



Department  
for Environment,  
Food & Rural Affairs

Official Statistics

# United Kingdom Food Security Report 2024: Theme 3: Food Supply Chain Resilience

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About the UK Food Security Report



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# Introduction

## Theme definition

Theme 3 measures the stability and resilience of the UK's food supply chain from production to consumption. This includes the physical, human, and economic infrastructure underlying the food supply chain. Food security requires stability, yet the interconnectedness of the global economy requires flexibility in the face of unexpected global challenges. Without the necessary stability, both the physical availability and accessibility of food becomes less certain. Stability is considered in terms of the shocks and stresses that key sectors within and outside the food sector are subject to. Resilience is considered by assessing the ability of the food supply chain to respond to and withstand those shocks and stresses, including key strengths like robustness (ability to recover), diversity and adaptability of the supply chain. Shocks often come from outside the food supply chain and cause immediate disruption, such as Russia's invasion of Ukraine, whereas stresses such as the effect of climate change, strain the food supply chain over the longer term, and exacerbate the effect of shocks. Theme 2 UK Food Supply Sources looked at shocks specifically to food production like weather and disease.

The UK food supply chain is built on a set of interdependent sectors working together. This theme looks at the risks and resilience across these sectors in three areas: input dependencies such as agricultural inputs, broader supply chain inputs, labour and skills, water and energy (Sub-theme 1); movement of goods including the stability of import flows into the UK and travel within the UK (Sub-theme 2); and finally food businesses including cyber security of businesses, UK food retailers and their diversity, and broader economic and business stability throughout the supply chain (Sub-theme 3). This edition includes new indicators tracking water dependency and import flows.

Food, along with water, energy and transport are recognised as [critical national infrastructure sectors](https://www.npsa.gov.uk/critical-national-infrastructure-sectors) (<https://www.npsa.gov.uk/critical-national-infrastructure-0>). Changes and disruption to sectors outside of food can have

a direct effect on food. Given the wide range of potential shocks and stresses that could affect the food supply chain, contingency planning is in place to mitigate against these risks. Defra, other UK government departments and the devolved governments routinely anticipate, prepare, mitigate, and respond to risks of national significance. This includes contributing to and monitoring the [National Risk Register](https://www.gov.uk/government/publications/national-risk-register-2023) (<https://www.gov.uk/government/publications/national-risk-register-2023>) which provides public information on the most significant risks that could occur in the next two years, and which could have a wide range of effects on the UK. While the UKFSR tracks risks and broad attributes of the UK related to supply chain resilience, it does not include data on contingency planning for these risks.

## Overall findings

- **Russia's invasion of Ukraine caused a spike in input costs such as energy and fertiliser.** This was a major development of the period between 2021 and 2024, having an effect across the food supply chain. The shock led to business uncertainty and the highest food inflation spike for consumers in 45 years. It showed the UK's and the rest of Europe's vulnerability to food inflation from high energy prices and the effect of other cost pressures in the system. Food inflation persisted up to 2024 despite wider global prices falling. At no point in the last three years has the UK population faced shortages of food items for a sustained period, demonstrating a continued resilience in providing food availability through shocks.

**Key statistic:** Fertiliser costs for UK farms rose from £1.5 billion in 2021 to £2 billion in 2022, before dropping to £1.4 billion in 2023. These changes contrast with a stable level of cost in the decade up to 2020. Similarly, electricity and gas prices climbed far surpassing prices in the period 2014 to 2020, doubling for electricity and nearly tripling for gas (electricity 100%, gas 187%) significantly from mid-2022 (see Indicator 3.1.1. Agricultural Inputs and Indicator 3.1.5 Energy).

- **Single points of failure in food supply chains pose resilience risks** with evidence of reliance on regionally concentrated suppliers of supply chain inputs making the UK vulnerable to supplier failure (such as sunflower oil from Ukraine and calcium carbonate from France). This risk is compounded by a prevailing 'Just in Time' (JIT) model and low stock approach for many businesses and by a more volatile international context.

**Key statistic:** From 2007 to 2021 UK imports of sunflower oil were broadly stable at around 300,000 tonnes. Following the Russian invasion of Ukraine, total UK imports of sunflower oil fell to 224,000 in 2023, a 25.3% decrease, creating temporary shortfalls for key processors while driving substitution of other oils, such as rapeseed (see Indicator 3.1.2 Supply chain inputs).

- **While there was a sharp fall in volume of imports of Feed Food and Drink to the UK in 2021, imports have increased slightly since then** and the EU remains the UK's largest external supplier.

**Key statistic:** The EU accounted for 64% of the volume of UK imports of food, feed and drink in 2023. The volume imported from both the EU and Non-EU countries was 6% lower in 2023 compared to 2018 (see Indicator 3.2.3 Import Flows).

- **Overall imports of food and, feed and drink are spread across several major ports and a large number of small ports, but diversity of ports varies for different commodities.** The Short Straits has the largest share of imports and shows a higher level of concentration for perishable goods.

**Key statistic:** On average, 18% of the total volume of UK Food, Feed and Drink imports are recorded as entering the UK through the Short Straits. The average is greater for perishable products such as **dairy** and **eggs** (42% in 2023), **meat** (39% in 2023) and **vegetables** and **fruit** (29% in 2023).

- **Agri-food sector labour and skills shortages continue and are compounded by significantly more restrictive access to EU labour and skills.** Although overall employment in the food sector has increased, there have been long term perceptual challenges in attracting labour and skills to certain sectors such as horticulture and seafood, causing a reliance on migrant workers. These challenges have been exacerbated following the UK leaving the European Union causing increased strain on the UK labour and skills market due to difficulty in workers entering the UK to work.

**Key statistic:** Between 2021 and 2023, the workforce in the food sector in Great Britain increased from 4.04 million to 4.38 million, showing a steady upward trend. However, this does not show shortages in skills in key areas of the UK's food supply chain such as the seafood sector and the veterinary profession (see Indicator 3.1.3 Labour and Skills).

- **UK agricultural water availability is at risk from increased extreme weather events** driven by climate change, but adaptation measures through storage of water are underway.

**Key statistic:** Between 2010 and 2024 England saw a significant increase in water licensed for abstraction for both direct irrigation (up 16%) and reservoir storage for irrigation (up 15%). The abstraction of water can be disrupted by the activation of hands of flow measures in response to extremely dry weather. This was demonstrated during drought conditions in 2022 across the UK, with abstraction licenses suspended in [Scotland \(https://beta.sepa.scot/news/2023/sepa-working-with-scottish-businesses-to-prepare-for-water-scarcity-this-summer/\)](https://beta.sepa.scot/news/2023/sepa-working-with-scottish-businesses-to-prepare-for-water-scarcity-this-summer/) for the first time (see Indicator 3.1.4 Water).

- **Many food businesses have shown resilience and recovery** in response to shocks, but investment levels are not back to levels before

the price shock in 2022.

**Key statistic:** Average total quarterly investment by food and drink manufacturing businesses increased by 5.7% in 2023 compared to 2022 but was 21% lower than 2021 levels (see Indicator 3.3.3 Business resilience).

## **Cross-theme links**

The UK food supply chain has been affected by geopolitical and climate volatility on a global level, covered substantially in Theme 1 Global Food Availability. Theme 3 looks at the resulting effect of increased costs in the UK supply chain. These have raised costs of production and created a challenging business environment, affecting the production of food on the UK covered in Theme 2 UK Food Supply Sources.

Labour shortages continue throughout different sections of the food supply chain, having different influences. Reduced capacity in food safety and veterinary professions pose a risk to the maintenance of the UK's food safety regime covered in Theme 5 Food Safety and Consumer Confidence.

Since 2021 input price increases, extreme weather and shortages of skilled workers have had a cumulative effect on food businesses. This has all fed into food price increases which have contributed to complex decisions on purchasing food on the household level, which is considered in Theme 4 Food Security at Household Level.

Use of inputs such as fertiliser and pesticides, covered in this theme, directly affect the measures of environmental sustainability of food production in Theme 2.

# **Sub-theme 1: Input dependencies**

## **3.1.1 Agricultural inputs**

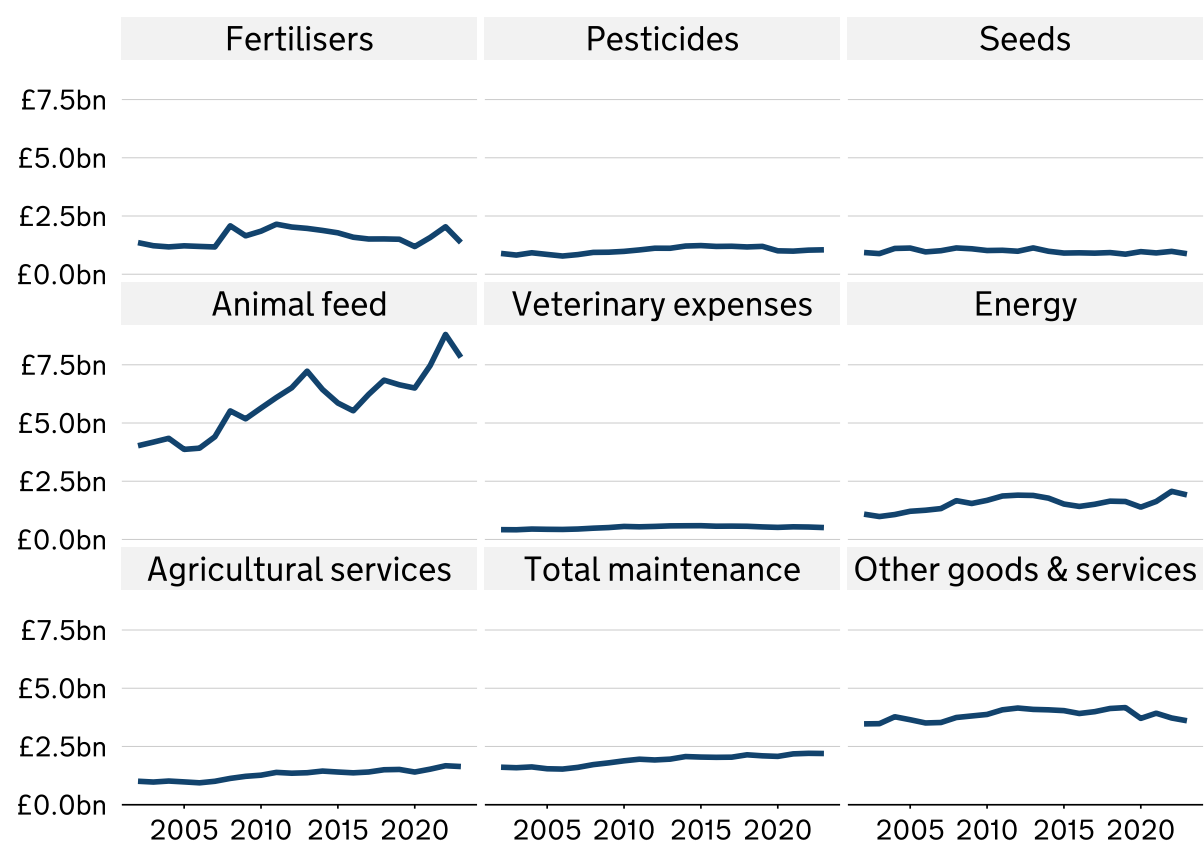
### **Rationale**

The production of crops, livestock and aquaculture in the UK is reliant on a range of agricultural inputs such as fertiliser, pesticides, feed (terrestrial animal and fish). Prices of inputs can vary from year to year depending on the level of supply domestically and on international markets. Factors such as weather, geo-political conflict and [competition](https://assets.publishing.service.gov.uk/media/66fd3b10080bdf716392ec91/GST_7_Final_WEB_compressed_updated.pdf) (https://assets.publishing.service.gov.uk/media/66fd3b10080bdf716392ec91/GST\_7\_Final\_WEB\_compressed\_updated.pdf) can tighten supply of inputs, causing price spikes that affect the overall use of key inputs. Longer-term trends such as the removal of products from the market, further affect demand for these inputs and the sustainability of farming practices. This indicator looks at usage, price, and supply of inputs to surface these trends. Other critical inputs to food production, such as water (Indicator 3.1.4), energy (Indicator 3.1.5) and labour (Indicator 3.1.3), are discussed elsewhere in Theme 3.

## Headline evidence

**Figure 3.1.1a:** Principal farm costs (real terms), 2003 to 2023

Source: [Agriculture in the United Kingdom 2023, Defra, Total income from farming data](https://www.gov.uk/government/statistics/agriculture-in-the-united-kingdom-2023/chapter-9-intermediate-consumption) (https://www.gov.uk/government/statistics/agriculture-in-the-united-kingdom-2023/chapter-9-intermediate-consumption)



[Download the data for this chart \(ODS, 58.9 KB\)](https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods)  
 (https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods)

Agricultural costs in real terms in the UK have fluctuated, in the last three years. Costs are driven by input unit prices and the volume of inputs



consumed. As shown in figure 3.1.1a above, most input costs increased from 2021 to 2022, before decreasing in 2023. The majority of input costs remain higher than before 2021, placing increased pressure on farm businesses and driving up food prices. Notable changes were seen in animal feed, fertiliser, and energy costs. Animal feed costs show a steep increase, climbing from £7.5 billion in 2021 to a high of £8.8 billion in 2022, before decreasing to £7.8 billion in 2023. Fertiliser costs also saw a volatile pattern, rising from £1.5 billion in 2021 to £2.0 billion in 2022, before dropping to £1.4 billion in 2023. Energy costs rose sharply from £1.6 billion in 2021 to £2.1 billion in 2022, and then decreased to £1.9 billion in 2023. Other inputs costs, for example seeds, remained much more stable. However, for some costs such as maintenance and agricultural services there is an increasing price trend over a longer term which may pose a future risk to food prices.

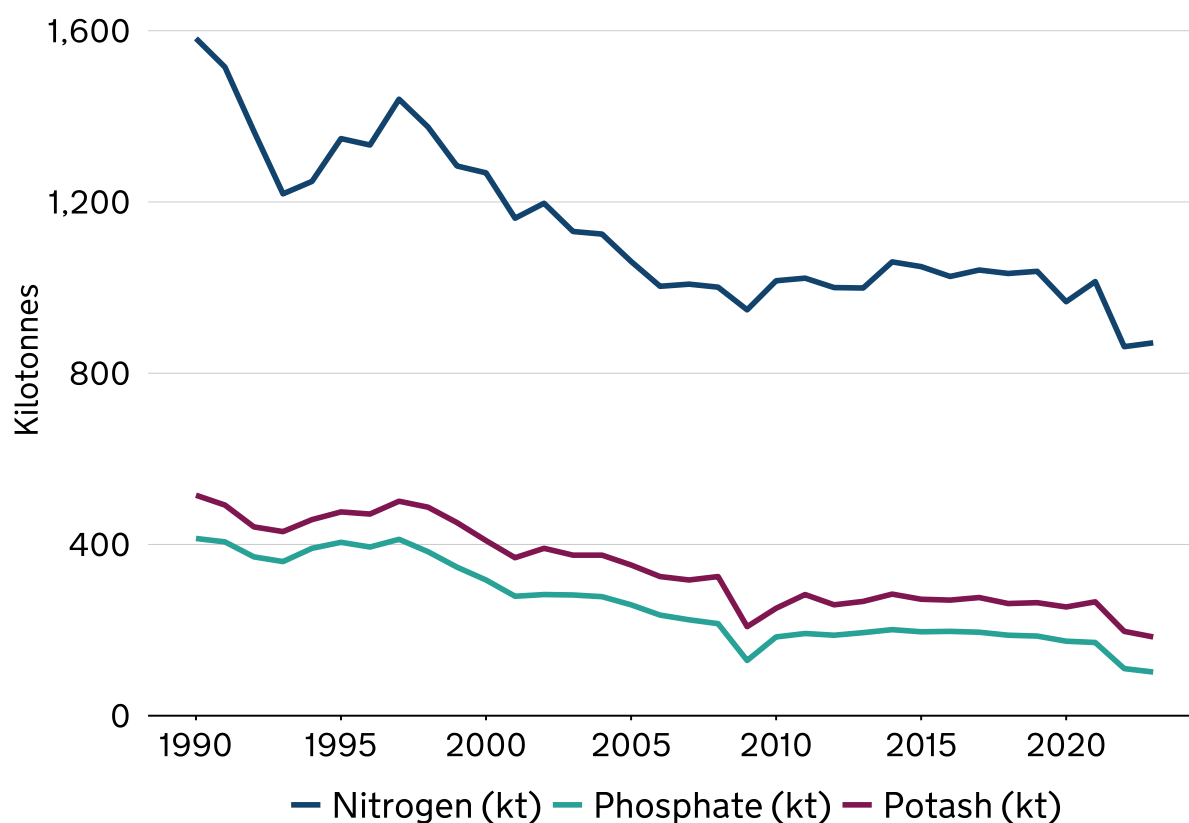
Notable changes were driven by global price shocks related to Russia's invasion of Ukraine and the resulting spike in energy prices covered in Indicator 3.1.5 Energy. The effect can be seen in the cost difference between imported and domestic inputs. From 2022 to 2023 producer input prices for home-produced food materials rose by 15.1% from 2022 to 2023, while for imported food materials the increase was 29.1% ([ONS, 2023](https://www.ons.gov.uk/economy/inflationandpriceindices/articles/foodandenergypriceinflationuk/2023#food-price-inflation) (<https://www.ons.gov.uk/economy/inflationandpriceindices/articles/foodandenergypriceinflationuk/2023#food-price-inflation>)). See supporting evidence.

## **Supporting evidence**

### **Fertiliser use and supply**

**Figure 3.1.1b:** Fertiliser use in the UK, kilotonnes, 1990 to 2023.

Source: [British Survey of Fertiliser Practice, Defra, Figure ES1](https://www.gov.uk/government/collections/fertiliser-usage) (<https://www.gov.uk/government/collections/fertiliser-usage>)



[Download the data for this chart \(ODS, 58.9 KB\)](#)

<https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods>

The UK demand for nitrogen is approximately 2 million tonnes and for phosphorus is 250,000 tonnes per annum. Approximately 50% of nitrogen is imported as inorganic fertilisers (or raw materials), and 50% of this is domestically produced via livestock manures. For phosphorus approximately 20% is imported inorganic fertiliser and 70% comes from livestock manures (Defra, 2022 ([https://www.gov.uk/government/statistics/uk-and-england-soil-nutrient-balances-2022/soil-nutrient-balances-uk-2022-statistics-notice#:~:text=Estimates%20for%202022%20show%20that%20the%20UK%20phosphorus%20balance%20was,71.0%25\)%20compared%20to%202000.](https://www.gov.uk/government/statistics/uk-and-england-soil-nutrient-balances-2022/soil-nutrient-balances-uk-2022-statistics-notice#:~:text=Estimates%20for%202022%20show%20that%20the%20UK%20phosphorus%20balance%20was,71.0%25)%20compared%20to%202000.))). The UK imports both finished fertiliser products and raw materials to satisfy the inorganic fertiliser demand. While the UK has a diverse supply sourcing from 60 countries, it imports certain products which are concentrated to a small number of countries due to geological reserves. Notable cases include dependence on [Israel](#) ([https://www.trademap.org/Country\\_SelProductCountry.aspx?nvpm=1%7c826%7c%7c%7c%7c3103%7c%7c%7c4%7c1%7c1%7c1%7c1%7c2%7c1%7c1%7c1](https://www.trademap.org/Country_SelProductCountry.aspx?nvpm=1%7c826%7c%7c%7c%7c3103%7c%7c%7c4%7c1%7c1%7c1%7c1%7c2%7c1%7c1%7c1)) for 62.8% of phosphatic fertilisers and on [Spain](#) ([https://www.trademap.org/Country\\_SelProductCountry.aspx?nvpm=1%7c826%7c%7c%7c%7c3104%7c%7c%7c4%7c1%7c1%7c1%7c1%7c2%7c1%7c1%7c1](https://www.trademap.org/Country_SelProductCountry.aspx?nvpm=1%7c826%7c%7c%7c%7c3104%7c%7c%7c4%7c1%7c1%7c1%7c1%7c2%7c1%7c1%7c1)) for 31.2% of potassic fertilisers in 2023. Diversity of supply is important to security of supply as it spreads risks from disruption from shocks such as conflicts, high prices or other barriers to trade, as discussed in Theme 1 (see Indicator 1.2.3 Global fertiliser production).

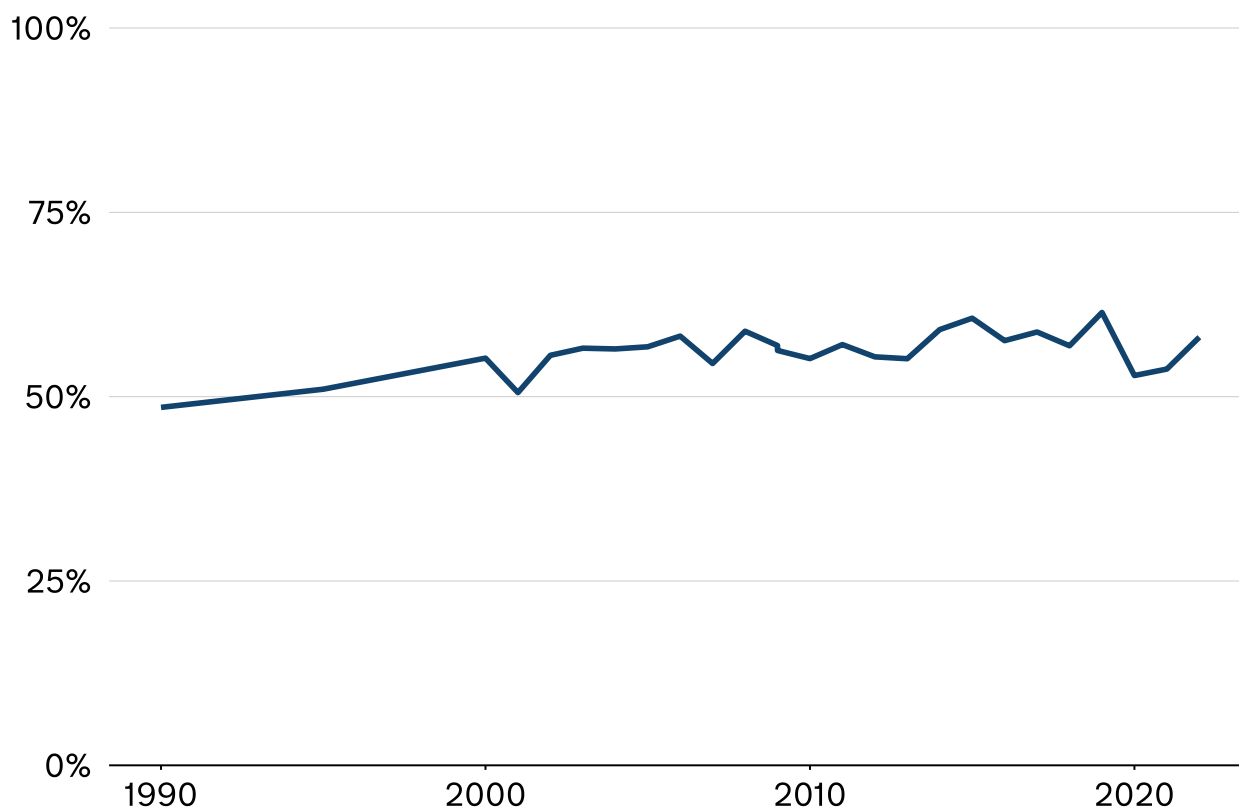
In August 2022, the only UK producer of ammonium nitrate moved to an import-only model for ammonia and has now permanently closed their ammonia production. While this is a change in the supply chain for ammonium nitrate, the product lines remain the same and it has not impacted ammonium nitrate availability in the UK. The UK imports both finished fertiliser products and raw materials to satisfy the inorganic fertiliser demand.

