continue to provide valuable additional income for lowland beef and sheep farmers. While this income could come under pressure, there may be opportunities for further diversification such as letting rural premises, developing alternative enterprises etc. which some farmers may decide to pursue.

4.4.4 Land use and scheme participation

There is unlikely to be significant land use change in the lowland grazing sector. As noted above, there could be greater interaction between arable and livestock farms, with more arable land being used for sheep grazing on rotation. There may also be some additional tree planting in lowland areas, supported by the functional benefits of trees in terms of shade, shelter etc.

It is anticipated that less lowland grassland would benefit from agri-environment scheme payments under Scenario 2. However, land delivering valuable public benefits such as species-rich grasslands, grazing marsh and parkland could be expected to continue to be targeted. Where available, it is anticipated that many farmers would wish to take advantage of such payments.

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4.4.5 Environmental impacts

The projected environmental impacts of the Brexit scenarios on lowland grazing livestock farms are set out in Table 4-4 below. The type of potential environmental impacts outlined apply to both scenarios, however the scale, intensity and distribution of the changes can be expected to be greater under Scenario 2.

Table 4-4: Lowland grazing livestock farms – potential environmental impacts

	Positive	Negative
Biodiversity	+ Some lowland grazing livestock farms may become part-time so less intensive, less managed – more space for nature, less disturbance + Some additional tree planting for livestock shade and shelter – beneficial for wildlife + Improved soil quality – beneficial for soil biota, insects, birds etc. + More efficient use of inputs, per unit of production – reduced impact on farmland habitats and species	– Many lowland cattle and sheep farms will become more production-oriented, with higher stocking rates and more intensively managed – loss of species-rich grasslands in certain locations, impacts on associated flora and fauna, more fragmentation of habitats – Loss of grazing livestock in certain areas – deterioration of semi-natural grazed habitats – Loss of margins etc. with fewer agri-environment scheme agreements and voluntary measures – loss of habitat and protection of hedges and ditches – Less labour, impacting on optimal management of hedgerows, ditches, margins etc.
Water	+ Smarter use of fertilisers, sprays etc. – less nitrogen, phosphates and pesticides per unit of production.	– More cattle and sheep in certain locations – increased risk of poaching, capping, run-off of nutrients, soils, organic wastes etc. into water courses. – Fewer margins and buffer strips – potentially greater risk of nutrients and pesticides reaching watercourses
Carbon/soils	+ Greater focus on soils – improvement in soil structure, more soil organic matter / soil carbon.	– High levels of cattle and sheep in certain locations likely to lead to adverse impact on soil quality

Expert opinion: *"a small amount of fertiliser could make a big difference (to species-rich grasslands)"*

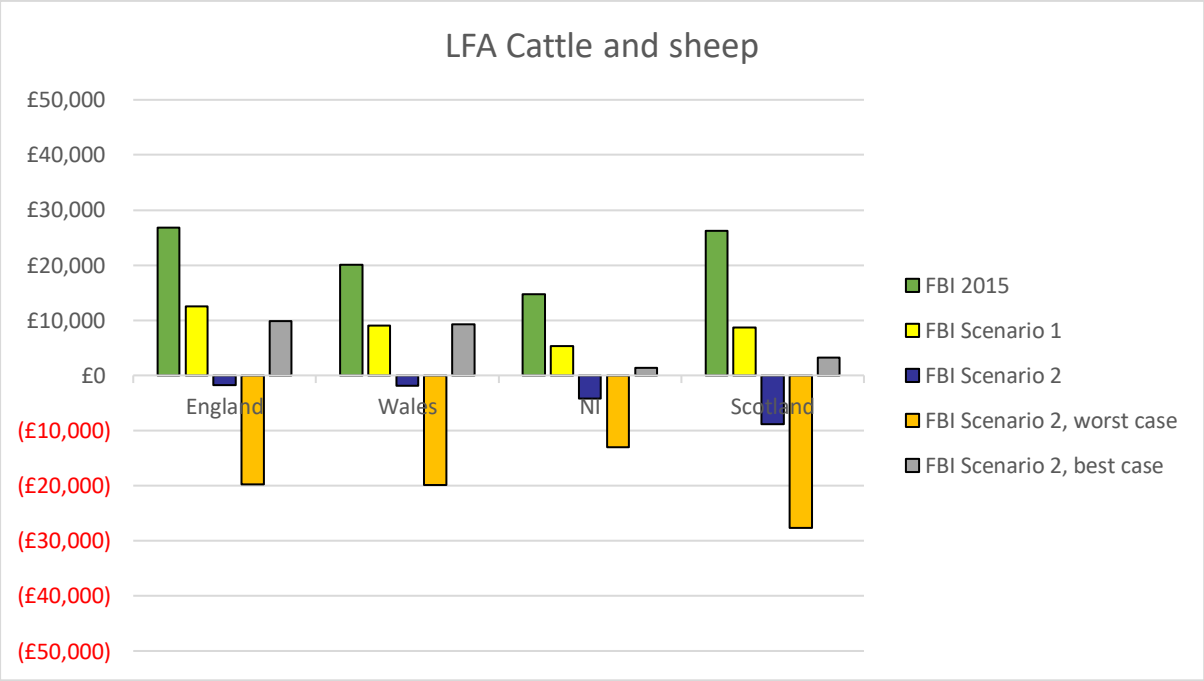
4.5 LFA grazing livestock farms

4.5.1 Projected static changes to FBI

The direct impacts of the different Brexit scenarios on average LFA grazing livestock farm FBI are set out in Figures 4-4 to 4-6.

For LFA cattle and sheep farms, Scenario 1 would reduce FBI significantly by between 53% and 67%. England LFA cattle and sheep farms would be least affected and Northern Ireland LFA cattle and sheep farms most affected, although the impact would be relatively even, and severe, across all four countries. Scenario 2 would reduce LFA cattle and sheep farm FBI by between 107% and 134% compared to the baseline, resulting in a negative FBI in all four countries, between -£2,000 (in England) and -£9,000 (in Scotland). Under the worst case, average LFA cattle and sheep farm FBI would deteriorate further to between -£13,000 to -£28,000. Under the best case, there would be a recovery in FBI but only to between 9% and 46% of baseline levels (Northern Ireland and Wales respectively). This reflects the limited impacts that improved trading conditions could have on FBI for LFA cattle and sheep farms given significant cuts in support payments.

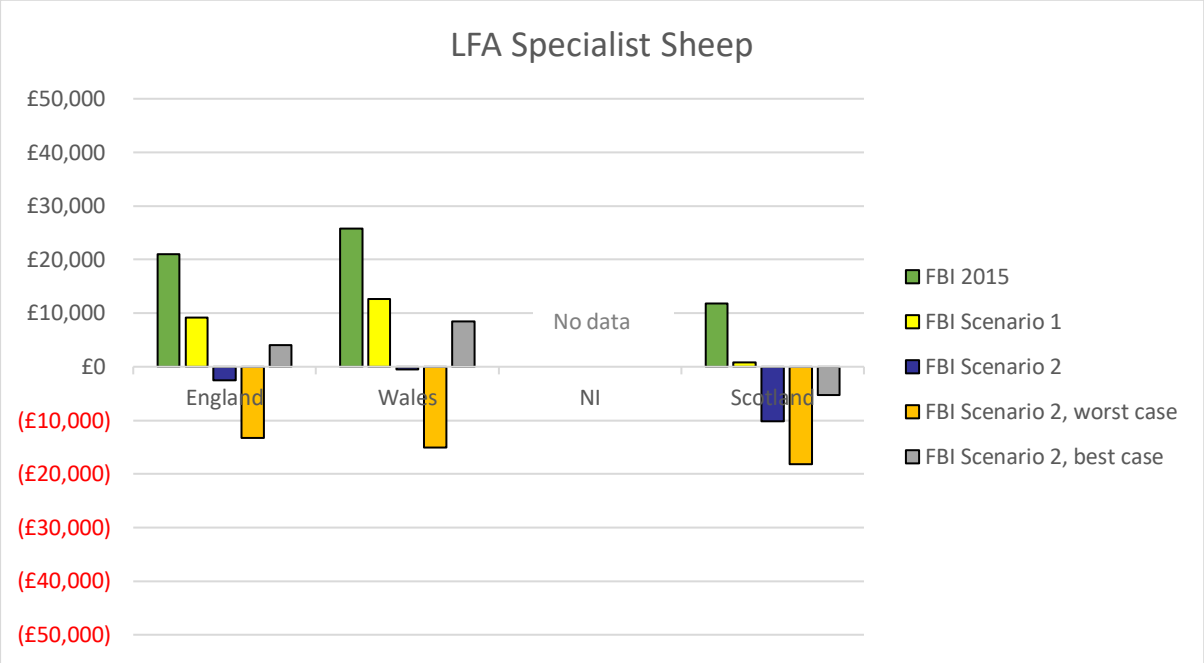
Figure 4-4: LFA cattle and sheep farms FBI – impact of Brexit by scenario



Source: Defra/RBR, WG/IBERS, SG, DAERA (2016) Farm Business Survey and own analysis

For LFA specialist sheep farms, the impacts would be broadly similar to LFA cattle and sheep farms in England and Wales, but would be more severe in Scotland, in terms of percentage reductions in FBI under the two main scenarios. From a relatively modest FBI of £12,000 under the baseline, FBI in Scotland would reduce to £800 under Scenario 1 and -£10,000 under Scenario 2. Under the worst case, average LFA specialist sheep farm FBI would deteriorate further to between -£13,000 to -£18,000. Under the best case, there would be a modest recovery in FBI but only to 33% of baseline in Wales and 19% in England. In Scotland, FBI under the best case in Scenario 2 would be negative at -£5,000.

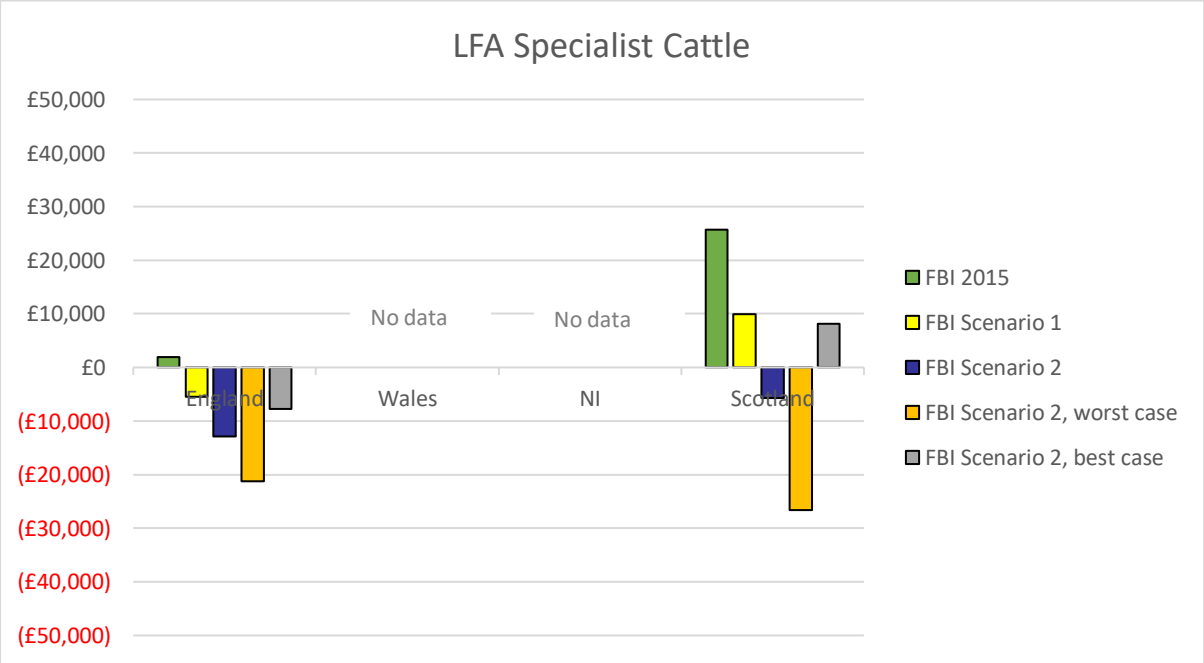
Figure 4-5: LFA specialist sheep farms FBI – impact of Brexit by scenario



Source: Defra/RBR, WG/IBERS, SG, DAERA (2016) Farm Business Survey and own analysis

For LFA specialist cattle farms, the impacts would be broadly similar to LFA cattle and sheep farms in Scotland, but with a slightly stronger recovery, to 32% of baseline FBI, under the best case in Scenario 2. For LFA specialist cattle farms in England, the situation would be bleak given their very low FBI to start with. FBI would be pushed to -£5,000 under Scenario 1 and -£13,000 under Scenario 2, with an FBI of -£21,000 in the worst case and -£8,000 in the best case.

Figure 4-6: LFA specialist cattle farms FBI – impact of Brexit by scenario



Source: Defra/RBR, WG/IBERS, SG, DAERA (2016) Farm Business Survey and own analysis

4.5.2 Analysis of implications for trade, prices and income

The trade, prices and income context set out in Section 4.4.2 also applies to the beef and sheep producers in LFAs.

In summary, Scenario 1 is not expected to result in significant changes in trade, prices and hence farm income. Scenario 2, however, can be expected to result in significantly reduced FBI and profitability for LFA grazing livestock farms. These farms would be particularly vulnerable to decreases in public support, including direct, LFA and agri-environment scheme payments, as set out in Section 4.5.1. It is also worth noting that the sheep and lamb exports to the EU, which would be directly affected by tariffs, typically include smaller carcases from Wales and other hill areas.

4.5.3 Farm management and restructuring

Under Scenario 1, current trends in farm management and restructuring - for example scaling up, reducing variable and fixed costs, improving efficiency, better use of data etc. - can be expected to continue, but not go as far as those that might occur under Scenario 2, see below.

In the uplands, in particular, there is likely to be a polarisation between:

- those seeking to farm their way out of reduced support by improving production and productivity; and
- those choosing to: deliver public goods in return for public payments; or turn to forestry; or give up.

In the first category, there are a number of producers who are already on this path, including farmers in their 30s with a “passion to produce”. They are adopting similar approaches to reducing costs, improving efficiencies and generating scale as their equivalents in the lowlands, including the use of composite breeds, technology, data etc. and this trend could be expected to accelerate under Scenario 2. Increasingly, these producers are seeking to integrate their lines of production into their own farm set-up, including both hill land and good land (for finishing). There is likely to be a greater focus on productive land, with hill land becoming more marginal to the business (and less suited to composite breeds). The extent to which these farms might expand onto other land would depend on rental prices, but productive land would be favoured.

The majority of LFA grazing livestock farmers, however, would fall into the second category. Some would utilise available public payments to deliver public goods including biodiversity, landscape, carbon storage, water quality, flood risk management etc., with many continuing to graze traditional breeds on the hill, albeit at relatively low stocking rates. Some would look to forestry as an alternative land use, or simply retire or give up, resulting in the abandonment of land, particularly in Scotland. This would have implications on land use which are explored below.

These different approaches could be expected to result in a large overall reduction in livestock numbers in the uplands, particularly sheep on the hills. It is likely that sheep on the hills would be ranched more, with less labour available for shepherding. Less labour and money would also be available for management such as bracken and scrub control, maintaining dry stone walls etc. Reduced support would mean less cross-subsidisation for management of this kind. Livestock would instead be concentrated more on in-bye land, putting pressure on this land.

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Where tenanted land is given up, then estates could be expected to manage land in-hand, either as productive farmers or focusing on public goods and/or forestry. In Scotland, many estates are foreign owned and owners are looking to sell as a consequence of the land reform changes. This creates additional uncertainty, but also provides opportunities.

Some estates and farms can be expected to diversify or diversify more, for example, into rural premises, rural tourism and recreation, food and drink processing etc. More part time farms could also be expected, with off farm income supporting reduced income from agriculture.

4.5.4 Land use and scheme participation

The most profound implications for land use are likely to be in the uplands, where farming is marginal and has been dependent on public payments for many years.

The extent of land use change depends on the availability and targeting of funds to support upland management for public goods. In Scenario 2, it is envisaged that the uplands would be prioritised for public payments given the scale and range of public goods delivered, but nonetheless some cut in budgets could be anticipated which would reduce agri-environment scheme coverage. Many farmers would seek to secure agri-environment scheme payments where this is available, but there would be resistance to tying up productive, in bye land, except where this is designated SSSI and there is no option to use the land flexibly or intensify management.

More forestry can also be expected in the uplands, although the extent depends on the grant aid/payments available and land prices amongst other factors. The policy context, and hence scope for grant aid, is already encouraging forestry expansion. This is on the grounds that it contributes to climate change mitigation (through carbon sequestration), natural flood management, biodiversity and recreation amongst other public goods, as well as the broader natural capital agenda, although inappropriate woodland creation can also create significant dis-benefits for these services. Scotland has already announced increased annual tree planting targets, from 10,000 hectares currently to 15,000 hectares by 2025 in order to meet its climate change objectives; if achieved this would represent an increase in Scotland's woodland cover from 18% to 21% of the Scottish land area by 2032 (SG, 2017). Forestry processing companies could be expected to buy land for planting, particularly in areas with good access and processing infrastructure, such as the Southern Uplands.

Other factors to take into account with planting are National Parks and common land. Sheep grazing maintains the landscape we have become used to and value in many National Parks, however this may not be a viable model everywhere in the future. This could result in more woodland being permitted in National Parks. No planting would be expected on common land, in National Parks or elsewhere, due to the need for Secretary of State Consent for such a change in land use.

New planting in the uplands would most likely comprise coniferous species, given the end market, although single species monoculture is not expected due to the UK Forestry Standard and disease risk.

