

Contributions of UK Agriculture

FINAL REPORT

February 2017

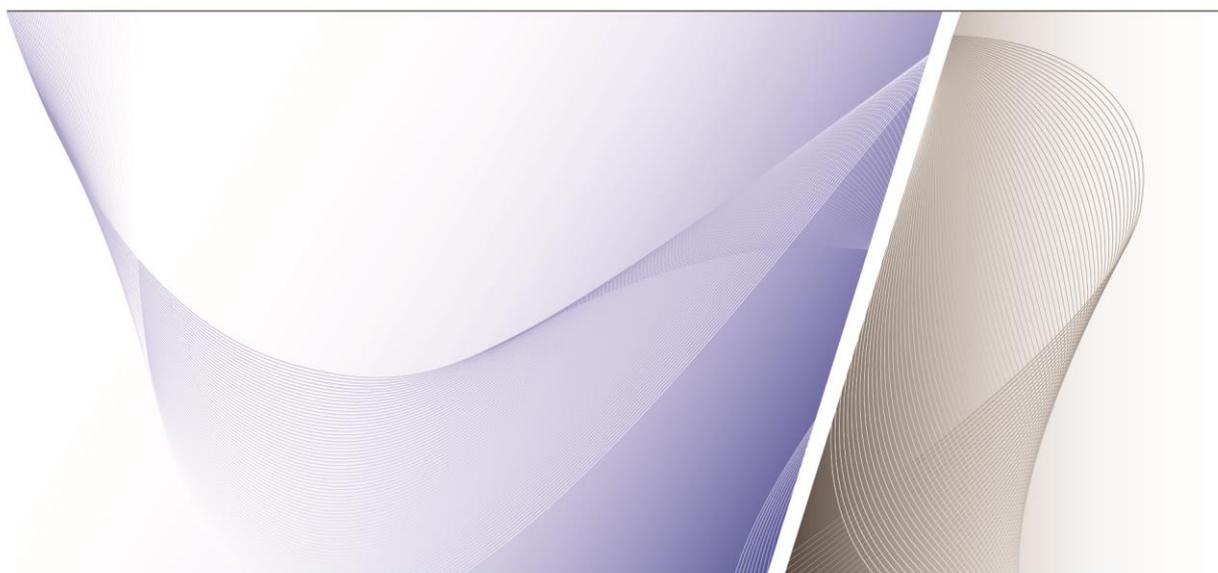


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1: Executive Summary

- 1.1 On 17th January 2017 the Prime Minister announced that the UK would be leaving the EU single market. As a result, Article 50 is expected to be triggered before the end of March 2017, commencing a negotiation process lasting up to 2 years.
- 1.2 Farming is a vitally important UK industry making a major economic contribution, both in its own right and as a key supplier to the UK's agri-food industry.
- 1.3 Departure from the EU single market will bring about momentous change for UK agriculture, for a number of reasons:
 - the EU's Common Agricultural Policy has provided the policy framework for UK agriculture since the early 1970s, so the UK will now have to develop a new policy framework for agriculture and the countryside environment;
 - the European market is both the most important destination for UK agricultural exports as well as being the most important source of our food imports; and
 - the EU has negotiated international trade agreements on our behalf with our most important non-EU trading partners, so replacement deals will have to be negotiated to ensure continued access to important non-EU export markets.
- 1.4 With the Government about to commence a complex and lengthy process of Brexit negotiations with the EU and trade negotiations with a large number of other countries, it is important to begin with a clear understanding of the contributions that farming makes to the UK, taking into account both the costs and the benefits of agriculture and the overall return that agriculture generates in return for the support it receives.
- 1.5 This report, commissioned by the NFU, sets out to identify and quantify the contributions made by UK agriculture, both directly (in the growing of food) and in terms of its wider role as a major component of the UK's food and drink industry. It also assesses the social and cultural contribution of farming, including the role farmers' play in helping to manage the rural environment.
- 1.6 The key finding of this report is that, for the first time, the total contribution of agriculture to the UK economy and society has been calculated. This ratio is the return on investment for the nation, taking into account the value of farming to the UK and the costs associated with the sector. During 2015, farming made a major contribution to the nation, being worth at a minimum 7.4 times the support it received via direct payments plus the carbon costs and external costs for soil, air and water resources of UK domestic food production.

Current contribution of farming

- 1.7 Farming in the UK is a vitally important part of the overall economy as well as meeting the majority of our domestic food consumption needs. Overall, agriculture contributed around £24 billion of revenues and around £8.5 billion of Gross Value Added to the UK economy in 2015. Agriculture also provides around 475,000 jobs directly, as well as supporting a further 30,000 jobs through procurement activity benefiting other sectors of the UK economy (ranging from manufacturing, transport and construction through to professional and financial services).
- 1.8 Agriculture also plays a vital role providing 61% of the raw materials for the wider UK agri-food industry which is worth around £108 billion of GVA to the national economy and provides over 3.7 million jobs. The agri-food sector as a whole generates around £18 billion of gross export earnings for the UK each year.
- 1.9 Farming also plays an important role in managing the environment of over 70% of the UK's land area. Farmers are responsible for managing both important landscape features and providing habitats for wildlife of local, national and international importance. The overall value of these habitat and species protection services is estimated to be worth around £672 million each year.
- 1.10 Farmland also plays a positive environmental role by acting as a carbon sink. The overall value of this service is estimated to be worth around £514 million each year.
- 1.11 Moreover, in recent years UK agriculture has managed to increase the production of food at the same time as decreasing its impact on the environment. In recent decades the emissions of greenhouse gases and ammonia – plus the usage of mineral fertilisers and water – have all decreased, while overall agricultural production has increased.
- 1.12 As well as decreasing its own environmental footprint UK agriculture has also become an increasingly important provider of renewable energy for the UK economy including wind power, solar power and energy produced from biomass. Altogether, around 10% of overall UK electricity generation now comes from renewable energy technologies sited on agricultural land.
- 1.13 The quality of the UK's farmed landscape provides recreational opportunities enjoyed by millions of people each year. Overall, an estimated 3.7 billion day visits are made by UK resident adults to the countryside each year, and the annual value of these visits (in terms of users' estimated willingness to pay) is estimated to be worth just over £19 billion per annum.
- 1.14 The countryside is also an asset important in attracting overseas visitors to the UK. Visit Britain estimate that about 20% of international visitors visit the countryside during their stays. This tourism is estimated to be worth at least £2 billion per annum to the UK economy.
- 1.15 The overall value of all of these monetisable contributions in 2015 is estimated to be £46.496 billion.
- 1.16 However, it should also be recognised that as well these contributions there are also a number of items that reflect the costs of UK agricultural production to the UK economy and society:

- First, UK agriculture received payments worth an estimated £2,803 million during 2015.¹ These included payments received by farmers under the aegis of the Common Agriculture Policy, such as Basic and Single Payment schemes (£2,176 million) and payments received by participants in various agri-environment schemes (£488 million).²
- Second, there are external costs associated with the use of soil, water and air resources. Based on a study undertaken by the Environment Agency, it is estimated that a reasonable estimate of these costs in 2015 was £2.603 billion.
- Third, greenhouse gas emissions associated with UK agricultural production during 2015 carried an implicit cost of £886 million.

1.17 The table below summarises the contributions and external costs associated with UK agriculture in year 2015 that can be readily expressed in annual monetary values.

Table 1-1: UK Agriculture's Contribution to the UK economy (2015 only)

Benefits to UK	Value £million
Agriculture GVA	8,457
Purchase of goods & services	15,356
Carbon savings from renewable energy production	395
Air filtration services	20
Habitat and species protection	672
Carbon sink services	514
Countryside use for recreation (UK residents)	19,082
Countryside use for recreation (overseas visitors)	2,000
Total monetisable contributions to UK	46,496
Costs to UK	Value £ million
Direct payments	2,803
Air, water and soil costs	2,603
Carbon costs from agriculture production	886
Total monetisable costs	6,292
Ratio of benefits to costs	7.4:1.0

Source: *Development Economics*

1.18 Overall, the scale of the monetisable benefits (£46.496 billion) compared to estimated costs (£6.292 billion) indicates that UK agriculture generated benefits to costs in the UK at a ratio of 7.4:1.0 during 2015.