In Great Britain, the British Survey of Fertiliser Practice annually records the main trends in fertiliser usage. The long-term trend in fertiliser use is broadly downward. As shown above in figure 3.1.1b usage from 2003 decreased continuously before a substantial drop in the period 2008 to 2009. From the period 2008 to 2009, usage for nitrogen, phosphate and potash fertilisers plateaued. The overall downward trend is mostly due to a reduction in grazing livestock herd size reducing herbage production requirements. By contrast, overall nitrogen application rates for main arable crops have seen only marginal reductions over the last 30 years.

Long-term downward trends in fertiliser use need to be compared to the harvested outputs for a more useful comparison of how efficiently the UK uses nutrients. The Defra soil nutrient balance statistics (Figure 3.1.1c below) show that since 2000 there has been no substantial change in nitrogen use efficiency, despite a reduction in overall fertiliser use in that time.

**Figure 3.1.1c:** Nitrogen use efficiency (NUE) for England, 1990 to 2022.

Source: [UK and England soil nutrient balance 2022, Defra](https://www.gov.uk/government/statistics/uk-and-england-soil-nutrient-balances-2022/soil-nutrient-balances-uk-2022-statistics-notice#:~:text=Estimates%20for%202022%20show%20that%20the%20UK%20phosphorus%20balance%20was,71.0%25)%20compared%20to%202000.)  
([https://www.gov.uk/government/statistics/uk-and-england-soil-nutrient-balances-2022/soil-nutrient-balances-uk-2022-statistics-notice#:~:text=Estimates%20for%202022%20show%20that%20the%20UK%20phosphorus%20balance%20was,71.0%25\)%20compared%20to%202000.](https://www.gov.uk/government/statistics/uk-and-england-soil-nutrient-balances-2022/soil-nutrient-balances-uk-2022-statistics-notice#:~:text=Estimates%20for%202022%20show%20that%20the%20UK%20phosphorus%20balance%20was,71.0%25)%20compared%20to%202000.))



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## Fertiliser prices

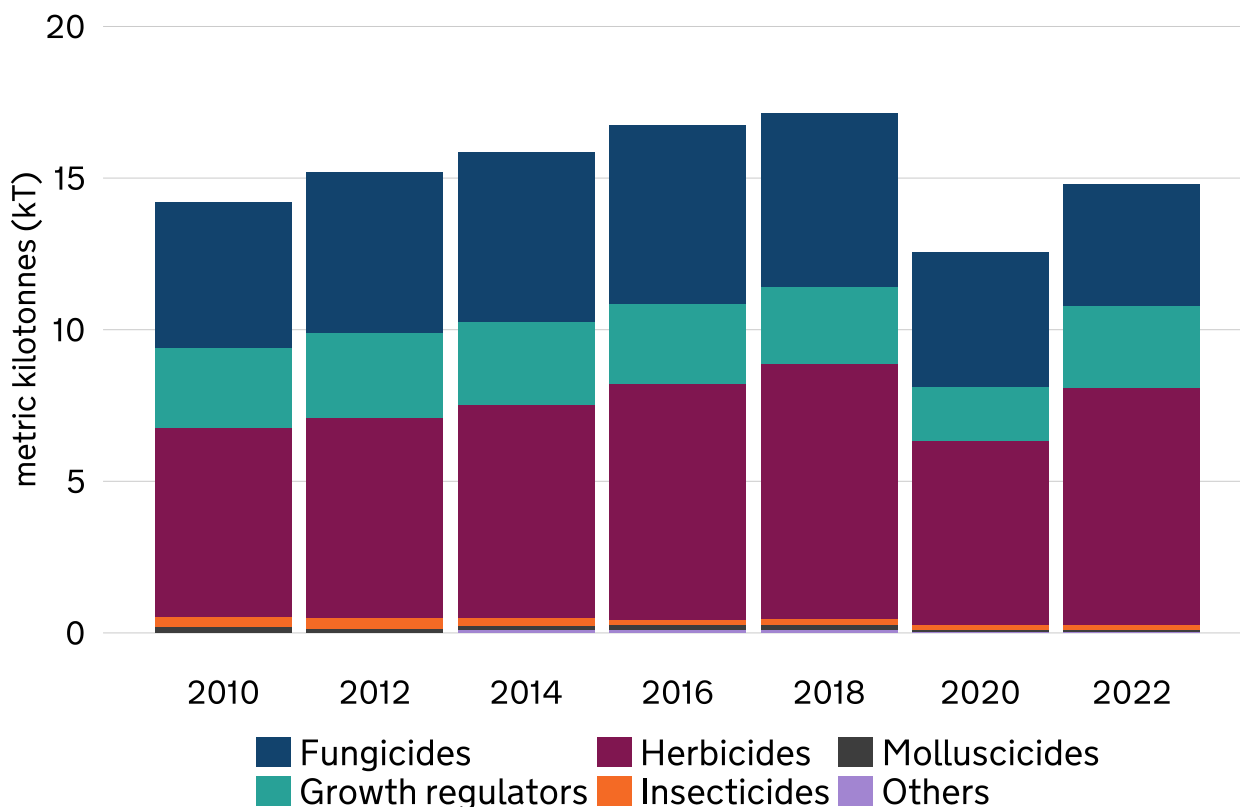
Changing fertiliser prices as a result of international markets have affected usage. Usage continually decreased from 2003 with the exception of periods during two major events: the financial crisis in 2008 and the 2021 gas price hike as a result of increased oil demand following the COVID-19 pandemic. Oil and gas price rises were further exacerbated by Russia's invasion of Ukraine in 2022 ([AHDB, 2024](https://ahdb.org.uk/GB-fertiliser-prices) (<https://ahdb.org.uk/GB-fertiliser-prices>)). Natural gas is a key component in fertiliser production and so the 2021-2022 events resulted in increased fertiliser prices. The price rises prompted a modest reduction in usage, which may have been in part due to farmers' expectation of enduring high market prices for agricultural commodities. Fertiliser prices decreased in the latter part of 2022 and in 2023 but remain above 2020 levels. This reduction was driven by falls in the price of natural gas.

## Pesticide use and supply

**Figure 3.1.1d:** Pesticide use, UK 2010 to 2022

Source: [Pesticide Usage Survey Report 2022, Defra](#)

<https://www.gov.uk/government/statistics/pesticide-usage-survey-report-arable-crops-in-the-united-kingdom-2022>



[Download the data for this chart \(ODS, 58.9 KB\)](#)

<https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods>

Plant protection products (PPPs) are pesticides that are used to regulate growth and to manage pests, weeds, and diseases in plants and plant products. They play an important role in maintaining high crop yields. However, they can have detrimental effects on the environment, particularly on terrestrial and aquatic biodiversity. In the UK, pesticide usage is reported through the [Pesticide Usage Survey Report](#)

<https://www.gov.uk/government/statistics/pesticide-usage-survey-report-arable-crops-in-the-united-kingdom-2022>), which consists of surveys for a range of crop groups and produces estimates from representative samples of growers. Pesticides applied to arable crops make up around 85% to 90% of all pesticides applied to agricultural land in the UK.

Between 2010 and 2018 there was a gradual increase in the weight of pesticides applied to arable land. There was a subsequent drop in usage in 2020, which was partly due to a switch from winter cropping to spring cropping due to challenging weather conditions in the autumn of 2019. In 2022, pesticide use rebounded but fell below the levels seen in 2018. However, the amount of data available makes it difficult to assess or establish trends. Changes to future farming practices such as use of [Integrated Pest Management \(IPM\)](#) (<https://www.gov.uk/guidance/sfi-actions-for-integrated-pest-management>) may mean that growers become less reliant on chemical pesticides over time.

UK imports and exports for PPPs exceed the UK's usage, suggesting that the UK plays a significant role in manufacturing or processing of PPPs for other markets. Currently there is a data gap on what proportion of PPPs used in the UK are imported. The UK's exit from the EU could lead to increased [frictions](#)

([https://www.legislation.gov.uk/ukia/2023/141/pdfs/ukia\\_20230141\\_en.pdf](https://www.legislation.gov.uk/ukia/2023/141/pdfs/ukia_20230141_en.pdf))

associated with bringing PPPs to the GB market, although anecdotal evidence suggests that these have not yet led to significant impacts on GB PPP availability. Manufacturers of PPPs now must incur the [costs of authorising and renewing PPPs in GB](#)

(<https://researchbriefings.files.parliament.uk/documents/POST-PB-0043/POST-PB-0043.pdf>) and the EU, which could affect availability of products in GB for

access to a relatively small market. In addition, existing transitional arrangements with the EU to enable free movement of seed treatment products and 'parallel' products into the GB market will end in 2028. This could further affect GB product availability as PPPs that were previously imported through this route but do not have GB authorisation could lose access to the GB market.

## **Pesticide prices**

Pesticide prices remained relatively constant (in real terms) from 2004 to 2021, with only moderate fluctuations. This consistency is likely due to the absence of significant supply shocks during that period and the broadly competitive global market for pesticide products keeping prices stable over the long-term. The recent increase therefore represents an anomaly due to unprecedented global disruptions rather than a regular fluctuation pattern.

Latest [agricultural price indices](#)

(<https://www.gov.uk/government/statistics/agricultural-price-indices>) show a 25% increase in prices for plant protection products between July 2021 and July 2023. This was driven primarily by a significant rise in prices starting in early 2021 and peaking in June 2022 before stabilising just below the peak.

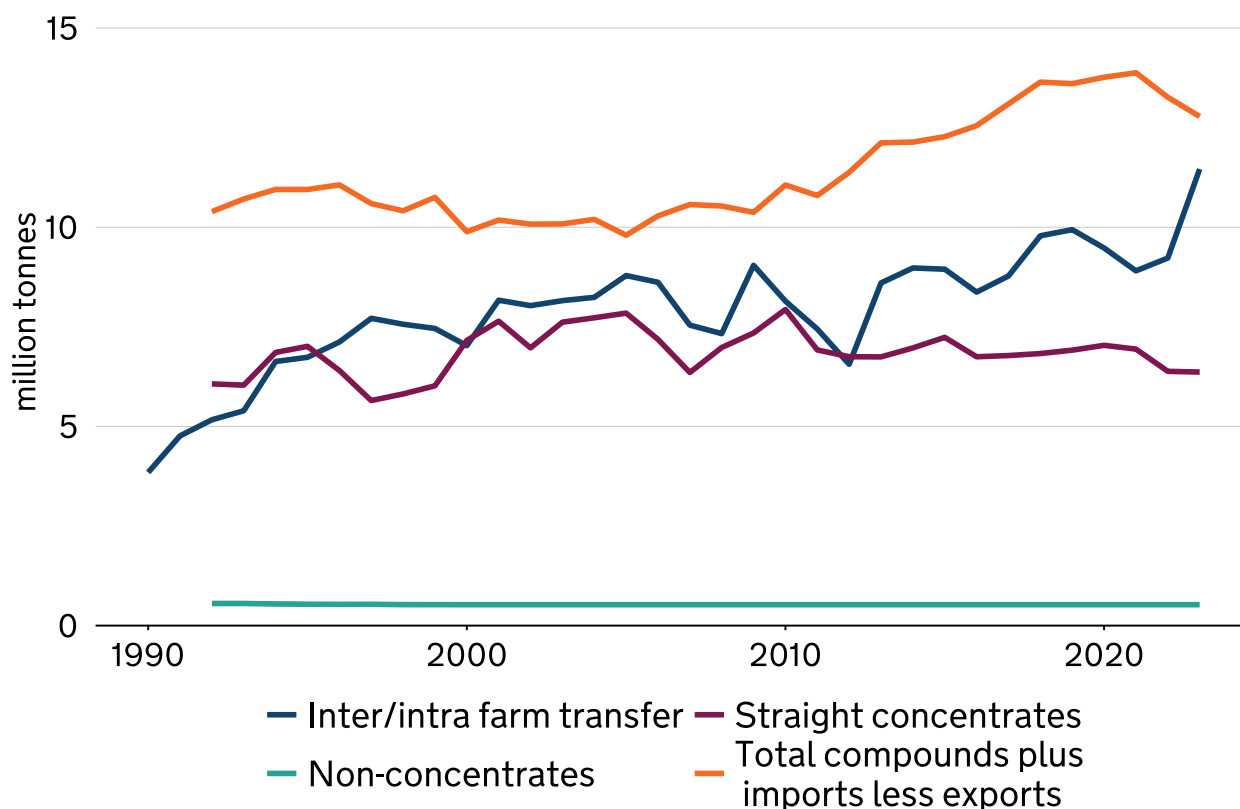
Pesticides are formulated using a variety of key raw materials, including petrochemicals, ammonia, phosphorus, sulphur, and **chlorine**. These materials are essential for creating the active ingredients and inert components that make pesticides effective. The increase in prices between July 2021 and July 2023 arose primarily due to the shocks to energy supply and supply logistics mentioned above.

## **Animal feed use, supply, and price**

**Figure 3.1.1e:** Animal feed use, tonnes, UK 1990 to 2023

Source: [Agriculture in the United Kingdom 2023, Defra](#)

(<https://www.gov.uk/government/statistics/agriculture-in-the-united-kingdom-2023/chapter-9-intermediate-consumption>)



[Download the data for this chart \(ODS, 58.9 KB\)](#)

<https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods>

#### Note:

1. Straight concentrates are cereals, cereal offals, proteins and other high energy feeds.
2. Non-concentrates are low-energy bulk feeds expressed as concentrate equivalent. Includes Brewers and distillers' grains (e.g barley), hay, milk by-products and other low-energy bulk feeds.
3. Inter/intra farm transfer is feed produced and used on farm or purchased from other farms.
4. Compound feed is a mixture of at least two feed materials.

Demand for animal feed as an input to the UK supply chain is driven by increases to livestock used in domestic production of animal products. Production of UK livestock is covered in Theme 2 (see Indicator 2.1.3 Livestock and poultry products). The cost of animal feed is the largest item of expenditure recorded in agricultural accounts. Usage of animal feed remained broadly level from 1993 to 2009 (around 25 million tonnes) before rising steadily since then to reach a peak of 30.8 million tonnes in 2018 before falling to 28.5 million tonnes in 2022. In 2023 the total volume increased to 31.1 million due to a 24% increase in inter/intra farm sales. However, total compound feed (see data note for definition) volume decreased by 3.6%, with decreases in **pigs** (-8.9%), **sheep** (-9.4%), **poultry**



(-3.3%) and **cattle** (-0.3%). Compound feed for calves showed a small increase of 1.3%.

To meet these volume demands the UK imports commodities such as soybean meal and maize ([AHDB, 2024 \(https://ahdb.org.uk/cereals-oilseeds/feed-ingredient-prices\)](https://ahdb.org.uk/cereals-oilseeds/feed-ingredient-prices)). Soybean meal is used to feed all livestock but is particularly important in the pig and poultry sectors. Soybean meal is favoured due to its low-cost, year-round availability and nutritional value, particularly its high protein content and few anti-nutritional factors post-processing. The UK is not an ideal growing environment for soybeans. The estimated area of soybeans in the UK is around [2000ha \(https://www.pgro.org/soya/\)](https://www.pgro.org/soya/), but plant breeding work continues to develop varieties more suited to UK conditions. Despite a relatively satisfactory level of fodder maize production in the UK (mainly used for on farm feed of dairy cattle or for [bioenergy \(https://www.gov.uk/government/statistics/bioenergy-crops-in-england-and-the-uk-2008-2023/bioenergy-crops-in-england-and-the-uk-2008-2023#anaerobic-digestion\)](https://www.gov.uk/government/statistics/bioenergy-crops-in-england-and-the-uk-2008-2023/bioenergy-crops-in-england-and-the-uk-2008-2023#anaerobic-digestion)), there is little grain [maize \(https://www.gov.uk/government/statistics/agricultural-land-use-in-england/agricultural-land-use-in-england-at-1-june-2024\)](https://www.gov.uk/government/statistics/agricultural-land-use-in-england/agricultural-land-use-in-england-at-1-june-2024) production in the UK meaning that almost all is imported, mostly for human and industrial usage and poultry feed. However, cereals (maize, wheat, and barley) can generally be used interchangeably following reformulation of the feed product. The UK continues to import soybean and maize from a wide variety of countries in recent years, showing a diversity of supply. Some of the environmental impacts estimated to be associated with UK consumption of cattle related products, such as maize and soy, are covered in Theme 4 (see Indicator 4.3.3 Sustainable diet). There is significant variation from year to year based on availability and [price \(https://ahdb.org.uk/cereals-oilseeds/feed-ingredient-prices\)](https://ahdb.org.uk/cereals-oilseeds/feed-ingredient-prices). The total import volume of maize (excluding seed for sowing) in 2023 amounted to 2.1 million tonnes, a decrease of 12% compared to 2022, when imports stood at 2.4 million tonnes. UK imports of soybeans are covered in Theme 2 (see Indicator 2.1.2 Arable products). The UK is dependent on imports of feed additives (such as amino acids, enzymes, vitamins, minerals, phosphates) where supply is limited to a small number of countries and important to animal health and welfare ([Environment, Food and Rural Affairs Committee, 2022 \(https://committees.parliament.uk/event/15120/formal-meeting-oral-evidence-session/\)](https://committees.parliament.uk/event/15120/formal-meeting-oral-evidence-session/)).

Higher feed costs from 2022 to 2023 were driven by higher international prices in feed due to the global price shocks. This particularly challenged the pig and poultry sectors which have faced other challenges from butcher shortages capacity and increasing disease risks. This is explored further in Theme 2 (Indicator 2.1.3 Livestock and poultry products). Sufficient grass growth in the latter half of 2023 reduced the need for extra supplementary compound feed for cattle and sheep. Additionally, the volume of straight concentrates (see data note for definition) decreased by 0.3% in 2023



(AUK, 2023 (<https://www.gov.uk/government/statistics/agriculture-in-the-united-kingdom-2023/chapter-9-intermediate-consumption>)).

## **Fish feed use, supply, and price**

UK production of seafood is discussed in Theme 2 (see Indicator 2.1.5 Seafood). Unlike terrestrial animal feeds, there are no equivalent public statistics on usage and prices for fish feed within UK aquaculture. Various diets are used for different species at various stages of production. Fish feeds are formulated from a range of ingredients, sourced from marine and terrestrial origins, from domestic and international suppliers. Fish feed therefore has a complex supply landscape, giving it similar strengths and risks to other animal feeds (see animal feed section above). In recent years prices for certain fish feed ingredients have surged. For instance, fish meal (ground-up fish) rose from 1,900 USD per tonne in October 2022 to 2,200 USD in October 2023. This is due to limited global supply availability as a result of reduced production from Peru, the main global supplier of fishmeal and fish oil (FAO, 2024 (<https://openknowledge.fao.org/handle/20.500.14283/cd1265en>)). Increases in production of fish meal may lead to sustainability issues, because of overfishing to meet the demands of fish feed in aquaculture (Nagappan and others, 2021 (<https://www.sciencedirect.com/science/article/pii/S0168165621002376#:~:text=Currently%2C%20some%20of%20the%20feed,an%20ingredient%20of%20aquaculture%20feed.>)).

## **Land use**

A final consideration for both feed types is land use and environmental sustainability of supply. Although animal feed and livestock contribute to 80% of agriculture land use, from a food availability and nutrition perspective meat, dairy, and farmed fish provide just 17% of the world's calories and 38% of its protein (FAOSTAT, 2024 (<https://www.fao.org/faostat/en/#data>)). Consideration of this statistic needs to factor in that type of land use is limited by type and quality of land. This is discussed in more detail in Theme 1 (see Indicator 1.2.2 Global land use change). Theme 1, Indicator 1.2.2 Global land use change, also discusses that soybean and maize have historically driven crop expansion resulting in deforestation in regions such as South America, an important supplier region of animal feed to the UK.

## **Semi-conductors**

Agricultural production relies on broader inputs to the UK economy that are subject to a range of variables. Important examples are water and energy, which are considered as separate indicators in this sub-theme. Another important consideration is technological innovation, which continued growth in agri-productivity is dependent on (discussed in Theme 2 (see Indicator 2.2.3 Agricultural productivity)). Technological innovation relies on resilient

supply of key technological inputs, the majority of which are not specific to agri-sector uses only. [Semi-conductors](https://researchbriefings.files.parliament.uk/documents/POST-PN-0721/POST-PN-0721.pdf) (<https://researchbriefings.files.parliament.uk/documents/POST-PN-0721/POST-PN-0721.pdf>) are a ubiquitous technological input, required for technological innovation of existing production efficiencies and new components and techniques. Global production of the highest-grade processing chips is limited to specific suppliers in specific regions. Notably 75% of the manufacturing capacity and required materials are located in China and East Asia ([Mohammad, Elomri and Kerbache, 2022](https://www.sciencedirect.com/science/article/pii/S2405896322017293) (<https://www.sciencedirect.com/science/article/pii/S2405896322017293>)). There is therefore a global dependency on these specific regions for both supply and further development of semi-conductors. Recent international volatility and geopolitical [contestations](https://assets.publishing.service.gov.uk/media/673602412469c5b71dbc7b6f/Global_Strategic_Trends_Out_to_2055.pdf) ([https://assets.publishing.service.gov.uk/media/673602412469c5b71dbc7b6f/Global Strategic Trends Out to 2055.pdf](https://assets.publishing.service.gov.uk/media/673602412469c5b71dbc7b6f/Global_Strategic_Trends_Out_to_2055.pdf)) such as Russia's invasion of Ukraine highlights the risk of being dependent on narrow supply chains.

## 3.1.2 Supply chain inputs

### Rationale

The food consumers purchase depends on a complex set of inputs at the processing stage (post-farmgate). This indicator tracks a select number of post-farmgate inputs to represent this complexity and to surface key trends affecting resilience of their supply over time. As with agricultural inputs, broader supply chain inputs are affected by domestic and international disruption. Import reliance and general supply landscape are considered for each input.

**CO<sub>2</sub>:** CO<sub>2</sub> is an example of a chemical that is used across the food supply chain. CO<sub>2</sub> is used for animal stunning, for refrigeration, as a packaging gas and in carbonated drinks.

**Sunflower oil:** Edible oils are used in food manufacturing for a range of uses cooking, emulsifying, as a stabilizer. Sunflower oil has been selected to represent the wider edible oils category.

**Wheat:** Wheat, used to produce flour, is a staple ingredient of the UK diet not just in bread but in wider food manufacturing of other baked goods, as an ingredient in sauces and dressings, and the production of bioethanol.