Expert opinion: ***"Forestry is as, if not more, profitable now than upland sheep enterprises. But this applies to established, existing forestry – it still needs investment and time to reach this stage. In future, I can see the economics working."***

Abandonment of land could be expected in more remote, more challenging areas for farming. This could result in a change in the nature and structure of vegetation, and in some cases a change in habitat from open, grazed land to scrub and woodland. This is explored further below.

4.5.5 Environmental impacts

The projected environmental impacts of the Brexit scenarios on LFA grazing livestock farms are set out in Table 4-5 below. The type of potential environmental impacts outlined apply to both scenarios, however the scale, intensity and distribution of the changes can be expected to be greater under Scenario 2.

Table 4-5: LFA grazing livestock farms – potential environmental impacts

	Positive	Negative
Biodiversity	+ Some reduction in grazing pressure in areas that are currently over-grazed could benefit biodiversity associated with sensitive semi-natural habitats e.g. upland rough grassland. + Reduction in grazing pressure and/or abandonment could result in the natural regeneration of certain hill areas – beneficial for biodiversity associated with natural habitats (woodland, blanket bog, heather moorland) + Active restoration of areas with reduced livestock numbers could speed up and maximise these biodiversity benefits.	– Some LFA cattle and sheep farms will become more production-oriented, with higher stocking rates and more intensively managed – loss of species-rich grasslands especially on in-bye land (e.g. upland hay meadows), impacts on associated flora and fauna, more fragmentation of habitats. – Loss of grazing livestock and loss of mixed grazing (sheep and cattle) in hill areas – deterioration of valuable semi-natural grazed habitats, with more coarse grasses, rushes, bracken, scrub etc. and loss of species diversity/ populations; this could be via reduced stocking rates or abandonment in some areas. – Conversion of some hill areas to coniferous forestry – loss of semi-natural grazed habitat. – Loss of agri-environment scheme agreements – less, beneficial grazing management, including shepherding of stock, and localised over and under grazing. – Less money and labour, impacting on maintenance of walls, hedges and other features. – Loss of agri-environment scheme money could stop

		ongoing work to restore peatland and other upland habitats.
Water	+ Reduction in grazing pressure and development of scrub, woodland etc. - could help slow the flow of water off the hill and reduce flood risk in certain locations. + Reduction in grazing pressure in some areas could reduce soil run-off, delivering benefits to water quality.	– More cattle and sheep in certain locations, especially on in bye land – increased risk of poaching, capping, run-off of nutrients, soils, organic wastes etc. into water courses. – Fewer margins and buffer strips – potentially greater risk of nutrients and pesticides reaching watercourses – Process of planting (commercial forestry) could cause soil erosion.
Carbon/soils	+ Reduction in livestock numbers – lower greenhouse gas emissions + Reduction in livestock numbers could allow regeneration of natural vegetation, improving carbon sequestration.	– High levels of cattle and sheep in certain locations likely to lead to adverse impact on soil quality. – Loss of carbon associated cessation of peatland restoration.

Expert opinion: ***"A reduction in support by one third to two thirds would be game changing for the uplands. A reduction by two thirds would be especially bad for upland farmed wildlife. Every farm would lose money – catastrophe."***

4.6 Broader context

4.6.1 Transition

The changes in trading arrangements and support can be expected to take place over an extended period. Even though it seems likely that the UK will leave the EU in 2019, a new trade deal with the EU may not be in place for some months or more likely years afterwards and there is likely to be a transitional arrangement in the meantime. In the same way, while BPS payments are guaranteed until 2020 and potentially 2022, it seems likely that new policies and schemes will take time to develop and may not be implemented until some years later; transitional arrangements, possibly a version of the current schemes, could plug the gap.

For farm businesses, this is likely to mean evolution rather than revolution. While some farmers are already planning for a future without support (Jones, 2017) and will make changes to their farms sooner rather than later, others may wait until the 'cliff edge' or not change at all. For most, a process of continuous adjustment can be expected. How farmers react will depend on the speed of change, although farming is a 'naturally cautious' industry.

Expert opinion: ***"It is likely that some farms will begin to make changes in response to the changing market environment sooner rather than later: especially those with younger, more flexible farmers…… it may be that some people at the tail-end of the process do not change at all."***

An example of present thinking amongst farmers in Scotland is set out in Figure 4-7. A major feature going forward will be uncertainty, affecting investment and other significant decisions.

Figure 4-7: Scottish farmer and crofter thoughts on Brexit

A recent survey conducted of farmer and crofter clients of SAC Consulting revealed the following interesting facts on Scottish farmers' thoughts on Brexit (Skerratt et al, 2016)

- A fifth of the sample said they felt that Brexit may increase the likelihood of retirement from farming: a quarter of farmers and crofters that were 55 and over said it may bring forward retirement.
- 57% of the sample reported that Brexit has increased business uncertainty – something that inevitably leads to lower on-farm investment. Increased uncertainty was highest in the younger farm and croft population and on mixed farms and the beef and sheep sectors (which have historically been heavily supported by CAP)
- Nearly two-thirds felt that Brexit would not affect the mix of crops and livestock that they have, with around 20% thinking it would have some impact.
- A third of the farmers and crofters surveyed believe that Brexit will mean that they will have to increase off-farm income sources or diversify their business.

4.6.2 Ongoing changes

The impact of Brexit on farm businesses needs to be seen alongside ongoing changes and trends. Some ongoing on-farm trends have already been mentioned above, such as improvements in resource efficiency, adoption of technology, use of big data etc. Other changes and trends, away from the farm, are also important, for example:

- Changing consumer preferences and consumption trends
- Post-Brexit immigration policy
- UK economic performance, including confidence and investment
- Continuing volatility affecting global output and input prices
- Global economic cycles and increasing protectionism

These factors could affect the trading environment and political decisions, and ultimately farm business responses to Brexit. It is also important to note that, alongside farmers, others in the supply chain will also be adjusting to Brexit, including processors, wholesalers, retailers and consumers.

4.6.3 Land values

Rents can be expected to reduce over time with a reduction in farm profitability. Without direct payments, there can be expected to be some divergence in rent, with greater weight given to land quality and its earning capacity (Andersons 2016).

Farmland prices are less directly linked to farm profitability than farmland rents. There is a wide range of issues affecting land prices, although farm profitability is still an important driver. There has been a reduction in land prices in 2015 and 2016 – on average by 7% (RICS/RAU, 2017) - with Brexit uncertainty adding to the weakening. A Hard Brexit is expected to result in a downward shift in prices; a drop of 10-20% compared to 2015 values is possible (Andersons, 2016), although opinion varies.

Expert opinion: ***"Land prices are unlikely to decline significantly, as they do not behave as market principles suggest i.e. if income per hectare declines, land values per hectare do not decline in accordance"***

4.6.4 Labour

Maintaining the supply of labour is an important factor influencing the competitiveness of the agricultural industry and the wider economy. A shortage of labour, which may result from changes to immigration rules with Brexit, could mean higher wages and increased costs of production. By changing the relative cost of factors of production, this could divert farm businesses into less labour-intensive production systems i.e. more mechanised approaches. While sectors such as horticulture are most vulnerable to a reduction in affordable, seasonal labour, other sectors could be affected in a similar way. The need to improve agricultural productivity would also drive greater mechanisation (Swales & Baker, 2016) (Buckwell, 2016).

4.6.5 Lending

Many farms have borrowings of one kind or other. At the end of March 2017, UK farmers had total liabilities of £18.16 billion – 2.8% higher than March 2016 – mainly secured on land (Defra *et al.* 2016; and Horne, S. 2017). Brexit could have a number of impacts relating to debt. Firstly, farmers with borrowing can be expected to be under greater pressure than those without when farm incomes fall, resulting in an earlier response. Secondly, existing borrowing could come under pressure with falling land values affecting the asset base. Thirdly, future borrowing will be affected by farmer and funder confidence, which could be tested by uncertainty over the next two years, at least, and result in less on-farm investment and land purchases by farmers, at least in the short term.

4.6.6 Protected food names

EU protected food names – including Protected Designation of Origin (PDO), Protected Geographic Indication (PGI) and Traditional Speciality Guaranteed (TSG) – are used by producers to try to differentiate their products in domestic and international markets and help improve their competitiveness and profitability. They have been shown to deliver added value for some products such as Welsh Lamb, and in combination with market development and regional co-operation have helped increase sales. (Roussel & Doherty, 2016). There may be a need to maintain a similar system in future post-Brexit especially for vulnerable sectors/areas such as LFA beef and lamb producers.

5 Country Summaries

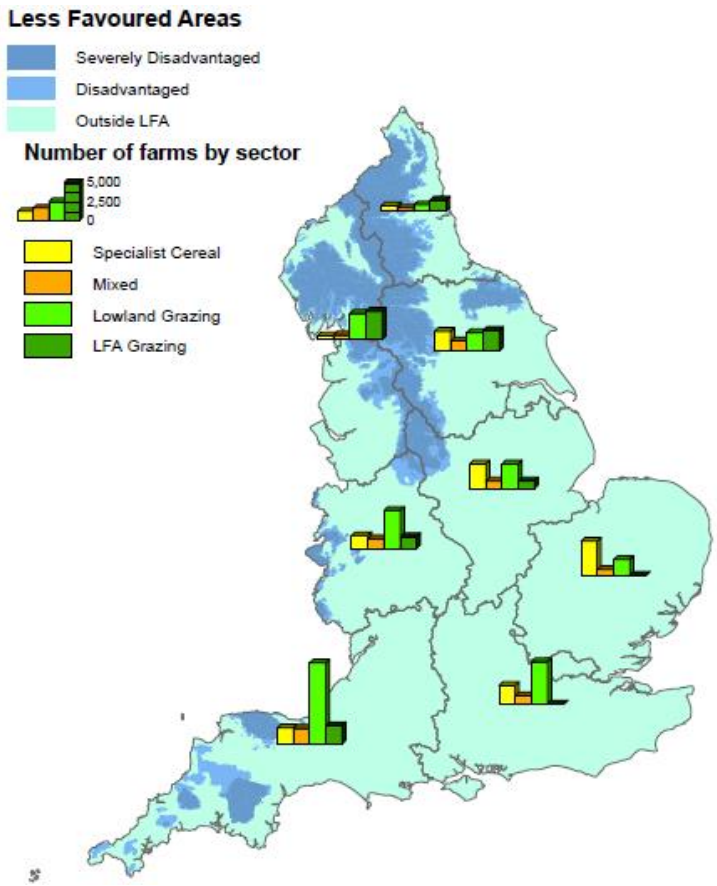
5.1 England

5.1.1 Current status of farming in England

There are 102,500 farms in England, covering 8.9 million hectares (over 70% of the total land area; Defra, 2016), and supporting a wide variety of agricultural sectors and systems. The average farm size in England is 88ha – similar to the UK average (80ha).

Perhaps more than any other UK country, there is enormous regional diversity in farming systems in England, see Figure 5-1. The South and South-West of the country support significant areas of lowland grazing, as well as a considerable proportion of England's mixed farmland; the East, East Midlands and Yorkshire and Humber have some of England's most fertile agricultural soils, and support significant areas of cereal farming; while upland areas in the North East and North West have a relatively high proportion of LFA cattle and sheep farming. 1.5 million hectares of English farmland are classified LFA – similar in area terms to Wales but accounting for only 16.6% of England's total agricultural area.

Figure 5-1: Number of farms in each of the four focal sectors and extent of LFAs in each region of England



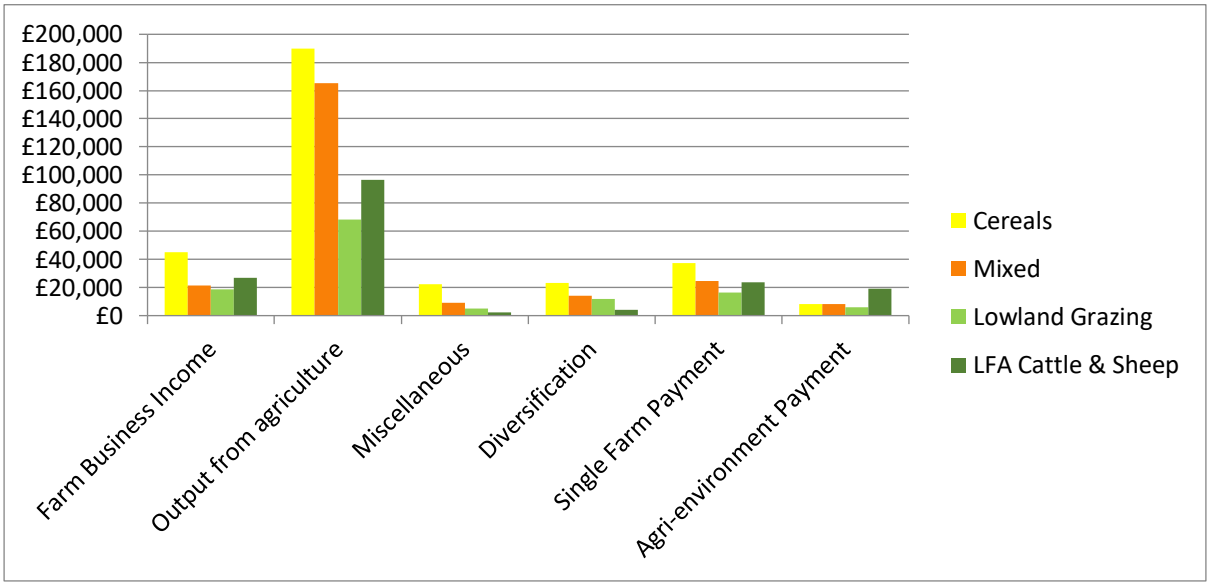
Source: Defra (2016) and own analysis. Scale is shown in figure legend.

In 2015, average FBI in England ranged from £18,471 for lowland grazing, to £45,021 for specialist cereals – the highest income for any UK sector assessed, see Figure 5-2. The proportion of average FBI made up of support payments (direct payments plus agri-

environment) ranges from an average of 102% for specialist cereals to 160% for LFA cattle and sheep farming.

The average Basic Payment rate in England in 2015 ranged from £47.58 to £181.37 per hectare, and England no longer offers coupled support payments or specific direct support payments for LFA farms (see Table 3-2). Agri-environment schemes offer an average payment of £63 per hectare (slightly higher than the UK average of £58 per hectare; see Table 3-3). AES agreements cover c. 6.5 million hectares of farmland, with an annual cost of £410 million. Average income from agri-environment payments is highest for LFA cattle and sheep farms in England. In the current CAP programming period, England shifted 12% of its funding allocation from Pillar I (Direct Payments) to Pillar II (Rural Development, including agri-environment).

Figure 5-2: Breakdown of average FBI for four major agricultural sectors in England



Source: Defra (2016) Farm Business Survey and own analysis

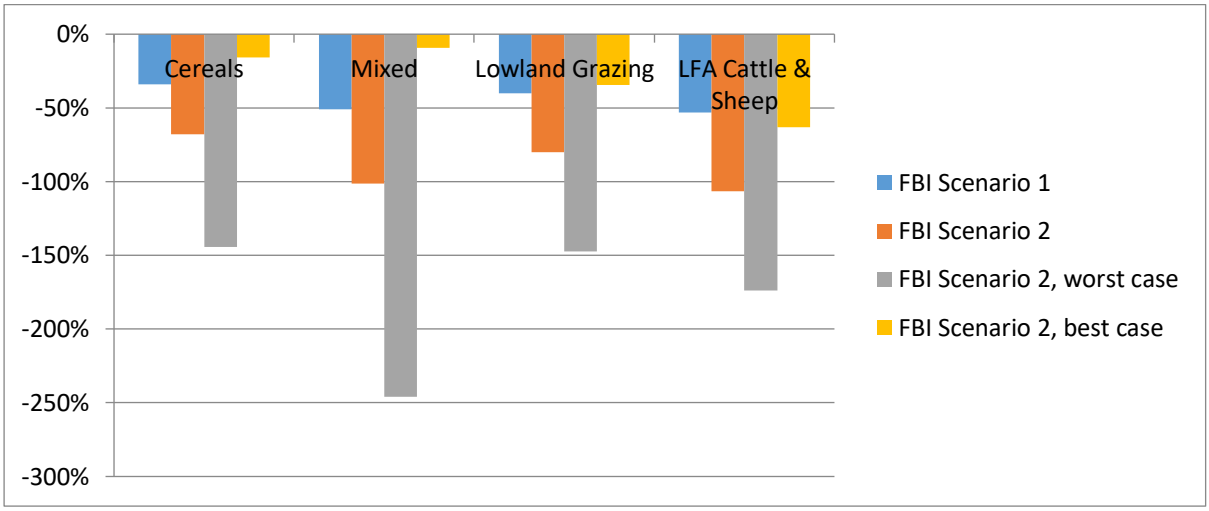
5.1.2 Impact of Brexit on farm incomes and management in England

Average FBI in England is predicted to decline for almost all sectors (relative to 2015) across all of the Brexit scenarios assessed, see Figure 5-3.

For the 'worst case' Scenario 2 (two-thirds reduction in support payments, significantly increased variable costs and decreased output prices), average FBI for all four sectors is predicted to decline by more than 100% i.e. farm incomes would effectively become negative. By contrast, under a 'best case' Scenario 2 (two-thirds support reduction, but increased output prices and only slightly increased variable costs), both cereal and mixed farms in England manage to maintain over 80% of their 2015 average income.

For LFA cattle and sheep farming, average FBI is predicted to decline by over 50% for all of the Brexit scenarios assessed in this report. This sector is particularly vulnerable to the scenarios modelled in this analysis as it has a high dependence on support.