¹ Defra: Agriculture in the UK 2015, Table 4.1, page 20

² Farmers also received £91 million under the Less Favoured Areas support schemes, £21 million under animal disease compensation schemes and £26 million in other payments.

2: Introduction

- 2.1 On 17th January 2017 the Prime Minister made it clear that the UK would be leaving the EU single market. Article 50 is expected to be triggered before the end of March 2017, commencing a negotiation process lasting up to 2 years. This decision and its aftermath will be crucial for UK agriculture: for the past four decades agricultural policy in the UK has been framed around the EU's Common Agricultural Policy (CAP). The EU also provides a destination for around 72% of the UK's agricultural exports, as well as the being the origin of a large proportion of our imported food.
- 2.2 The decision to leave the European Union creates a once-in-a-generation opportunity for the re-casting of policy for the future development of agriculture in the UK. But even before the Brexit decision was made, UK farming was already facing major challenges, including increasing globalisation, international competition and price volatility, changing consumer expectations and preferences, accelerating technological innovation, and longer term pressures brought about by climate change.
- 2.3 UK agriculture plays a vital part in the economic and everyday life of the United Kingdom. UK farmers produce over 60% of the food that is consumed in the UK, and exports of agri-food products amount to over £18 billion annually. Around 500,000 people rely on agriculture for employment either directly or through supply chains, but when the broader agri-food sector is taken into account (including the manufacture, distribution and preparation of food in catering establishments) the workforce exceeds 3.5 million people, which is about 13% of the UK total workforce.
- 2.4 As well as the important contribution that agriculture makes to the UK economy, farmland is also an important provider of outdoor recreation and leisure opportunities for millions of UK residents and thousands of international visitors each year. Activities such as walking, horse-riding, cycling and many other pursuits are enjoyed by millions of visitors to farmed countryside each year.
- 2.5 Farmland accounts for over 70% of the UK's land area, and this agricultural landscape – including farm woodlands, hedges, ponds and meadows – also provides habitats for wildlife and biodiversity. In addition, farmland also helps to regulate the natural environment including water and air resources.
- 2.6 Harder to quantify or value is the contribution that farmland makes to our national identity and sense of who we are. But the abundance of references to the scenic and landscape value of farmland in the writings of our most famous playwrights, poets and authors – and in the work of some of our most treasured artists – makes clear that this contribution is both unique and important.

Purpose and approach

- 2.7 Farming is a vitally important UK industry and makes a major contribution to the UK economy, both in its own right and as a key supplier to the UK's agri-food industry. The departure from the EU single market is momentous for UK agriculture for a number of reasons:

- the EU's Common Agricultural Policy has provided the framework for the UK's agricultural policies since the early 1970s, so the UK will now have to develop a new policy framework for agriculture and the countryside environment;
 - the European market is both the most important destination for UK agricultural exports as well as being the most important source of our food imports; and
 - the EU has negotiated international trade agreements on our behalf with our most important non-EU trading partners, so replacement deals will have to be negotiated to ensure continued access to important non-EU export markets.
- 2.8 The UK's farmers are ready to respond to the challenges that will be brought about by departure from the EU, but in order for the transition from the CAP to a new UK agriculture policy to be successful, it is important that decision-makers understand the scale of the current contribution of farming, firstly in terms of food production but also in terms of farming's linkages to the UK economy as well as the environmental management services that viable farm businesses provide.
- 2.9 In order to highlight the breadth and value of these links and services, the purpose of this report is two-fold:
- First, it quantifies and otherwise assesses the contribution of farming to the UK economy, both directly (in the growing of food) and in terms of agriculture's wider role as a major component of the UK's food and drink industry.
 - Second, it assesses the social and cultural contribution of farming, including the role that farmers' play in managing the countryside environment.
- 2.10 The approach taken in assessing the current contribution of farming has mainly involved the development and deployment of a policy assessment framework, utilising where possible data on the current volume and value of agricultural production and other indicators.
- 2.11 In particular, an assessment framework has been developed based on four categories:
- **Farm performance:** this quadrant focuses on the volume of agricultural outputs (such as the amount of milk, beef and wheat produced). This assessment also considers the proportion of the food we eat that is produced in the UK and the security of our food supplies, as well as trends for productivity.
 - **Economic performance:** this quadrant considers the contribution of farming as a generator of both economic output (measured by Gross Value Added, GVA) and employment. As well as the value generated directly by farming, it is also important to consider the role farming plays in supporting UK food manufacturing, which is the largest manufacturing sub-sector in the UK economy.
 - **Environment:** this considers the role that farming plays in managing the countryside, through the provision and management of habitats, and also the role that farmland increasingly plays in the production of renewable energy via a range of technologies. This theme also covers the trends for emissions of greenhouse gases and the use of resources (such mineral fertilisers) in the growing of our food.
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- **Social contribution:** this assesses the role that our farmland plays in contributing to public goods, such as recreation and enjoyment of the countryside.
- 2.12 The themes and indicators mentioned above have been quantified and wherever possible these have been converted to monetary values.
- 2.13 Most of the data used in the report has been sourced from various publications produced by the Department for the Environment, Food and Rural Affairs (Defra) and the Office for National Statistics (ONS).

Structure of the Report

- 2.14 The remainder of this report is structured as follows:
- Chapter 3 describes the current economic, social and environmental contribution of agriculture to the UK using the latest available data.
 - Chapter 4 presents some conclusions.

3: Current contribution of agriculture

- 3.1 This chapter describes the current contribution of agriculture to the UK, in economic terms and in terms of the wider environmental and social value contributed by farming.

Economic contribution

- 3.2 The value of agricultural activity to the UK economy can be measured in a number of different ways, but whichever indicator is used the message is the same: agriculture contributes hugely to the wealth and prosperity of the country as well as putting food on the tables of millions of households throughout the UK.

Value of production

- 3.3 The overall value of gross UK agricultural production in 2015 is provisionally estimated to be worth around £23.85 billion (2015 prices).³ This is a reduction compared to the gross output figure of £25.93 billion produced in 2014.⁴ Much of the difference is accounted for by volatile international commodity prices as well as variations in production levels due to climatic factors.
- 3.4 The growing of food by farmers generates in turn demand for goods and services produced or supplied by other UK businesses and industries. UK agriculture provides a significant source of demand for businesses in the wider economy, including: for wholesalers of animal feed and crop seed; for suppliers of fuel and energy, fertilisers and plant protection products, vehicles, vehicle parts and repair services; for construction and buildings maintenance services businesses; for haulage companies; and for providers of veterinary services, and financial and professional services, etc.
- 3.5 The total value of this stimulus to the wider economy on the part of UK agriculture was worth around £15.3 billion during 2015.⁵ The approximate breakdown of this procurement expenditure across arrange of goods and services is as follows:
- Wholesale of animal feeds: £4.9 billion
 - Other goods and services: £3.4 billion
 - Maintenance and repair services: £1.5 billion
 - Fertilisers: £1.4 billion
 - Fuels and energy: £1.2 billion
 - Professional services: £1.1 billion
 - Wholesale of crop seeds: £0.7 billion

³ Defra, Agriculture in the UK 2015, Table 3.2, page 12. Unless stated otherwise, all monetary values in this report are in 2015 price terms

⁴ Defra, Agriculture in the UK 2015, Table 4.1, page 19

⁵ Defra, Agriculture in the UK 2015, Table 3.2, page 12.

- Veterinary costs: £0.5 billion.

- 3.6 In addition to this procurement expenditure, the value of purchases made by farming businesses from other sectors of the economy generates further economic benefits through the workings of multiplier effects. The estimated value of these effects at a national (UK) level in 2015 was £6.8 billion.
- 3.7 The approximate regional disaggregation of the £15.3 billion procurement and the £6.8 billion wider multiplier effects are set out in the table below.