**Cardboard and Polyethylene Terephthalate (PET):** Packaging is an important part of the food manufacturing process. Both Cardboard and PET

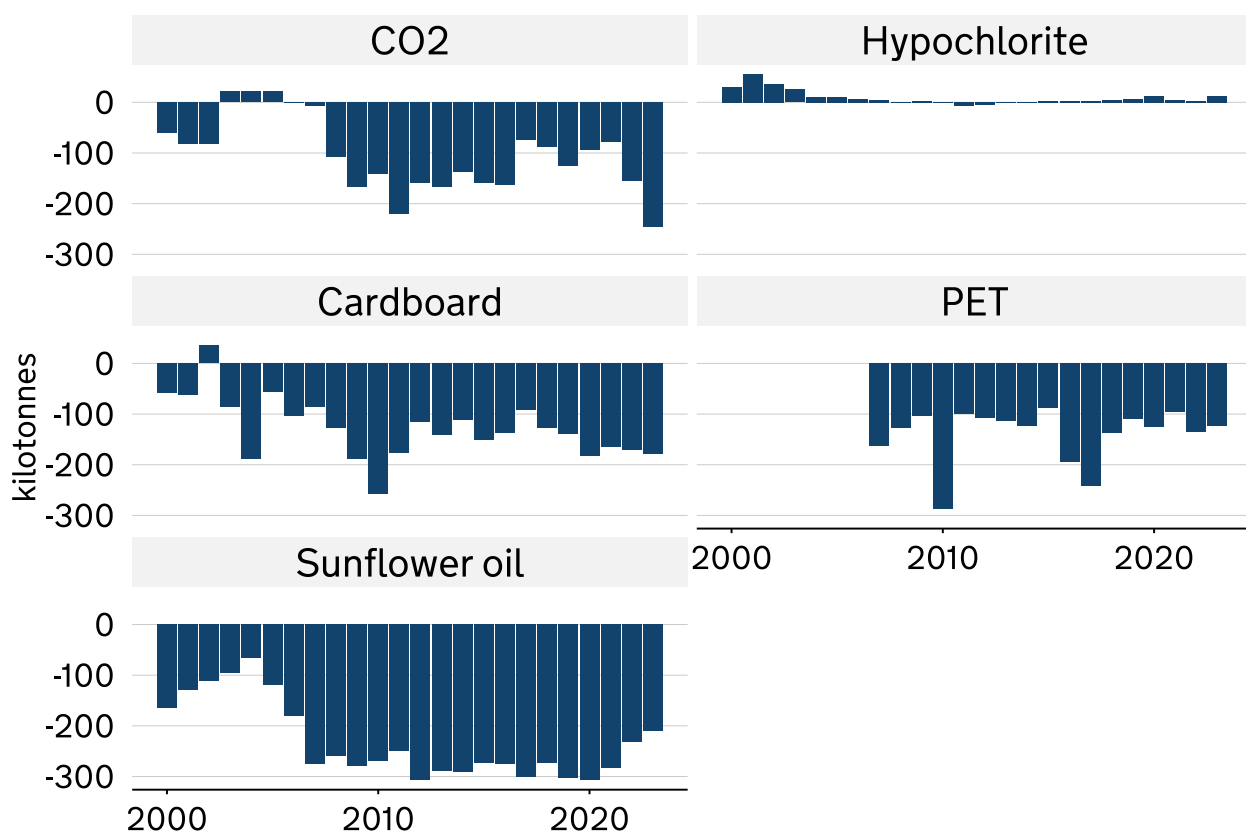
are prevalent packaging inputs. Paper based packaging can be both carton board (or solid board) for sandwich packs, food trays, breakfast cereal, confectionery and others or it can be corrugated for fruit and vegetable trays and pizza boxes, e-commerce/home delivery. In both carton and solid board, packaging starts as reels of paper before conversion into its final form. PET is a type of plastic that is used to produce beverage bottles and packaging for food products.

**Sodium hypochlorite:** Cleaning agents are vital across the supply chain for food hygiene and in the processing of horticulture and agricultural inputs. Sodium hypochlorite has been chosen as an example of a cleaning agent for this indicator as it is widely used in the food industry as a disinfectant, primarily for fresh fruit and vegetables and bagged salads.

### Headline evidence

**Figure 3.1.2a:** Net trade of key supply chain inputs, kilotonnes UK 2000 to 2023

Source: [HMRC \(http://www.uktradeinfo.com\)](http://www.uktradeinfo.com)

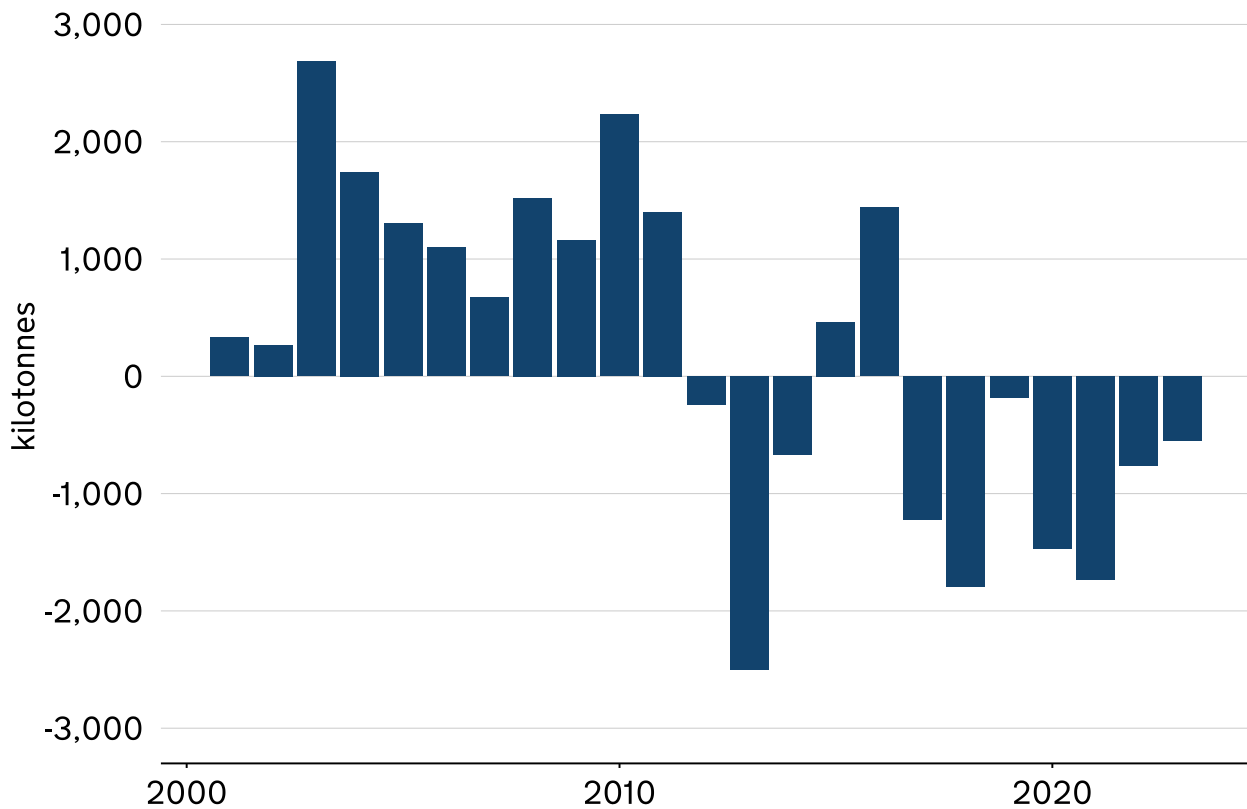


[Download the data for this chart \(ODS, 58.9 KB\)](https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods)  
(<https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods>)

Note: Net trade is exports minus imports. Thus, a negative value of net trade indicates that a country is a net importer of that product.

**Figure 3.1.2b:** Net trade of wheat, kilotonnes UK 2000 to 2023

Source: [HMRC \(http://www.uktradeinfo.com\)](http://www.uktradeinfo.com)



[Download the data for this chart \(ODS, 58.9 KB\)](#)  
(<https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods>)

Note: Net trade is exports minus imports. Thus, a negative value of net trade indicates that a country is a net importer of that product.

## CO<sub>2</sub>

Figure 3.1.2a above shows that the UK has been a consistent net importer of CO<sub>2</sub> over the last 15 years, with a steep rise in the last 3 years. From 2021 to 2023, The Netherlands was the largest supplier of CO<sub>2</sub> imports to the UK, accounting for 70 to 90% of imports. Much of UK CO<sub>2</sub> is supplied by companies that import to the UK from the EU either by origin or dispatch and therefore the supply landscape is interlinked with the EU market for CO<sub>2</sub>. There is some domestic production of CO<sub>2</sub> as a co-product in the production of bioethanol and through anaerobic digestion. As a byproduct of fertiliser production (energy intensive), CO<sub>2</sub> production is also affected by energy price increase. Detailed CO<sub>2</sub> price data is not currently available. Indefinite shelf life gives some stability to supply in an event of supply disruption, but storing CO<sub>2</sub> can be costly. The recent notable increase in imports is likely related to domestic production gap left by closure of one of

CF Fertilisers' company assets in 2022, and another in 2023, where CO<sub>2</sub> was a co-product of processes at these assets. A CO<sub>2</sub> shortage in 2022 affected the meat industry (animal slaughter) for months, causing animal welfare issues, as well as affecting large parts of the food and drinks sector (brewers, soft drinks producers, some packaging processors) ([Food Standards Agency, 2023](https://www.food.gov.uk/sites/default/files/media/document/STRATEGIC%20ASSESSMENT%202023_REPORT_V2.0%20-%20final.pdf) ([https://www.food.gov.uk/sites/default/files/media/document/STRATEGIC%20ASSESSMENT%202023\\_REPORT\\_V2.0%20-%20final.pdf](https://www.food.gov.uk/sites/default/files/media/document/STRATEGIC%20ASSESSMENT%202023_REPORT_V2.0%20-%20final.pdf))). There are a relatively small number of companies supplying CO<sub>2</sub> in the UK and infrastructure enabling deliveries is often owned by the supplier, so it is difficult for food businesses to divert to alternative suppliers when disruptions occur. Finding alternatives to CO<sub>2</sub> is difficult, with limited uses of alternative gases across the food industry.

## Sunflower oil

Sunflower oil is a component in a wide range of processed foods. Therefore, any disruption in supply will impact a wide range of food manufactures. As shown in figure 3.1.2a above, the UK has a high import reliance on sunflower oil. In the mid-2000s, after implementation of export tariffs for unprocessed sunflower seed, Ukraine developed a leading sunflower oil industry and became the leading exporter of sunflower oil in the world, accounting for 50% of the global export market ([Food Standards Agency, 2022](https://www.food.gov.uk/about-us/fsa-22-06-04-fsa-response-to-ukraine-conflict-supply-chain-disruption-ingredient-substitution-and-labelling) (<https://www.food.gov.uk/about-us/fsa-22-06-04-fsa-response-to-ukraine-conflict-supply-chain-disruption-ingredient-substitution-and-labelling>)). While there are several refineries in the UK which can crush oilseeds and produce oil, they could not crush sunflower seeds competitively and instead concentrated their activity on processing domestically grown or imported rapeseed, to produce bulk vegetable oil for retail bottles or use in food manufacturing. This model worked well for several years, with UK oil processors meeting demand by importing sunflower oil that had already been through primary processing. Following Russia's invasion of Ukraine in 2022, sunflower supplies from Ukraine were suddenly withdrawn from the market. As a result, total UK imports of sunflower oil fell to 241,000 tonnes in 2022 and 224,000 in 2023 from an average of around 300,000 tonnes per year since 2007. Many food manufacturers showed resilience in response to the tightening of supply by adapting their recipes to use alternative oil supplies, which was supported by rapid assessment of risks of allergic reactions by the Food Standards Agency and Food Standards Scotland ([Food Standards Agency, 2022](https://www.food.gov.uk/about-us/fsa-22-06-04-fsa-response-to-ukraine-conflict-supply-chain-disruption-ingredient-substitution-and-labelling) (<https://www.food.gov.uk/about-us/fsa-22-06-04-fsa-response-to-ukraine-conflict-supply-chain-disruption-ingredient-substitution-and-labelling>)). Since the initial disruption, Ukraine has been able to export sunflower oil again by road and sea. On a country-of-origin basis Ukraine and France accounted for 73% of the total volume imported to the UK in 2023. However, import volumes have not returned to pre-war levels. This in part due to weather patterns in both Ukraine and France reducing the seed available for crushing. After adjusting recipes to be more flexible following the initial disruption, food manufacturers are now able to place orders

according to price point by switching from sunflower oil to rapeseed oil or using a blend of both when setting contracts. This could be interpreted as an example of [re-orientation](https://www.nature.com/articles/s43016-023-00762-5) (<https://www.nature.com/articles/s43016-023-00762-5>) that helps mitigate the effect from future disruptions.

## **Wheat**

Wheat is used in a number of inputs throughout the supply chain and is the UK's largest food import. Figure 3.1.2b above shows that the UK was consistent net exporter of wheat from 2000 to 2011. Since 2011, the UK's net trade in wheat has fluctuated between being a net importer and net exporter. 2013 was a peak year for imports due to an exceptionally wet autumn leading to much reduced area of winter crops, followed by a particularly cold spring with unseasonably late snowfalls in the last three years. Production of UK wheat is covered in Theme 2 (see Indicator 2.1.2 Arable). Depending on the quality of domestically produced wheat, UK flour millers will need to import some of the required wheat. From 2021 to 2023, Canada and Germany were the top two importers of wheat to the UK with around 40% to 60% of imports in total. North American wheat has good characteristics (high protein and gluten strength) to work well with a blend of UK wheats and import levels are relatively consistent. As discussed in Theme 1 (see Indicator 1.3.2 Global real prices), there have recently been several disrupting factors affecting the supply and price of wheat on international markets. Wheat is substitutable by a range of alternatives including barley, buckwheat, corn, maize/polenta, millet, oats, quinoa, rice, rye, and sorghum, but application of these options varies across a range of food products.

## **Cardboard and Polyethylene terephthalate (PET)**

The UK is currently a net importer of both PET and cardboard, both of which are used in the food and drink manufacturing process as packaging. From 2021 to 2023, the UK imported cardboard from a number of sources, with the Netherlands and Türkiye the principal suppliers accounting for around 30%. Similarly, the UK imported PET from a number of importers, with China the primary supplier accounting for around a third of imports. Over the last three years the UK's net trade balance has remained broadly stable for PET and cardboard. Substitution depends on the product contained within the cardboard or PET packaging. For example, during shortages of pulp for egg cartons, single-use plastic cartons have been temporarily used. There is currently limited data available to adequately disaggregate how much of the total volume of PET and cardboard is used in the food and drink supply chain.

## **Sodium hypochlorite**

Over the last 20 years the UK has been primarily a net exporter of sodium hypochlorite, this trend has continued over the last 3 years. Not all sodium hypochlorite is used domestically and therefore despite being a net



exporter, the UK still imports sodium hypochlorite. From 2021 to 2023, Ireland and Italy were the top two suppliers to the UK, accounting for around 40 to 60% of imports in total. Sodium hypochlorite is used in a wide range of applications as a disinfectant. Examples include preventing algae or shellfish from growing in stored water, washing fruit and vegetables and the preparation of meat and fish for consumer consumption. Due to commercial sensitivities, there is limited data available on the UK's supplier landscape for sodium hypochlorite. Reports from industry body Eurochlor ([Chlor-Alkali Industry Review, 2023](https://www.eurochlor.org/wp-content/uploads/2023/10/Chlor-Alkali-Industry-Review_CORRECTED-2023-10-06.pdf) ([https://www.eurochlor.org/wp-content/uploads/2023/10/Chlor-Alkali-Industry-Review\\_CORRECTED-2023-10-06.pdf](https://www.eurochlor.org/wp-content/uploads/2023/10/Chlor-Alkali-Industry-Review_CORRECTED-2023-10-06.pdf))) show UK domestic production of chlorine (an input in the production sodium hypochlorite) stood at 440 (total kt Cl<sub>2</sub>), for the period between 2021 and 2023. It is expected that the UK's domestic production of chlorine will decline because of plant closures. Due to the wide-ranging uses any possible disruption of supply would affect several actors within the food supply chain. Chlorine dioxide has been used as an alternative to hypochlorite solutions in cleaning applications with high organic loads such as poultry or fruit processing. It has much more oxidizing power than bleach, is less corrosive to equipment, and is less harmful to the environment.

## Supporting evidence

Over the last three years, across the inputs within this indicator, except for sodium hypochlorite, the UK has continued to be a net importer. Broadly across the inputs, the UK's domestic production has fluctuated due to varying factors such as extreme weather and energy prices. Inputs such as wheat and sunflower oil have a number of substitutions, if their availability were to be disrupted. In contrast, CO<sub>2</sub> is more difficult to replace. While both domestic production and trade carry risks, risks to trade are made more acute where inputs have limited numbers of suppliers or concentrated supply, and this risk becomes stronger in conditions of volatility as seen in the years 2021 to 2023. Sunflower oil and CO<sub>2</sub> both show high import reliance on one or two countries. The risk for sunflower oil was demonstrated in 2022. Inputs to mandatory flour fortification of bread such as calcium carbonate also have a concentrated reliance on imports that was affected by recent volatility, this is discussed further in the case study below. A [2023 strategic assessment](https://www.food.gov.uk/sites/default/files/media/document/STRATEGIC%20ASSESSMENT%202023_REPORT_V2.0%20-%20final.pdf) ([https://www.food.gov.uk/sites/default/files/media/document/STRATEGIC%20ASSESSMENT%202023\\_REPORT\\_V2.0%20-%20final.pdf](https://www.food.gov.uk/sites/default/files/media/document/STRATEGIC%20ASSESSMENT%202023_REPORT_V2.0%20-%20final.pdf)) of the food system, commissioned by the Food Standards Agency, summarised that supply chain volatility can affect the food system mainly in two ways: through sudden unavailability of goods with systemic effect, and the increased risk of unexpected contaminants and food quality issues when sourcing from new suppliers and using new trade channels.

This indicator has not considered sustainability of these post-farmgate inputs. As an indicator of the challenges, recyclable inputs for plastics

continue to be less accessible than non-recyclable inputs ([IGD, 2024](https://www.igd.com/Social-Impact/Sustainability/Reports/Sustainable-packaging-business-case-and-calls-to-action/47328) (<https://www.igd.com/Social-Impact/Sustainability/Reports/Sustainable-packaging-business-case-and-calls-to-action/47328>)). Plastics and packaging broadly offer a range of benefits for food manufacturers, as discussed above. However, the effect of plastic and plastic pollution to the environment, ocean and human health, has led to increased scrutiny on [the use of plastics in the food sector](https://www.foodindustry.com/articles/problems-with-the-use-of-plastic-in-the-food-industry/) (<https://www.foodindustry.com/articles/problems-with-the-use-of-plastic-in-the-food-industry/>) and over the longer term can feed into the depletion of the world's natural capital on which food production and productivity is dependent.

## **Case Study 1: Flour fortification and calcium carbonate**

The Bread and Flour Regulations 1998 mandate the compulsory addition of calcium carbonate, iron, niacin, and thiamin to non-wholemeal wheat flour to help protect against nutrient deficiencies within the population. Previously, the supply of calcium used for flour fortification in the UK was sourced from a quarry in England, Steeple Morden. While this met the purity criteria for calcium carbonate in the Bread and Flour Regulations 1998, it was not compliant with the criteria set out for calcium carbonate in EU food law. Hence, industry has moved to a new calcium carbonate source which is compliant with both domestic laws and EU laws enabling single lines of production and giving the ability to serve both domestic and export markets. Calcium carbonate composition is determined by the natural geological makeup and is therefore unvarying and very difficult to change, meaning that existing UK quarried supply of calcium carbonate cannot meet EU criteria as they stand. Additionally, calcium carbonate used in flour has other requirements such as particle size which is needed to be suitable for purpose. The multinational supplier of calcium carbonate has since decided to rationalise their business model which has led to a reliance on a single quarry site in France to source all calcium carbonate for UK flour. Since this shift, the quarry in England has ceased production of food-grade calcium carbonate, meaning that domestic production is no longer a contingency option should supply of calcium carbonate from France be disrupted. Even if this were a contingency option, there could be significant challenges around supplying flour fortified with calcium carbonate that is not compliant with EU food additive requirements. Events such as the widespread protest in France in early 2024 have demonstrated knock-on effect to supply chains, pointing to the potential vulnerabilities of reliance on this single source.

Due to the scale of flour production in the UK and restrictions of storage space, frequent deliveries of calcium carbonate are required with some larger mills receiving tanker load deliveries 1 to 2 times per week. This is the JIT model whereby raw materials are purchased to align with



production schedules and large stockpiles are not held. While enabling efficiencies in supply, it means that a disruption in the supply of calcium carbonate could lead to the depletion of stocks quickly with immediate effects on UK millers' ability to produce flour compliant with UK law. While there has been no break in the supply of compliant flour in the UK, this example highlights that there are areas where highly specialised ingredients and inputs are required by the UK food system, and limited suppliers producing to this specification. This, combined with an industry model that does not encourage stockpiling beyond immediate needs, presents a risk to the UK food system. Bread is a staple food for the UK population with a short shelf life and any disruption would be felt immediately by the population and would likely affect public confidence in the UK food system.

This issue is not exclusive to calcium carbonate and could also be true for most of the mandatory nutrients required to be added to flour. Thiamin and niacin are obtained exclusively from China due to difficult synthesis and low profit margins. A short-term issue with thiamin supplies was seen at the beginning of the COVID-19 pandemic but the effects were minimised, and stocks of worldwide supplies were redirected to the UK in time.

## 3.1.3 Labour and skills

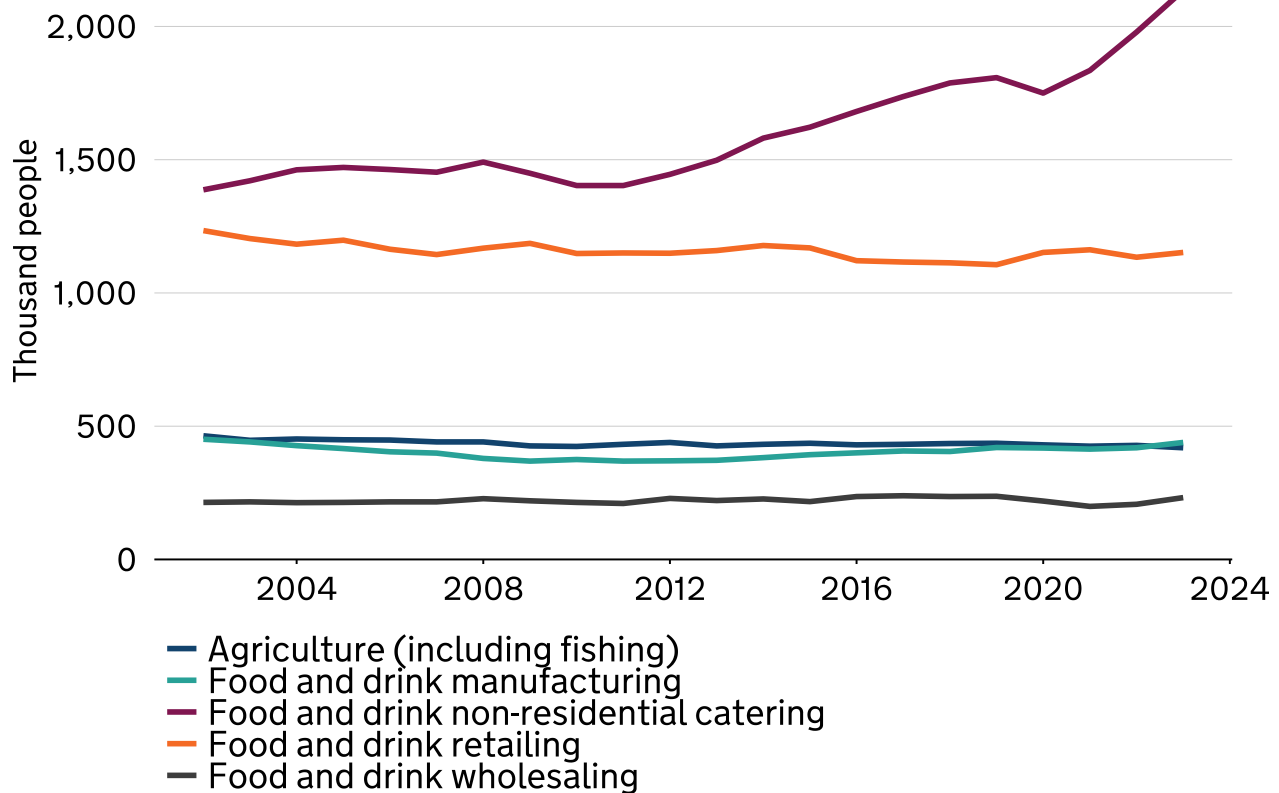
### Rationale

Labour is a critical dependency within the food system which requires specific roles be filled to avoid risks and shocks to the supply chain. This indicator tracks overall numbers to quantify UK dependency on labour and surface trends, before highlighting specific types of roles to track pressure points, where labour supply is failing to meet demand and posing risks to the supply chain.