Figure 5-3 Percentage change in average FBI in England (relative to 2015) by Brexit scenario



Source: Own analysis based on Defra (2016) Farm Business Survey

These changes in FBI could result in significant shifts in farm management in England, particularly in some sectors. For cereal farms (and to some degree, mixed farms), experts predict that a fall in FBI could lead to higher-performing farms focussing on reducing costs, maximising resource-use efficiency, and increasing productivity. Depending on the availability of post-Brexit support, areas that are currently out of production (field margins and corners etc.) may be brought back in to production. Experts also predict a potential increase in land rental by 'high performing' farm businesses (benefitting from smaller or less economically efficient businesses stepping back from farming), alongside an increase in contract farming operations. At the same time, and particularly if input prices increase (as under Scenario 2), farmers may look to reduce costs by increasing focus on mixed farming operations (recycling manure and nutrients etc. to improve soil quality). Some mixed farms may focus on other business strategies including developing added-value products (often with shorter supply chains), diversifying their income (either through engagement with agri-environment, or through non-agricultural income streams), and/or switching to part-time farming.

For lowland grazing livestock farms, ongoing trends of scaling-up, reducing costs, improving efficiency, and better use of data are predicted to continue post-Brexit and potentially go further still under Scenario 2. This could result in higher livestock numbers on more productive farms. For lowland sheep farms, a polarisation in approach may emerge post-Brexit between those with high sheep numbers (often with a single genetic strain), where the focus is likely to be on improving productivity for the global market, and those who specialise in added-value products, focusing on native breeds and developing short supply chains and access to local markets where a price-premium can be achieved. Similar to cereal and mixed farms, whilst some lowland livestock farmers may choose to leave the sector in the face of potential economic challenges, significant change in land use is unlikely as expanding 'top-performers' and new entrants are predicted to fill the gap.

More significant changes in land use are predicted for the LFA cattle and sheep sector, where the implications of the modelled Brexit scenarios would likely be profound. Whilst some LFA farmers (particularly those currently achieving above-average incomes) may be able to adapt to worsening economic conditions – focusing on reducing costs, making use of

more productive in-bye land etc. – many others face inherent limitations to their potential productivity, which will reduce their resilience and adaptability. This is likely to be particularly true of farms that fall entirely within SDAs, which will be less able to make significant increases in productivity compared to their counterparts with access to more-productive lower-lying areas. For those farmers, the shape of the future will be hugely dependent on the nature and scale of public support available to the sector. In the northern English uplands, where agriculture is dominated by high-cost, heavily-supported sheep farming within the SDA, this could have a dramatic, transformative impact on farming and the wider environment.

5.1.3 Implications for biodiversity and the wider environment in England

As outlined in Section 4 of this report, the environmental impacts of the Brexit scenarios (and the knock-on effects on incomes and management) are likely to be mixed. In areas with a relatively high proportion of arable farmland (East Anglia, the East Midlands and some areas of Yorkshire and the Humber), improvements in resource-use efficiency coupled with an ongoing growth in more sustainable soil management practices (e.g. minimum tillage, cover crops etc.) could deliver environmental benefits, particularly in terms of water quality and soil health. However, these benefits could be counter-balanced by a renewed focus on increased productivity, leading to the potential loss of some important farmland habitats (field margins and corners, buffer strips etc.), and farmers choosing to 'play it safe' in terms of agro-chemical inputs. In combination, these changes could have negative impacts for soils and water, as well as some farmland biodiversity.

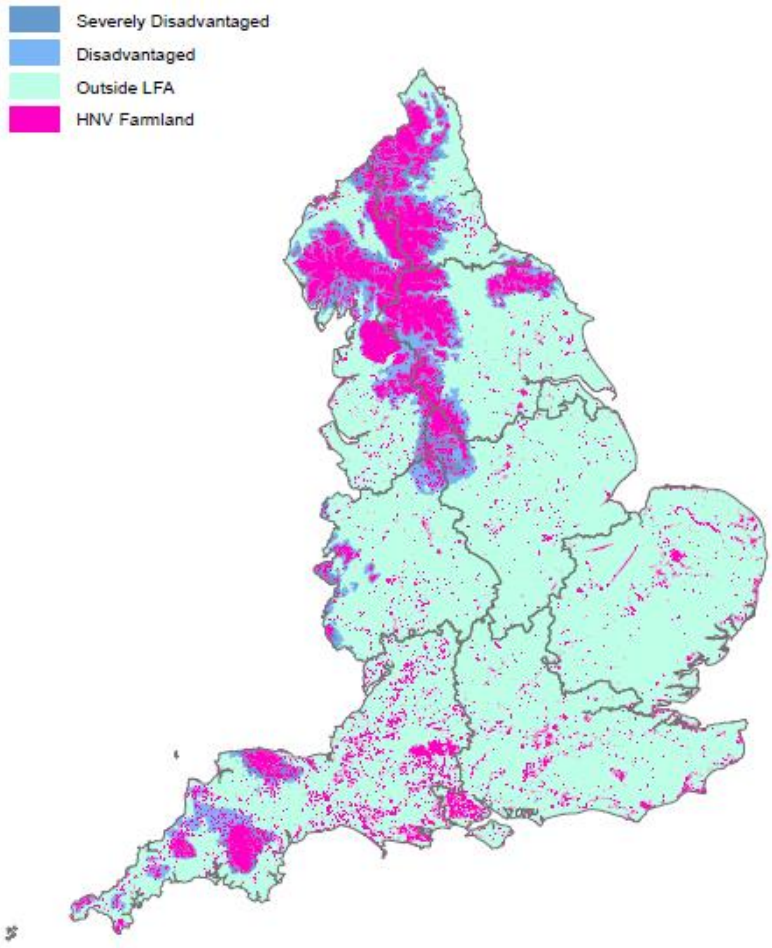
In the West Midlands, South and South West – regions with relatively large areas of mixed farming and lowland grazing – again, the environmental consequences are likely to be mixed. More efficient use of inputs (particularly if input costs increase significantly) along with a reduction in stocking densities on some (less-productive) areas, and better join-up with arable farming businesses could all contribute to improvements in water quality, soil health, and to some degree farmland biodiversity. By contrast, increased stocking densities in some areas, and the loss of some on-farm habitats (as areas are brought back into production) could have negative implications, particularly for water quality.

In areas that are dominated by LFA cattle and sheep farming (Northern England Uplands, Welsh borders and some parts of the South West), the environmental implications of Brexit are likely to depend heavily on future policy. Some more-productive farms (typically those with access to more-productive, lower-lying and in-bye land) may be able to adapt, focussing on reducing costs, restructuring their livestock operations and stratifying their farm business to make effective use of their natural resources. Where these changes include a decrease in sheep grazing and an increase in cattle grazing, this could have positive impacts on some sensitive grassland habitats. Where diversification of farm businesses includes income from agri-environment schemes (if available), this is also likely to yield benefits for the environment as well as for business resilience. By contrast, increasing stocking densities within the upland fringe could have negative implications in terms of run-off, water quality, flood risk reduction and farmland biodiversity.

The environmental implications of Brexit in less productive areas managed by LFA cattle and sheep farms are likely to depend heavily on the shape of future policy – perhaps more so than for any other sector in England.

This is particularly true of some habitats associated with so-called High Nature Value (HNV) farming systems. In England, a considerable proportion of these HNV systems are associated with economically marginal farming systems within LFAs, see Figure 5-4. These include extensively managed, species-rich open grassland habitats that are maintained by low-intensity grazing, see Figure 5-5. Falls in livestock numbers within the LFA (particularly within the SDA), driven by economic changes post-Brexit, could cause these sensitive and precarious habitats to become under-grazed, reducing their value for biodiversity.

Figure 5-4: Areas likely to support HNV Farming systems in England

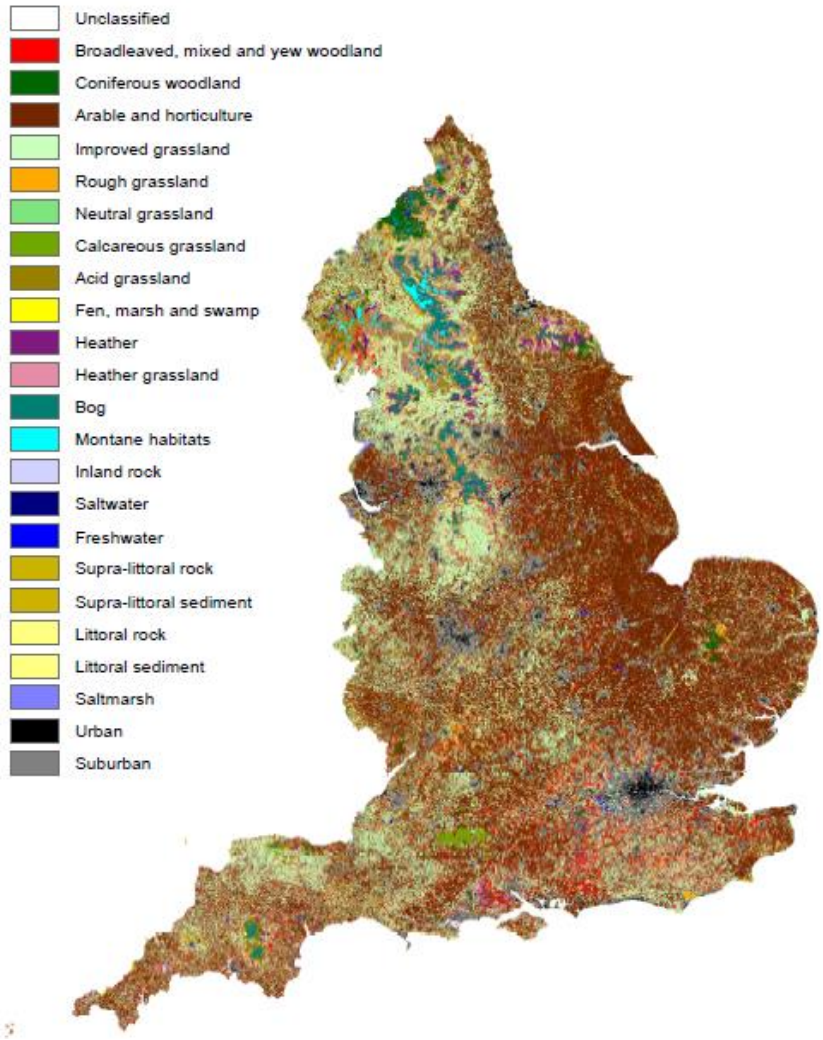


Source: European Environment Agency

By contrast, in some areas, the reduction or removal of livestock could deliver significant environmental benefits, depending on the subsequent land use and habitat. Natural regeneration of upland habitats (e.g. blanket bog, heather moorland and native broadleaved woodland on the upland fringe) could have significant benefits, not only for biodiversity but also for water quality, flood risk reduction, and carbon storage. It should be noted though, that optimal environmental outcomes may not be achieved through natural regeneration – capital investment and ongoing management may be required, at least in the short-medium term, to ensure that these habitats are restored effectively.

Whilst natural regeneration or active habitat restoration may deliver environmental benefits, the potential increase in non-native plantation forestry in areas no longer economically viable as farmland would likely have negative implications for upland biodiversity, particularly species associated with natural and semi-natural open habitats.

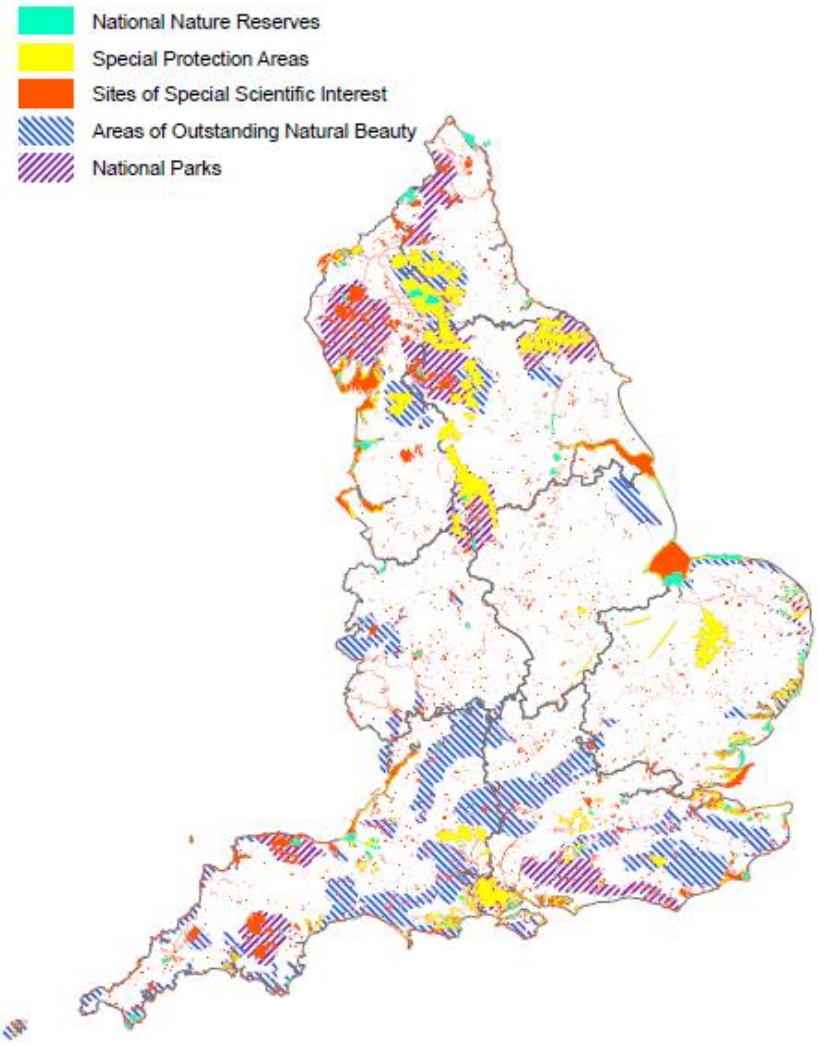
Figure 5-5: England Land Cover



Source: CEH Land Cover Map (2007)

Some of the potential changes to farm incomes and management in England could have implications for the status of designated sites, see Figure 5-6. Many sensitive habitats within SSSIs are dependent to some degree on low-intensity grazing – agri-environment schemes are often the primary mechanism for managing these habitats. A redistribution of grazing livestock, not only in the uplands but also in lowland grazing systems, could result in these sensitive habitats become under- or over-grazed, potentially leading to a deterioration in SSSI condition.Figure 5-6

Figure 5-6: Protected Areas in England



Source: Defra

Expert opinion: ***"There will be a positive impact on SSSIs which are currently in unfavourable condition due to overgrazing, particularly those in the uplands. However, there is a risk that some upland areas, particularly at localised levels, may become undergrazed, negatively affecting associated SSSIs."***

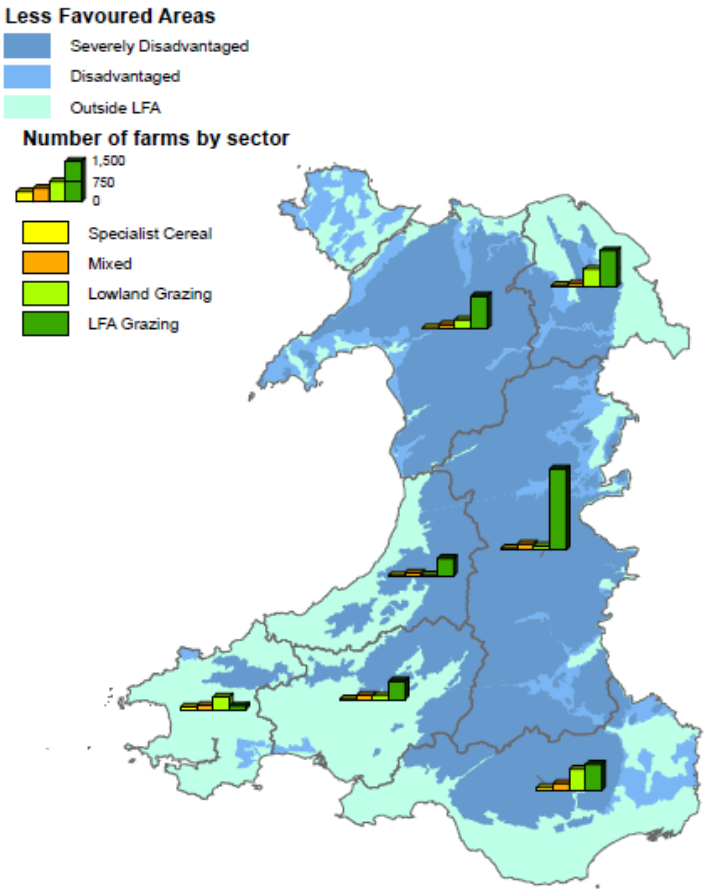
The mixed, but potentially significant environmental implications of these farming scenarios on biodiversity and the wider environment in England highlights the important role of agricultural and environmental land management policy in shaping these outcomes – either to maximise potential environmental benefits or minimise environmental harm.

5.2 Wales

5.2.1 Current status of farming in Wales

There are roughly 35,000 farms in Wales, covering 1.66 million hectares (76% of the total land area; WG, 2016), and agriculture plays a fundamental role in shaping the landscape and environment of the country. The average farm size in Wales is 48ha – smaller than the UK average (80ha). Wales, like Scotland, is dominated by land that is classified as LFA (over 80% of the total agricultural area) and of that, a significant majority (68%) is classified Severely Disadvantaged, see Figure 5-13. Powys has nearly 3,000 LFA cattle and sheep farms, covering over 270,000 ha. These areas are made of permanent grassland and rough grazing land used for cattle and sheep grazing. Some areas (North East Wales, South Wales and Pembrokeshire) support a comparatively high proportion of lowland grazing farms alongside LFA cattle and sheep. By contrast, only about 1% of the agricultural area of Wales is made up of specialist cereal farms (compared to 33% in England), and only 3% is mixed farming – primarily found in Pembrokeshire, Carmarthenshire and South Wales.