Table 3-1: Regional shares of Purchases by UK Agriculture (2015)

Region	Procurement £millions	% of total	Multiplier effects £millions	% of total
North East	486	3.2%	204	3.0%
North West	1,068	7.0%	491	7.2%
Yorkshire & Humber	1,106	7.2%	498	7.3%
East Midlands	1,908	12.4%	878	12.9%
West Midlands	830	5.4%	349	5.1%
East of England	2,232	14.5%	1,004	14.7%
London	305	2.0%	101	1.5%
South East	2,060	13.4%	927	13.6%
South West	2,117	13.8%	953	14.0%
England sub-total	12,113	78.9%	5,404	79.3%
Wales	868	5.7%	365	5.4%
Scotland	1,889	12.3%	831	12.2%
GB sub-total	14,870	96.8%	6,600	96.9%
Northern Ireland	486	3.2%	214	3.1%
Total (UK)	15,356	100.0%	6,814	100.0%

Sources: Development Economics, based on data published by Defra and the ONS

- 3.8 The East of England, the South West, the South East and Scotland benefit from above average shares of the stimulus to the wider economy generated through the procurement activity of UK agriculture.
- 3.9 An estimate based on UK Input-output tables suggests that around 30,000 jobs in the UK are dependent on supply chain purchases by the UK's farm businesses.

Gross Value Added

- 3.10 The overall value of the direct contribution made by agriculture to the national economy can also be measured in terms of Gross Value Added (GVA). GVA is a measure of the value of final output minus the costs of production, and is a proxy for the contribution of industries or regions to national Gross Domestic Product (GDP).
- 3.11 The GVA produced by UK agriculture in 2015 was worth an estimated £8.46 billion. This production accounted for around 0.51% of the overall value of the UK economy in 2015.⁶

⁶ Source: ONS UK GVA Reference tables

3.12 To place this figure into context, the UK agriculture sector in 2015 made a similar (or greater) contribution to the UK economy as a number of other sectors, including:

- the manufacture of chemicals;
- the manufacture of computer, electronic and optical equipment; and
- UK film, video and television production.

3.13 Total income from farming (TIF) in the UK during 2015 was £3.769 billion. This figure takes into account costs such as consumption of capital, compensation for employees, rents and interest paid, etc.

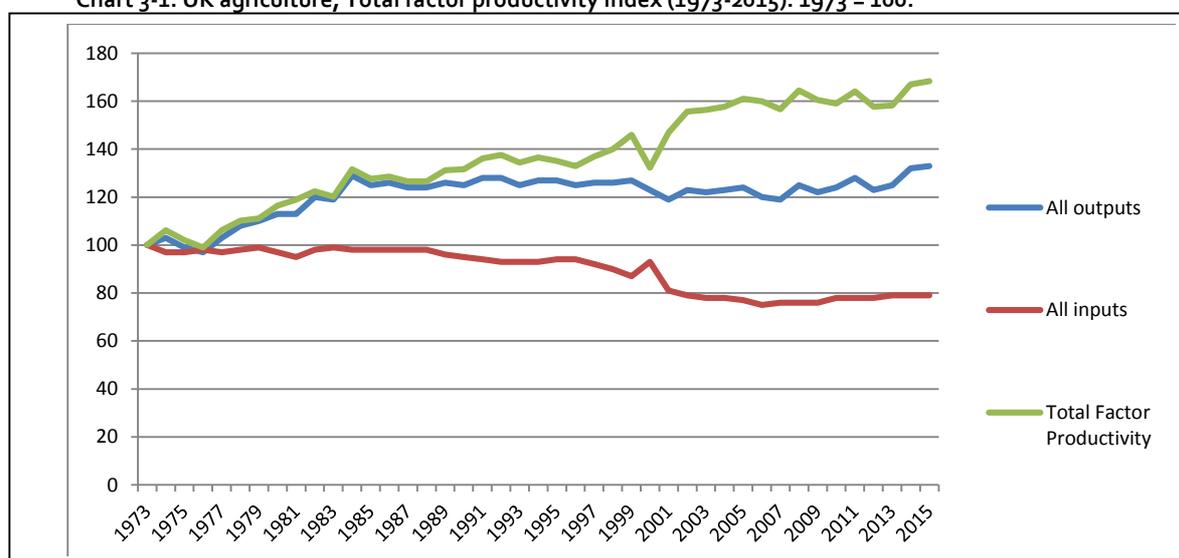
Labour force

3.14 The total size of the UK's agricultural labour force in 2015 was about 476,000, a figure that is unchanged since 2014.⁷ This figure, which includes farmers and those spouses that also work on the farm – either on a full time or part time basis – accounts for around 1.4% of the UK workforce. In rural areas agriculture plays a much bigger role in providing employment, both directly (on farms) and indirectly (through supply chains). Procurement by farm businesses supports employment in both rural businesses including feed suppliers and other wholesale distribution, machinery sales and repair, transport and haulage, and a wide range of financial & professional services.

Productivity

3.15 Long term trends for total factor productivity (TFP) of agriculture over the period 1973-2015 in the UK shows average annual productivity growth of 1.25% per annum. The chart below shows the trend for agricultural output, inputs and TFP over this period.

Chart 3-1: UK agriculture, Total factor productivity index (1973-2015). 1973 = 100.



Source: Defra – Agriculture in the UK 2015 (Table 5.1, page 32) and earlier editions

⁷ Defra, Agriculture in the UK 2015, Table 2.5, page 8

- 3.16 For most of the period since 1970 the increase in productivity has been influenced by reductions in volumes of labour inputs, focusing production on more productive areas of farmland. In recent years the growth in TFP has been mainly driven by increased output.
- 3.17 However, it should be noted that despite the strides made in improving productivity, the UK lags behind gains made by agriculture in other major economies, in particular by the United States and Germany.

Regional shares

- 3.18 Agriculture contributes to the economy of every part of the UK. The table below sets out estimates of the proportion of the contributions made directly by agriculture to GVA and employment, by region. (Note: some column totals may not sum exactly due to rounding).

Table 3-2: Regional shares of Agriculture GVA and Employment (2015)

Region	GVA £millions (2015 prices)	GVA %	Workforce (‘000s of jobs)	Workforce %
North East	256	3.0%	10,000	2.1%
North West	681	8.1%	33,000	6.9%
Yorkshire & Humber	867	10.3%	33,000	6.9%
East Midlands	861	10.2%	34,000	7.1%
West Midlands	830	9.8%	43,000	9.0%
East of England	1,243	14.7%	41,000	8.6%
South East & London	894	10.6%	48,000	10.1%
South West	1,250	14.8%	66,000	13.9%
England sub-total	6,882	81.4%	308,000	64.7%
Wales	407	4.8%	57,000	12.0%
Scotland	814	9.6%	64,000	13.4%
GB sub-total	8,103	95.8%	429,000	90.1%
Northern Ireland	354	4.2%	47,000	9.9%
Total (UK)	8,457	100.0%	476,000	100.0%

Sources: Defra – Regional Statistics (England) and Scottish, Welsh and Northern Ireland Government publications

- 3.19 Agriculture makes significantly above-average contributions to the economies of certain countries and regions, including Northern Ireland, Scotland, the East Midlands, the East of England and South West England.

Agri-food GVA and employment

- 3.20 Farming is a crucial component of the wider agri-food industry in the UK. The definition of the agri-food industry used by Defra includes food manufacturing and distribution and also food retailing and catering. The UK agri-food sector was estimated to be worth £108 billion in **direct** terms to the UK economy in 2014 (2014 prices).