### Headline evidence

**Figure 3.1.3a:** Employment levels of people in agri-food sector, Great Britain, 2002 to 2023

Source: [Agriculture in the United Kingdom 2023, Defra, Table 14.1](https://assets.publishing.service.gov.uk/media/668663677541f54efe51b990/AUK-chapter14-06jun24.ods)  
(<https://assets.publishing.service.gov.uk/media/668663677541f54efe51b990/AUK-chapter14-06jun24.ods>)



[Download the data for this chart \(ODS, 58.9 KB\)](#)

<https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods>

Between 2021 and 2023, the workforce in the food sector in Great Britain increased from 4.04 million to 4.38 million, showing a steady upward trend. In line with the longer-term trend this was driven by the food and drink non-residential catering sector, which added 300,000 workers, rising from 1.84 million in 2021 to 2.14 million in 2023. The food and drink manufacturing sector also saw a small increase, from 414,000 in 2021 to 439,000 in 2023. The food and drink retailing sector fluctuated slightly but ended the same period broadly where it started, at 1.15 million workers. Meanwhile, the food and drink wholesaling sector showed an increase from 199,000 to 232,000 workers. In the last decade, the percentage of the total Great Britain workforce employed in the food sector has remained stable around 13.4%, but this increased in 2023 to 13.9%.

Agri-food employment data is GB only. In Northern Ireland specifically, the latest data shows that in 2021, 32,000 people were employed in the agriculture, forestry and fishing, and food and drink processing sectors, which is down from 35,000 in 2020 and 40,000 in 2019. This constituted 3.7% of total employment in Northern Ireland. Comparably these sectors made up 2% of total employment across the whole of the UK in the same period ([Northern Ireland Agri-Food Sector Key Statistics \(https://www.daera-ni.gov.uk/publications/key-statistics-2007-onward\)](https://www.daera-ni.gov.uk/publications/key-statistics-2007-onward)).

Although the overall number of people employed in the agri-food sector is stable, it does not show the variance at a sectoral level. There are persisting

labour shortages, resulting in a high reliance on migrant labour over recent decades in a range of roles. These include shortages in skilled and highly skilled roles throughout the supply chain, for example butchers and veterinary nurses, as well as manual labour roles such as deck hands on fishing boats and fruit and vegetable pickers. Many roles are permanent, but some are shorter term or seasonal. While many jobs still require manual tasks, automation is increasing across the supply chain, bringing new opportunities and new skill requirements. However, a combination of changing job preferences in UK society, broader sectoral image issues, the timeframe to train skilled workers and challenges with retention all contribute to the current high reliance on migrant workers to fill vacancies. These challenges have been exacerbated following the UK leaving the European Union causing increased strain on the UK labour market due to short term difficulty in workers entering the UK to work long-term dependants ([Migrant Advisory Committee \(https://www.gov.uk/government/publications/seasonal-worker-visa-review/review-of-the-seasonal-worker-visa-accessible#chapter-2-how-the-seasonal-work-visa-works\)](https://www.gov.uk/government/publications/seasonal-worker-visa-review/review-of-the-seasonal-worker-visa-accessible#chapter-2-how-the-seasonal-work-visa-works), 2024).

Migrant workers have helped some agri-food sectors to grow rapidly to meet demand and to keep production costs down, helping increase UK domestic food production. For example, the meat processing sector expanded rapidly in the early 2000s as EU freedom of movement brought easier access to Eastern European workers with butchery skills. The UK leaving the EU has increased the cost and complexity of accessing migrant workers who now tend to come from non-EU countries.

Similarly, the manufacturing, poultry and horticulture sectors also employ a high proportion of temporary and seasonal workers work during certain times of the year to meet peaks in workforce demand. These sectors have always relied on seasonal migrants for short term harvesting tasks that are difficult to automate.

Larger companies may have more flexibility to manage higher absence rates due to their ability to move staff around, whereas small and medium-sized enterprises (SMEs) may have limited capacity to develop contingency plans for sudden increases in absence rates. SMEs may also struggle to compete with the wages and hours that large manufacturers can offer.

## **Supporting evidence**

Notable pressures and shortages across the sector are set out below, as well developments and opportunities such as automation. The section starts with lower skilled and temporary roles (e.g. seasonal labour) and moves to higher skilled roles (e.g. farmers and vets). Both have issues with sector attraction that have led to high reliance on migrants. For lower skilled roles, there is a greater challenge of attracting workers. For higher-skilled roles, there is the additional challenge of shortage of skills.

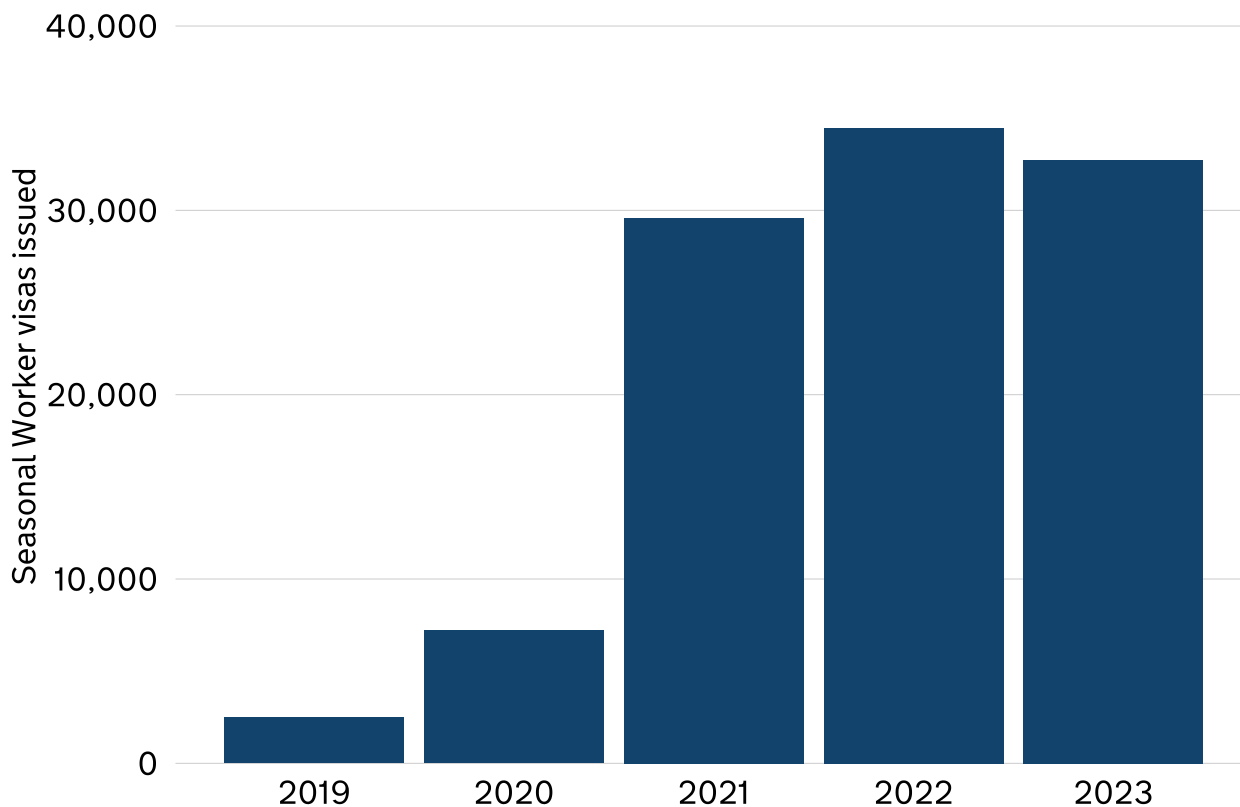
## Seasonal Labour

The Seasonal Worker visa (Temporary Work) allows workers to come to the UK to work in horticulture (both ornamental and edible) or pre-Christmas poultry processing. The visa is delivered through the Seasonal Worker Scheme (SWS), which the Home Office and Defra are jointly responsible for. The government sets a quota for the number of visas to be allocated through the SWS, divided between several scheme operators. In 2019 the quota (including extension) was 2,500. For 2024, the Seasonal Worker visa quota was 47,000 (45,000 for horticulture and 2,000 for poultry, with an additional 10,000 available as a contingency if needed). In 2025, this quota will be 45,000, with 2,000 for poultry. Horticulture workers will be able to come to the UK for a maximum of 6 months in any 12-month period, and poultry workers will be able to come for the period between 2 October and 31 December inclusive. The route does not allow settlement, switching or dependants ([Migrant Advisory Committee \(https://www.gov.uk/government/publications/seasonal-worker-visa-review/review-of-the-seasonal-worker-visa-accessible#chapter-2-how-the-seasonal-work-visa-works\)](https://www.gov.uk/government/publications/seasonal-worker-visa-review/review-of-the-seasonal-worker-visa-accessible#chapter-2-how-the-seasonal-work-visa-works), 2024).

While Defra estimates the overall seasonal workforce for horticulture and Christmas poultry remains in the region of 50,000 to 60,000 annually (it fluctuates in response to weather and supply chain factors), the demand for workers recruited through the SWS has increased rapidly since the scheme was re-introduced in 2019 (see Figure 3.1.3b below). This is because fewer EU workers with Settled Status (the main alternative source) are returning to horticulture work each year. EU workers provided over 95% of the seasonal horticulture workforce before EU Exit. Recruitment is now centred on central Asian nations through the visa scheme. Fewer than 5% of seasonal workers in horticulture are UK nationals ([Defra, 2024 \(https://www.gov.uk/government/publications/independent-review-into-labour-shortages-in-the-food-supply-chain-government-response/independent-review-into-labour-shortages-in-the-food-supply-chain-government-response\)](https://www.gov.uk/government/publications/independent-review-into-labour-shortages-in-the-food-supply-chain-government-response/independent-review-into-labour-shortages-in-the-food-supply-chain-government-response))

**Figure 3.1.3b:** Seasonal Worker visas issued, UK, 2019 to 2023

Source: [Home Office immigration statistics, 2019 to 2023 and ONS UK payrolled employments by nationality, region and industry, 2023 \(https://www.gov.uk/government/publications/seasonal-worker-visa-review/review-of-the-seasonal-worker-visa-accessible#introduction\)](https://www.gov.uk/government/publications/seasonal-worker-visa-review/review-of-the-seasonal-worker-visa-accessible#introduction)



[Download the data for this chart \(ODS, 58.9 KB\)](#)

<https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods>

From the inception of the visa in 2019 through to 2022 the quota of visas available was below sector demand. This was compounded in 2022 by Russia's invasion of Ukraine, which disrupted recruitment plans. Some crops were left unharvested in fields and there were threats of production going offshore. In late 2022, the government announced that the visa scheme would continue to the end of 2024 and increased the visa quota considerably to ensure it met the sectors' demand. In 2023, visa demand dropped slightly but the SWS still supplied around 60% of overall seasonal worker demand. The land area of vegetable production fell compared to 2022 (mainly due to weather) and the sector was able to utilise several thousand Ukrainian workers still in the UK with extended visas.

## Horticulture

Horticulture is the most labour-intensive UK farming sector, employing the highest proportion of casual staff, while relying on additional seasonal workers from overseas. Over three hundred horticulture crops are grown in the UK, using a variety of growing methods from fields: polytunnels, traditional orchards, glasshouses, and vertical farms. Each crop and each growing method come with its own unique labour needs for establishment, husbandry, handling and harvesting. Labour costs have been rising steadily in recent years, adding pressure on growers in a sector with tight profit margins and at a time when other costs such as energy have risen. The minimum hourly rate for migrant workers under the Seasonal Worker visa is

linked to the national living wage and over recent years that rate has increased significantly to £11.44 per hour in 2024 ([Migrant Advisory Committee \(https://www.gov.uk/government/publications/seasonal-worker-visa-review/review-of-the-seasonal-worker-visa-accessible#chapter-2-how-the-seasonal-work-visa-works\)](https://www.gov.uk/government/publications/seasonal-worker-visa-review/review-of-the-seasonal-worker-visa-accessible#chapter-2-how-the-seasonal-work-visa-works), 2024). Labour accounts on average for over 40% of overall production costs, and is increasing at a two-year compound figure of 24.3% (NFU and Promar, 2023 (<https://www.nfuonline.com/updates-and-information/promar-report-2023/>)). The horticulture sector continues to struggle to attract British workers due to the short term, physical, repetitive, and outdoor nature of the work, but also its rural location which brings challenges of poor public transport and lack of affordable housing. Without the necessary labour to pick horticulture produce, there is a heightened risk that food will be wasted, rather than entering the supply chain, or that production moves overseas ([Environment, Food and Rural Affairs Committee, 2022 \(https://committees.parliament.uk/publications/9580/documents/162177/default/\)](https://committees.parliament.uk/publications/9580/documents/162177/default/)).

## Seafood

Seafood sector jobs are perceived as difficult and poorly-paid, while offering unattractive working conditions ([Seafish, 2023 \(https://www.seafish.org/document/?id=1b9931f1-4f7a-4224-aef7-ee8cedfcac74\)](https://www.seafish.org/document/?id=1b9931f1-4f7a-4224-aef7-ee8cedfcac74)). These factors alongside low unemployment rates, particularly outside the main urban centres, and [competition \(https://committees.parliament.uk/writtenevidence/40075/pdf/#:~:text=The%20extent%20and%20nature%20of%20labour%20shortages,in%20fish%20processing%20roles%20and%20shortages%20in\)](https://committees.parliament.uk/writtenevidence/40075/pdf/#:~:text=The%20extent%20and%20nature%20of%20labour%20shortages,in%20fish%20processing%20roles%20and%20shortages%20in) for labour with other sectors make for difficult business conditions and highlight the critical dependence on non-UK labour in the sector. Following changes to the immigration system in April 2023, the only route available to recruit non-UK workers in both seafood processing and catching sectors is the Skilled Worker Visa. The recent increase to the [Skilled Worker Visa salary \(https://www.gov.uk/skilled-worker-visa/your-job\)](https://www.gov.uk/skilled-worker-visa/your-job) threshold (from £26,200 to £38,700, a 48% rise) has made it harder to recruit non-UK workers. Consequently, labour shortages in the catching and seafood processing sectors are causing closure of fishing vessels and reduced productivity in processing businesses.

## Skills and training challenges across the food supply chain

The [Independent Review into Labour Shortages in the Food Supply Chain \(https://www.gov.uk/government/publications/independent-review-into-labour-shortages-in-the-food-supply-chain-government-response/independent-review-into-labour-shortages-in-the-food-supply-chain-government-response\)](https://www.gov.uk/government/publications/independent-review-into-labour-shortages-in-the-food-supply-chain-government-response/independent-review-into-labour-shortages-in-the-food-supply-chain-government-response) identified a number of factors behind the sector's workforce recruitment and retention challenges. These include a negative perception of the industry, the rural location of many jobs and a lack of investment in relevant skills and training. Additionally, a lack of engagement with the current recruitment methods of advertising vacancies through online job sites and through social media, results in the sector having a low online profile. Inadvertently, this absence



leads to a lack of pertinent data for government to analyse vacancies and skills needs. The agri-food sector lacks an effective relationship with the domestic workforce and the jobcentres in their locality as well as with national teams and central Department of Work and Pensions services.

The increasing use of digitisation, robotics and automation requires highly qualified staff to maintain and operate such technologies and the specialised skills required for these roles, which often require degrees and postgraduate qualifications, can make recruitment of staff more difficult. The Food and Drink Federation (FDF) has stated that apprenticeships and non-apprenticeship training courses allow businesses throughout the supply chain to upskill new and existing employees ([Food and Drink Federation, 2024 \(<https://eur03.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.fdf.org.uk%2Fglobalassets%2Fbusiness-insights-and-economics%2Ffdf-state-of-industry-survey%2Fsi-q2-2024.pdf&data=05%7C02%7CElaine.Akester%40defra.gov.uk%7Ce45e6895a4134e77014d08dccc076d8c%7C770a245002274c6290c74e38537f1102%7C0%7C0%7C638609579477142508%7CUnknown%7CTWFPbGZsb3d8eyJWljojMC4wLjAwMDAiLCJQljojV2luMzliLCJBTil6lk1haWwiLCJXVCi6Mn0%3D%7C0%7C%7C%7C&sdata=NLIW%2FUo%2FYd3kaG03dGIQKhp5e%2FH6kAXvvkpSdwsp0z8%3D&reserved=0>\)](https://eur03.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.fdf.org.uk%2Fglobalassets%2Fbusiness-insights-and-economics%2Ffdf-state-of-industry-survey%2Fsi-q2-2024.pdf&data=05%7C02%7CElaine.Akester%40defra.gov.uk%7Ce45e6895a4134e77014d08dccc076d8c%7C770a245002274c6290c74e38537f1102%7C0%7C0%7C638609579477142508%7CUnknown%7CTWFPbGZsb3d8eyJWljojMC4wLjAwMDAiLCJQljojV2luMzliLCJBTil6lk1haWwiLCJXVCi6Mn0%3D%7C0%7C%7C%7C&sdata=NLIW%2FUo%2FYd3kaG03dGIQKhp5e%2FH6kAXvvkpSdwsp0z8%3D&reserved=0)).

### **Average farmer age**

42% of farmers in the UK were 60 years old or older at the time of the [2021 Census](https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/theoccupationsmostdependentonolderandyoungerworkers/2023-05-31), (<https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/theoccupationsmostdependentonolderandyoungerworkers/2023-05-31>) with 29% being over 65 years old. This contrasts with the wider population of workers of whom 11% are over 60 years and 4.3% are over 65. The current state pension age in the UK is 66 years old. Less than 11% of farmers are under 30 years old. There is a risk to the agricultural sector if it cannot attract younger farmers to take on roles from the older generation of experienced farmers when they retire.

### **HGV drivers**

In [2023](https://www.gov.uk/government/statistical-data-sets/rfs01-goods-lifted-and-distance-hauled#domestic-road-freight-by-commodity) (<https://www.gov.uk/government/statistical-data-sets/rfs01-goods-lifted-and-distance-hauled#domestic-road-freight-by-commodity>) GB-registered [HGVs](https://www.gov.uk/government/statistics/road-freight-statistics-2023/domestic-road-freight-statistics-united-kingdom-2023#commodities) (<https://www.gov.uk/government/statistics/road-freight-statistics-2023/domestic-road-freight-statistics-united-kingdom-2023#commodities>) lifted 219 million tonnes of food products, 14% of all goods lifted in the UK. HGV drivers ensure that these goods are transported smoothly throughout the food supply chain. In 2023 the number of HGV drivers in the UK was 271,800, the lowest in the last 19 years and down 5% from 2022 (286,500) ([ONS](https://www.nomisweb.co.uk/datasets/aps218/reports/employment-by-occupation?compare=K02000001) (<https://www.nomisweb.co.uk/datasets/aps218/reports/employment-by-occupation?compare=K02000001>), 2024). There were acute shortages of HGV drivers during COVID-19 due partly to the unavailability of HGV driver tests preventing new entrants to the sector. However, between Q1 2022 to Q1

2024, the number of HGV businesses reporting missing deliveries due to HGV drivers not being available decreased by 55% ([Department for Transport, 2024](https://www.gov.uk/government/statistical-data-sets/hgv-drivers-vacancies-rfs03) (<https://www.gov.uk/government/statistical-data-sets/hgv-drivers-vacancies-rfs03>)). The current risks to the sector are the ageing workforce ([ONS, 2021](https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/adhocs/12930largegoodsvehicledriversbyagegroupukselectedperiodsfromoctobertodecember2005tooctobertodecember2020) (<https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/adhocs/12930largegoodsvehicledriversbyagegroupukselectedperiodsfromoctobertodecember2005tooctobertodecember2020>)) and lower median salary (<https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/datasets/occupation4digitsoc2010ashtable14>) compared to the UK average.

## **Butchers**

The UK's meat processing industry relies heavily on overseas skilled labour for butchers, partly due to the lack of suitably trained domestic workers butchers. [Higher salary requirements](https://www.gov.uk/government/publications/skilled-worker-visa-going-rates-for-eligible-occupations/skilled-worker-visa-going-rates-for-eligible-occupation-codes) (<https://www.gov.uk/government/publications/skilled-worker-visa-going-rates-for-eligible-occupations/skilled-worker-visa-going-rates-for-eligible-occupation-codes>) for skilled migrant butchers could have knock-on effects on the wider labour market for butchers. Equality law requires workers to receive similar wages for performing the same work. There are potential risks to remaining competitive internationally and to the cost and availability of butchered meat.

## **Veterinary professionals**

Around 1,000 vets are employed in government roles, including Official Veterinarians (OVs). Food safety and animal welfare legislation requires OVs to be present in [approved](https://www.food.gov.uk/business-guidance/approved-food-establishments) (<https://www.food.gov.uk/business-guidance/approved-food-establishments>) meat establishments to oversee the delivery of official controls. OVs play a key role in ensuring UK food security verifying compliance with regulatory requirements and working with businesses to provide assurance over food safety. These duties enable continued trade in animal products, and the management of risk to human health from zoonotic diseases. Veterinary services underpin the £10.9bn [domestic meat industry](https://www.gov.uk/government/statistics/agriculture-in-the-united-kingdom-2023/chapter-8-livestock#meat-production) (<https://www.gov.uk/government/statistics/agriculture-in-the-united-kingdom-2023/chapter-8-livestock#meat-production>) and the £2.1bn meat export trade ([FSA, 2024](https://committees.parliament.uk/writtenevidence/128651/pdf/#:~:text=In%202021%2C%2045%25%20of%20leavers,UK%20practice%20in%2010%20years.) (<https://committees.parliament.uk/writtenevidence/128651/pdf/#:~:text=In%202021%2C%2045%25%20of%20leavers,UK%20practice%20in%2010%20years.>)).

Although numbers have been broadly increasing, demand has also expanded. Reasons include the need for increased veterinary public health expertise to support trade-related work including veterinary certification and attestation requirements resulting from the UK leaving the EU. Demand is also due to increased levels of animal ownership.