Figure 5-7: Number of farms in each of the four focal sectors and extent of LFAs in each region of Wales

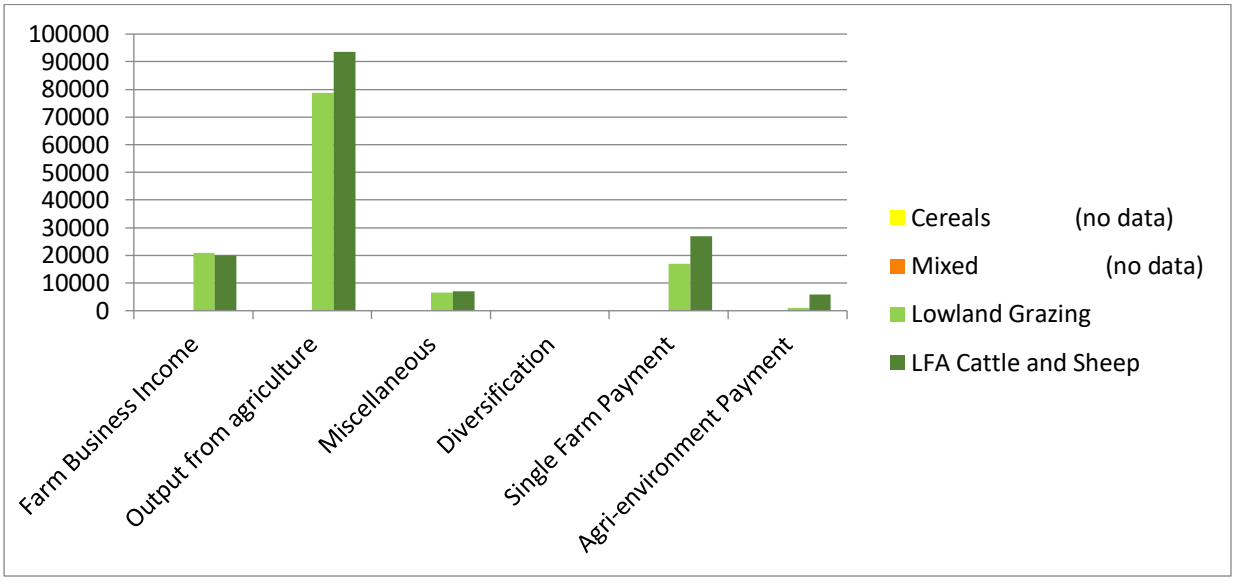


Source: WG (2016) and own analysis. Scale is shown in figure legend

FBI data for Wales is not available for specialist cereal or mixed farms. In 2015, average FBI was £20,815 for lowland grazing farms and £20,047 for LFA cattle and sheep farms, see Figure 5-14. Although average FBI is similar for both these sectors, support payments represent a far greater proportion of FBI for LFA grazing farms: 164%, compared to 87% for lowland grazing.

The average Basic Payment rate in Wales ranges from £68.16 to £117.30 per hectare (see Table 3-2). Agri-environment schemes offer an average payment of £44 per hectare (slightly below the UK average), and agreements cover 978,000 hectares of farmland, with an annual cost of £43 million (see Table 3-3). Wales no longer offers specific direct support for LFA farmers. In the current CAP programming period, Wales chose to move the maximum 15% of its funding allocation from Pillar I (Direct Payments) to Pillar II (Rural Development, including agri-environment).

Figure 5-8: Breakdown of average FBI for two major sectors in Wales

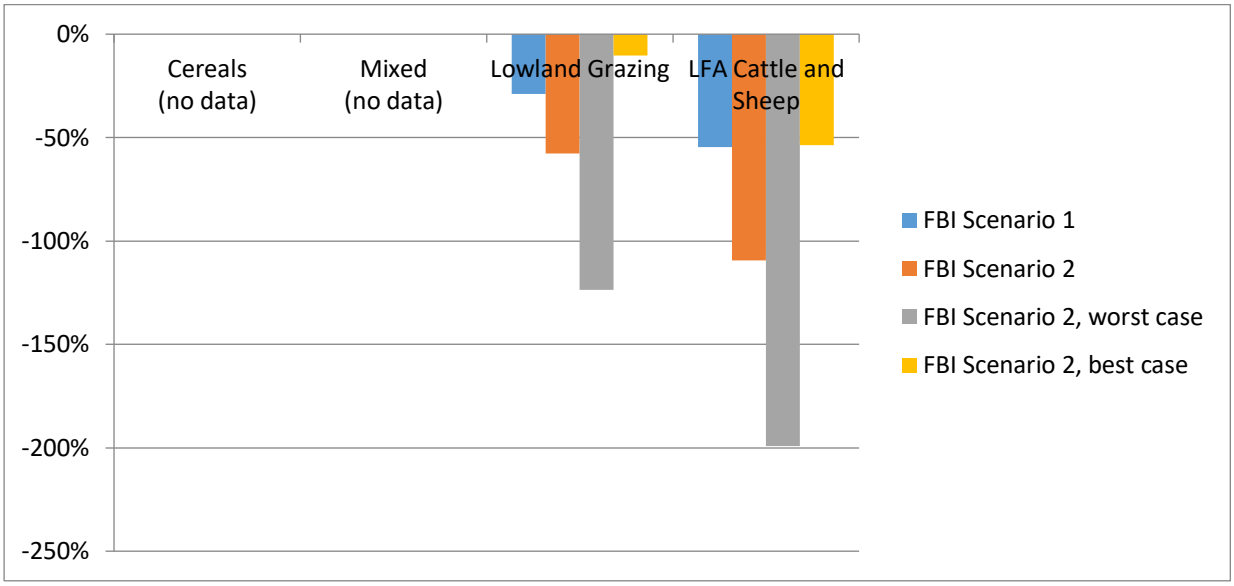


Source: WG (2016) Farm Business Survey and own analysis. Data unavailable for Specialist Cereals and Mixed Farms.

5.2.2 Impact of Brexit on farm incomes and management in Wales

Average FBI in Wales is predicted to decline for both lowland grazing and LFA cattle and sheep farms, relative to 2015 across all of the Brexit scenarios assessed, see Figure 5-15. Although current average FBI is similar for both sectors, falls in income are predicted to be significantly higher for Welsh LFA farms - over 50% for all of the Brexit scenarios assessed. By contrast, lowland grazing farms are expected to achieve 90% of their current FBI under a 'best case' Scenario 2. This difference in resilience to the modelled Brexit scenarios is primarily due to the higher dependence on support payments on LFA farms in comparison to lowland grazing farms.

Figure 5-9: Percentage change in average FBI in Wales (relative to 2015) based on four potential Brexit scenarios



Source: Own analysis based on WG (2016) Farm Business Survey. Data unavailable for Specialist Cereals and Mixed Farms.

Whilst some farmers in these two sectors will obviously achieve higher-than-average incomes, Brexit could be expected to present a significant challenge to the sectors, and could lead to significant shifts in farm management right across Wales. For lowland beef farms, ongoing trends of scaling-up, reducing costs, improving efficiency, and better use of data are predicted to continue and potentially go further still under 'Scenario 2'. This could result in higher beef numbers on more productive farms. For lowland sheep farms, a polarisation in approach may emerge post-Brexit between those with high sheep numbers (often with a single genetic strain), where the focus is likely to be on improving productivity for the global market, and those who specialise in added-value products, focusing on native/traditional breeds and developing short supply chains. Whilst some farmers may choose to leave the lowland grazing sector in the face of potential economic challenges, significant change in land use is unlikely as expanding 'top-performers' and new entrants are predicted to fill the gap.

For LFA cattle and sheep farming in Wales, Brexit could have a significant impact on farm incomes and management, and across the vast areas dominated by this type of farming the wider implications could be profound. Whilst some LFA farmers may be able to adapt to changing economic circumstances – through a focus on reducing costs and making greater use of more productive in-bye land – many others face inherent limitations to their productivity. Farms that fall entirely within SDAs (68% of the LFA) will be less able to make significant increases in productivity compared to their counterparts with lower-lying land. For those farmers, the shape of the future will be profoundly dependent on the nature and scale of public support available to farming.

5.2.3 Implications for biodiversity and the wider environment in Wales

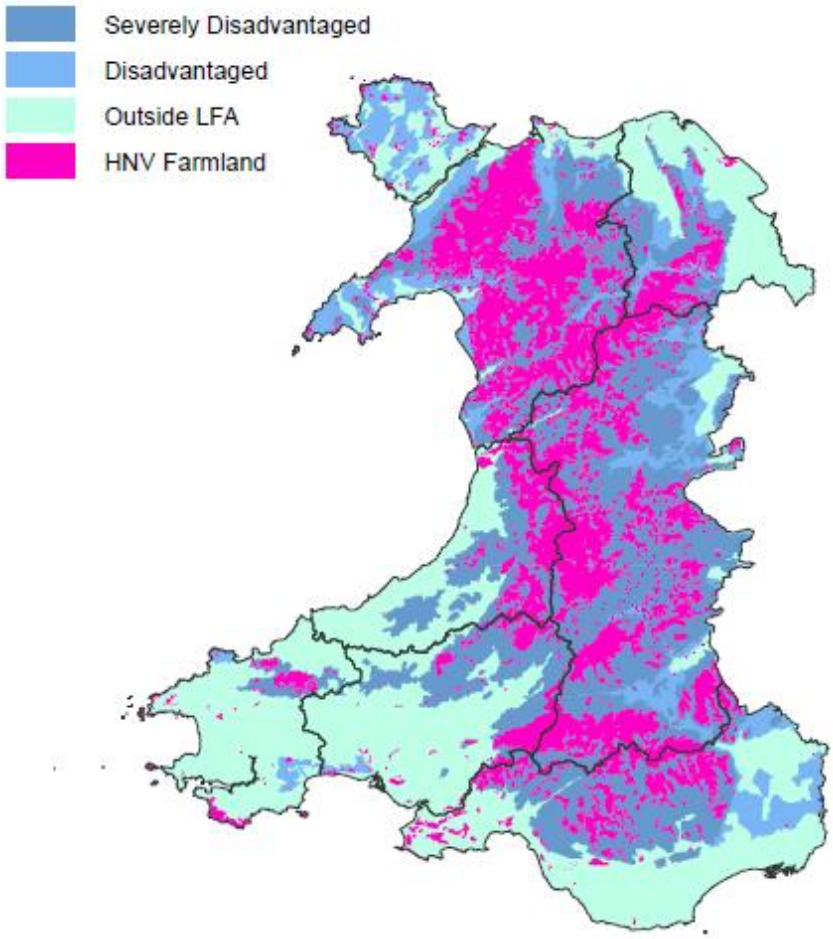
As discussed in Section 4 of this report, the variation in responses of farmers to these changes may lead to mixed environmental outcomes.

In areas with relatively large areas of lowland grazing (Carmarthenshire, Pembrokeshire and South Wales), an increased focus on productivity associated with higher stocking rates and more intensive management of some grassland areas could have negative consequences not only for biodiversity (particularly associated with species-rich grasslands), but also for soil health and water quality.

The polarisation in the responses of LFA farmers is likely to lead to a mixture of positive and negative environmental consequences. For those farms choosing to focus on improving productivity, increases in stocking density in more productive lower-lying areas and in-bye land could lead to negative impacts in terms of run-off, water quality, flood risk reduction and farmland biodiversity. In less productive areas, the environmental outcomes are likely to depend heavily on the shape of future policy.

As Figure 5-10 shows, a high proportion of the HNV farming systems in Wales are associated with marginal farming areas, typically but not exclusively within SDAs. These HNV areas often support a mixture of priority habitats including blanket bog, heather moorland, native broadleaved woodland and extensively managed open grassland habitats, see Figure 5-11.

Figure 5-10: Areas likely to support HNV Farming systems in Wales



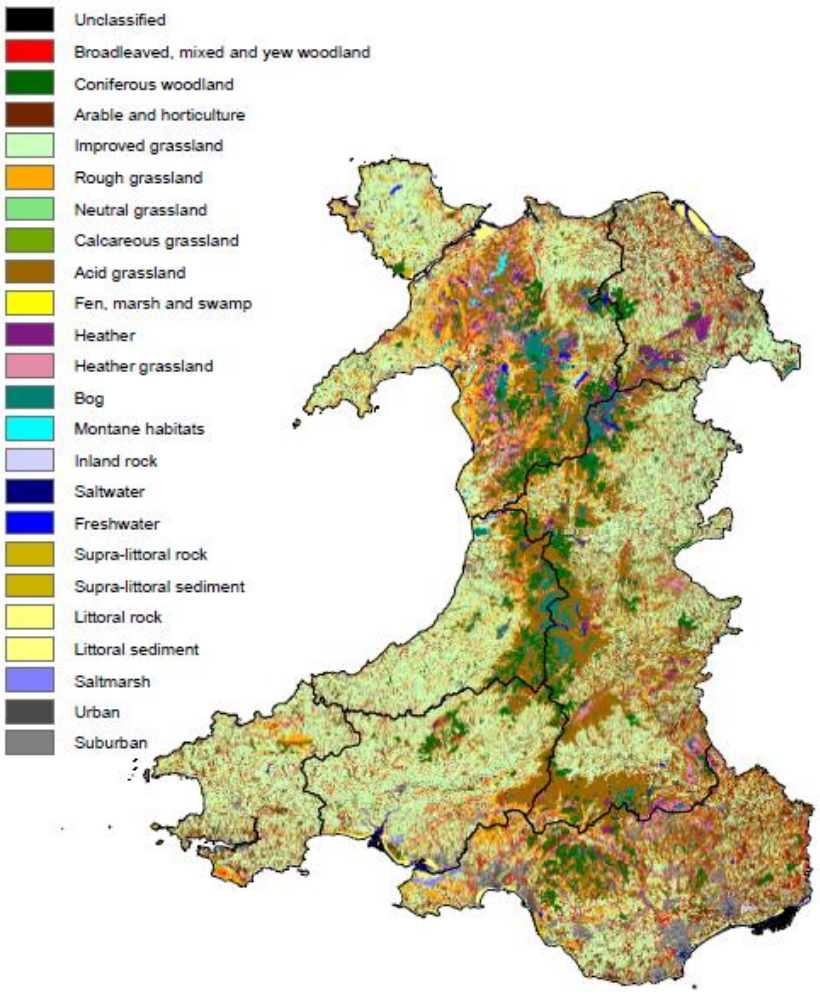
Source: European Environment Agency

Loss of grazing livestock from some of those areas could be environmentally beneficial in terms of carbon storage, water quality, and biodiversity associated with natural or near-natural habitats (including blanket bog). In some areas, a significant reduction in grazing

pressure (or even land abandonment) may allow the natural regeneration of native broadleaved woodland to take place with minimal management input. However, in some areas where the abundance and diversity of species has been dramatically reduced by generations of sheep grazing, simple land abandonment is unlikely to result in the maximisation of positive environmental outcomes, and some level of active management may be required, at least in the short- to medium-term.

On the other hand, the loss of grazing livestock from some HNV farmland habitats, in particular extensively managed priority grassland habitats, could have a negative impact on some species.

Figure 5-11: Wales Land Cover



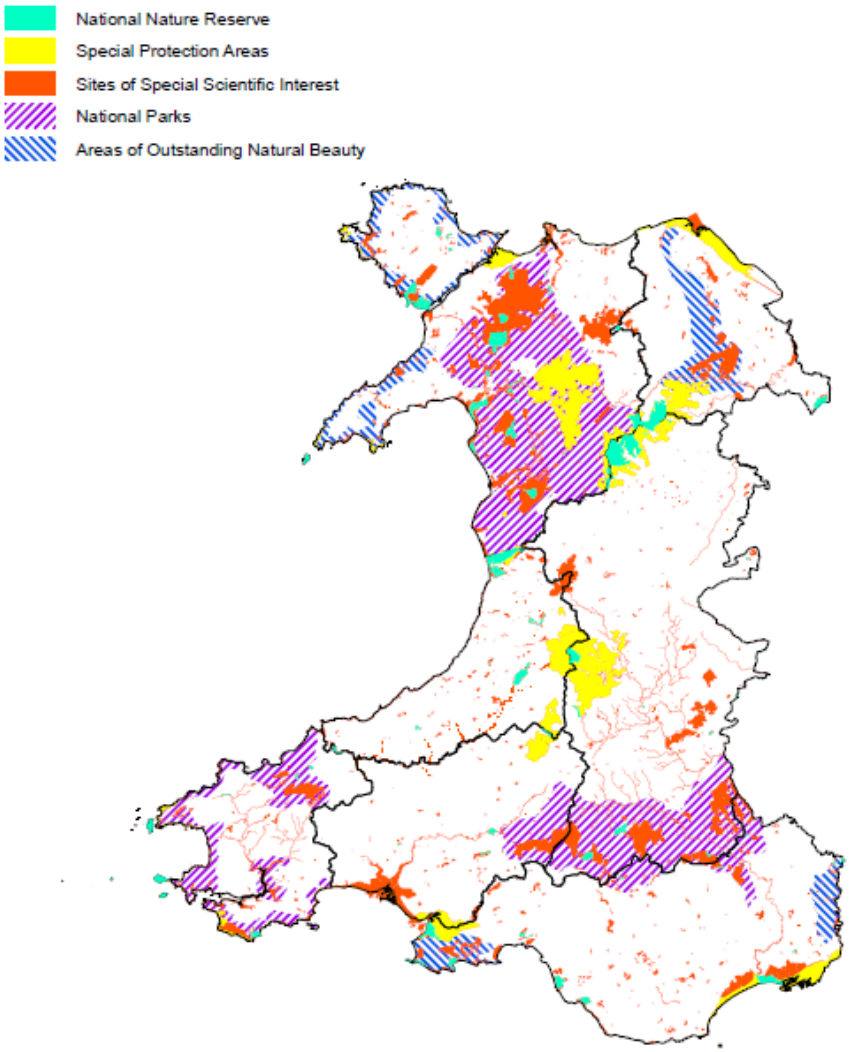
Source: CEH Land Cover Map (2007)

Some of these areas of sensitive semi-natural habitats and HNV farming systems lie within the network of Protected Areas in Wales, see Figure 5-12. A redistribution of livestock (leading to over- or under-grazing) within the uplands could have an impact on the condition of SSSIs, particularly those designated for extensively managed grassland species/habitats. Agri-environment schemes are currently the main mechanism for maintaining and enhancing these sensitive habitats (both inside and outside protected areas), and significant reductions in the funding available to support such schemes could have considerable negative consequences for biodiversity. Where these habitats are dependent on extensive agricultural

systems that are extremely vulnerable to potential economic shifts, additional financial support (relative to current agri-environment) may be required to ensure the underlying agricultural management is economically viable post-Brexit.