Table 3-3: Value of the UK Agri-food sector in 2014

Sector	GVA Ebillions (2014 prices)	GVA %	Workforce ('000s of jobs)	Workforce %
Agriculture	9.9 ⁸	9.2%	429	11.4%
Food manufacturing	26.9	24.9%	381	10.1%
Food retailing	30.2	28.0%	228	6.1%
Food wholesale	11.9	11.0%	1,174	31.2%
Catering	29.1	26.9%	1,552	41.2%
Total	108.0	100.0%	3,764	100.0%

Source: Defra – Agriculture in the UK 2015 (Table 13.1, page 86)

- 3.21 The agri-food sector is also associated with around 3.76 million workforce jobs directly (2014). This means that the agri-food sector accounts for just over 13% of all workforce employment in the UK.
- 3.22 The linkage between UK agriculture and the UK's food manufacturing industry is particularly strong. Many of the jobs in UK food manufacturing depend on the availability and close proximity of agricultural commodities and raw materials produced by UK agriculture, including meat, milk, wheat products, oils and starches.
- 3.23 Moreover, food manufacturing is one of the largest and most resilient sub-sectors of UK manufacturing, accounting for around 16% of the total amount of GVA across the UK manufacturing as a whole.⁹ The sector is also an important source of jobs. For example, in 2015:¹⁰
- there were nearly 75,000 jobs involved in the processing of meat and the manufacture of meat products in Great Britain alone.
 - there were nearly 22,000 jobs involved in the manufacture of dairy products; and
 - there were over 98,000 jobs found in the manufacture of bread and other baked products.
- 3.24 It is also the case that employment in the food manufacturing sector is growing: in 2015 there was an additional 19,900 jobs in the sector in Great Britain compared to the situation in 2010.
- 3.25 The figures reported above for GVA and employment for the UK agri-food sector cover direct contributions alone: e.g. the headcount of jobs found in agriculture, food manufacturing and catering businesses themselves. In addition, there are substantial numbers of jobs and value added generated indirectly (i.e. including benefits to businesses throughout the economy accruing through procurement and supply chain activity, and through the spending by agri-food sector employees).

Agri-food exports

- 3.26 Although the UK is a net importer of food, it is important to recognise that UK farming contributes to the generation of export income for the UK. The overall value of agri-food exports in 2015 is provisionally estimated at around £18 billion. When beverages, coffee and tea are excluded, the figure is around £10.5 billion.

⁸ Note: this figure is for 2014 and therefore is not the same as the 2015 figure (£8.457 billion) used elsewhere in this report.

⁹ Source: ONS regional GVA tables

¹⁰ This employment data is sourced from the ONS Business Register and Employment Survey (BRES) and dates from 2015. The data covers Great Britain but excludes Northern Ireland.

Table 3-4: Value of UK Food & Drink Exports, 2015, £millions (2015 prices)

Item	Value £ million	% of total
Meat	1,446	8.0%
Dairy & eggs	1,218	6.7%
Fish	1,314	7.3%
Cereals	2,098	11.6%
Fruit & vegetables	966	5.4%
Sugar	372	2.1%
Coffee, tea, etc.	1,219	6.8%
Animal feed	908	5.0%
Oils & fats	535	3.0%
Beverages	6,340	35.1%
Miscellaneous	1,632	9.0%
Total	18,048	100.0%

Source: Defra – Agriculture in the UK 2015 (Table 13.1, page 86)

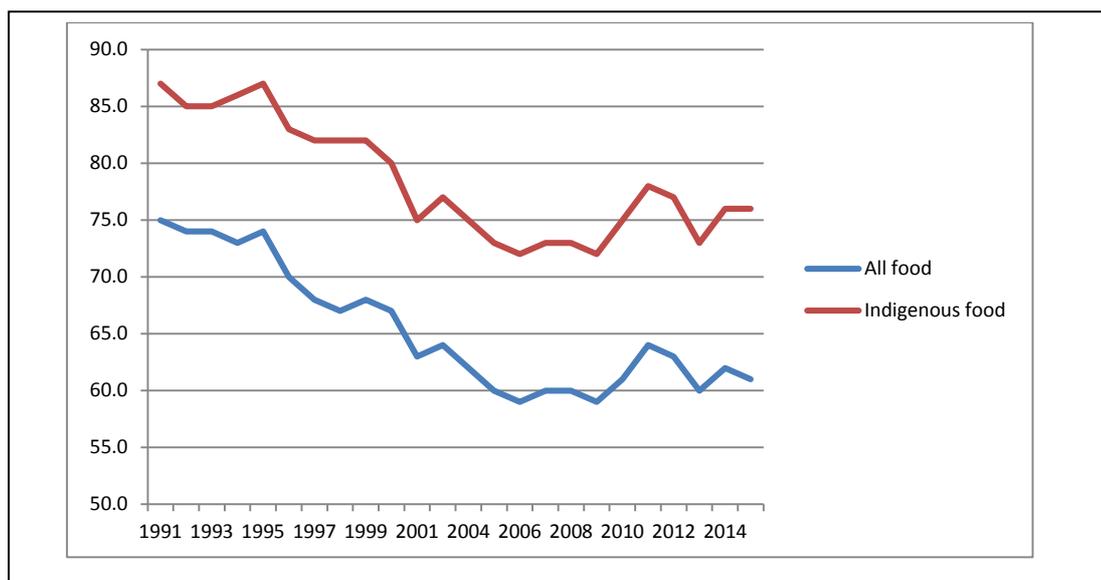
- 3.27 Since 2005 the value of the UK's agri-food exports in real terms has risen by around 35%.¹¹ The five most important destinations for UK exports in 2015 were the Irish Republic, France, the USA, the Netherlands and Germany.
- 3.28 Exports of raw and lightly processed food products are particularly important for certain types of UK agriculture produce, including lamb and mutton, beef and un-milled wheat.

Food security

- 3.29 The UK has for many generations been a net food importing country. Food imports are required because consumers have preferences for food that cannot (for climatic and other reasons) be grown in the UK. There is also an increasing expectation on the part of consumers for food of all types to be available throughout the year, meaning that some foods need to be imported to meet demand outside the UK growing season. In addition, the growth rate of the UK population has increased in recent years, increasing overall domestic demand for food.
- 3.30 This combination of factors has led to a declining proportion of the food we eat being met from UK production. The overall proportion of food produced domestically has fallen from 75% in 1991 to 61% in 2015. The proportion of indigenous food has also fallen over the same timescale, from 87% to 76%.
- 3.31 However, the evidence suggests that the decline in these proportions has slowed down considerably: i.e. since 2002 there has been a relatively small decline in the UK's food self-sufficiency ratios. Part of the explanation may be growing consumer interest in local food provenance, plus increasing awareness (on the part of at least some consumers) of the environmental issues associated with transporting food over long distances. Of course, UK agriculture has also played its part by increasing production.

¹¹ Defra, Agriculture in the UK 2015, page 85

Chart 3-2: UK food self-sufficiency ratios



Source: Defra – Agriculture in the UK 2015 (Chart 14.4, page 100)

3.32 A Foresight report produced by UK Government Office for Science in 2011 identified that the global food production system would face unprecedented pressures over the next 40 years. Global demand for food will be expanded by two main influences:¹²

- **Demand:** First, global human population is expected to increase by a further 2 billion between 2010 and 2050. Second, there is also expected to be a growing number of households with higher levels of income, creating additional demand for a more varied and higher quality diet.
- **Supply:** On the production side, competition for land, water and energy resources will increase while the longer term effects of climate change will create problems in an increasing number of areas, including some countries that are currently important net exporters of food.

3.33 A high or increasing level of reliance on food imports creates a potential danger of an insecure future national food supply. For the UK the dangers are potentially increased by the forecast of an increased demand for food driven by a growing domestic population.

3.34 The recent well-publicised spike in the retail price of certain vegetables – including lettuces and courgettes – caused by unusually cold weather conditions in the growing areas of Spain highlights the vulnerability of UK food supplies to production problems in overseas countries.

Food safety and animal welfare

3.35 Food grown in the UK is produced to some of the world's highest food safety and animal welfare standards. Greater reliance on imports creates a danger of importing food produced to lower standards, potentially threatening the health and safety of the UK population as well as undermining the UK's commitment to high standards of environmental management and animal welfare.

¹² https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/288329/11-546-future-of-food-and-farming-report.pdf

- 3.36 Foods imported into the UK from some countries have been found to contain traces of hormones that are illegal in the UK. Other food imports have been found to contain traces of powerful antibiotics the use of which is highly controlled in the UK.