In 2019, there was an estimated 11.5% shortage in the profession as a whole ([RCVS, 2024](https://committees.parliament.uk/writtenevidence/128646/default/) (<https://committees.parliament.uk/writtenevidence/128646/default/>)). There are several potential reasons for these shortages. A survey conducted by the Institute for Employment Studies in 2019 found poor work-life balance (60%), not feeling valued (55%) and chronic stress (49%) as the top three reasons for why individuals were intending to leave the veterinary profession ([RCVS, 2019](https://www.rcvs.org.uk/news-and-views/publications/the-2019-survey-of-the-veterinary-profession/) (<https://www.rcvs.org.uk/news-and-views/publications/the-2019-survey-of-the-veterinary-profession/>)). Additionally, retention is low; in 2021, 45% of vets leaving the workforce had been in the profession for four years or less, including 21% who had less than one year of experience. There has also been a decrease in new UK-practising registrants from overseas, particularly from the EU; in 2018, 53% of new registrants were EU-qualified, compared to 23% in 2021 ([RCVS, 2021](https://www.rcvs.org.uk/news-and-views/publications/recruitment-retention-and-return-in-the-veterinary-profession/#:~:text=covering%20their%20own.,7.,than%20a%20quarter%20(23%25).) ([https://www.rcvs.org.uk/news-and-views/publications/recruitment-retention-and-return-in-the-veterinary-profession/#:~:text=covering%20their%20own.,7.,than%20a%20quarter%20\(23%25\).](https://www.rcvs.org.uk/news-and-views/publications/recruitment-retention-and-return-in-the-veterinary-profession/#:~:text=covering%20their%20own.,7.,than%20a%20quarter%20(23%25).))). This has been driven by changes following the UK leaving the EU. For example, vets now need to meet specific criteria, as well as obtain a work visa, to practice in the UK, whereas previously EU veterinary school qualifications were recognised in the UK through mutual recognition of professional qualifications ([FSA, 2024](https://committees.parliament.uk/writtenevidence/128651/pdf/) (<https://committees.parliament.uk/writtenevidence/128651/pdf/>)).

Ensuring sufficient OV levels is essential for upholding public health and animal welfare standards and ensuring the UK's meat supply chain operates smoothly. While FSA and FSS differ in how they recruit OVs, both organisations continue to face difficulties from supply challenges. In England and Wales, FSA OVs overseeing official controls in approved meat establishments are recruited and employed through a delivery partner. FSA also directly employs 77 vets who complete assurance visits and carry out approvals and audits of slaughterhouses and cutting plants.

COVID-19, EU Exit and increased demand across the wider veterinary profession contributed to a drop in the number of FSA's delivery partner OVs in 2021. Use of the [RCVS Temporary Registration \(TR\) scheme](https://www.food.gov.uk/sites/default/files/media/document/FS%20AnnualReport2022-accessible_for_web.pdf#page=80) ([https://www.food.gov.uk/sites/default/files/media/document/FS%20AnnualReport2022-accessible\\_for\\_web.pdf#page=80](https://www.food.gov.uk/sites/default/files/media/document/FS%20AnnualReport2022-accessible_for_web.pdf#page=80)) allowed FSA to increase OV numbers and avoid risks to service delivery in meat establishments. In preparation for the scheme ending in December 2024, FSA reduced its reliance on TRNOVs from 38% in December 2022 (103 TRNOVs of 272 total OVs) to 17% in December 2023 (57 TRNOVs of 340 total OVs).

In Scotland, FSS employs OVs directly and uses temporary agency staff as needed. As of December 2023, FSS figures showed that the number of OVs in post was running at 82% of the capacity required for service delivery, causing some limited delays in meat production on some sites while OV cover was arranged. This is based on an estimated requirement of 29.8 FTE vs 24.4 FTE that were employed and deployable as of December

2023 ([Our Food 2023](#)

([https://www.foodstandards.gov.scot/downloads/Our\\_Food\\_2023 -](https://www.foodstandards.gov.scot/downloads/Our_Food_2023_-_FSS_and_FSA_joint_annual_report.pdf)

[FSS and FSA joint annual report.pdf](#)). In the UK, local authorities are responsible for monitoring hygiene controls in food businesses. Food businesses include restaurants, cafés, pubs, supermarkets, and other places where food is supplied, sold, or consumed, such as hospitals, schools, and care homes. The professionals involved in the inspection process are food safety officers, environmental health officers (EHOs) and additionally in Scotland, food law officers.

[Approved](#) ([https://www.food.gov.uk/business-guidance/approved-food-](https://www.food.gov.uk/business-guidance/approved-food-establishments)

[establishments](#)) meat establishments include abattoirs, cutting plants, game-handling establishments, and meat markets. Responsibility for monitoring hygiene controls of those establishments lies with the FSA and local authorities in England and Wales, with FSS in Scotland, and with the FSA and the Department of Agriculture, Environment and Rural Affairs (DAERA) in Northern Ireland. The professionals involved in the inspection processes are official veterinarians (OVs), meat hygiene inspectors (MHIs) and food safety officers/food law officers including EHOs.

## Food Safety and Standards

Local authorities play an important role in protecting public health by verifying and validating food businesses' compliance with food law, and by taking enforcement action where necessary. Access to safe food is integral to a secure food system. The section below looks at trends in LA food safety and standards resourcing. It also reviews LA sampling activity from 2013/14 to 2023/24:

## Local Authority Food Safety Resourcing

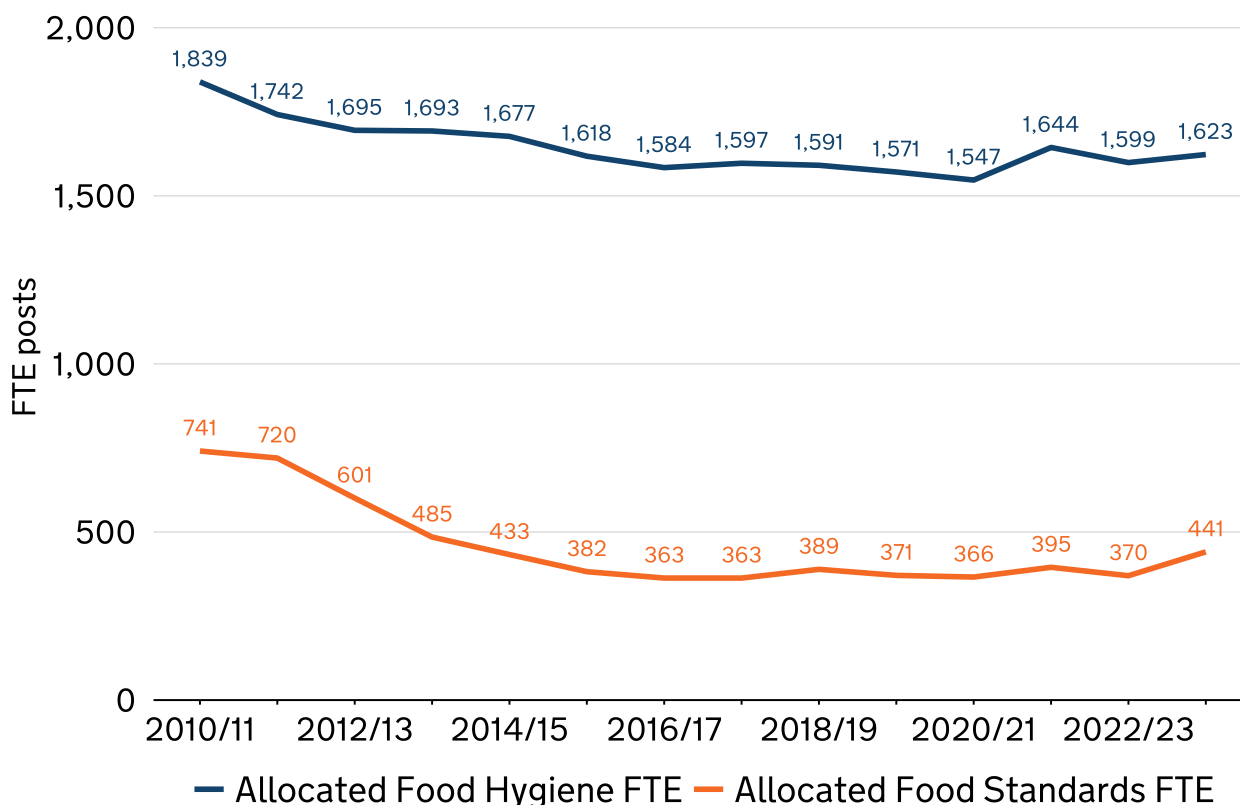
The food chain relies on qualified and experienced local authority staff to conduct inspections and work with businesses to ensure that they are operating in accordance with the law and that the food they are placing on the market is safe and meets legal requirements with regard to compositional standards, nutritional content, and labelling. Local authorities provide a critical line of defence in enforcing safety and standards regulations, and in identifying and tackling food crime. These activities help to keep consumers safe and maintain their confidence in our food system.

The FSA and FSS have [highlighted concerns](#)

([https://www.food.gov.uk/sites/default/files/media/document/Our%20Food%202023%20Report\\_Accessible\\_1.pdf#page=63](https://www.food.gov.uk/sites/default/files/media/document/Our%20Food%202023%20Report_Accessible_1.pdf#page=63)) about shortages of local authority food hygiene and food standards officers.

**Figure 3.1.3c:** Number of allocated food hygiene and food standards full time equivalent posts in local authorities across England, Wales, and Northern Ireland FYE 2011 to FYE 2024

Source: Food Standards Agency



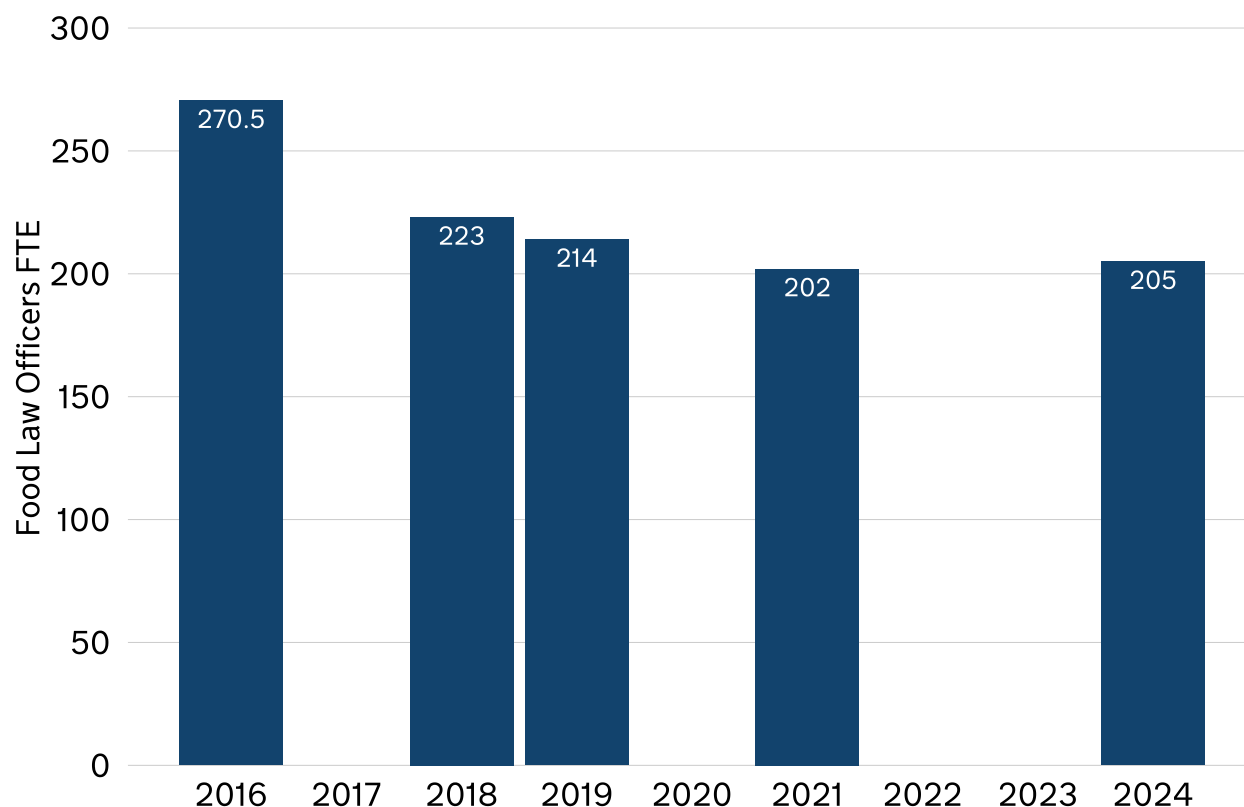
[Download the data for this chart \(ODS, 58.9 KB\)](#)

<https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods>

Figure 3.13c shows a decline of approximately 11.7% for allocated (the total number of positions available) food hygiene FTEs in England, Wales, and Northern Ireland between 2010/2011 and 2023/24, and a 40.5% decline in allocated food standards FTEs between 2011/12 and 2023/24. For England, Wales and Northern Ireland, resourcing data provides a snapshot of numbers at the time of the survey and does not represent average workforce estimates across the year. Additionally, a change in methodology, implemented in 2020/21, rephrased the question of incorporating COVID-related working conditions, which may have influenced how local authorities responded.

**Figure 3.1.3d:** Number of allocated Food Law Officers Full Time Equivalent posts in Scotland 2016 - 2024

Source: Food Standards Agency



[Download the data for this chart \(ODS, 58.9 KB\)](#)

<https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods>

In Scotland (see Figure 3.1.3d) where food officers cover both food hygiene and food standards, food officer FTEs decreased from 270.5 in 2016 to 205 in 2024, a 24% reduction.

The FSA and FSS have highlighted that the ongoing decline in the number of vacant local authority food hygiene and food standards officer posts has resulted in a significant backlog in the number of food businesses awaiting inspection ([Our Food 2023](#)

[https://www.foodstandards.gov.scot/downloads/Our\\_Food\\_2023\\_-\\_FSS\\_and\\_FSA\\_joint\\_annual\\_report.pdf](https://www.foodstandards.gov.scot/downloads/Our_Food_2023_-_FSS_and_FSA_joint_annual_report.pdf)), and there are concerns that this

problem could worsen over the next 5-10 years, when a proportion of the existing workforce reaches retirement age. As a result, the FSA and FSS are working closely with the relevant professional bodies to review competency requirements against the range of food law activities and identify strategies for attracting new entrants into the profession.

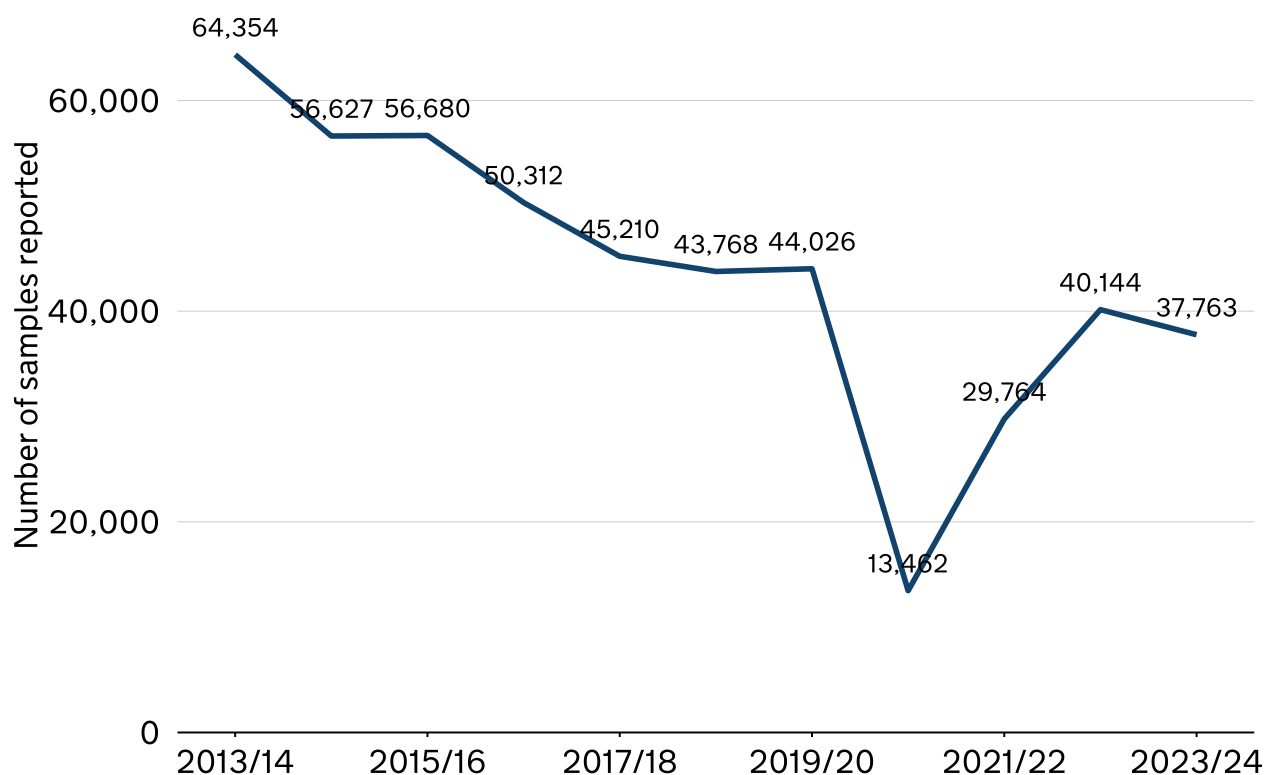
### Local authority sampling

Food samples collected by local authority environmental health and trading standards teams are tested at designated Official Laboratories (OL) for safety and authenticity issues, including [substitution and adulteration](#) (<https://www.food.gov.uk/sites/default/files/media/document/FSA-Food%20Crime%20Strategy%202024.pdf>). Figures 3.1.3e and 3.1.3f show that the number of food samples taken by local authorities has declined over the

past ten years. This is in part due to local authority resourcing shortages as well as overall financial constraints. The FSA and FSS also coordinate national surveillance programmes, which are referenced in Theme 5.

**Figure 3.1.3e:** Number of samples reported by local authorities in England, Wales, and Northern Ireland 2013/14 - 2023/24

Source: Food Standards Agency



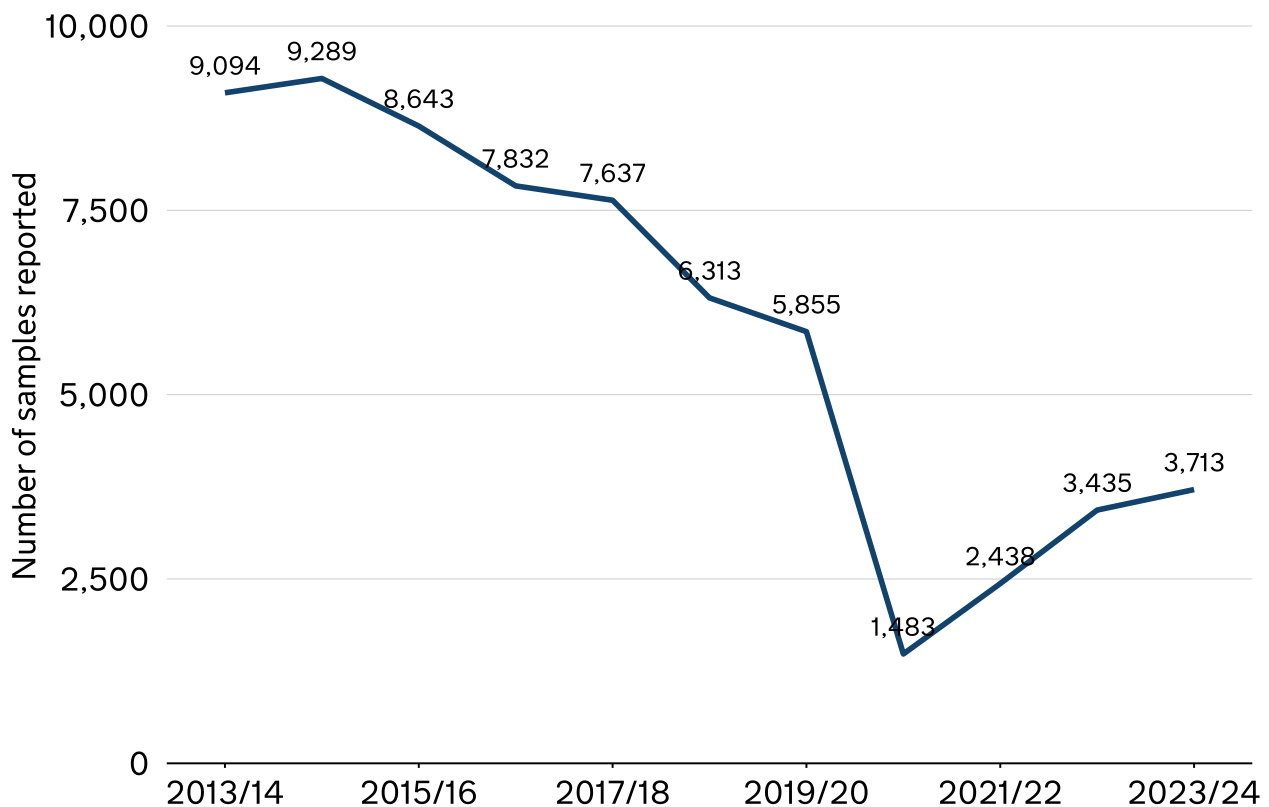
[Download the data for this chart \(ODS, 58.9 KB\)](https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods)

<https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods>

Samples taken by local authorities in England, Wales and Northern Ireland reduced by 41.3% between 2013/14 and 2023/24. Two anomalous data points (2020/21 and 2021/22) show a marked reduction in the number of samples when many local authority officers were diverted to the pandemic response.

**Figure 3.1.3f:** Number of samples reported by local authorities in Scotland 2013/14 to 2023/24

Source: Food Standards Scotland



[Download the data for this chart \(ODS, 58.9 KB\)](#)

<https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods>

Similar to the pattern seen in England, Wales and Northern Ireland, the number of samples taken by local authorities in Scotland reduced by 59% between 2013/14 and 2023/24. An anomalous data point in 2020/21 shows a sharp decline in Scottish samples due to the pandemic response when many local authority officers were diverted to other work.

## 3.1.4 Water

### Rationale

Water is essential to food production. Access to water presents increasing challenges due to increased extreme weather events and increasing competition for use of water. This indicator focuses on agriculture water demand rather than covering the whole food supply chain. Although, the supporting evidence includes some analysis of food and drink manufacturing water usage.

On the farming level, having sufficient access to water for irrigation affects agricultural production and yields; dry conditions produce smaller and fewer

fruit and vegetables. Farms access water for irrigation via abstraction, from both ground and surface water, which is then either directly applied to the land or held in reservoirs for use during dry periods.

This indicator tracks volume of water abstracted to show the level of water required for irrigation including during times of water shortages, when conditions have been drier. The Environment Agency (EA) is responsible for regulating the abstraction of water from river, lakes, and groundwater across England on behalf of the government. Extracting water from these natural sources is known as abstraction and is subject to licensing conditions. An abstraction licence stipulates location, volume and use of the water extracted from natural resources, whether it is ground or surface water. These conditions are determined on a case-by-case basis, allowing the EA to tailor water usage to local environmental and catchment conditions, ensuring sustainable water management. This helps protect the environment during low flows (reduced water flow in a river or stream during a prolonged dry period or drought) and prevents over-abstraction. It also safeguards the water rights of other abstractors and improves drought resilience. All of these are increasingly important as population growth and climate change lead to an increased frequency of drought incidents ([Rey and others, 2016](#) (<https://www.sciencedirect.com/science/article/pii/S0378377416301342>)).