The need for active management – either to help kick-start and shape the restoration of natural habitats within the uplands, or to support economically marginal HNV farming systems – highlights the important role that public policy and public payments have to play in shaping the environmental outcomes of Brexit on farmland in Wales.

Figure 5-12: Protected Areas in Wales



Source: Welsh Government

Expert opinion: ***"Changes in Welsh hill farming will have to be seen in the light that (a) farming is a 'naturally cautious' industry, and (b) the self-perception of farmers is that they are producers of food, not that they are producers of environmental quality"***

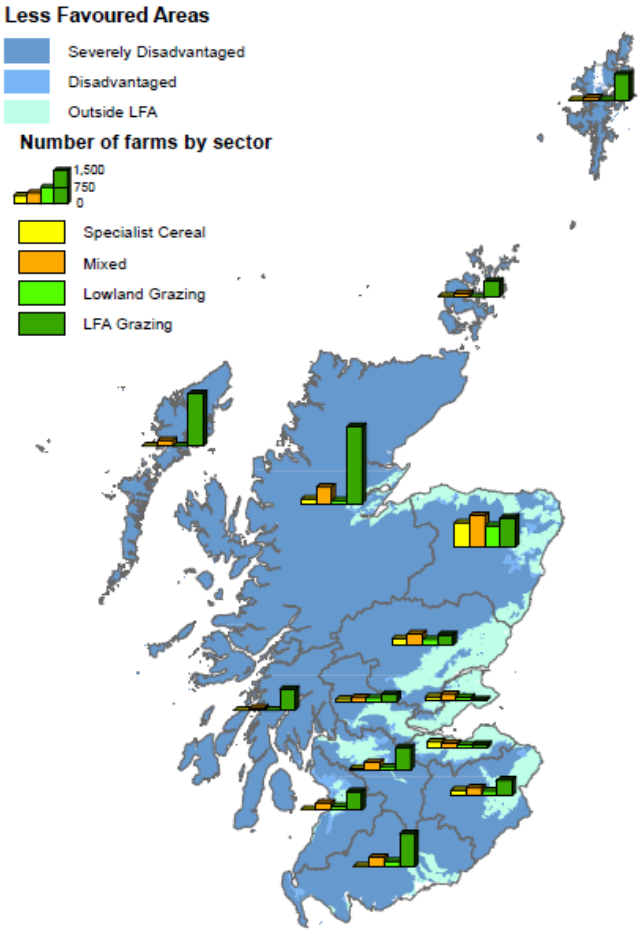
5.3 Scotland

5.3.1 Current status of farming in Scotland

With over 50,000 farms covering 5.6 million hectares (73% of the total land area; SG, 2016), Scottish agriculture plays a profound role in shaping the landscape and environment of the country. The average farm size in Scotland is 107ha – considerably larger than the UK average (80ha). Scotland is dominated by land that is classified as LFA (c.85% of the total agricultural area) and, of that, a vast majority is classified SDA, see Figure 5-13. These areas are primarily rough grassland used for cattle and sheep grazing. The average LFA farm size in Scotland is 217ha – also much larger than the UK average (113ha).

Within Scotland, there is considerable regional variation in the types and extent of agricultural land use. The majority of the relatively limited extent of arable and mixed farmland is in the eastern and north-eastern areas (Grampian, Tayside, Fife and Lothian), while other areas – including Scotland's vast uplands – are dominated by LFA cattle and sheep farms, see Figure 5-13.

Figure 5-13: Number of farms in each of the four focal sectors and extent of LFAs in each region of Scotland.

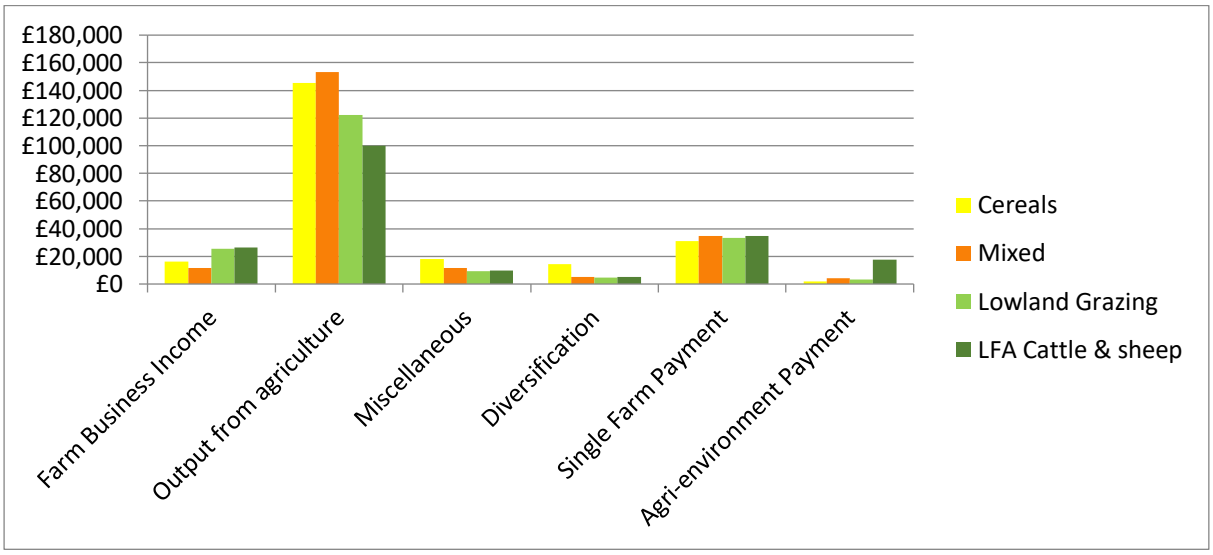


Source: SG (2016). Scale is shown in figure legend

In 2015, average FBI in Scotland ranged from £11,506 for mixed farms, to £26,185 for LFA cattle and sheep farms, see Figure 5-14. Across all sectors, farm incomes in Scotland are heavily subsidised – with support payments (direct payments plus agri-environment) on average representing 143% of FBI for lowland grazing up to 338% for mixed farming.

The average Basic Payment rate in Scotland ranges from £16.38 (Region 3) to £148.96 (Region 1) per hectare (see Table 3-2). Scotland also continues to pay coupled support payments in the beef and sheep sectors, and directly support farmers within the LFA, with payments in the range £34.12-£71.35 per hectare. Agri-environment schemes offer an average payment of £31 per hectare (lower than the UK average), and agreements cover 1.1 million hectares of farmland, with an annual cost of £35 million (see Table 3-3). In the current CAP programming period, Scotland chose to move 9.5% of its funding allocation from Pillar I (Direct Payments) to Pillar II (Rural Development, including agri-environment).

Figure 5-14 Breakdown of average FBI for four major agricultural sectors in Scotland



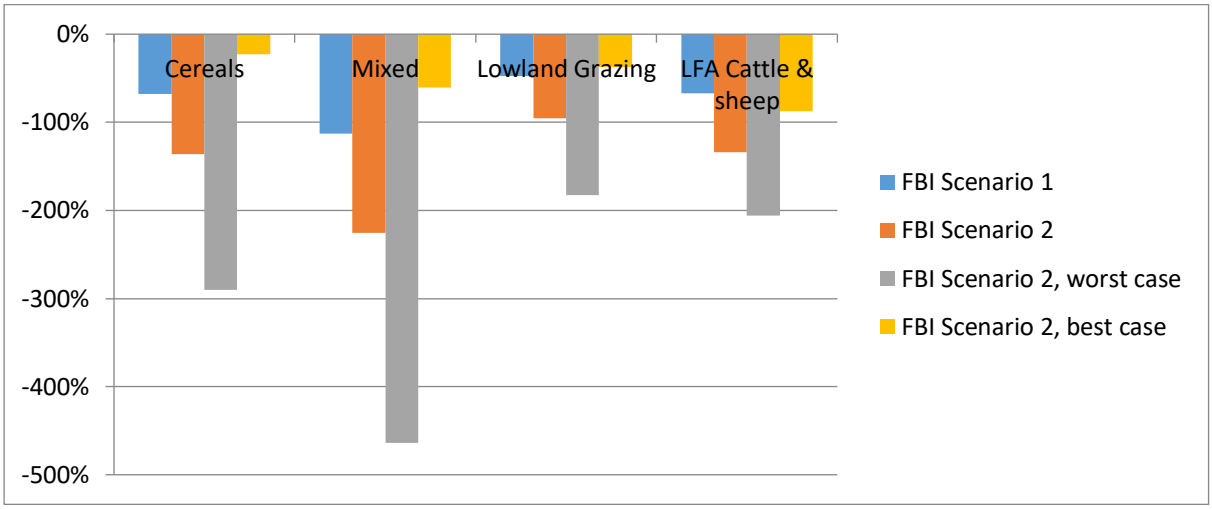
Source: SG (2016) Farm Business Survey and own analysis.

5.3.2 Impact of Brexit on farm incomes and management in Scotland

Average FBI in Scotland is predicted to decline for almost all sectors relative to 2015 across all of the Brexit scenarios assessed, see Figure 5-15.

For mixed farms and LFA cattle and sheep farms, average FBI is predicted to fall by more than 50% across all scenarios, and become loss-making under several scenarios. These modelled predictions are driven by the fact that dependence on support payments is high for both of these sectors. Whilst some farmers in these sectors will obviously achieve higher-than-average incomes, this could be expected to present a significant challenge to both sectors.

Figure 5-15: Percentage change in average FBI in Scotland (relative to 2015) based on four potential Brexit scenarios.



Source: Own analysis based on SG (2016) Farm Business Survey

These changes in FBI could result in significant shifts in farm management, particularly in some regions of Scotland. For cereal and mixed farms (more dominant in eastern and north-eastern regions), experts predict that a fall in FBI could lead to higher-performing farms focussing on reducing costs, maximising resource-use efficiency, and increasing productivity. Depending on the availability of agri-environment support, areas that are currently out of production (field margins and corners etc.) may be brought back in to production, leading to a loss of important habitats for farmland wildlife. Experts interviewed for this report also predict an increase in land rental by large, more efficient farms (benefitting from smaller or less economically efficient businesses stepping back from farming), alongside an increase in contract farming operations. At the same time, and particularly if input prices increase (as under Scenario 2), farmers may look to reduce costs by expanding mixed farming operations (recycling manure and nutrients etc. to improve soil quality). Alternatively, some mixed farms may focus on other business strategies including developing added-value products (often with shorter supply chains), diversifying their income (either through engagement with agri-environment, or through non-agricultural income streams), and/or switching to part-time farming.

For LFA cattle and sheep farms – representing 28% of Scottish farms (including sectors not assessed in this report) – Brexit could have a significant impact on farm incomes and management, and in areas dominated by this type of farming (western Scotland, the highlands and islands), the wider implications could be profound. Whilst some LFA farmers may be able to adapt to these changing economic circumstances – through a focus on reducing costs and making use of more productive in-bye land – many others face inherent limitations to their potential productivity. Those farms that fall entirely within SDAs (the vast majority of LFA in Scotland) will be less able to make significant increases in productivity compared to their counterparts with land in lower-lying areas. For those farmers, the shape of the future will be profoundly dependent on the nature and scale of public support available to farming but a significant reduction in stocking rates on less productive land is likely.

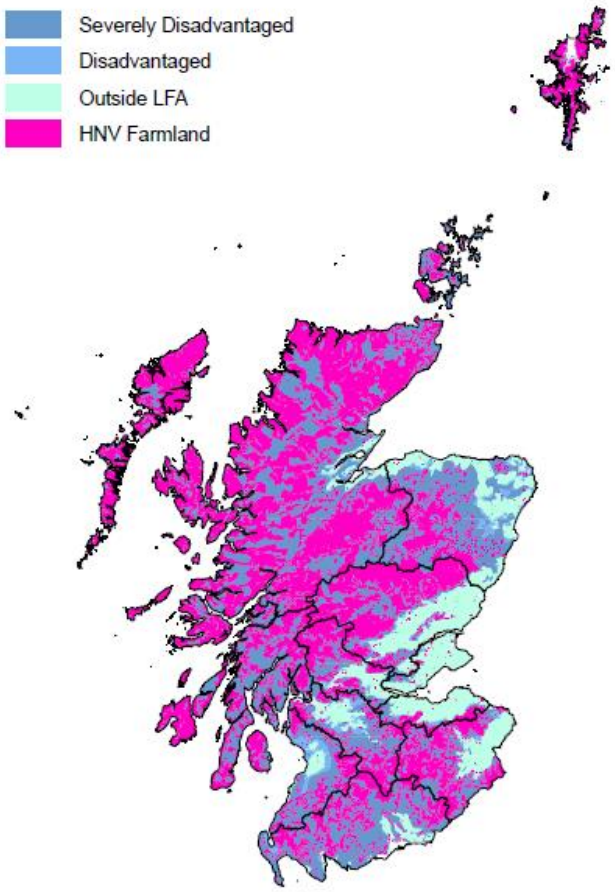
5.3.3 Implications for biodiversity and the wider environment in Scotland

As discussed in Section 4 of this report, the environmental impacts of these modelled changes to farm incomes and management are likely to be mixed.

In areas with a relatively high proportion of arable farmland (the east and north east), improvements in resource-use efficiency and a link-up with livestock enterprises could have significant benefits, particularly in terms of soil health and water quality. These benefits could be countered, however, by a renewed focus on increased productivity, leading to the potential loss of some important farmland habitats (field margins and corners, buffers etc.), and farmers choosing to 'play it safe' in terms of inputs.

In areas that are dominated by LFA cattle and sheep farming, the environmental outcomes are likely to be mixed. For those farms choosing to focus on improving production, an increase in stocking density in more productive lower-lying areas and in-bye land, this could lead to negative impacts in terms of run-off, water quality, flood risk reduction and farmland biodiversity. In less productive areas, and perhaps more than for any other sector, the outcomes are likely to depend heavily on the shape of future public policy.

Figure 5-16: Areas likely to support HNV Farming systems in Scotland

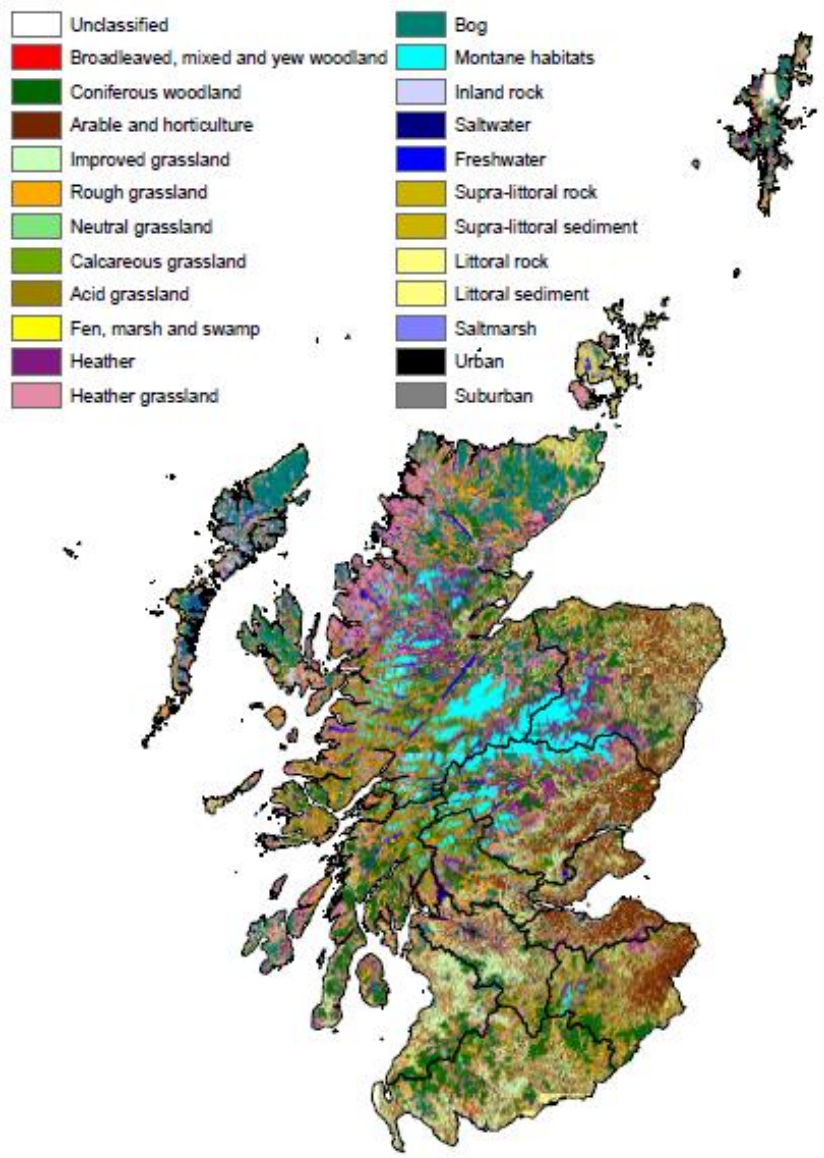


Source: European Environment Agency

As Figure 5-16 illustrates, a majority of Scotland's HNV farming systems are associated with marginal farming systems within SDAs. These HNV areas often support a mixture of priority habitat including blanket bog, heather moorland, and extensively managed open grassland

habitats, see Figure 5-17. Some of these habitats are dependent on continued agricultural management to maintain their biodiversity value.