Environmental management

- 3.37 The ability of agricultural systems to produce food to feed future generations depends on the maintenance of a balanced and well managed natural environment, including soil and water resources.
- 3.38 As has already been noted, farmland accounts for over 70% of the UK's land area. The overall extent of farmland coverage in the UK has changed comparatively little since the late 1990s, but the proportions of land used for rough grazing and arable has fallen while the land used for permanent grassland has increased.¹³ Future pressures on the overall quantum of farmed land in the UK are likely to arise from an increasing UK population, which may create further pressures for the conversion of farmland into housing and/or commercial development and the provision of infrastructure.
- 3.39 Farmland in the UK provides vital services to the country's human population in various ways:
- **Provisioning services:** through the production of services that are vital to sustaining human populations. This includes the production of food, but also through the production of crops used in industrial process and through the production of energy (through fuel crops and also, increasingly, the production of renewable energy).
 - **Regulating services:** such as the role farmland plays in acting as catchments for the supply of water and helping to control flood risk, and also the role played in helping to maintain air and water quality. Farmland vegetation (including hedgerows) also plays an important role in maintaining the quality of biodiversity assets and the provision of pollination services.
 - **Cultural services:** such as the provision of recreation services and the protection of cultural heritage.
 - **Aesthetic services:** such as management of the landscape.
- 3.40 In addition to these, farmland contributes to our shared social and cultural values. Interactions with social and cultural values are discussed in a later section of this chapter.
- 3.41 Attributing financial values to the environmental and cultural services provided by farmland presents a considerable methodological and data challenge, but the UK Government has recently embarked upon a process of developing national ecosystem accounts for farmland.¹⁴ The approach taken in this report is to present estimates of value generated by some aspects of ecosystem services, but for other themes the underlying trends in key indicators are noted but with no attempt to pre-judge the valuations for these services that are expected to be provided by Government in due course.

¹³ UK Natural Capital Ecosystem accounts

¹⁴ Statistical Bulletin: UK Natural Capital Ecosystem accounts for farmland available at: <https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/uknaturalcapital/ecosystemaccountsforfarmlandexperimentalstatistics>

Managing landscapes and protected areas

- 3.42 In 2015 the area utilised for agriculture in the UK amounted to just over 17 million hectares. This constitutes about 70% of the UK's land area.¹⁵
- 3.43 Farmed land provides a variety of important features. For example:
- In England alone there is an estimated 373,000 kilometres of hedges.¹⁶ In addition, there are thousands of kilometres of other linear features such as lines of trees, drystone walls, banks and ditches. All of these make a valued contribution to landscape and habitats, and many of them also provide benefits in terms of helping to regulate soil erosion and in the management of water resources.
 - Farmed land in the UK is also estimated to provide just under 900,000 ha of woodland, which are also significant providers of habitats for wildlife as well as contributing to both landscape quality and ecosystem management.¹⁷
 - Other important features found on farmland include an estimated 478,000 ponds¹⁸ as well as numerous dells, pits and other features which can provide important homes for wildlife.
- 3.44 Through the management of fields, walls & hedges, woodlands and other landscape features, farmers also play a major role in shaping and protecting highly treasured landscapes found in our country's designated National Parks and Areas of Outstanding Natural Beauty. Indeed, without a continuation of traditional farming practices many culturally important and iconic landscapes would look very different.
- 3.45 In addition, there are large numbers of Sites of Special Scientific Interest (SSSIs) found on farmland. The proportion of agriculturally managed SSSIs in favourable or recovering condition has remained above 96% since 2011.

Use of pesticides and fertilisers

- 3.46 Advances in technology and skills mean that UK agriculture has been able to increase production with decreased average usage of chemical inputs such as pesticides and fertilisers.
- 3.47 Data from the Pesticides Usage Survey confirms that the average volume (by weight) of pesticides used in England (on a kilograms per hectare basis) fell by 71% over the period 1990-2015.¹⁹
- 3.48 It is also relevant to consider the rate of usage of the main types of mineral fertilisers used in UK agriculture. Firstly, **nitrogen usage** on agricultural land in the UK has reduced significantly over the 1984-2013 period²⁰, particularly on grassland:
- On cropped land, average rates of use have fallen from 157 kg per hectare in 1984 to 146 kg/ha by 2015, an annual average efficiency gain of 0.25% per annum over this period.

¹⁵ Defra: Agriculture in the UK (2015), Table 2.1, page 5

¹⁶ Ordnance Survey

¹⁷ Countryside Survey, 2007

¹⁸ Countryside Survey, 2007

¹⁹ Source: <https://secure.fera.defra.gov.uk/pusstats/myresults.cfm>

²⁰ The 1984-2013 period is cited here because this is the longest period for which this data is available on a comparable basis. Different time periods are used in this chapter for other indicators reflecting the varying historic availability of data.

- On grassland the average rate of usage has fallen from 131 kg/ha in 1984 to 56 kg/ha by 2015, an average annual reduction of 2.7% p.a.
- 3.49 The average rate of **phosphate** usage on UK agricultural land has also fallen significantly:
- On cropped land, average rates of use have fallen from 62 kg per hectare in 1984 to 29 kg/ha by 2015, an annual average efficiency gain of 2.4% per annum over this period.
 - On grassland the average rate of usage has fallen from 26 kg/ha in 1984 to 9 kg/ha by 2015, an average annual reduction of 3.4% p.a.
- 3.50 Further gains in efficiency in the use of nitrogen and phosphates are likely as a greater proportion of farmers adopt precision farming technologies allowing more precise applications of mineral fertilisers and other inputs.

Soil, air and water resources

- 3.51 In terms of air quality, agriculture is a significant source of emissions of methane and ammonia through manure spreading and the housing of livestock. Methane production is considered separately as a greenhouse gas emission later in this chapter. In terms of ammonia production, data from Defra indicates that **ammonia emissions** from agriculture have diminished since year 1990, from 308,000 tonnes per annum (1990) to 222,000 tonnes (2013, the latest year for which data is available). This represents an annual reduction in agricultural emissions of ammonia of about 1.4% per annum.
- 3.52 However, cropland and grassland also provides air filtration services to the wider environment. Estimates of the annual value of air filtration that enclosed farmland provide are in the order of £1.10 per hectare per year (2013 prices).²¹ If this value is extended across UK farmland as a whole, the estimated annual value (in terms of 2015 prices) would be around £20 million per annum.
- 3.53 According to data from the Environment Agency, **water abstraction** for use in agriculture was significantly lower in 2014 compared to 2000. However, water use in any one year is obviously influenced by the weather conditions in that year, so a better indicator is to consider a rolling average over a number of years. On this basis, the annual average usage by agriculture over the period 2010-2014 was 118 million cubic litres, compared to an annual average of 144 million cubic litres over the period 2000-2004. On this basis, UK agriculture has achieved an annual average water usage saving of about 18% compared to levels that were occurring in the early 2000s. This is an impressive result given that production levels have increased over this time period.
- 3.54 It is also worth highlighting that since the droughts of the early 1990s farm reservoirs in the East of England now account for 28% of all abstracted water (from a very low start), indicating a significant switch towards more sustainable practices.²²

²¹ Developing Natural Ecosystem Accounts for Protected Areas in England and Scotland (Aecom, produced for Defra and Scottish Government), October 2015, Technical Appendix, Chapter 9

²² Source: National Abstraction Licence Data (NALD) published by the Environment Agency

- 3.55 The most recent comprehensive assessment of the external costs associated with UK agricultural production was undertaken on behalf of the Environment Agency in 2007.²³ The assessment estimated that the overall costs associated with UK agriculture with respect to soil, air and water resources was within a range with a lower value of £1.149 billion per annum, and an upper value of £3.050 billion per annum (2004 prices).
- 3.56 Updating this range to 2015 prices using HM Treasury's GDP deflators produces a revised range of between £1.425 billion and £3.780 billion per annum (2015 prices).
- 3.57 However, because this assessment is nearly a decade old, it does not reflect the improvements in agricultural practices (e.g. greater resource efficiency from improved practices and greater use of precision technologies) that have been implemented over that time period. On this basis, we have decided to use the mid-point figure within the range, but would make the comment that it is quite likely that this represents a conservative figure (i.e. it is more likely that the current annual value is below this figure rather than above it).
- 3.58 Notwithstanding this caveat, we estimate that annual external soil, air and water resource costs associated with UK agriculture production to amount to a maximum of £2.603 billion during 2015.