The amount of abstracted water required for irrigation will vary by year and region depending on how wet or dry climate conditions have been, as well as factors such as soil type and the crops being produced. The volume of water licensed for spray irrigation can indicate the level of water dependency in agriculture. Higher volumes of water licensed for spray irrigation in any given region suggests a higher dependence on abstracted water. The risk of high dependence on abstraction can be mitigated if abstracted water is stored, and then used in the following irrigation season, providing resilience when water restrictions are in place. Storage is therefore tracked in supporting evidence.

Data for England is the focus in this indicator. The other UK nations also face challenges from water shortages related to climate change. Notably, abstraction licences in Scotland were suspended for the first time in [2022](#) (<https://beta.sepa.scot/news/2023/sepa-working-with-scottish-businesses-to-prepare-for-water-scarcity-this-summer/>).

## Headline evidence

### Figure 3.1.4a: Water licensed for irrigation, England, 2023

Source: National Abstraction Licensing Database Reports, 2024

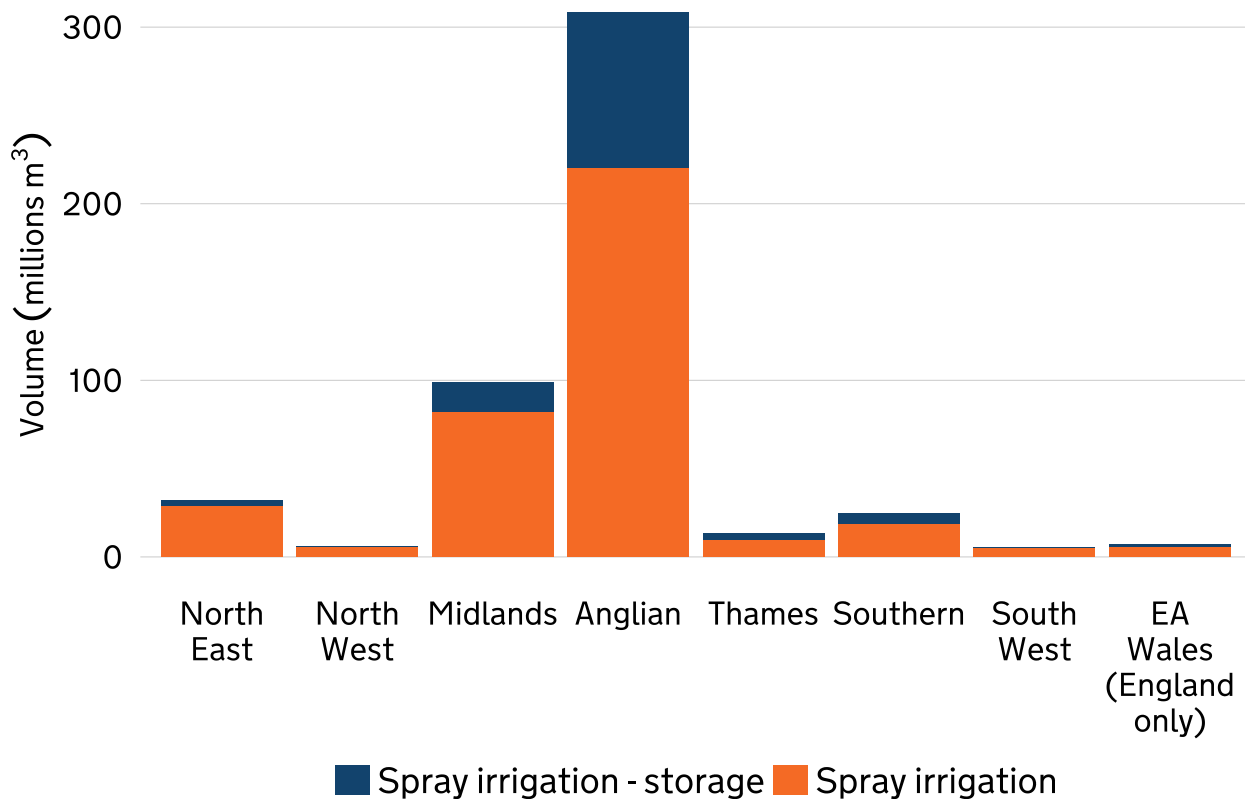


Former EA Region	Number of licences for spray irrigation - storage	Indicative total volume licensed for spray irrigation - storage (‘000m <sup>3</sup> )	Indicative total volume licensed for all spray irrigation (‘000m <sup>3</sup> )	Indicative proportion of spray irrigation volume licensed for storage (%)	% change in storage since 2010	( in irr
Anglian	1,075	90,502	222,909	41%	21%	
Midlands	372	17,166	81,759	21%	0%	
North East	94	3,727	28,614	13%	-1%	
North West	15	406	5,439	7%	82%	
South West	35	778	4,861	16%	-9%	
Southern	153	6,538	18,312	36%	2%	
Thames	87	3,660	9,121	40%	-10%	
EA Wales	81	2,174	5,317	41%	-35%	
<b>Total</b>		<b>124,949</b>	<b>376,332</b>	<b>33%</b>	<b>13%</b>	
Total for England	1,831	122,777	371,015	33%	15%	

**Figure 3.1.4b:** Spray irrigation licences by region (million m<sup>3</sup>), England, 2023

Source: Environment Agency





[Download the data for this chart \(ODS, 58.9 KB\)](#)

<https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods>

Figure 3.1.4a shows the volume of water licensed for spray irrigation and storage across different regions in England between 2010 and 2024.

England saw a significant increase in water licensed for abstraction for both direct irrigation (16%) and reservoir storage for irrigation (15%). This growth is likely to be a response to the higher quality and production demands from supermarkets and decisions by farmers to protect themselves against the financial effect of crop losses resulting from water shortages and possible irrigation restrictions.

Regional variation of rainfall across the England means that there is varying level of need to supplement natural rainfall with irrigation from abstraction across the country. Some areas are already experiencing stress from high irrigation intensity, most notably in the east of England ([UK Irrigation Association](https://www.ukia.org/3d-flip-book/irrigation-strategy-2020a/) (<https://www.ukia.org/3d-flip-book/irrigation-strategy-2020a/>), 2020).

In 2022, East Anglia was the largest area of the country where water was not available for licensing, because there was limited water available for abstraction ([see map](https://environment.data.gov.uk/explore/62514eb5-e9d5-4d96-8b73-a40c5b702d43?download=true) (<https://environment.data.gov.uk/explore/62514eb5-e9d5-4d96-8b73-a40c5b702d43?download=true>)). In the last 14 years East Anglia experienced the most substantial increase in volume water licensed for spray irrigation and storage, with the area now accounting for 63% of all water licensed for direct irrigation in England and 74% of all reservoir-stored water (see Figure 3.1.4b above). Reasons for the higher water dependency are the use of land for field-scale vegetable production due to the region's climatic and topographical suitability and high number of large-scale farms

suited to irrigation. Most of the water is used to irrigate field-scale vegetables such as potatoes, onions, and carrots.

One data limitation is that abstraction licences are not required for those abstracting less than 20 cubic metres (approximately 4,400 gallons) per day. This means that small agricultural businesses using low volumes of water on land are not captured in the data. However, commercial enterprises will be abstracting far more than this limit so most agricultural water usage will be captured here. It is also worth noting that glasshouses and vertical farming systems tend to use public water supply for their crops rather than abstracted water, meaning that their water usage volumes are not captured here either.

Climate projections point to increasing severity and frequency of drought ([UKCP18 \(https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18\\_headline\\_findings\\_v4\\_aug22.pdf\)](https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18_headline_findings_v4_aug22.pdf)). Consequently, water abstraction for direct irrigation and storage is likely to increase. Farmers are finding solutions through water management such storing water and building infrastructure to provide resilience to droughts, for example, the [Felixstowe Hydrocycle \(https://felixstowehydrocycle.com/\)](https://felixstowehydrocycle.com/). These are considered further in supporting evidence and the case study below.

## Supporting evidence

### Hands-Off Flows

Water abstraction is subject to disruption from low availability in the source and to demand spikes due to increased need. There is also activation of Hands-off Flow which alerts licence holders to stop abstraction to protect the environment. Hands-off Flow data therefore provides an indicator of risk to supply, reflecting cases where farmers may need to stop irrigating during the irrigation season, potentially affecting food production. Hands-Off Flow thresholds are determined on a case-by-case basis. However, restrictions are strongly driven by climatic conditions when water levels are either too low to abstract (low rainfall) and/or there is high demand (periods of drought or high temperatures). In July 2022 the temperature exceeded 40 degrees in some parts of the UK for the first time on record, and the period of January to August 2022 was the driest across England and Wales since 1976, with drought status declared across parts of England and all of Wales ([Met Office \(https://rmets.onlinelibrary.wiley.com/doi/10.1002/joc.8167\)](https://rmets.onlinelibrary.wiley.com/doi/10.1002/joc.8167), 2023). Between April and October, there were 49,678 (2022) and 7,993 (2023) instances where Hands-off Flow measures were in activation for spray and trickle irrigation, meaning that no water could be abstracted for direct irrigation. The effects of the water shortages during the drought were shown by reduced yields for some commodities such as potato and onion crop ([Barker and others, 2024 \(https://rmets.onlinelibrary.wiley.com/doi/10.1002/wea.4531\)](https://rmets.onlinelibrary.wiley.com/doi/10.1002/wea.4531)).

## Reservoir storage

The drought events of [2010 to 2012](#)

(<https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/leam-about/uk-past-events/interesting/2012/england-and-wales-drought-2010-to-2012---met-office.pdf>), [2018](#) (<https://ahdb.org.uk/drought-2018-the-continuing-effects>), and [2022](#)

([https://rmets.onlinelibrary.wiley.com/doi/10.1002/wea.4531#:~:text=Summer%202022%20ranked%20among%20the,and%202018%20\(Figure%204\).](https://rmets.onlinelibrary.wiley.com/doi/10.1002/wea.4531#:~:text=Summer%202022%20ranked%20among%20the,and%202018%20(Figure%204).)) show the

importance of abstracted water storage. Abstracted water can be drawn during the winter months or periods of high flow for storage into reservoirs held on farm. The water can then be used during times of drought or when access to abstraction sources is restricted. UK farmers are being encouraged to aim for sustainable abstraction and preparing for water storage is one way to mitigate the risks of low flow, low rainfall, and activation of Hands-off Flow. The storage volumes of these reservoirs can be used as a measure of resilience; they reflect the national planning for shocks and disruptions to water supply. The reported 15% growth in abstracted water licensed for storage (see Figure 3.1.4a) may underestimate the actual demand. There was a hiatus in reservoir construction between 2022 and 2023 while farmers awaited grants under Defra's Farming Transformation Fund Water Management program. The Environment Agency has also seen a strong recent interest in new reservoir licence applications, which was likely driven by the availability of grants and by farmers seeking to find alternatives to their existing direct irrigation abstractions.

## Climate change impacts

### [Climate projections](#)

([https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18\\_headline\\_findings\\_v4\\_aug22.pdf](https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18_headline_findings_v4_aug22.pdf)) indicate that, on average, UK winters will become wetter, and summers drier, with the frequency and intensity of heavy summer rainfall events also projected to increase. Natural variability means that years with wetter summers or drier winters will still occur. The seasonality of extremes will also change. Increases in heavy hourly rainfall intensity in autumn indicates that the [convective](#)

(<https://www.rmets.org/metmatters/what-are-convective-storms>) season is extending from summer to autumn ([Met Office, 2022](#)

([https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18\\_headline\\_findings\\_v4\\_aug22.pdf](https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18_headline_findings_v4_aug22.pdf))). Heavy rainfall and related flooding can increase the risk of food contamination and water-borne diseases. Flooding may also damage infrastructure, potentially affecting safe storage and disrupting the transportation of food. Abstracting water for agricultural use compounds water-stressed catchments especially, as the timing is during hot and dry weather when abstraction will have the greatest effect on the environment. The UK generally [abstracts](#)

(<https://www.gov.uk/government/statistics/water-abstraction-estimates/water-abstraction-statistics-england-2000-to-2018>) more water from surface water than

from ground water. Increased drought events will mean lower availability of ground water, leading to a higher dependence on surface water/storage from rainfall, which may also carry a higher risk of contamination.

Drought severity, frequency, duration and spatial extent are projected to increase for the UK ([Hanlon and others, 2021](#) (<https://link.springer.com/article/10.1007/s10584-021-03100-5>); [Reyniers and others, 2023](#) (<https://hess.copernicus.org/articles/27/1151/2023/>); [Parry and others, 2024](#) (<https://hess.copernicus.org/articles/28/417/2024/hess-28-417-2024.pdf>)). Droughts covering larger areas will become more common. Small (<10%) reductions in groundwater levels are projected for many UK boreholes by 2080 under [RCP8.5](#) (<https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18-guidance---representative-concentration-pathways.pdf>) ([Parry and others, 2024](#) (<https://hess.copernicus.org/articles/28/417/2024/hess-28-417-2024.pdf>)). The increase in droughts is expected to increase the risk of aflatoxin contamination of food crops, which could increase post-harvest losses ([Bezner Kerr and others, 2022](#) ([https://eur03.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.ipcc.ch%2Freport%2Far6%2Fwg2%2Fdownloads%2Freport%2FIPCC\\_AR6\\_WGII\\_Chapter05.pdf&data=05%7C02%7CDaniel.Scott%40defra.gov.uk%7Caff3f3e467274170fbfd08dcf8f7207c%7C770a245002274c6290c74e38537f1102%7C0%7C0%7C638658990624383141%7CUnknown%7CTWFpbGZsb3d8eyJWljojMC4wLjAwMDAiLCJQIjojV2luMzliLCJBTiI6IjEkaWwiLCJXVCi6Mn0%3D%7C0%7C%7C%7C&sdata=YFF6LCP16Q3IPOsWChzjIGIQQS4tz56H3uSAqwZDBQE%3D&reserved=0](https://eur03.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.ipcc.ch%2Freport%2Far6%2Fwg2%2Fdownloads%2Freport%2FIPCC_AR6_WGII_Chapter05.pdf&data=05%7C02%7CDaniel.Scott%40defra.gov.uk%7Caff3f3e467274170fbfd08dcf8f7207c%7C770a245002274c6290c74e38537f1102%7C0%7C0%7C638658990624383141%7CUnknown%7CTWFpbGZsb3d8eyJWljojMC4wLjAwMDAiLCJQIjojV2luMzliLCJBTiI6IjEkaWwiLCJXVCi6Mn0%3D%7C0%7C%7C%7C&sdata=YFF6LCP16Q3IPOsWChzjIGIQQS4tz56H3uSAqwZDBQE%3D&reserved=0))).

## Food and drink manufacturing water usage

The food and drink manufacturing sector is a [large consumer of water](#) ([https://assets.publishing.service.gov.uk/media/5a7c9a6b40f0b6629523a970/LIT\\_8767\\_4d1fe5.pdf](https://assets.publishing.service.gov.uk/media/5a7c9a6b40f0b6629523a970/LIT_8767_4d1fe5.pdf)). Although the industry has grown since 1990, overall water consumption (both public water supply and non-public water supply) has reduced. This is because of economic conditions and a commitment by the industry to cut its water consumption. [The latest published data](#) ([https://assets.publishing.service.gov.uk/media/5e6a276386650c7275b78067/Appendix\\_5\\_Future\\_non-public\\_water\\_supply\\_demand.pdf](https://assets.publishing.service.gov.uk/media/5e6a276386650c7275b78067/Appendix_5_Future_non-public_water_supply_demand.pdf)) shows that possible changes in demand for direct abstraction by the food and drink industry could range from the baseline of 20.8 million cubic metres per year (56.9 Ml/day) to 33.4 million cubic metres per year (91.6 Ml/day). The latest direct abstraction National Framework 2 data for food and drink manufacturing recent revised actual baseline is 19.6 million cubic metres per year (53.6 Ml/day) (Environment Agency).

## Case study 2: Felixstowe Hydrocycle

Some farmers are investigating innovative solutions to water management. The [Felixstowe Hydrocycle](#)

[\(https://www.felixstowehydrocycle.com/\)](https://www.felixstowehydrocycle.com/) project is one example of a farmer-led initiative to develop a sustainable water supply to farmers in the area. The project involves the Environment Agency, Suffolk County Council, Felixstowe Hydrocycle Ltd, the University of East Anglia and five local farmers.

The Felixstowe Peninsula, in the East of England, has been subject to increasingly dry conditions in recent years with abstraction becoming an unsustainable option for agriculture in the area. There is an estimated 1 million cubic meter shortfall in water, and abstraction poses a risk to the unique wetlands in the area. Conversely, up to 1 million tonnes of water is drained from fields in the Kings fleet catchment every year, to prevent flooding, and pumped into the River Deben estuary ([Environment Agency, 2021 \(https://environmentagency.blog.gov.uk/2021/02/16/recycling-one-million-tonnes-of-water-in-felixstowe/\)](https://environmentagency.blog.gov.uk/2021/02/16/recycling-one-million-tonnes-of-water-in-felixstowe/)).

In 2018, the project secured funding to build an 11km pipeline to divert drainage water away from the River Deben back inland for use. Rerouting the drainage water aims divert the usable 'grey' water back inland to a managed aquifer recharge system for irrigation while also preventing further erosion of the biodiverse saltmarsh and mudflat habitats of the area. Felixstowe Hydrocycle is now in its third year, with permits in place to deliver up to 600Ml of new water and store and recover up to 40Ml each year using managed aquifer recharge.

## 3.1.5 Energy

### Rationale

Energy dependency exists throughout the food supply chain and capturing the energy intensity of the food supply chain is complex. From farmers to consumers, energy is needed to grow, transport and process food and other critical inputs such as fertiliser. Disruptions in supply or changes in energy price can have significant implications for food security, particularly with regard to stability and access. This indicator tracks both energy demand and prices in the food sector. Energy price data focuses on non-domestic energy prices as they are the prices paid by food businesses for electricity and gas.

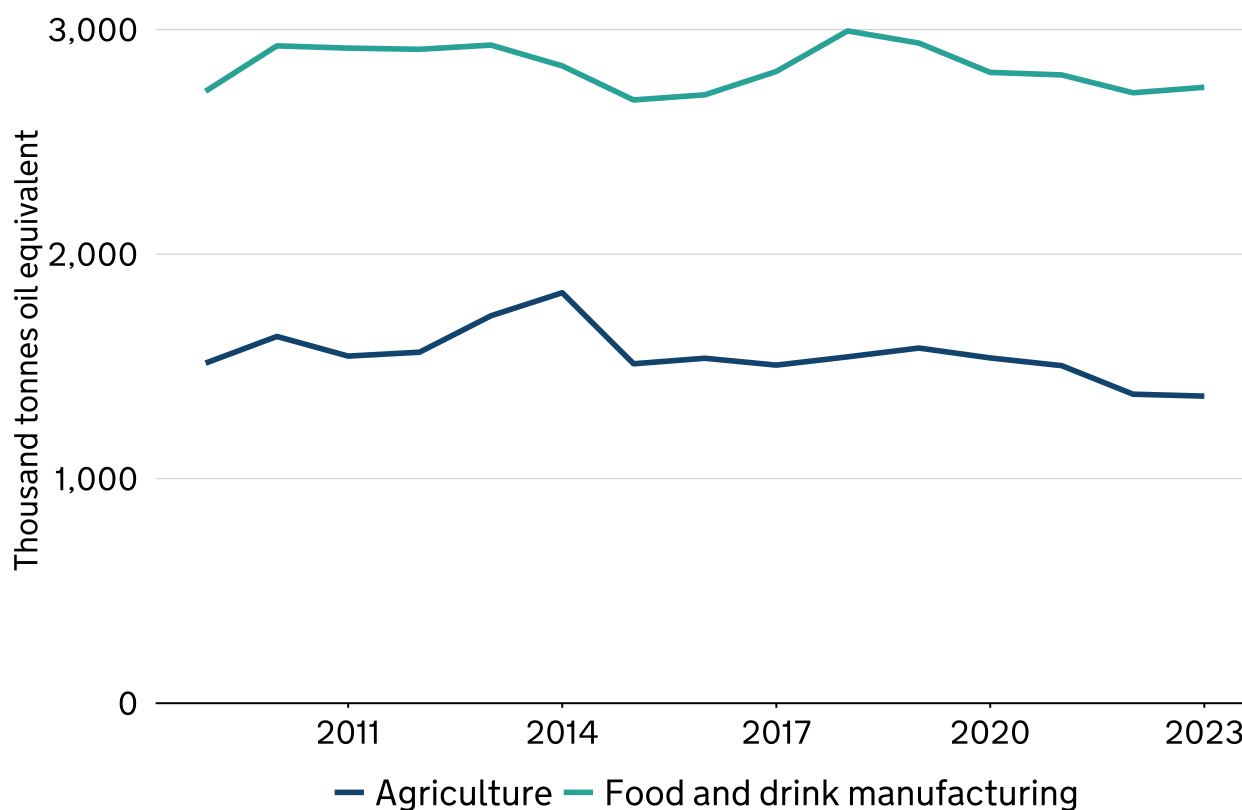
### Headline evidence



**Figure 3.1.5a:** Aggregate energy demand (Thousand Tonnes Oil Equivalent (ktoe) for agriculture and food and drink manufacturing in the UK, 2009 to 2023

Source: [Digest of UK Energy Statistics, Table 1.1](#)

<https://www.gov.uk/government/statistics/energy-chapter-1-digest-of-united-kingdom-energy-statistics-dukes>



[Download the data for this chart \(ODS, 58.9 KB\)](#)

<https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods>

In absolute terms, energy used in the food and drink manufacturing sector has generally declined over the last 14 years (more significantly on a per capita basis), reflecting increased energy efficiency. From 2021 to 2023 specifically demand has continued to decline, but at a slower rate of approximately 2%. Notably, there was a decline of around 2.8% from 2021 to 2022, reducing from 2798 (ktoe) to 2719 (ktoe), which was likely related to the price spikes in 2022 following Russia's invasion of Ukraine. In contrast, from 2022 to 2023, there was a modest increase of about 0.9% in energy consumption, indicating a slight recovery in this sector.

For agriculture, total energy use increased between 2009 and 2014 before then declining between 2014 and 2021. Since 2021 energy consumption has decreased, with consumption dropping approximately 9% over the three-year period from 1503 (ktoe) in 2021 to 1367 (ktoe) in 2023. The drop occurred between 2021 and 2022, where energy usage fell by about 8.5%, from 1503 (ktoe) to 1376 (ktoe). This drop was notable in demand for

electricity and gas following the price spikes during 2022. The reduction slowed from 2022 to 2023, with overall total usage remaining above 2002 to 2008 levels.