Figure 5-17: Scotland Land Cover



Source: CEH Land Cover Map (2007)

Loss of grazing livestock from some of those areas could be environmentally beneficial in terms of carbon storage, water quality, and biodiversity associated with natural or near-natural habitats (including blanket bog). In some areas, a significant reduction of grazing pressure (or even land abandonment) may allow the natural regeneration of woodland to take place with minimal management input. More land may become available for commercial forestry; any impacts on biodiversity will be variable depending on the tree species chosen, planting design and the location. Loss of open ground habitat could be problematic for some already declining species such as curlew and lapwing.

In other areas, for example significantly degraded areas that would naturally support blanket bog, land abandonment alone is unlikely to result in beneficial environmental outcomes

being maximised. Some level of capital investment and active management may be required, at least initially.

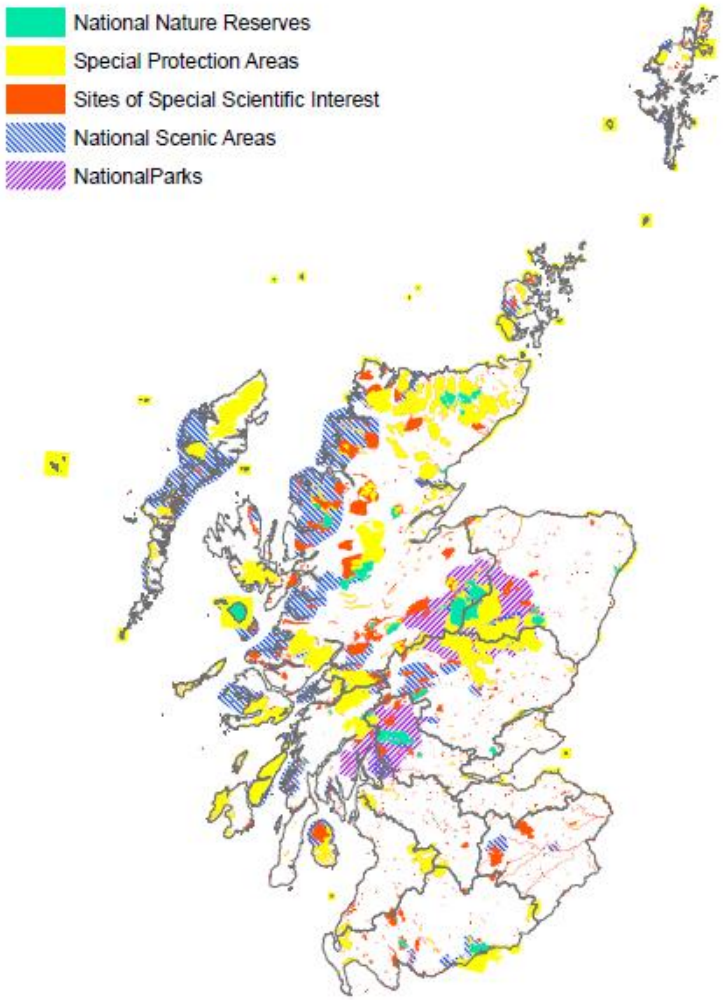
Expert opinion: ***"For a short period, abandonment could be beneficial. However eventually it would become rank/overgrown or planted with forestry. This would result in a reduction in species diversity and populations"***

Additionally, if grazing is removed from some HNV farmland habitats, including some areas of extensively managed grassland, and management practices change, this could have a negative impact on some species dependent on open, semi-natural habitats e.g. corncrake and breeding waders.

Some of these areas of sensitive semi-natural habitats and HNV farming systems lie within protected areas, see Figure 5-18. A redistribution of livestock (leading to over- or under-grazing) within the uplands could have an impact on the condition of SSSIs, particularly those designated for extensively managed grassland species/habitats. Agri-environment schemes are currently the primary mechanism for maintaining and enhancing these sensitive habitats, and significant reductions in the funding available to support such schemes could have considerable negative consequences. Where these habitats are dependent on extensive agricultural systems that are extremely vulnerable to potential economic shifts, additional financial support (relative to current agri-environment) may be required to ensure the underlying farming system is economically viable.

The need for active management – either to help seed and steer successful habitat restoration, or to support economically marginal HNV farming systems – highlights the important role of public policy and public payments in shaping the environmental outcomes of Brexit on farmland in Scotland.

Figure 5-18: Protected Areas in Scotland



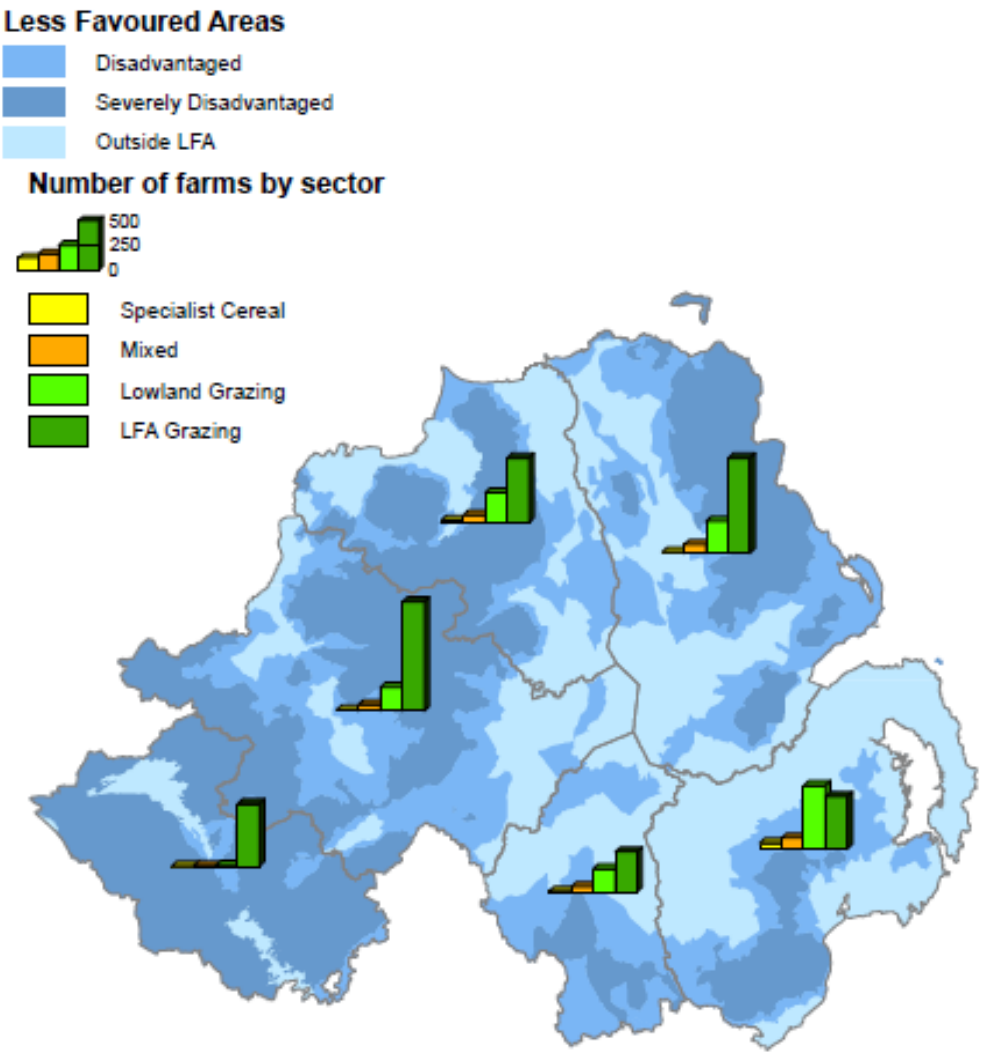
Source: Scottish Government

5.4 Northern Ireland

5.4.1 Current status of farming in Northern Ireland

There are c. 25,000 farm holdings in Northern Ireland (DAERA, 2015; includes sectors not covered in this report), covering around a million hectares of farmland. At 40ha, the average farm size in Northern Ireland is roughly half the overall UK average. Beef, sheep and dairy are the largest agricultural sectors, with relatively smaller areas of land under cereal and mixed farming, see Figure 5-19. Roughly 70% of farmland in Northern Ireland falls within LFAs, and LFA cattle and sheep grazing is the dominant sector in five of Northern Ireland's six counties – the exception being County Down, where lowland livestock grazing represents marginally more farms.

Figure 5-19: Number of farms in each of the four focal sectors and extent of LFAs in each region of Northern Ireland

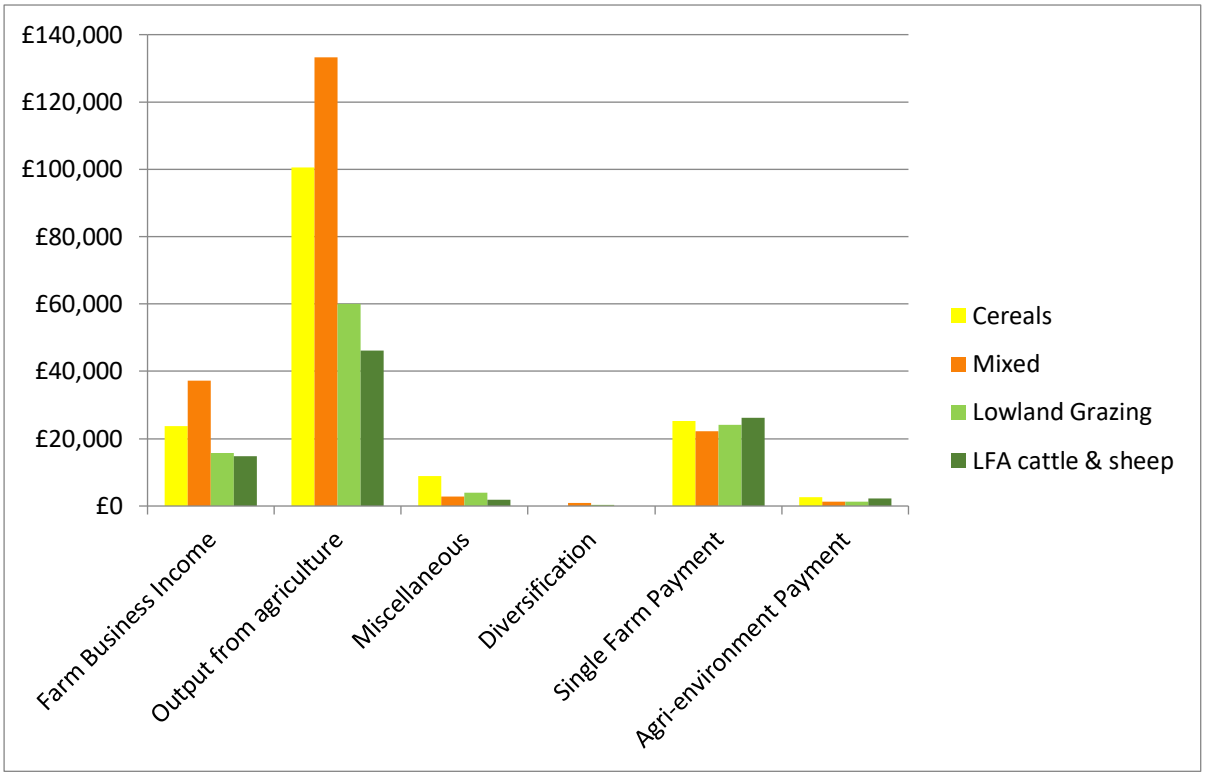


Source: DAERA (2015) and own analysis. Scale is shown in figure legend

In 2015, average FBI in Northern Ireland ranged from £14,745 for LFA cattle and sheep farms to £37,138 for mixed farms, see Figure 5-20. The proportion of average FBI made up of support payments (direct payments plus agri-environment) ranges from 64% for mixed farms to 193% for LFA cattle and sheep farms.

The average Basic Payment rate in Northern Ireland is £241.63 per hectare, higher than the UK average. Northern Ireland also continues to directly support farmers within the LFA, with payments in the range £42.35-£56.47 per hectare (see Table 3-2). Agri-environment schemes offer an average payment of £85 per hectare (again, higher than the UK average; see Table 3-3). AES agreements cover 305,000 hectares of farmland, with an annual cost of £26 million. In the current CAP programming period, Northern Ireland chose not to move any of its funding allocation from Pillar I (Direct Payments) to Pillar II (Rural Development, including agri-environment) following a legal dispute between Ministers.

Figure 5-20: Breakdown of average FBI for four major agricultural sectors in Northern Ireland



Source: DAERA (2015) Farm Business Survey and own analysis.

5.4.2 Impact of Brexit on farm incomes and management in Northern Ireland

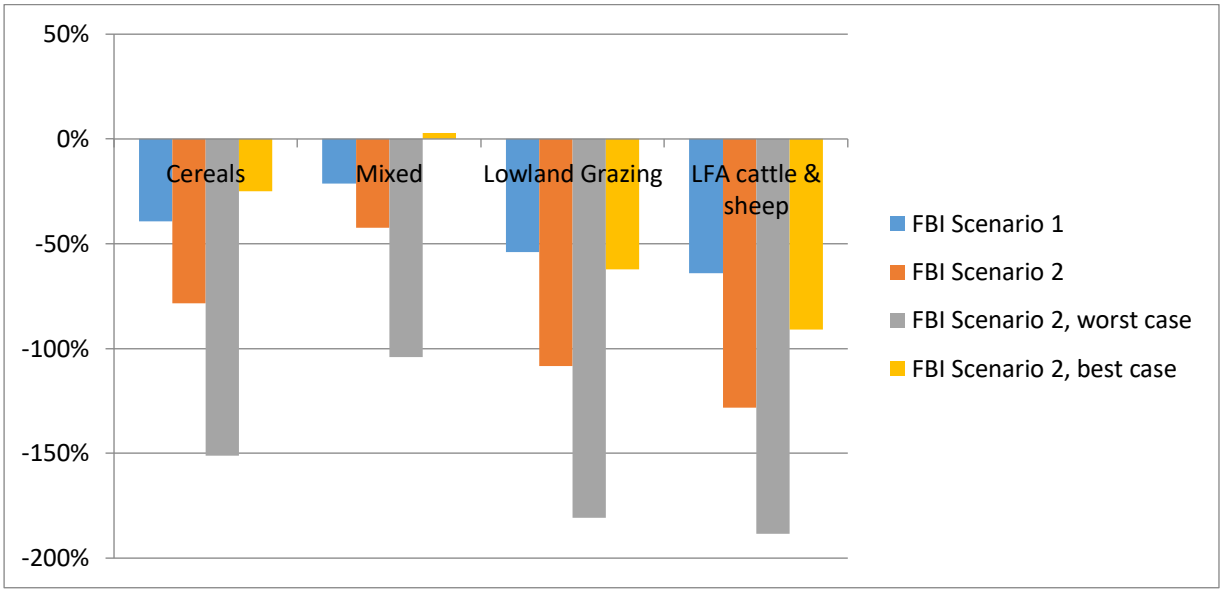
Expert opinion: "*Subsidies is the big thing and will be the deciding factor in terms of how farms will be changed*"

Average FBI in Northern Ireland is predicted to decline for almost all sectors relative to 2015 across all of the Brexit scenarios assessed, see Figure 5-21. The only exception is mixed farming which shows greater resilience than other sectors in Northern Ireland, linked to a lower dependence on public support. Under a 'best case' WTO scenario, average FBI for this sector is predicted to increase by 3%.

For lowland grazing and LFA cattle and sheep, the average FBI is predicted to fall by more than 50% across all scenarios. Whilst some farmers in these sectors will obviously achieve above-average incomes, these challenging results and the prevalence of these two sectors in Northern Ireland would suggest these changes could have a significant and widespread impact.

The potential impacts of Brexit for farmers and farmland wildlife

Figure 5-21 Percentage change in average FBI in Northern Ireland (relative to 2015) based on four potential Brexit scenarios.



Source: Own analysis based on DAERA (2016) Farm Business Survey

These changes in FBI could result in shifts in farm management in Northern Ireland. Many dairy farms are likely to focus on increasing productivity and efficiency, potentially leading to more grassland being intensively managed. Likewise, many lowland beef and sheep farms are expected to respond by becoming more production-oriented, with a divergence in the response of sheep farmers between those focussing on the global market (characterised by high sheep numbers, single genetic strains etc.) and those specialising in added-value products, primarily for the UK market (focussed on provenance, native breeds, short supply chains etc.).