Agri-environment schemes

- 3.59 Farmers manage their land in a way that contributes to the management of the landscape and provides habitats for wildlife. Many farmers also participate in voluntary environmental management schemes that enable them to do even more for the environment.
- 3.60 Agri-environment schemes provide compensation for farmers to adopt land management and farming practices that provide extra benefits for the environment. Different schemes operate in each of the four countries of the UK, making it difficult to provide aggregate totals across the UK, but in 2015 there were just over 72,000 agreements with farmers in operation, altogether accounting for over 8.87 million hectares of farmed land across the UK.²⁴
- 3.61 Although farmers will continue to manage their land responsibly, future improvements in biodiversity for plants, insects, birds and other wildlife will depend on the future commitment by the UK and devolved governments to the continuation of funding for agri-environment schemes.

Habitat and species protection services

- 3.62 The countryside provides non-market goods and services through the provision of ecological habitats and by hosting species of wildlife. These benefits arise from the work that the UK's farmers in terms of maintenance of:
- habitat features such as hedges, field margins, banks, etc.; and
 - semi-natural habitats such as natural grasslands, bogs, heathland, moorlands, farm woodlands, etc.

²³ O'Neill, D. (2007) The Total External Environmental Costs and Benefits of Agriculture in the UK, for the Environment Agency

²⁴ Defra, Agriculture in the UK 2015, Tables 10.5 & 10.6 (pages 66 & 67)

- 3.63 A report produced by the Environment Agency valued the net environmental benefits of the habitat and species protection services of UK agriculture as follows:²⁵
- habitat protection services: £229 million per annum
 - species protection services: £313 million.
- 3.64 Both of these values were assessed in terms of 2004 prices, and together they amounted to £542 million.
- 3.65 We are not aware of a more recent comprehensive assessment of the annual value of these types of services, so the approach taken here is to update the 2007 study to 2015 prices. This approach yields a total annual value of £672 million (2015 prices).

Greenhouse gases

- 3.66 Agriculture contributes an estimated 10% of total greenhouse gas emissions in the UK.²⁶ While agriculture is a relatively minor contributor to the UK's carbon dioxide emissions (around 1% of the overall UK total) it is a much more significant generator of nitrous oxide (N₂O) and methane (CH₄). In 2014:²⁷
- N₂O emissions from UK agriculture amounted to around 16.3 million tonnes of CO₂ equivalent (mtCO₂e). This represents a decrease of around 1.7 mtCO₂e (9.4%) compared to levels in year 2000.
 - CH₄ emissions from UK agriculture amounted to around 27.4 mtCO₂e. This represents a decrease of around 3.4 mtCO₂e (11.0%) compared to levels in year 2000.
 - CO₂ emissions from UK agriculture amounted to around 5.3 mtCO₂e. This represents a decrease of around 0.4 mtCO₂e (7.0%) compared to levels in year 2000.
- 3.67 Overall, the total volume of greenhouse gas emissions attributable to agriculture is estimated to have been 49.0 million tonnes in 2014. Therefore, the overall amount of CO₂ equivalent emissions produced by UK agriculture is estimated to have fallen by 5.5 million tonnes per annum since year 2000 (i.e. an overall decline of 10.1%, and an annualised reduction of 0.76% per annum since year 2000).
- 3.68 Based on the rolling forward of recent trends for the emissions of each contributing gas by a further 12 months, a working assumption with respect to the 2015 level of emissions can be estimated: the resulting estimate is 48.6 million tonnes. This estimated volume of emissions can be converted to a cost using the floor price for carbon emissions announced by the UK Government. In the 2016 Autumn statement the floor price continued to be fixed at £18 per tonne until 2020.²⁸ Using this value, the overall 2015 cost of agricultural greenhouse emissions is to be £886 million (in terms of 2015 prices, calculated using the HM Treasury's GDP deflator series).

²⁵ O'Neill, D. (2007) The Total External Environmental Costs and Benefits of Agriculture in the UK, for the Environment Agency

²⁶ Source: DECC, 2014 Greenhouse Gas emissions by sector, (February 2016)

²⁷ DECC, 2014 Greenhouse Gas emissions by sector, Table 9

²⁸ Source: <https://www.gov.uk/government/publications/autumn-statement-2016-documents/autumn-statement-2016>

Carbon sink services

- 3.69 The 2007 report produced for the Environment Agency also considered the benefit that UK agriculture plays in terms of providing a reservoir for carbon.²⁹ The study determined that this service was worth £415 million per annum to the UK (2004 prices).
- 3.70 We are not aware of a more recent comprehensive assessment of the annual value of these types of services, so the approach taken here is to update the 2007 study to 2015 prices. This approach yields a total value of £514 million per annum during 2015 (2015 prices).

Renewable energy

- 3.71 The UK agricultural sector has become an increasingly important provider of renewable energy for the country as a whole. Altogether, around 25% of the UK's electricity production is now produced from renewable sources, and around 10% of overall UK generation derives from renewable energy technologies located on agricultural land.³⁰
- 3.72 Overall, it is estimated that more than one-third of the UK's farmers have already invested in some form of renewable energy production, including the following:³¹
- **Wind power.** The vast majority of the UK's onshore wind power derives from capacity that is installed on UK farmland.
 - **Solar power:** the NFU estimate that farmers and growers host around 60% of the UK's installed solar energy generation capacity.
 - **Energy from agricultural biomass.** Energy produced from plant and animal biomass and anaerobic digestion amounted to 5.3 million tonnes of oil equivalent in 2015.
- 3.73 Altogether, renewable energy produced on the UK's agricultural land accounted for an estimated 7.1 million tonnes of oil equivalent in 2015, which was just under 40% of the total produced from all renewable sources.³²
- 3.74 It is also possible to estimate the quantum of carbon saved from the production of renewable energy on UK agricultural land. On the basis that every tonne of oil equivalent used for energy generation would be associated with the production of 3.08 tonnes of CO₂, the renewable energy produced on UK farmland is saving 21.9 million tonnes of CO₂ equivalent. Based on a value of £18 per tonne (see above), this equates to an annual saving estimated at about £395 million in 2015.
- 3.75 This implies that UK farmland is current offsetting around 45% of the carbon produced by the growing of food in the UK. Moreover, this proportion has been growing in recent years, because while domestic renewable energy production has been growing strongly, the volume of greenhouse gases associated with the growing of food in the UK has continued to fall steadily.

²⁹ O'Neill, D. (2007) The Total External Environmental Costs and Benefits of Agriculture in the UK, for the Environment Agency

³⁰ Source: <http://www.nfuonline.com/back-british-farming/why-should-i-back-british-farming/renewable-energy-from-farms/>

³¹ Source: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/532963/Renewable_energy_in_2015.pdf

³² Source: DECC *Renewable Energy in 2015* published June 2016 available at <https://www.gov.uk/government/statistics/energy-trends-june-2016-special-feature-article-renewable-energy-in-2015>

- 3.76 With the right combination of policies it is possible to envisage a future scenario where the production of carbon from growing of food in the UK could be more than offset by carbon saved via the generation of renewable energy on UK farmland.

Utilities

- 3.77 Nearly all of the energy produced by the UK's electricity generators is transmitted to commercial and residential consumers via pylons and other apparatus carried across UK farmland that is owned by National Grid or other energy companies.
- 3.78 Farmers also host thousands of mobile phone masts and other apparatus that allows the UK's network operators to provide around 90% geographical coverage of the third generation telecommunications network and the current (and growing) 50% geographical coverage of the fourth generation network. The future fifth generation network, which is expected to commence being installed from 2020 onwards, will require an even denser coverage of masts, so it is likely that the quantum of communications apparatus installed on farmland will continue to increase.

Social and cultural value

- 3.79 The UK's farmed landscape also provides important and highly valued social and cultural services, including the provision of recreation and education opportunities, as an attraction for both domestic holiday makers and international tourists, as an inspiration for artistic and cultural activity, as a setting for much of our archaeology and many of our most famous historic buildings, and as a place where film and television programmes can be made.