While there has been decline in energy use, energy will continue to remain a significant input for both agriculture and food manufacturing. As set out in the supporting evidence, the complex supply landscape means that there is a significant risk to stability of supply from price fluctuations caused by international disruption, as demonstrated over the last three years. The UK and continental Europe were particularly exposed by recent geopolitical disruption and limited in their ability to mitigate high prices due to their reliance on gas imports. This was demonstrated by UK annual [energy price inflation](https://www.ons.gov.uk/economy/inflationandpriceindices/articles/foodandenergypriceinflationuk/2023#energy-price-inflation) (<https://www.ons.gov.uk/economy/inflationandpriceindices/articles/foodandenergypriceinflationuk/2023#energy-price-inflation>) being the highest among G7 economies in March 2023 reaching 40.5%.

The reduction of dependence on energy, particularly the reduced use of non-renewable sources, could be interpreted as an example of re-orientation that helps mitigate effects from future disruptions. It is difficult to establish from the data the extent to which the sector is re-orientating by reducing its dependence on energy or, by contrast, making short term business decisions.

## **Supporting evidence**

### **Energy supply landscape**

The UK meets its energy demand through domestic production and trade. In 2023, overall energy demand in the UK dropped to levels last seen in the 1950s due to elevated temperatures and high energy prices. UK energy production in 2023 dropped to a new record low, down 8% in 2022, with non-renewable energy such as oil, gas and nuclear production all dropping. In contrast, output from renewable energy such as wind, solar and hydro reached record highs in 2023 but combined formed under 10% of UK production. Overall, energy imports in 2023 stood at 137.4 million tonnes of oil equivalent (mtoe), 6.5% lower than in 2022, and 24% lower than the peak in 2013. Over 90% of the UK's energy imports comprise of oil and gas. Norway and the US together supplied more than 80% of [gas](https://www.gov.uk/government/statistics/natural-gas-chapter-4-digest-of-united-kingdom-energy-statistics-dukes) (<https://www.gov.uk/government/statistics/natural-gas-chapter-4-digest-of-united-kingdom-energy-statistics-dukes>) imports in 2023. Each supplied more than 2.5 times the amount of [oil](https://www.gov.uk/government/statistics/petroleum-chapter-3-digest-of-united-kingdom-energy-statistics-dukes) (<https://www.gov.uk/government/statistics/petroleum-chapter-3-digest-of-united-kingdom-energy-statistics-dukes>) as the Netherlands, which was the third largest UK oil supplier in 2023. This continues a ten-year trend of Norway being the UK's principal supplier of energy. The US has become a larger supplier following the closure of energy trade with Russia and decrease in supply from Qatar. Despite not being directly reliant on Russian energy (6% of gas and 13% of oil in 2021), UK energy prices



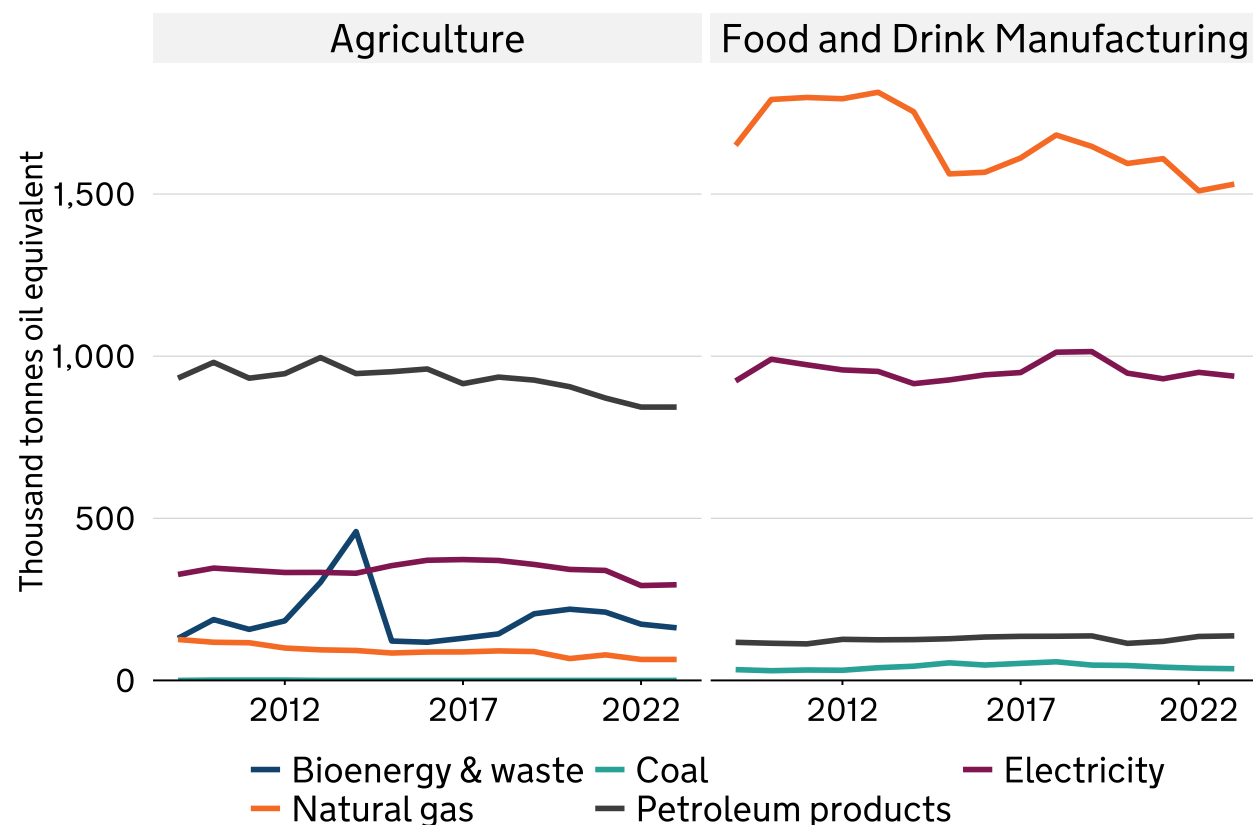
rose following Russia's invasion of Ukraine in 2022 and subsequent rise in international gas and oil prices.

## Energy consumption by energy type

**Figure 3.1.5b:** Energy consumption by energy type in agriculture and food and drink manufacturing in oil equivalent values, UK, 2009 to 2023

Source: [Digest of UK Energy Statistics, Table 1.1](#)

<https://www.gov.uk/government/statistics/energy-chapter-1-digest-of-united-kingdom-energy-statistics-dukes>



[Download the data for this chart \(ODS, 58.9 KB\)](#)

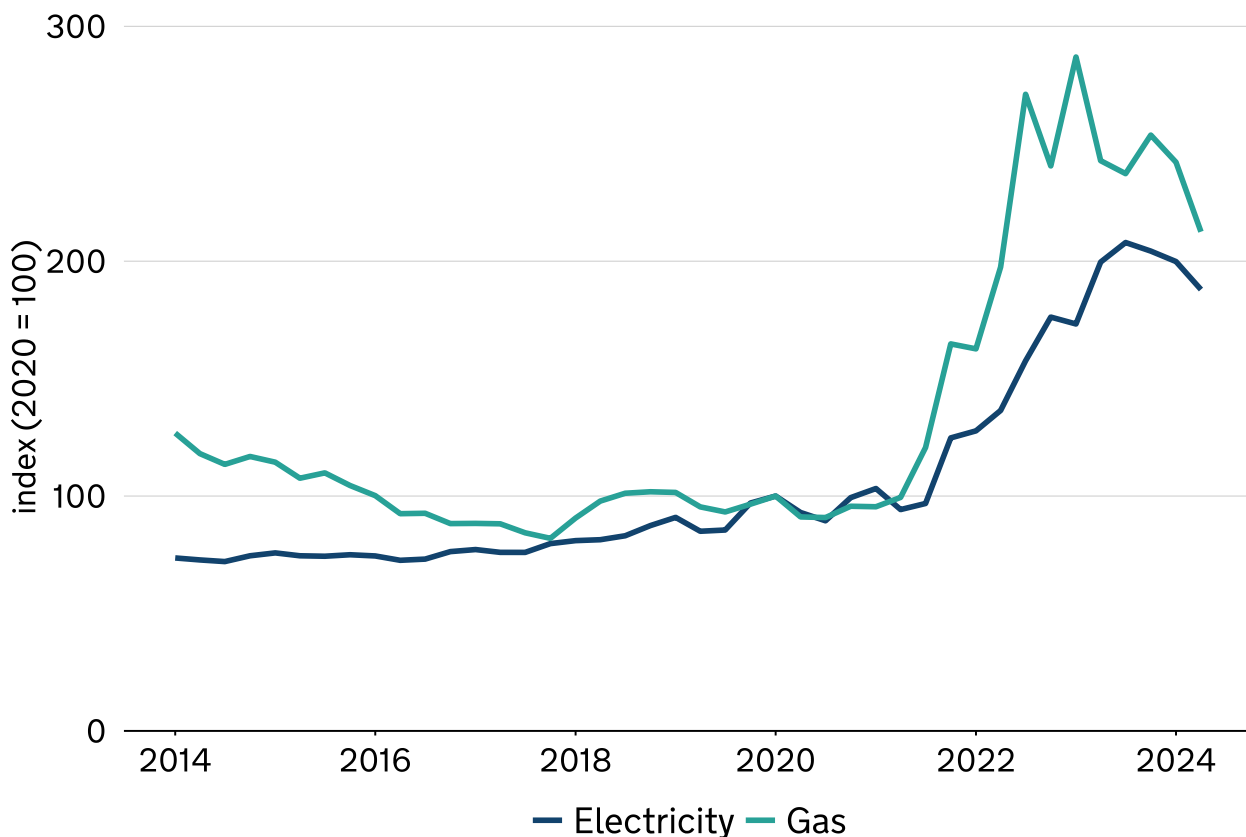
<https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods>

Energy demand in agriculture remains heavily reliant on non-renewables. Fuel types such as petroleum products continue to meet the majority of energy needs. Petroleum products consist of burning oil used for drying of crops and heating and gas oil (commonly known as red diesel) used to power non-road machinery. A small amount of propane is used mainly for heating (most commonly on poultry farms). In the food and drink manufacturing sector, demand changes have varied across different energy sources. Natural gas remains the main energy source for food and drink manufacturing. Usage declined from 2017 to 2022 and increased in 2023.

## Energy prices

**Figure 3.1.5c:** Non-domestic energy prices, UK, Q1 2014 to Q2 2024.

Source: Prices of fuels purchased by non-domestic consumers in the United Kingdom (excluding the Climate Change Levy) ([DESNZ Quarterly Energy Prices](https://www.gov.uk/government/statistical-data-sets/gas-and-electricity-prices-in-the-non-domestic-sector#full-publication-update-history) (<https://www.gov.uk/government/statistical-data-sets/gas-and-electricity-prices-in-the-non-domestic-sector#full-publication-update-history>) table 3.4.1)



[Download the data for this chart \(ODS, 58.9 KB\)](https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods)  
(<https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods>)

Note: DESNZ Quarterly data was first collected in 2004.

Non-domestic energy prices are the prices paid by businesses for electricity and gas. In recent years energy prices have reflected geopolitical shocks to energy supply, such as Russia's invasion of Ukraine. Figure 3.1.5.c above shows that both electricity and gas prices climbed significantly from mid-2022 onwards, well surpassing prices in the period 2014 to 2020. The price doubled for electricity and nearly tripled for gas compared to the 2020 baseline (electricity 100%, gas 187%) significantly from mid-2022. Following the price shock in 2022 energy prices stopped rising in 2024 but remain around double the pre-2022 levels. Non-domestic electricity prices remain high in comparison to the rest of the world, but gas prices are relatively low compared to EU and G7 prices.

It is difficult to isolate the effect of the recent energy price spike on businesses and where these may have contributed to business failures. The rise in energy prices affect some food sub-sectors more acutely than others

and some inputs have cross-sectoral demand beyond the food supply chain which further tightens supply to the food sector. As a short term response to price rises in 2022, businesses that were eligible accessed support through the [Energy Bill Relief Scheme](https://www.gov.uk/guidance/energy-bill-relief-scheme-help-for-businesses-and-other-non-domestic-customers) (<https://www.gov.uk/guidance/energy-bill-relief-scheme-help-for-businesses-and-other-non-domestic-customers>) and [Energy Bills Discount Scheme](https://www.gov.uk/guidance/energy-bills-discount-scheme) (<https://www.gov.uk/guidance/energy-bills-discount-scheme>). Some food businesses responded to price rises by trying to reduce energy costs by making efficiencies and adapting their production methods, in both the short and long term. Where possible some businesses made applications to the [Industrial Energy Transformation Fund \(IETF\)](https://www.gov.uk/government/collections/industrial-energy-transformation-fund) (<https://www.gov.uk/government/collections/industrial-energy-transformation-fund>). The IETF is designed to help businesses with high energy use to cut their energy bills and carbon emissions through investing in energy efficiency and low carbon technologies. In some cases, adaptation has had knock-on consequences in different sectors. For example, in [horticulture](https://researchbriefings.files.parliament.uk/documents/POST-PN-0707/POST-PN-0707.pdf) (<https://researchbriefings.files.parliament.uk/documents/POST-PN-0707/POST-PN-0707.pdf>) (excluded from energy bill schemes) many growers faced with rising heating bills chose to delay or reduce planting altogether. This led to a significant shortfall in domestically produced vegetables adding pressure on imports from regions such as Spain and North Africa that already faced weather-related challenges, as discussed in Theme 2 (see Indicator 2.1.4 Fruit and Vegetables). The confluence of these factors (adverse weather and geopolitical disruption) resulted in a reduction of fresh produce availability (tomatoes, peppers, cucumbers, lettuce, salad bags, broccoli, cauliflower, and raspberries) in the spring of 2023, which led to higher prices and reduced supplies.

Energy as a proportion of overall business costs will differ from sector to sector. Energy costs are intricately linked to other inputs such as fertiliser and CO<sub>2</sub>. This has meant that the energy price rises have had a cumulative effect, making it difficult for businesses to bring down prices. Since 2021 food input prices have outpaced food output prices, which in turn have outpaced consumer price. This was one of the principal drivers of the 2022 to 2023 food price inflation spike that was significantly higher than general inflation, as discussed in Theme 4 (see Indicator 4.1.3 Price changes of main food groups). Despite a fall in global food prices from the end of 2022, food price inflation persisted in the UK and continental Europe up to March 2023, due in part to high reliance on gas. In the UK food price inflation was among the highest across G7 economies, second only to Germany. This was because energy price inflation coincided with a range of factors such as increased labour costs, increased costs of imports, and delayed price transition due to fixed term contracts ([ONS, 2023](https://www.ons.gov.uk/economy/inflationandpriceindices/articles/foodandenergypriceinflationuk/2023) (<https://www.ons.gov.uk/economy/inflationandpriceindices/articles/foodandenergypriceinflationuk/2023>)). More recently, all prices have stabilised.

As an example of the impact of the inflation spike on food prices and consumers, in the out of home sector the average price of takeaway has risen from £13.50 in 2021 to £23.60 in 2024. Fish and chips have seen the

largest increase in price, increasing by 19% from March 2022 to March 2023 ([ONS, 2023](#)

(<https://cy.ons.gov.uk/economy/inflationandpriceindices/articles/exploringhowtheaveragepriceofindividualitemshaschangedinthelastyear/2023-05-03>)).

## Sub-theme 2: Movement of goods

### 3.2.1 Transport

#### Rationale

Transport is a critical national infrastructure sector. A functioning road, sea and rail network is an essential part of the supply chain, ensuring movement of goods into, out of and around the UK in a timely manner to meet demand. As all food is transported at least part of the way via road, this indicator looks at the Road Congestion and Travel Time Statistics which cover the Strategic Road Network (SRN) in England. The SRN is comprised of 4,500 miles of motorways and major A roads in England, connecting the large towns and cities. It is the most heavily used set of roads in the country carrying roughly a third of all freight traffic ([National Highways Agency](#) ([https://nationalhighways.co.uk/our-roads/roads-we-manage/#:~:text=The%20strategic%20road%20network%20\(SRN\)%20is%20arguably%20the%20biggest%20and,of%20our%20national%20transport%20system.](https://nationalhighways.co.uk/our-roads/roads-we-manage/#:~:text=The%20strategic%20road%20network%20(SRN)%20is%20arguably%20the%20biggest%20and,of%20our%20national%20transport%20system.)), 2024). Delay indicators are only available for the SRN in England. Road traffic statistics are published for [Scotland](#) (<https://www.transport.gov.scot/publication/scottish-transport-statistics-2023/chapter-5-road-traffic/>), [Wales](#) ([https://www.gov.wales/road-traffic-2023-html#:~:text=Road%20traffic%20volume%20in%20Wales,\(30.7bvk%20in%202019\).](https://www.gov.wales/road-traffic-2023-html#:~:text=Road%20traffic%20volume%20in%20Wales,(30.7bvk%20in%202019).)) and [Northern Ireland](#) ([https://www.infrastructure-ni.gov.uk/news/travel-survey-northern-ireland-depth-report-2021-has-been-published-today#:~:text=On%20average%2C%20838%20journeys%20were,\(279%20hours%20per%20person\)](https://www.infrastructure-ni.gov.uk/news/travel-survey-northern-ireland-depth-report-2021-has-been-published-today#:~:text=On%20average%2C%20838%20journeys%20were,(279%20hours%20per%20person))) but are not comparable.

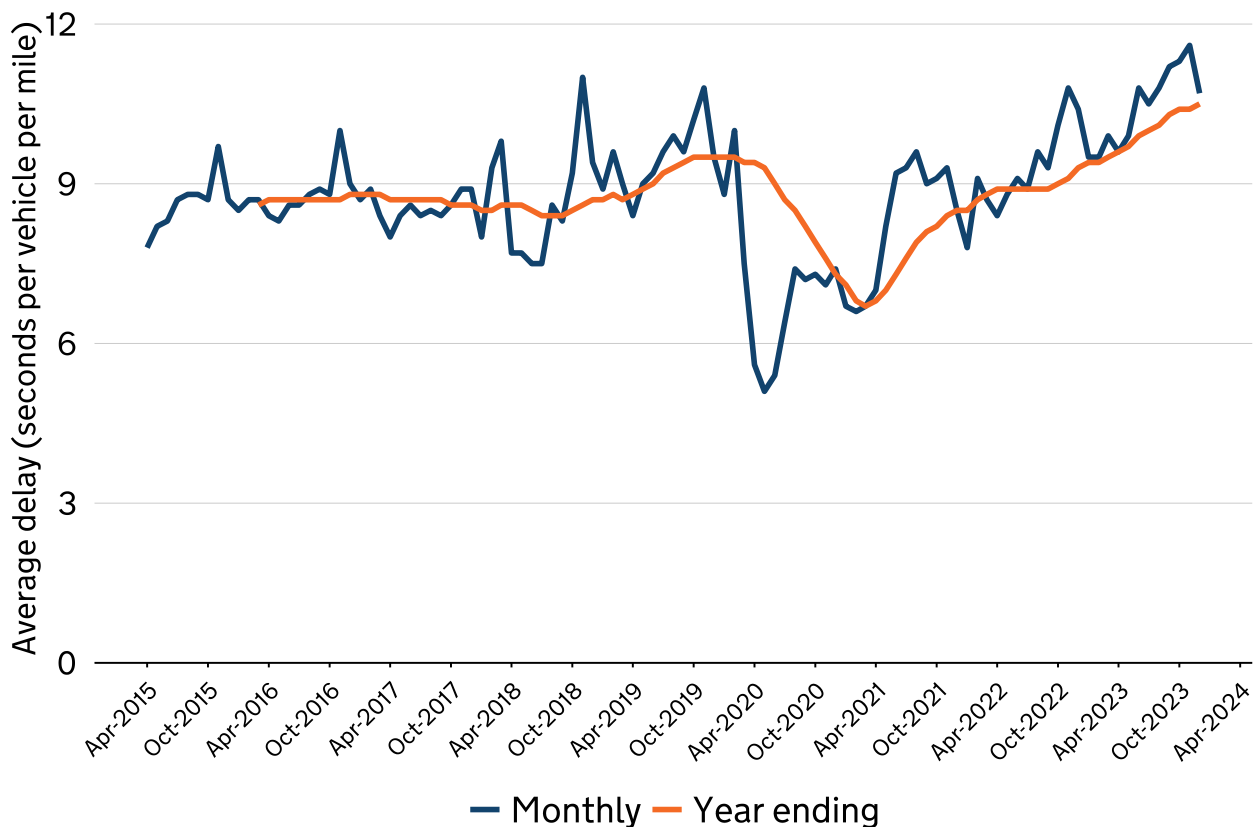
The JIT inventory management model, used by the food industry, means very low stockpiles (if any) are held at any point, reducing the cost of holding stock on business premises. The system needs to be kept moving to function effectively. JIT supply chains are sensitive to transport disruption,

particularly in road freight as it is the most used mode of transport. [International Freight statistics for the UK](https://www.gov.uk/government/statistics/road-freight-statistics-2023/international-road-freight-statistics-united-kingdom-2023) (<https://www.gov.uk/government/statistics/road-freight-statistics-2023/international-road-freight-statistics-united-kingdom-2023>) show that in 2023, 0.88 million tonnes of food products were imported into the UK by UK-registered heavy goods vehicles. Food was the second most common commodity imported accounting for 27% of tonnage.

## Headline evidence

**Figure 3.2.1a:** Average delay on the Strategic Road Network in England (seconds per vehicle per mile), 2015 to 2024

Source: [Travel time measures for the Strategic Road Network, Department for Transport](https://www.gov.uk/government/statistics/travel-time-measures-for-the-strategic-road-network-and-local-a-roads-january-to-december-2023/travel-time-measures-for-the-strategic-road-network-january-to-december-2023-report#:~:text=2.2%20Delay,8.6%20spvpm%20and%209.0%20spvpm%20.) (<https://www.gov.uk/government/statistics/travel-time-measures-for-the-strategic-road-network-and-local-a-roads-january-to-december-2023/travel-time-measures-for-the-strategic-road-network-january-to-december-2023-report#:~:text=2.2%20Delay,8.6%20spvpm%20and%209.0%20spvpm%20.>)



[Download the data for this chart \(ODS, 58.9 KB\)](https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods) (<https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods>)

**Figure 3.2.1b:** Average delay on the Strategic Road Network in England (seconds per vehicle per mile), 2023

Source: [Strategic Road Network Speed and Delay, Department for Transport](https://dft.maps.arcgis.com/apps/instant/portfolio/index.html?), (<https://dft.maps.arcgis.com/apps/instant/portfolio/index.html?>)

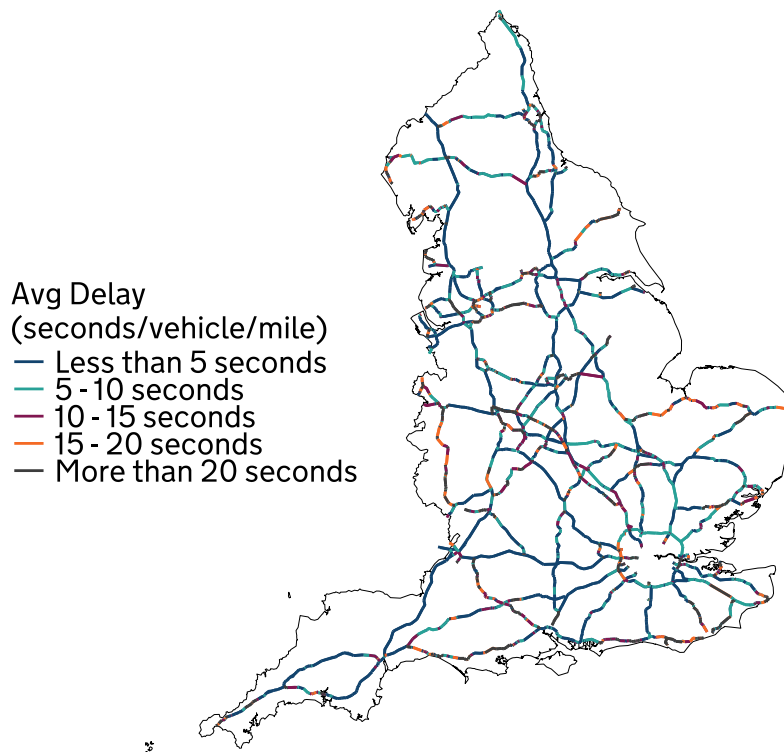


Figure 3.2.1a (see above) shows there has been a general increase in the average delay in journey time over the past three years on the strategic road network. In October 2020, the average delay was 7.2 seconds per vehicle per mile (spvpm) before rising to over 10 spvpm in October 2023. The lower delays in 2020 took place in the middle of COVID-19 lockdown restrictions. Subsequent rises in average delay following the lifting of lockdown restrictions have shown a general increase above levels before COVID-19. Average delay breached 10 spvpm in July 2023 and has continue to rise. In contrast, in the period 2015 to 2020 the average time delay fluctuated between 8 and 9 spvpm. Delays at the national level (see Figure 3.2.1b) are thought to be caused by road schemes designed to maintain and enhance the SRN ([National Highways - Delivery Plan 2020 to 2025](https://nationalhighways.co.uk/delivery-plan/index.html) (<https://nationalhighways.co.uk/delivery-plan/index.html>)). Factors include an increasing proportion of goods vehicles being speed limited in some regions and a change in driving habits.