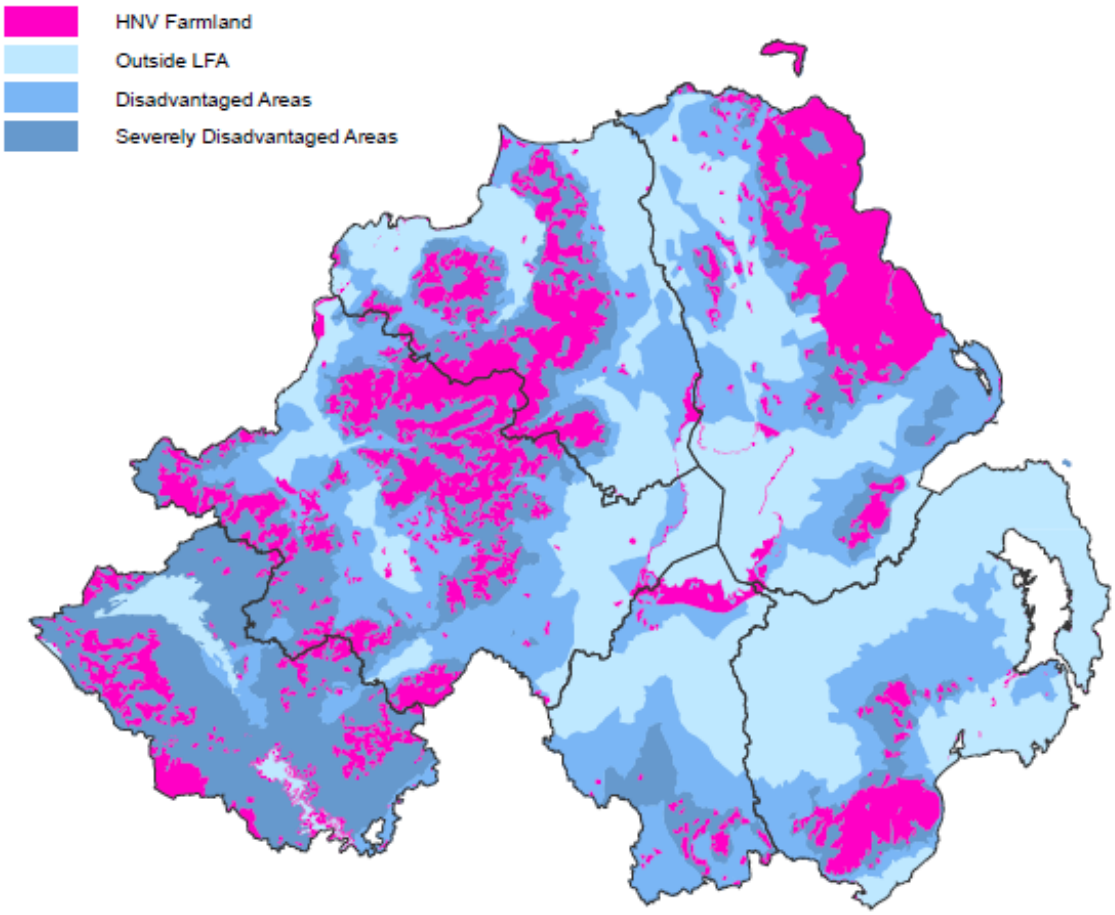
In areas with a relatively high number of lowland grazing farms (e.g. County Down), the consequences for the environment are likely to be mixed. On the one hand, a focus on cost reduction could lead to more efficient use of inputs, and some lowland grazing areas could become more part-time as farming households diversify their income. On the other hand, increased stocking densities in some areas could lead to a range of associated environmental problems, particularly for water quality and biodiversity associated with sensitive semi-natural habitats.

For LFA cattle and sheep farms – representing 58% of all Northern Irish farms - the implications of Brexit could be profound. Whilst some LFA farmers may be able to adapt to the changing economic conditions – focusing on reducing costs and greater utilisation of more productive in-bye land – many others face inherent limitations to their potential productivity; those farms that fall entirely within SDAs will be less able to make significant increases in productivity compared to their counterparts with land in lower-lying areas. For those farmers, the shape of the future will be profoundly dependent on the nature and scale of public support available to farming. In areas like Fermanagh, where agriculture is dominated by cattle and sheep farming within the SDA, this could have a dramatic, transformative impact on farming, and the areas deep rooted cultural link to the farmed environment.

5.4.3 Implications for biodiversity and the wider environment in Northern Ireland

As highlighted in Section 4 of this report, the environmental impacts of these potential changes to farm incomes and management are likely to be mixed: improved resource use efficiency, reduction in livestock densities in less productive areas and diversification could bring benefits to soil, water and biodiversity; whilst an increased focus on productivity, higher stocking densities in some areas, and the potential loss of some semi-natural habitats could do significant harm. In areas with a relatively high proportion of lowland grazing livestock (including County Down), the potential impacts of increasing stocking densities on water quality could be quite significant. However, in no sector are there likely to be more profound environmental implications than LFA cattle and sheep farming – particularly in those areas of Northern Ireland where this land use is most dominant (Fermanagh, Tyrone, Londonderry and Antrim).

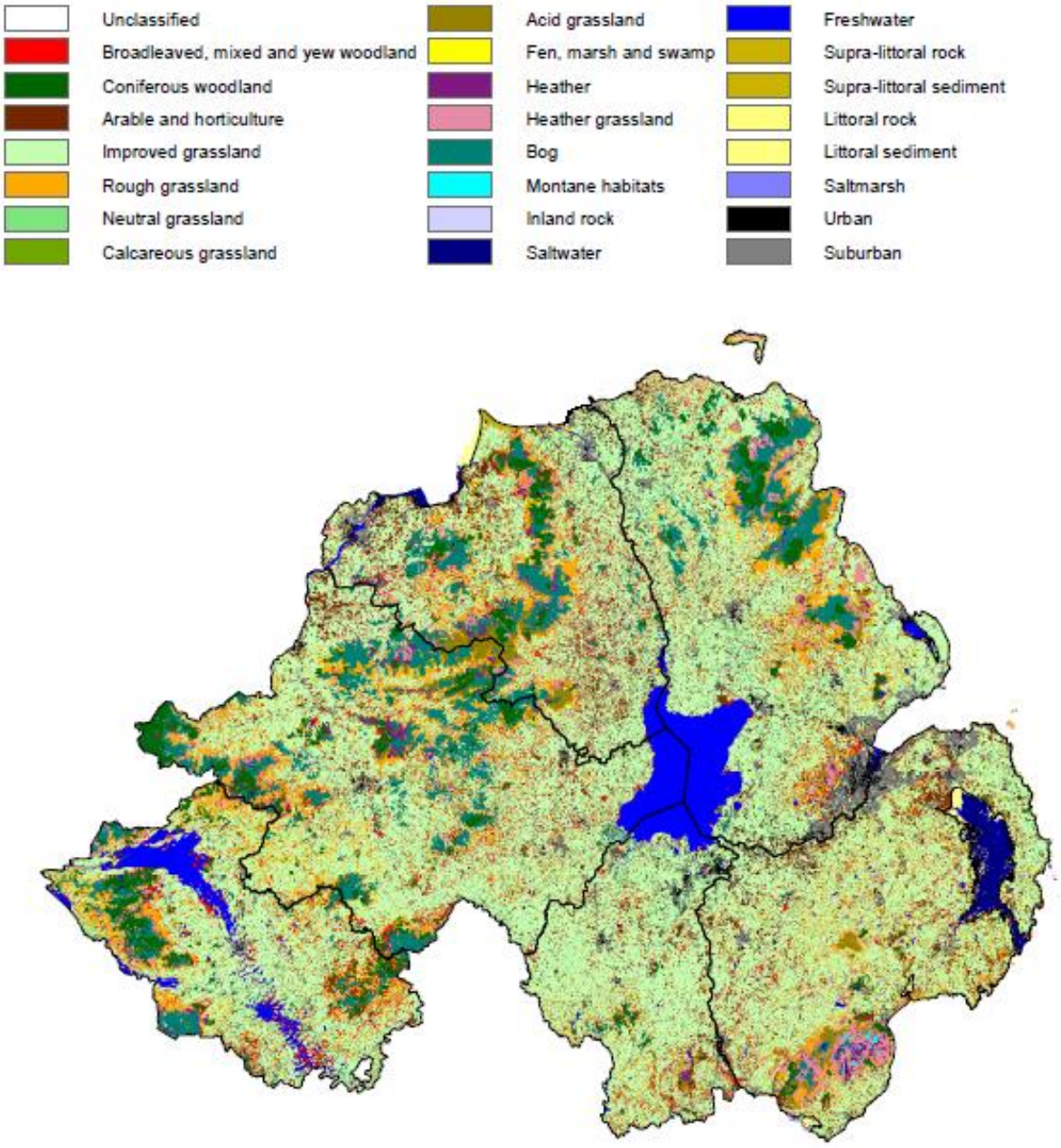
Figure 5-22: Areas likely to support HNV Farming systems in Northern Ireland



Source: European Environment Agency

As Figure 5-22 illustrates, many of Northern Ireland's HNV farming systems fall within LFAs, and are often limited to economically marginal farmland within the SDA. These HNV areas often support a mixture of priority habitats including blanket bog, heather moorland, and extensively managed rough grassland, see Figure 5-23. Some of these habitats are dependent on continued agricultural management to maintain their biodiversity value. However, not all LFAs are likely to support HNV farmland habitats – considerable areas are dominated by lower quality rough grazing and improved grassland.

Figure 5-23: Northern Ireland Land Cover



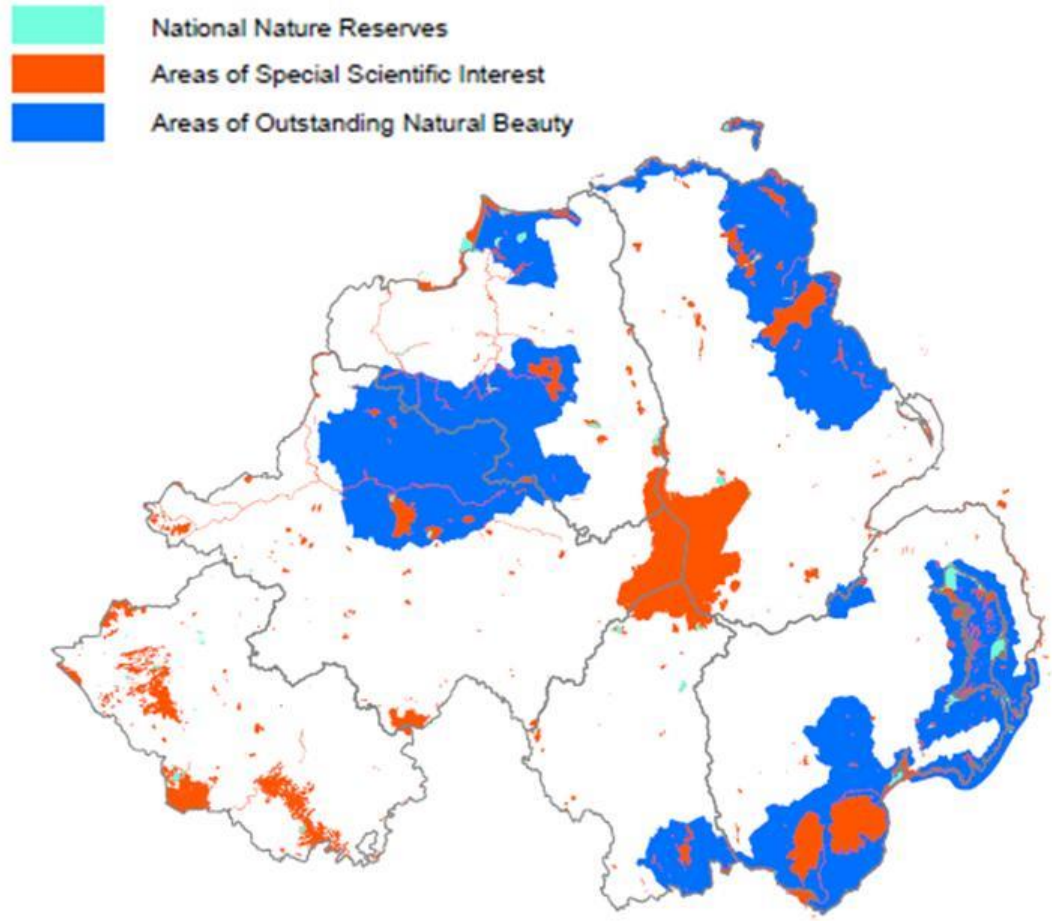
Source: CEH Land Cover Map 2007

Loss of grazing livestock from some of those areas could be environmentally beneficial in terms of carbon storage, water quality, and biodiversity associated with natural or near-natural habitats (including blanket bog). On the other hand, if grazing is removed from some

HNV farmland habitats, including some areas of rough grassland, this could have a negative impact on some species dependent on open, semi-natural habitats e.g. curlew.

Although some of these areas of sensitive semi-natural habitats and HNV farming systems lie within protected areas, see Figure 5-24, a considerable proportion fall within the wider countryside and so are afforded less protection. Agri-environment schemes are currently the primary mechanism for maintaining and enhancing these sensitive habitats, and significant reductions in the funding available to support such schemes could have considerable negative consequences. However, in the case of some HNV farmland habitats that are dependent on the continuation of some form of agriculture, significant reductions in direct payments (without an increase in AES spend) would pose an equal challenge. The extent (and nature) of all agricultural support available to Northern Ireland farmers in future will therefore have a vital role to play in shaping it's farmland and environment following Brexit.

Figure 5-24: Protected Areas in Northern Ireland



6 Conclusions

6.1 Key findings and challenges

6.1.1 Uncertainty in the short and medium-long term

Brexit is creating considerable uncertainty in the farming sector in the UK. This applies to the short term – the two-year period over which negotiations with the EU are now taking place – and the medium to long term. In the short term, some farmers are getting on and 'grabbing the bull by the horns', planning for a life with less support and different opportunities, while others are waiting until things become clearer before making any changes. Brexit is therefore already having an impact now, before the UK formally leaves the EU and before the launch of any new agricultural policies. Worryingly, there is anecdotal evidence that some are acting in an environmentally damaging way, such as breaching EU slurry-spreading rules, thinking these to be no longer relevant, and considering ploughing up species-rich grassland in anticipation of no further agri-environment scheme funding. In the medium to long term, uncertainty over future trading arrangements, policies, schemes etc. makes projections of farm business and environmental impacts extremely challenging; only indicative projections are possible. The assessment set out in this report therefore gives a sense of direction rather than an exact roadmap; the reality could be expected to be somewhere within the range of impacts set out under the two scenarios considered here.

6.1.2 Reduced Farm Business Income

Cutting public payments is likely to result in a significant reduction in average FBI for cereal, lowland and LFA grazing livestock and mixed farms, particularly under Scenario 2. There are considerable differences in impact by farm type and country; the range across the four UK countries for each farm type and scenario is shown in Table 6-1. While FBI for all four farm types would be adversely affected under Scenarios 1 and 2 (including the best and worst case under Scenario 2, with one exception[14]), there is more consistency (a narrower range), on the whole, in terms of the impacts on lowland and LFA grazing livestock farms.

Table 6-1: Reduction in average FBI by farm type and scenario

	Scenario 1	**Scenario 2**	**Scenario 2 - Best Case**	**Scenario 2 - Worst Case**
Cereals	34-68%	68-136%	16-25%	144-290%
Mixed	21-113%	42-225%	(3)-61%	104-464%
Lowland grazing livestock	29-54%	58-108%	10-62%	124-183%
LFA grazing livestock	53-67%	107-134%	54-91%	174-206%

[14] The model indicates a 3% increase in FBI for Northern Ireland mixed farms under Scenario 2 Best Case.

For three out of the four farm types, average FBI would be negative in one country under Scenario 2. However for LFA grazing livestock farms, Scenario 2 would result in negative FBI in all four countries. Scottish farm businesses would be particularly vulnerable to cuts in public payments, a reflection of the high proportion of FBI attributable to public payments in that country.

The worst case under Scenario 2 – where output prices reduce by 10% and variable costs go up by 15% – would result in average FBI being negative for all farm types across the UK. It could be expected that many farms would become uneconomic and unviable. The best case under Scenario 2 – where output prices rise more than variable costs – would turn the situation around with FBI recovering to a positive figure albeit some way short of the 2015 baseline in most cases.

While the direction of change in FBI resulting from cuts in public payments is clear, the impacts of different trading arrangements on prices, costs and ultimately income, are much more difficult to predict given the complexities, particularly under Scenario 2. Some crop enterprises could expect to benefit (e.g. high quality milling wheat) whereas other enterprises (e.g. sheep and beef) could be adversely affected, significantly so in the case of lamb. Trade liberalisation, allowing more imports of cheaper food, would put downward pressure on prices and further worsen farm incomes especially in more protected sectors such as beef. Diversification income, an important part of the mix for many farms, could be affected if there is a downturn in the economy, which might be more likely under Scenario 2.

6.1.3 A variety of responses

Farm business responses to reduced income and a changed trading and support environment are expected to be varied, as might be expected with the diversity of farms across the UK. These responses are likely to occur under both scenarios, but the extent and depth of change will greatest under Scenario 2.

Many farm businesses can be expected to seek to try to maintain profitability by improving productivity and the efficiency of production, perhaps focusing on higher value crops and livestock products and, in some cases, intensifying production. Farmers are likely to seek to cut costs, for example by getting bigger to generate economies of scale, improving efficiency in the use of inputs, sharing labour and machinery and/or using contractors more. The ability of farm businesses to increase income may be limited by global commodity prices and domestic food and farm-gate prices. Reduced payments can be expected to result in large areas of farmland with little or no support, resulting in lower rents, less investment and less labour.

Brexit can be expected to influence farm businesses in combination with existing influences and challenges such as the need to control blackgrass, improve soil quality or tackle TB, and new opportunities such as the use of big data and new technology. This could support the development of more resilient, sustainable systems in some cases.

Some farm businesses will choose an alternative path to one focused on improving productivity and production of commodities. In this sense, there could be a polarisation between production-oriented farms and other farms, although there are a number of different trajectories for other farms. These include choosing to produce for specialised markets, adding value by processing, marketing and direct sales. Some may decide to develop additional income through diversification. Others, especially in LFAs or other HNV areas, may choose to focus on delivering public goods including landscape, biodiversity, carbon

storage, water, either in response to public policy, or where new markets are developed for these. Farmers have fewer options in these areas, with less productive agricultural land and fewer opportunities to diversify income. Some may choose or be forced to reduce their farming activity, resulting in more part-time farmers reliant on external sources of income. Others can be expected to give up or retire from farming altogether. The proportion of farms in each category could be expected to vary significantly across the country, and by farm type.