Use of countryside for recreation

- 3.80 Data on day visits by residents in England to the natural environment are collected by Natural England and Defra. This data reveals that the total number of annual day visits by adults to the natural environment in 2014/15 totalled 3.122 billion.³³ If it is assumed that propensities to visit the natural environment are similar in other parts of the UK, then the overall number of visits across the UK is probably in the order of 3.7 billion per annum.
- 3.81 A very large proportion of these trips involve visits to agricultural land, including on the hundreds of thousands of miles of public footpaths, bridleways and other rights of way that pass over land managed by the UK's farmers.
- 3.82 A report produced for Defra in 2011 identified an average willingness to pay for visits to the countryside for informal recreation purposes of £4.87.³⁴ Taking inflation into account, this value is equivalent to £5.13 per trip in 2015 price terms. Applying this value to the estimated number of trips to countryside suggests that the economic value associated with these trips amounts to just over £19 billion per annum.

³³ Source: Natural England, Defra and the Forestry Commission: *Access to the Countryside surveys*

³⁴ Defra: *The Benefits of Inland Waterways* (Jacobs, 2011)

Overseas Visitors

- 3.83 Inbound international tourism to the UK generated 36 million visits and about £22.1 billion pounds worth of expenditure in 2015.³⁵ According to research undertaken by Visit Britain, around 20% of overseas tourists visited the countryside during their stay.³⁶ Activities such as walking, cycling and visits to National Parks were amongst some of the most popular activities undertaken by international visitors to the countryside.
- 3.84 Data from Visit Britain and sub-regional tourism agencies confirm the importance of overseas visitors and spending for rural tourism. For example, data from the Cumbria Tourism Board suggests that overseas visitors account for 8% of all tourist expenditure in that area, and was worth £200 million in 2015 alone.³⁷
- 3.85 Overall, the value of countryside visits by international visitors is estimated to be worth at least £2 billion annually to the UK economy directly. Indirect benefits from this expenditure will also be generated through the workings of supply chain and employee expenditure multiplier effects. We would expect these additional multiplier effects to be worth at least £880 million per annum to the UK economy.
- 3.86 The Visit Britain research also revealed that visits to the countryside by international visitors is particularly important for overseas visitors to Wales, Scotland, South West England and parts of the North of England, such as Cumbria and the Yorkshire Dales. For example, more than half of overseas visitors to each of these areas spent time walking in the countryside, compared to an average of 25% of all visitors to the UK.
- 3.87 Of course, providing accommodation, attraction and events for tourists – both domestic and international – is also an important area of diversification activity for many of the UK's farm businesses. But the scenic quality of the UK's farmed landscape attracts visitors and visitor expenditure that in turn generates spillover benefits for the UK's rural and wider tourism economy that is worth many times the share of the value that is captured by farmers themselves.

Education

- 3.88 The countryside provides a wide range of opportunities for learning and study for primary, secondary and tertiary students across a wide range of curriculum areas including science, geography, history, and art. Visits to the natural environment can also stimulate learning of valuable soft skills such as team work and leadership gained through shared learning experiences and programmes such as the Duke of Edinburgh's award.

³⁵ <https://www.visitbritain.org/visitor-economy-facts>

³⁶ Visit Britain: Inbound Tourism to Britain's Nations and Regions (2013)

³⁷ Source: Tourism in Cumbria, 2015

- 3.89 Data published by Natural England suggests that in England also there were over 13,500 visits to farms during 2014/15 under the Educational Access programme alone, and that over 230,000 children benefited from these trips.³⁸ However, this data does not include all trips to the countryside for outdoor recreation and other purposes and it obviously does not include trips made by children in the other countries.
- 3.90 In addition, more than a quarter of a million people visited a farm for Open Farm Sunday in 2016. One in five of these had never visited a working farm before. One in four farms hosted an Open Farm Sunday event for the first time in 2016, showing that increasing numbers of farmers recognise the importance of reaching out to their customers to build trust and understanding in farming.³⁹
- 3.91 Given the limited data it is not currently possible to place a monetary value on education services gained through visits to the UK's farmed areas.

Landscape amenity and other cultural values

- 3.92 The traditional agricultural landscape of the British Isles is also valued for its aesthetic quality and its contribution to our shared heritage. This landscape has been and continues to be celebrated in the works of some of our most famous artists, authors, poets and playwrights.
- 3.93 The agricultural landscape also provides a fitting setting for some of our most famous archaeological and historic sites, including Neolithic stone circles, henges and barrows; medieval castles, abbeys, churches and battlefield sites; and stately homes and other historic buildings. Millions of people – both UK residents and international tourists – make visits to such sites each year.
- 3.94 These farmed landscapes are also known and loved by millions of people throughout the UK and globally through the work of British and international film and television makers.

Conclusion: UK Agriculture's overall contribution

- 3.95 In this chapter a number of economic, environmental and social contributions from UK agriculture to the UK as a whole have been identified and quantified in monetary terms. The largest of these contributions include:
- Gross Value Added generated by UK agriculture itself – £8,457 million;
 - the value of purchases made by agriculture from other UK industries, including manufacturing, construction, transportation and professional services – £15,356 million
 - the value of habitat and species protection services – £672 million
 - the value of agricultural land as a carbon sink – £514 million

³⁸ Source: Natural England, quoted in the following:

<https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/uknaturalcapital/ecosystemaccountsforfarmlandexperimentalstatistics>

³⁹ <https://farmsunday.org>

- carbon savings from renewable energy production taking place on agricultural land – £395 million;
- use of the farmed countryside for recreation purposes by UK residents – £19,082 million
- use of the farmed countryside by international visitors – £2,000 million (direct effects only)

3.96 The table below summarises the monetisable contributions made by the UK agriculture. Of course, any such an assessment risks under-playing the valuable and important socio-economic contributions that cannot be readily quantified and monetised (such as aspects of the environmental and social contribution) but nevertheless it is a useful exercise to list in one place those contributions that can be expressed in monetary terms. Note: this table focuses on the contribution of the agriculture sector only, rather than the contribution of the wider UK agri-food industry.

3.97 The overall value of these monetisable contributions in 2015 is estimated to be £46.496 billion.

Table 3-5: UK Agriculture's Contribution, 2015 only

Benefits to UK	Value £ million (2015 only)
UK Agriculture GVA	8,457
Purchases from other industries	15,356
Carbon savings from renewable energy production	395
Air filtration services	20
Habitat and species protection	672
Carbon sink services	514
Countryside use for recreation (UK residents)	19,082
Countryside use for recreation (overseas visitors)	2,000
Total monetisable contributions to UK	46,496
Costs to the UK	Value £ million
Payments received	2,803
Air, water and soil costs	2,603
Carbon costs from agriculture production	886
Total monetisable costs	6,292
Ratio of benefits to costs	7.4:1.0

Source: *Development Economics*

3.98 The table also sets out three items that reflect costs of UK agricultural production borne by wider society.

3.99 First, UK agriculture received direct payments worth an estimated £2,803 million during 2015.⁴⁰ These comprised payments received by farmers under the aegis of the Common Agriculture Policy such as Basic Payment Scheme, Single Payment scheme and payments received by participants in various agri-environment schemes. The breakdown of these payments was as follows:

⁴⁰ Defra: Agriculture in the UK 2015, Table 4.1, page 20

- Basic/Single Payments scheme: £2,176 million
- Agri-environment schemes: £488 million
- Less favoured Areas support schemes: £91 million
- Animal disease compensation: £21 million
- Other payments: £26 million.

3.100 Second, the external environmental costs of agriculture in terms of impacts on soil, air and water resources. These costs are estimated at £2,603 million.

3.101 Third, greenhouse gas emissions associated with UK agricultural production during 2015 carried an implicit cost of £886 million as was discussed earlier in this chapter.

3.102 The sum of these estimated costs (direct payments; external effects on soil, air and water resources; and greenhouse gas emissions) totalled £6.292 billion in 2015.

3.103 The identification of estimated benefits amounting to £46.496 billion and estimated costs amounting to £6.292 billion implies a ratio between UK agriculture's benefits and costs of 7.4:1.0 during 2015.

3.104 That is, the quantifiable and monetisable contribution of agriculture to the UK economy and society during 2015 was worth at a minimum 7.4 times the support it received via payments for production and participation in agri-environment schemes (and when external resource costs and carbon costs are also taken into consideration).

- It should be noted that this benefit/cost ratio only considers benefits and costs that are estimated to have occurred during 2015. It is an expression of the effects that are associated with support received by the UK agriculture sector via direct payments (and also taking into account carbon and externalized costs in terms of soil, air and water resources). This ratio is therefore not comparable to a cost/benefit ratio for proposed capital investment (such as major transport infrastructure), which takes into account a future stream of benefits as well as future revenue costs.
- It should also be highlighted that the benefit/cost ratio includes market traded elements (such as procurement and GVA) as well as non-market traded elements such as the value of recreation and tourism in the countryside.

4: Conclusions

- 4.1 On 17th January 2017 the Prime Minister announced that the UK would be leaving the EU single market. As a result, Article 50 is expected to be triggered before the end of March 2017, commencing a negotiation process lasting up to 2 years.
- 4.2 Farming is a vitally important UK industry making a major economic contribution, both in its own right and as a key supplier to the UK's agri-food industry. Departure from the EU single market will bring about momentous change for UK agriculture, for a number of reasons:
- the EU's Common Agricultural Policy has provided the policy framework for UK agriculture since the early 1970s, so the UK will now have to develop a new policy framework for agriculture and the countryside environment;
 - the European market is both the most important destination for UK agricultural exports as well as being the most important source of our food imports; and
 - the EU has negotiated international trade agreements on our behalf with our most important non-EU trading partners, so replacement deals will have to be negotiated to ensure continued access to important non-EU export markets.
- 4.3 With the Government about to commence a complex and lengthy process of Brexit negotiations with the EU and trade negotiations with a large number of other countries, it is important to begin with a clear understanding of the contributions that farming makes to the UK, taking into account both the costs and the benefits of agriculture and the overall return that agriculture generates in return for the support it receives.
- 4.4 This report makes a contribution to this understanding by identifying and quantifying the contributions made by UK agriculture, both directly (in the growing of food) and in terms of its wider role as a major component of the UK's food and drink industry. It also assesses the social and cultural contribution of farming, including the role farmers' play in helping to manage the rural environment, as well as identifying and quantifying external costs associated with UK agricultural activity.
- 4.5 Farming in the UK is an important part of the overall UK economy as well as meeting the majority of our domestic food consumption needs. Overall, agriculture alone contributed just under £24 billion of revenues and around £8.5 billion of Gross Value Added to economy in 2015 alone, as well as providing around 475,000 jobs directly and a further 30,000 jobs through supply chains .
- 4.6 Agriculture is an important industry in all parts of the UK, but particularly so in the East of England, South West England, Wales, Scotland and Northern Ireland.
- 4.7 Agriculture also plays a vital role providing raw materials for the wider UK agri-food industry which is worth around £108 billion of GVA to the national economy and provides over 3.7 million jobs throughout the UK.

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- 4.8 Although the UK has been a net importer of food for many decades, the UK's agri-food sector generates around £18 billion of gross export earnings for the UK each year. In terms of raw or lightly processed agricultural products, exports are particularly important for farmers producing lamb and mutton, beef and some types of cereals. The EU provides a vital destination for UK food exports, with the Irish Republic, France, Germany and the Netherlands being the principal markets for these. Outside of Europe, the USA and the Gulf States are important destinations.
- 4.9 Farming also plays a vital role in managing the environment of over 70% of the UK's land area. Farmers are responsible for managing important landscape features including over 373,000 km of hedges and 900,000 ha of woodland as well as large numbers of ponds and other landscape features. These assets provide important habitats for wildlife as well as contributing to the variety of traditional landscapes found in different parts of the UK.
- 4.10 Farming also provides an essential role in helping to regulate soil erosion, in the management of water resources and also in protecting air quality.
- 4.11 Moreover, in recent years UK agriculture has managed to increase the production of food at the same time as decreasing its impact on the environment. Data published by Defra and other Government sources confirms that:
- Since year 2000 the annual production of greenhouse gases attributable to agriculture has decreased by 5.5 million tonnes per annum, a fall of just over 10%
 - The usage by UK agriculture of water and mineral fertilisers on an annual basis has continued to decrease and the yearly emissions of ammonia by UK agriculture have also fallen significantly.
- 4.12 This improved environmental performance is due to a range of factors including:
- efficiency and productivity gains driven by innovation and technological process on the part of farmers and the wider agri-industry supply chain;
 - more widespread use of best practice through the spreading of knowledge via farming industry networks and industry-led schemes; and
 - the availability of agri-environment schemes
- 4.13 As well as decreasing its own environmental footprint UK agriculture has also become an increasingly important provider of renewable energy for the UK economy through a number of technologies including wind power, solar power and energy produced from biomass. Altogether, around 10% of overall UK electricity generation now comes from renewable energy technologies sited on agricultural land.
- 4.14 UK farmers also host vital infrastructure including much of the apparatus needed for the UK's national systems for electricity transmission and mobile phone communications.
- 4.15 The quality of the UK's agricultural landscape provides recreational opportunities enjoyed by millions of people each year. Overall, an estimated 3.7 billion visits are made by UK resident adults to the countryside each year, and the annual value of these visits (as measured by willingness to pay proxy values) is just over £19 billion per annum.
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- 4.16 The countryside also provides important learning opportunities for large numbers of schoolchildren through organised visits to farms, through outdoor recreational activities and through programmes such as the Duke of Edinburgh's award.
- 4.17 In addition to providing recreation and learning opportunities for UK citizens, the countryside is an asset important in attracting overseas visitors to the UK. Visit Britain estimate that about 20% of international visitors visit the countryside during their stays. Overall, we estimate that the value of international tourism to the UK countryside is worth at least £2 billion per annum to the UK economy.
- 4.18 The following table summarises the estimated key current monetisable contributions of UK agriculture during 2015.

Table 4-1: UK Agriculture Contribution to the UK economy, 2015 only

Items	Value £ million (2015 only)
Agriculture GVA	8,457
Purchases from other industries	15,356
Carbon savings from renewable energy production	395
Air filtration services	20
Habitat and species protection services	672
Carbon sink services	514
Countryside use for recreation (UK residents)	19,082
Countryside use for recreation (overseas visitors)	2,000
Total	46,496

Source: Development Economics

- 4.19 The total value of the monetisable contributions made by UK agricultural during 2015 is estimated to amount to £46.496 billion.
- 4.20 In return for these contributions, UK farmers received direct payments (including those for participation in agri-environment schemes) worth in total £2,803 million in 2015. In addition:
- the external costs in terms of soil, air and water resources can be estimated: in 2015 these costs are conservatively estimated to be a maximum of £2.603 billion; and
 - the carbon costs associated with UK agricultural production can also be estimated: in 2015 this cost amounted to £886 million.
- 4.21 Overall costs associated with agricultural activity are therefore estimated to amount to **£6.292 billion** during 2015.
- 4.22 Overall, the ratio of benefits to costs implied by the figures above – that is, benefits totalling £46.696 billion and costs totalling £6.292 billion indicates an overall benefit/cost ratio of 7.4:1.0 during 2015.
- 4.23 In other words, the contribution of agriculture to the UK economy and society during 2015 was worth at a minimum 7.4 times the support it received via direct payments plus the carbon costs and external costs for soil, air and water resources of UK domestic food production.

Glossary of terms and acronyms

AONB	Area of Outstanding Natural Beauty
CAP	Common Agricultural Policy
DEFRA	The Department for Environment, Food and Rural Affairs
Gross Value Added (GVA)	GVA is the measure of the value of goods and services produced in an area, industry or sector of an economy. In national accounts GVA is output minus intermediate consumption.
Intermediate consumption	The value of inputs (such as animal feeds, crop seeds, fertiliser, pesticides and other chemicals, fuel & energy, maintenance of machinery etc.) used in agricultural production.
ONS	Office for National Statistics
SSSIs	Sites of Special Scientific Interest
Total Factor Productivity (TFP)	A measure of the efficiency of all of the inputs used in agricultural production
Total Income from Farming	The net income generated by UK agriculture once all costs (including compensation paid to employees, depreciation of capital and interest paid on borrowings) is taken into account.