6.1.4 Further restructuring

It seems likely that Brexit will bring about accelerated restructuring in UK agriculture. More efficient, higher performing farm businesses can be expected to grow in terms of land area (with a focus on the most productive land) and livestock numbers. Fewer farm businesses can be expected to account for a higher proportion of land, stock and agricultural output.

The growth of contract farming, share farming and other collaborative arrangements seems inevitable, operating alongside traditional owner-occupied and tenanted systems. Less efficient producers can be expected to give up their tenancies or farms. Those with significant borrowings would be under pressure to change more quickly.

In most cases, the land released is likely to be taken on by more efficient farmers. However, with the least productive land conversion to other land uses such as forestry and sporting uses could be anticipated, and even abandonment in the most difficult, remote areas, especially in Scotland.

As farmland prices remain relatively high but farmland rental prices are expected to fall, land ownership may become further disconnected from land management in general and farming in particular.

6.1.5 Land use and environmental management

In lowland areas, significant shifts in land use are unlikely given the relatively productive nature of the land, although there is likely to be more interaction between arable and livestock enterprises and less productive areas can be expected to revert to permanent pasture and in places tree planting.

There is much more scope for change in upland areas where farming is marginal and has been dependent on public payments for many years. More productive land (such as in-bye) can be expected to be put under greater pressure. In the hills, however, there could be a significant reduction in livestock numbers resulting in some areas being subject to more extensive grazing, some areas abandoned (agriculturally) and some areas converted to forestry. The extent of land use change will depend on the availability and targeting of funds to support agri-environmental public goods and the commercial attractiveness of forestry.

With regard to environmental management, many farmers would be loath to reduce or give up on this work, but there is a significant risk that they would be forced to, particularly under Scenario 2. Reductions in public payments would mean that whole farming systems become economically unviable, especially in the livestock sector, resulting in sub-optimal or no grazing management. Depending on the level of financial support available, conservation work to create or maintain habitats and other features may become harder to justify for individual businesses. While some landowners and farmers would continue some environmental management, as part of good stewardship and good farm practice, much of

the management undertaken to date could be expected to stop and, with increased financial pressure, go into reverse.

6.1.6 Environmental impacts

The environmental impacts of Brexit on farmland are likely to be mixed. More spring cropping, mixed farming systems, a focus on improving soil quality and more efficient use of inputs would be positive for biodiversity, water and soils. However loss of margins and field corners, and otherwise bringing more land back into productive use, would be negative due to loss of habitat and protection of hedges, ditches and watercourses. More intensive management of land could result in increased risk of pollution and loss of species-rich grasslands. Less labour to maintain and enhance hedges, ditches etc. would also be negative.

In hill and other areas, less intensive/less active management on some land could have both positive and negative impacts. There is a risk of deterioration in the quality of valuable semi-natural grazed habitats and associated species, but there may also be an opportunity for large-scale ecological restoration. The conversion of hill areas to coniferous forestry could be negative if valuable habitats are affected or lost outright. If ongoing work to restore peatland or other upland habitats was halted due to reduced funding, this would be detrimental.

It is not possible to be specific in terms of the impact on the key challenges for the farm environment referred to earlier in the report. While there could be positives, a reduction in public support and targeted effort, combined with many farmers having no choice but to increase agricultural production to recoup lost income is likely to mean an overall negative impact. This would apply particularly to biodiversity and water quality, and especially in the vicinity of more productive farmland.

Much will depend of course on the amount of support being targeted at agri-environmental measures. If this went up as a proportion of total support provided, then negative impacts could be ameliorated to an extent, and vice versa. We assume that the current baseline of cross compliance and environmental legislation and regulations are maintained ‘as is’ for the purposes of the assessment; if these were weakened then worse environmental outcomes could be expected.

6.1.7 Country differences

There are significant differences between countries, based on mix of farming, current reliance on farm support, cultural context and other matters (e.g. the Northern Ireland border).

In England, the diversity of farming systems and regional variations in land use mean that there is a wide range of challenges and opportunities associated with Brexit. The environmental implications of Brexit are likely to vary significantly from the arable east, to areas of lowland and mixed farming in the south and west, to the economically marginal upland grazing systems in the north, Welsh borders and south west.

In Wales, the prevalence of livestock farming, particularly sheep grazing within LFAs, combined with the potentially major financial implications of Brexit for the sector could have profound implications for farming, land use and the environment.

Likewise, the implications of Brexit for farming and the environment in Scotland is likely to be significant. The proportion of land classified as Severely Disadvantaged, combined with the

heavy dependence of LFA grazing livestock farmers on subsidies (including coupled support payments) could mean that shifts in funding may have huge effects. The extent to which these are positive or negative from an environmental perspective will depend on the direction of future policy.

In Northern Ireland, the impacts of Brexit may vary by region and by sector, and particularly in areas where LFA grazing systems dominate, these impacts could be quite dramatic. The ability to anticipate and prepare for the future in Northern Ireland is likely to be confounded by continued uncertainty over the border with the Republic and cross-border trade.

The scenarios modelled focus only on 'static' impacts on farm business incomes and the important subsequent role for policy to shape and steer these impacts in each country is clear. As more clarity emerges, Brexit impacts will layer in on top of country-specific circumstances, bringing certain issues to the fore in one country and not in others (e.g. family farms, Wales; land reform, forestry etc. in Scotland).

6.2 Implications for policy

A number of points can be drawn from the key findings and challenges above to inform future policy.

6.2.1 Transitional arrangements

Uncertainty over our future trading relationships with Europe (and the rest of the world), as well as future domestic policy arrangements mean that the direction and scale of the impacts of Brexit for UK farmers is still unclear, but could be very significant. A well-managed transitional period is likely to be important in minimising any potential negative impacts of Brexit for UK farming and the environment.

There is an important role for government/public policy to help set out a clear 'direction of travel' and to shape and manage that transition, to ensure that 'public benefit' is maximised.

6.2.2 Public money delivering public benefit

There is a strong case that an overarching principle for future policy should be "public money for public goods"; this is agreed by many stakeholders[15]. This principle applies across the UK, from cereal farms in East Anglia through to small livestock farms in the Outer Hebrides.

If this principle is accepted by decision makers, future financial support for farmers may shift away from area-based direct payments towards greater support for contractual agreements like existing agri-environment schemes. Such schemes can be expected to have a broad range of objectives covering biodiversity, landscape, soils, water, carbon, cultural heritage, access and other public goods.

Key success factors for such schemes, identified by the experts interviewed, include: farmer involvement and decision-making; a simple design linked to functional farming systems; an outcome-based approach; and financially attractive, prompt payments. One potential impediment to a creative approach to subsidies is the 'income foregone' principle embodied within the WTO agreements.

6.2.3 Maintaining support where it's needed

Some farming systems support semi-natural habitats that are important for wildlife. Many such HNV farms are already economically marginal, heavily dependent on current farm support and particularly vulnerable to both potential cuts in support payments and changes to future trading arrangements. These farms often have limited options for alternative income generation.

How such economically marginal farms can continue to deliver public goods post-Brexit given their vulnerability is a major challenge for public policy. If direct payments were removed from such marginal farming systems, environmental payments would need to increase from current levels to maintain economic viability and support their continued management.

Without continued support of the kind mentioned above, then there is a high likelihood that many HNV farms could go out of business with very serious consequences for the environment and for the economic and social fabric of these areas.

[15] For example, Greener UK principles, CLA document, RISE foundation report

6.2.4 Trade with the EU and the rest of the world

The potential loss of free trade with the EU is likely to result in reduced farm profitability, forcing many to adopt more intensive practices and others to go out of farming. While the environmental impacts would not all be negative, many would be.

In the event of the liberalisation of trade with non-EU countries, output prices and farm profitability could potentially be expected to reduce further. This would particularly affect grazing livestock farms, with Wales and Scotland especially impacted given the concentration of grazing livestock farms in these countries, and could exacerbate the challenge of maintaining HNV farming systems dependent on economically marginal grazing systems.

6.2.5 Building on existing trends

Many farmers are already making changes to their businesses with a view to enhancing their long term sustainability and resilience, both in economic and environmental terms. There is a potential role for public policy to ensure that such positive changes continue and gain momentum through any transitional period, and in the long term post-Brexit. This could include:

- Maintaining support for environmentally-beneficial management. The report highlights that if the economics of farming become more challenging, there is a risk that important farmland habitats may be lost. This risk may be reduced by a clear signal of long-term support from government for environmentally beneficial management.
- Building on existing trends in sustainable agronomy. Many farmers are already taking action to improve their soils, control blackgrass through diverse crop rotations, use inputs more smartly, plant trees for livestock etc. These activities deliver multiple benefits in terms of enhancing the long-term productivity and resilience of farmland as well as improving environmental sustainability. Although it is unlikely that Brexit will reverse such shifts where they have already started, there is a potential role for government to support and embed such management more widely, particularly through advice and knowledge-exchange.
- Developing more sustainable business models for farms. Within each sector assessed in this report, there is enormous variation between high- and low-economic performers. Research into farm business models which deliver financially and environmentally, alongside business planning advice for farmers, could help to reduce the economic and environmental impacts of Brexit.
- Providing skills training. This would help farmers, farm workers and contractors adapt to a new policy, trading and regulatory environment and deliver more public goods as part of, or alongside, their normal farming activities.
- Encouraging and integrating Payment for Ecosystem Services (PES) schemes. The cost of delivering certain public goods such as clean water and water storage could be shared between the public and private sectors.

6.2.6 Maintaining regulatory standards

Regulatory standards play a vital role in safeguarding the farmed environment. Under Scenario 2, with a more free market approach and potential reduction in agri-environmental scheme participation, there is a significantly higher probability of a ‘perfect storm’ including

more intensive agriculture, loss of important semi-natural habitats within the farmed landscape, less effective cross compliance, fewer regulations and a reduction in regulatory enforcement. Environmental and other standards could also be threatened by trade liberalisation.

It is acknowledged that the regulation and enforcement regime could be more streamlined and less bureaucratic than it is now. However the important environmental protection and enhancement role currently played by cross compliance and EU regulations, designations and projects would ideally continue.

6.2.7 Establishing a common framework for UK agricultural policies

There is a strong case for a common framework for UK agricultural policies, which will require co-operation between the UK Government and devolved administrations. This links to international trade agreements and international environmental agreements/obligations (Convention on Biological Diversity, Ramsar Convention on Wetlands etc.). It could also create an 'even playing field' across the UK, driving high environmental standards. It is recognised however that a common framework would need to be carefully designed both politically and practically, in order for policy to be able to address local needs and priorities.

6.3 Concluding remarks

70% of the UK is farmed and agriculture plays an important role in shaping the landscape and our environment. However, this report highlights that many UK farms may be vulnerable to economic shifts resulting from Brexit.

The report shows that some farming systems are inherently more vulnerable, and less able to adapt, than others. This may be particularly true of economically marginal livestock farming systems in upland and other areas facing natural constraints.

These economic changes could drive shifts in farm structure, land management and land use across all sectors. The scale and direction of these changes is likely to vary between and within sectors, and could have mixed consequences for the environment.

This highlights the vital role for public policy to shape the future of UK agriculture as we leave the EU, to support farmers and land managers to make this transition in a way that maximises the environmental benefits and minimises the environmental risks.

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Appendix 3 – Survey of expert opinion – participants

	Name	Organisation	Country Focus	Sector Focus
1	David Swales	Agricultural and Horticultural Development Board	UK	All
2	Carol Davis	Agricultural and Horticultural Development Board	UK/E	Beef
3	Chris Gooderham	Agricultural and Horticultural Development Board	UK/E	Dairy
4	Mike Seville	Country Land & Business Association	E&W	Forestry
5	Julia Aglionby	Federation for Common Land	E, S & W	Upland & environment
6	Dr. Alistair Leake	Game and Wildlife Conservation Trust	E	Arable & environment
7	Patrick McGurn	Independent	NI	Lowland, upland & environment
8	Prof. Peter Midmore	Aberystwyth University	W	Beef & sheep
9	Phil Stocker	National Sheep Association	UK	Sheep
10	Trystan Edwards	National Trust	W	Upland & environment
11	Prof. Davy McCracken	SRUC	S	Beef & sheep
12	Ben Lang	University of Cambridge	E	Arable
13	Ruth Barden & Tim Stephens	Wessex Water	E	Water

Appendix 4 – Commodity trade context

Table A4-1 summarises information on UK agricultural exports and imports derived from AHDB's Horizon Market Intelligence Report on UK trade in agricultural products (Howarth & Baker, 2016).

Table A4-1: UK exports and imports of agricultural commodities, 2015/16

Cereals and oilseeds

Wheat and barley

Exports: wheat 2.8m tonnes; barley 1.99 m tonnes; total wheat and barley = 4.79m tonnes (19% of production). This fluctuates from season to season due mainly to availability, price competitiveness and quality; exports accounted for 1.2 m tonnes (c.6% of production) in 2012/13. 80% of wheat and 66% of barley exported to the EU. This is mainly biscuit and feed wheat, and malting and feed barley.

Imports: total wheat and barley = 1.8m tonnes in 2015/16 (c. 11% of UK wheat demand on average over past ten years, although this varies from 7-20%). This is mainly high quality milling wheat from Germany, Canada and France.

Oilseeds

Exports: oilseed rape 443,000 tonnes in 2015/16; 94% to the EU (especially for biofuels).

Imports: limited

Other

Significant imports of maize (mainly from the EU) and soya (mainly from non-EU countries)

Beef

Exports: 100-120,000 tonnes (15-17% of production). Beef and veal exports only resumed in 2006 following BSE-related ban. Over 90% of exports went to EU. Processing capacity limited in UK, so some carcases exported and then returned after processing. Increasingly cuts are also being exported.

Imports: 250,000 tonnes (35% of UK demand); 90% of imports are from other EU countries, mainly Ireland. Imports are mainly fresh, boneless cuts.

Sheep meat

Exports: 90-100,000 tonnes (around 33% of production). Sheep meat exports have been recovering since the 2001 Foot and Mouth Disease outbreak. Over 95% of exports went to EU, mainly to France and Germany. Exports are both carcases and cuts.

Imports: 100,000 tonnes (around 33% of UK demand). Over 70% of imports are from New Zealand with a further 15% from Australia and around 10% from the EU. Imports are mainly frozen and fresh bone-in cuts.

Dairy

Exports: £1.1 billion, with nearly £800m to other EU countries and £300m to non-EU countries. Around 90% of UK dairy exports by volume go to EU countries. Exports fluctuate with domestic milk production, i.e. surplus milk. Exports to EU countries include milk and cream (with most liquid milk trade being across the Irish border), UHT milk, and cheese. Exports to non-EU countries are mainly powders and cheese

Imports: 99% from the EU, especially from Ireland. Imports include cheese, butter, dairy spreads, buttermilk and yoghurts.

Overall, the UK is around 75% self-sufficient in butter and 55% for cheese. However, with some home production exported, around half of butter and over 60% of cheese consumed on the UK market is imported. In contrast, the UK is a net exporter of milk powders.

EU import tariff rates and tariff rate quotas are also relevant. In the event that no free trade agreement is reached between the UK and the EU, and trade is conducted under WTO rules, then UK exporters to the EU could face import tariffs, effectively reducing the net price received by producers. A few key tariffs are outlined in Table A4-2 below. These equate to the WTO's Most Favoured Nation (MFN) rates.

Table A4-2: Selected EU import tariffs

Commodity	**€/tonne**	**Effective ad valorem rate (2015 prices)**
Wheat (excl. seed)	€95	53%
Barley (excl. seed)	€95	53%
Milk (fat content 3-6%)	€218	74%
Cheese	€1,671	42%
Lamb (fresh/chilled carcases)	12.8% + €1,713	46%
Beef (fresh/chilled carcases)	12.8% + €1,768	84%

Alongside import tariffs, certain commodities are subject to tariff rate quotas (TRQ) which allow certain quantities to be imported into the EU at low or no tariffs (e.g. up to 200,000 tonnes of lamb from New Zealand). There is a question over the extent to which the UK will inherit such TRQs from the EU or put in place its own TRQs as part of future trading arrangements. An increase in commodities able to be imported to the UK at low or no tariffs could increase competition for UK producers and lower prices.

Glossary

AD	Anaerobic Digestion
AES	Agri-environment scheme
ANC	Area of Natural Constraint
ASSI	Area of Special Scientific Interest
BPS	Basic Payment Scheme
BSE	Bovine spongiform encephalopathy
CAP	Common Agricultural Policy
CS	Countryside Stewardship
CSF	Catchment Sensitive Farming
DEFRA	Department for Environment, Food and Rural Affairs
DAERA	Department of Agriculture, Environment and Rural Affairs
EC	European Commission
EID	Electronic Identification
ELS	Entry Level Stewardship
ESU	European Size Unit
EU	European Union
FBI	Farm Business Income
FBS	Farm Business Survey
FERA	Food and Environment Research Agency
FTA	Free Trade Agreement
HMT	Her Majesty's Treasury
HNV	High Nature Value
IBERS	Institute of Biological, Environmental & Rural Sciences
LEAF	Linking Environment and Farming
LFA	Less Favoured Area
MFN	Most Favoured Nation
NNR	National Nature Reserve
PDO	Protected Designation of Origin
PES	Payment for Ecosystem Services
PGI	Protected Geographic Indication
RBR	Rural Business Research
RDP	Rural Development Programme
RSPB	Royal Society for Protection of Birds
SAC	Special Area of Conservation
SDA	Severely Disadvantaged Area
SFP	Single Farm Payment
SG	Scottish Government
SLR	Standard Labour Requirement
SSSI	Site of Special Scientific Interest
TIFF	Total Income from Farming
TRQ	Tariff Rate Quota
TSG	Traditional Speciality Guaranteed
UAA	Utilised agricultural area
UHT	Ultra-high temperature processing
UK	United Kingdom
WG	Welsh Government
WTO	World Trade Organisation