The effect of delays is often driven at a local rather than a national level. Although not part of the SRN, the local area around Dover and Folkestone ports covers the most popular point of entry to the UK for both international and national HGVs. On the local 'A' roads from 2021 to 2023 there were no significant change in average delay time around the port of Dover. However, around Folkestone there were larger changes in delays leading to the port.

## Supporting evidence



While the JIT inventory management model has several benefits such as being cost-effective and requiring less storage space, it raises the risk of short-term shortages from significant transport delays. Little stock is held 'on hand' by operators within the food supply chain, with stock purchased as needed. This coupled with tight timescales means it is important food-stock and other perishable goods arrive as scheduled in order to reach consumers to meet demand and limit waste.

Transport disruption could occur in a number of ways including border delays, extreme weather events, or accidental or malicious disruption affecting multiple points of the transportation network. There have been disruptions to the supply chain in recent years that were compounded by the JIT model. Consumer stockpiling during Covid-19, challenges with the UK's new trading relationship with the EU, and interruption to supply chains due to Russia's invasion of Ukraine all created temporary disruptions to the supply chain. These cases affected the range of goods available for consumer choice rather than presenting shortages in key components of the UK diet. They are indicative both of vulnerabilities that could be amplified by potential shocks, but also of the resilience of the supply chain in responding to disruptions to address shortages.

To better respond to future disruptions there is evidence of some [UK businesses adopting a Just in Case \(JIC\) supply model](https://news.sap.com/uk/files/2022/06/08/SAP-Supply-Chain-Report_FINAL.pdf) ([https://news.sap.com/uk/files/2022/06/08/SAP-Supply-Chain-Report\\_FINAL.pdf](https://news.sap.com/uk/files/2022/06/08/SAP-Supply-Chain-Report_FINAL.pdf)). The JIC model holds some stocks as a buffer against supply chain disruptions ([Jiang, Rigobon and Rigobon, 2021](https://link.springer.com/article/10.1057/s41308-021-00148-2) (<https://link.springer.com/article/10.1057/s41308-021-00148-2>)). However, the model presents its own limitations in terms of cost efficiencies and is not suitable for perishable items. The decision as to whether JIT or JIC is the best approach for any agri-food business will come down to individual businesses decisions. There is a data gap to illustrate the extent to which operators in the food supply chain have adopted the JIC supply model.

## Climate change impacts

The effects of extreme weather on the UK transport network have been demonstrated in recent years. In 2021, Storm Arwen was one of the most damaging winter storms of the decade so far. There were a series of delays as result of severe disruption on roads, including overturned vehicles due to high winds and 120 lorry drivers were stranded overnight on the M62 due to snow accumulations ([Kendon and others, 2022](https://rmets.onlinelibrary.wiley.com/doi/10.1002/joc.7787) (<https://rmets.onlinelibrary.wiley.com/doi/10.1002/joc.7787>)). In 2022 delays resulted from a 40°C heatwave caused rail disruption, associated with tracks buckling and sagging of overhead cables ([Kendon and others, 2023](https://rmets.onlinelibrary.wiley.com/doi/10.1002/joc.8167) (<https://rmets.onlinelibrary.wiley.com/doi/10.1002/joc.8167>)). In 2023 (<https://blog.metoffice.gov.uk/2023/12/28/2023-in-weather/>) seven named storms through the autumn and in December caused significant widespread disruption. Storm Babet caused widespread and severe flooding in all four nations, with red warnings of rain issued for parts of Eastern Scotland. The



disruption caused by climate change is projected to worsen in the future. Hourly rainfall, seasonal storm severity and the frequency and duration of compound wind and flood events are all projected to increase in the UK by 2100 ([Met Office, 2019](#)

(<https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18-factsheet-precipitation.pdf>); [Bloomfield and other, 2024](#) (<https://iopscience.iop.org/article/10.1088/1748-9326/ad1cb7/meta#erlad1cb7s3>)).

There is an added risk from delays to perishable foods due to their dependence on the cold chain. More extreme high temperature events are likely to increase risk to the cold chain, which will require adaptation to avoid losses through spoilage and ensure food safety ([Falloon and others, 2022](#) (<https://iopscience.iop.org/article/10.1088/1748-9326/ac68f9>)). Refrigeration may also become more challenging with increasingly severe heat events. Numerous retail facilities experienced the failure of refrigeration systems during the 2022 heatwave ([Davie and others, 2023](#)

(<https://eur03.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.frontiersin.org%2Fjournals%2Fenvironmental-science%2Farticles%2F10.3389%2Fenvs.2023.1282284%2Ffull&data=05%7C02%7CDaniel.Scott%40defra.gov.uk%7C88eadfe2c5544e62eae408dd0a134fcb%7C770a245002274c6290c74e38537f1102%7C0%7C0%7C638677800249546587%7CUnknown%7CTWFpbGZsb3d8eyJFbXB0eU1hcGkiOnRydWUsIlYiOiIlwLjAuMDAwMCIsIlAiOiJXaW4zMlslkFOljoITWFlpbCIsIlIdUljoyfQ%3D%3D%7C0%7C%7C%7C&sdata=Ito347X%2Bq9NGlQdfQrLviINCmf6tgxaM3WVoM3zHe7I%3D&reserved=0>)).

## 3.2.2 Points of entry in the UK

### Rationale

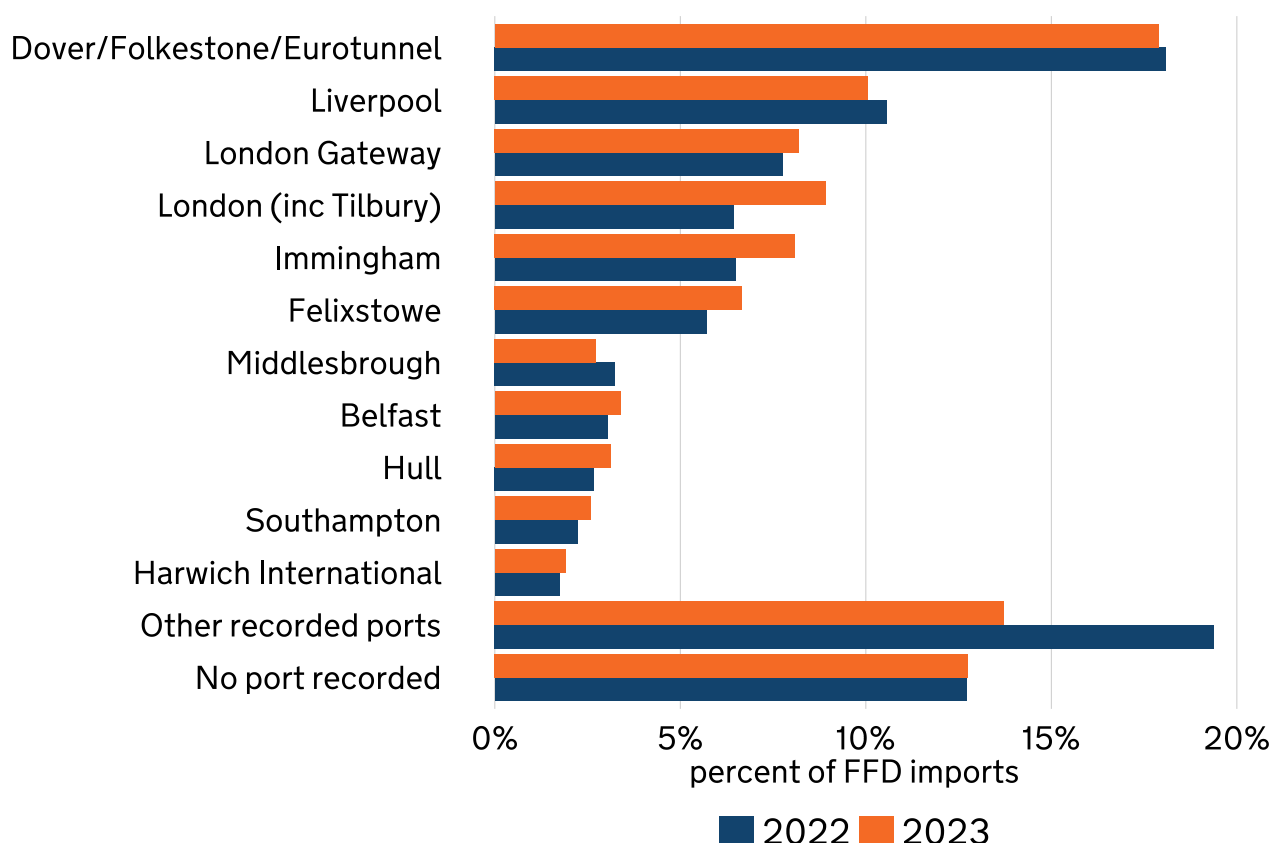
The UK's points of entry are the places where goods enter the country from abroad. Food and animal-feed from overseas enter the country through these international gateways. In [2023](#)

(<https://www.gov.uk/government/statistics/agriculture-in-the-united-kingdom-2023/chapter-14-the-food-chain#origins-of-food-consumed-in-the-united-kingdom>) the UK relied on imports for roughly 40% of its food, unchanged from 2021. This indicator measures volumes of food and feed entering different points of entry to track the overall diversity in points of entry to the UK. This can help with understanding the UK's resilience if a disruption were to occur at one or multiple points of entry. The indicator also tracks changes in port capacity that may affect this resilience.

### Headline evidence

**Figure 3.2.2a:** Percentage of imports of food, feed, and drink (FFD) by volume in the UK by port of entry, 2022 and 2023

Source: [HMRC \(http://www.uktradeinfo.com\)](http://www.uktradeinfo.com)



[Download the data for this chart \(ODS, 58.9 KB\)](#)

<https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods>

Note: Data on ports of entry for imports into Great Britain from the EU and Rest of World are available only from 2022 following the change in data collection method by HMRC. Ports of entry data remain unavailable for goods imported into Northern Ireland from the EU. Additionally, “No port recorded” includes goods arriving at freezones, inland clearance, undeclared ports, and imports into Northern Ireland from the EU.

Overall imports of food, feed and drink are spread across several major ports and a large number of smaller ports. However, some commodities are more reliant on some ports than others. The most notable case is the Short Straits (Dover, Folkestone/Euro Tunnel) where there is the most concentrated flow of food and feed and a critical dependency for entry of perishable products (see supporting evidence).

The period between 2022 to 2023 shows little overall change in the distribution of import volumes through UK points of entry. There were small increases in the proportion of foods entering through London (including Tilbury), Immingham and Felixstowe. However, with only two years of data,

it is not possible to say whether these changes are beyond usual annual fluctuations.

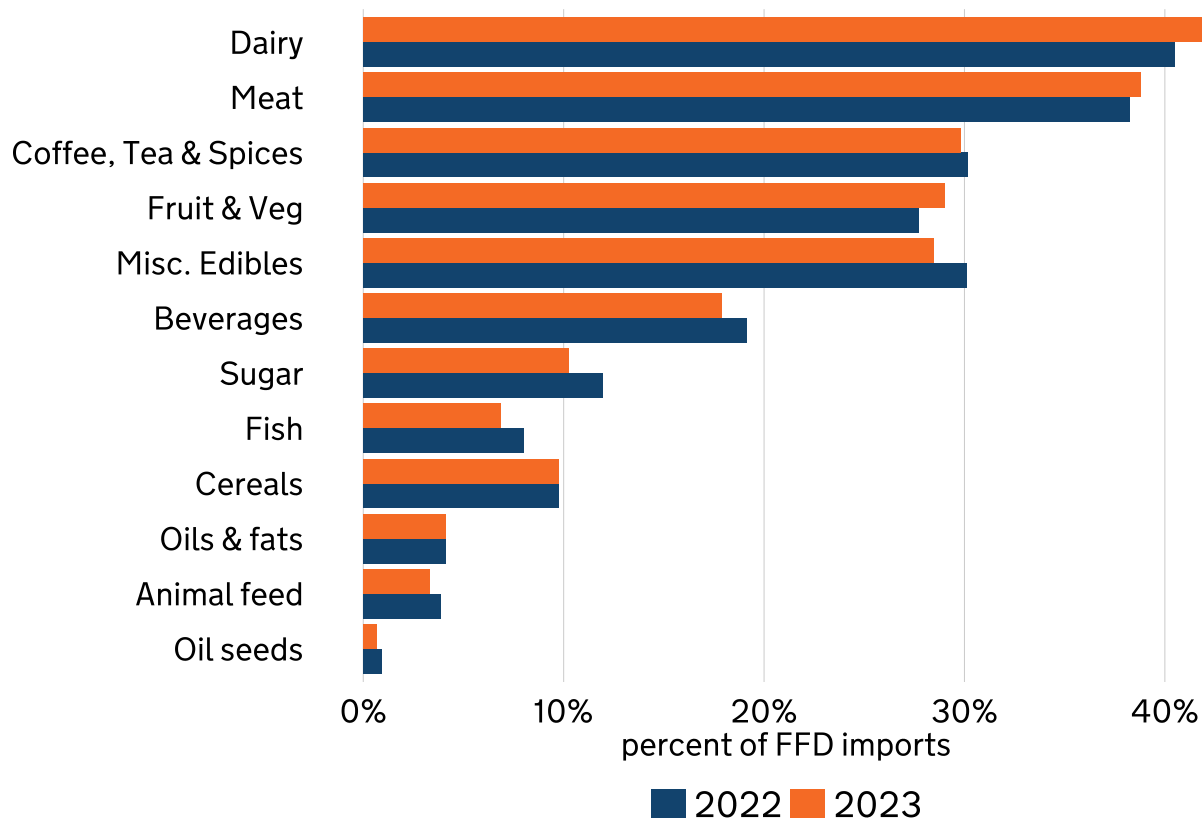
## Supporting evidence

### The Short Straits

The Short Strait routes refer to the ferry connections between the port of Dover, Calais and Dunkirk, and the Channel Tunnel railway connection between Folkestone and Calais. The Short Strait routes are the shortest routes from the UK to continental Europe, and offer advantages in time, cost, and frequency of services. The short journey times are particularly important for the transport of goods with a short shelf life, such as fresh fruit and vegetables. Maintaining JIT low stock levels, especially for short shelf-life products, relies on the Short Strait routes. Both the Roll-On-Roll-Off ferry services between Dover and Calais and Dover and Dunkirk and the Channel Tunnel's Freight Shuttle services between Folkestone and Calais could represent a point of potential risk if there is a disruption at the ferry or rail terminals ([Zurek and others, 2022](https://www.annualreviews.org/docserver/fulltext/energy/47/1/annurev-environ-112320-050744.pdf?expires=1726830315&id=id&accname=guest&checksum=29790E469B043A834FAB500A45012363) (<https://www.annualreviews.org/docserver/fulltext/energy/47/1/annurev-environ-112320-050744.pdf?expires=1726830315&id=id&accname=guest&checksum=29790E469B043A834FAB500A45012363>)).

**Figure 3.2.2b:** Proportions of the volume of UK food, feed and drink imports that are recorded as entering the UK at Dover, Dover/Eurotunnel, or Eurotunnel (Folkestone), 2022 and 2023.

Source: [HMRC](https://www.uktradeinfo.com/trade-data/ots-custom-table) (<https://www.uktradeinfo.com/trade-data/ots-custom-table>)



[Download the data for this chart \(ODS, 58.9 KB\)](#)

<https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods>

On average, 18% of the total volume of UK Food, Feed and Drink imports are recorded as entering the UK through the Short Straits. The average is greater for perishable products such as **dairy** and **eggs** (42% in 2023), **meat** (39% in 2023) and **vegetables** and **fruit** (29% in 2023) which require faster transit times to ensure that products reach consumers as quickly as possible (see Figure 3.3.2b above). Products such as cereals and oilseeds tend to be transported in bulk, requiring different specialised port facilities. The majority (62%) of imports of fish and fish products are recorded as entering through Immingham, Felixstowe, and London Gateway. This route is also important for UK exports, with approximately 52% of meat and 50% of fish exports (by volume) going to continental markets through this route in 2023.

## Port capacity

Managing risk of disruption by having a diversity of ports is dependent on the capacity of ports to receive rerouted goods. Resilience may be stronger where there are clusters of ports (such as in the South East and North East regions) used for handling food import traffic, where geographical proximity may allow ports to share some of the risks of disruption. However, there continues to be an evidence gap at both the individual port and UK level to allow for an accurate assessment of the ease with which food import traffic can be switched between ports in the event of disruption. Generally, ports mitigate any risks by operating a long-term supply model and planning well

in advance to avoid potential disruption. The ability of ports to take on additional short notice shipments will be determined by a number of factors including utilisation levels, the availability of trained people in place to accommodate increased traffic flow, the ability of industry to reconfigure their supply chains and the infrastructure available at the port.

## Shipping

The Poole-Tangier route discussed in UKFSR 2021 is still in development. Since 2021 there have been several new shipping routes established. New shipping routes are designed to expand the diversity of choice for traders and hauliers and to build supply chain resilience in the routes between the UK and other countries. There is limited data available on the mode of transport for goods entering the UK or the extent that new routes will be used in the food supply chain. Notable developments are new routes from South America that will transport [bananas](https://www.dpworld.com/southampton/news/latest-news/dp-world-southampton-connects-uk-and-central-america-with-major-new-reefer-service) (<https://www.dpworld.com/southampton/news/latest-news/dp-world-southampton-connects-uk-and-central-america-with-major-new-reefer-service>) to Southampton and frozen food (<https://www.dpworld.com/london-gateway/news/latest-news/dp-world-welcomes-new-south-america-shipping-service-to-its-london-gateway-logistics-hub>) to London Gateway and a new route from Agadir to Liverpool that will transport [tomatoes](https://www.dpworld.com/london-gateway/news/latest-news/dp-world-welcomes-new-south-america-shipping-service-to-its-london-gateway-logistics-hub) (<https://www.dpworld.com/london-gateway/news/latest-news/dp-world-welcomes-new-south-america-shipping-service-to-its-london-gateway-logistics-hub>).

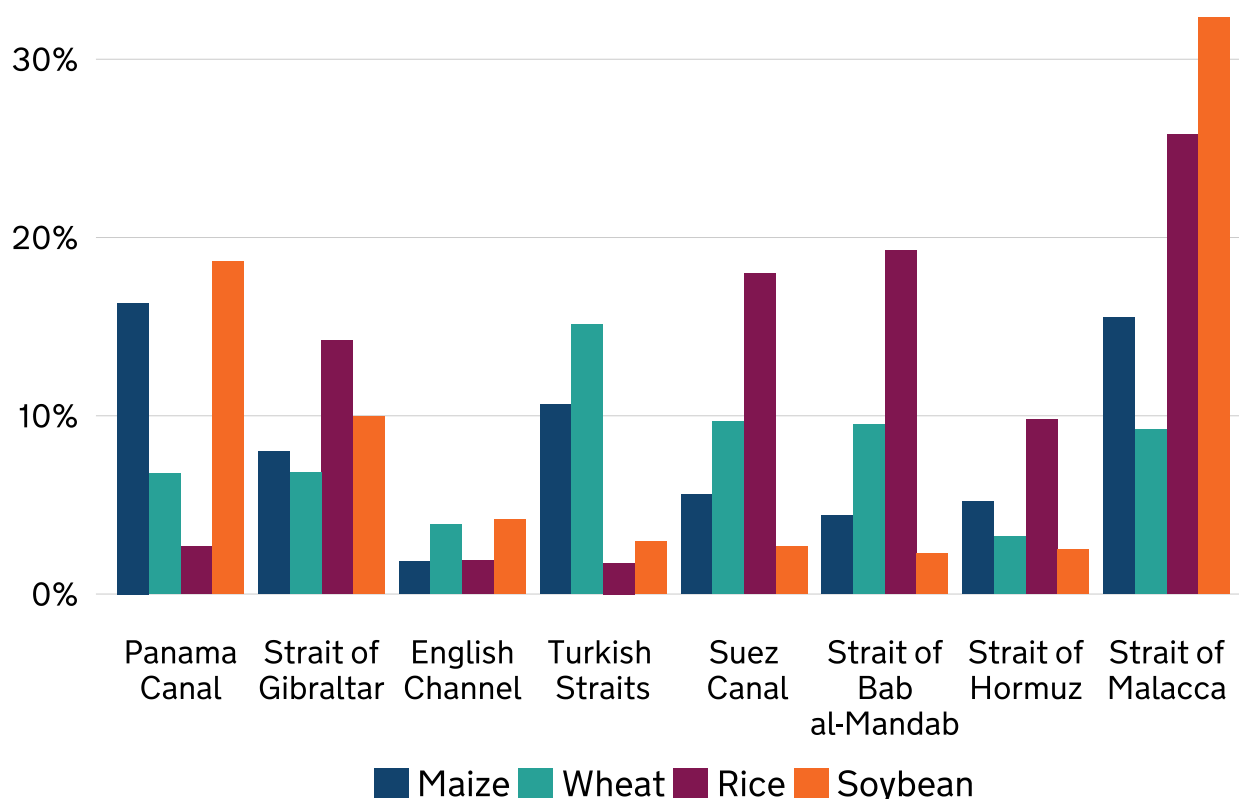
## Shipping disruption between 2021 and 2024

Global disruptions to shipping such as **Russia's invasion of Ukraine** and the attacks on shipping in the **Red Sea** (Strait of Bab al-Mandab) have affected the movement of goods. These disruptions occurred within the context of challenges already experienced by UK traders following the UK leaving the EU. The disruption in the Red Sea and Black Sea at a global level is covered in more detail in Theme 1 (see Indicator 1.3.3 for a case study on the role of maritime trade chokepoints in global food security). From a UK perspective, the disruptions primarily affected prices, rather than supply. Global trade was diverted via The Cape of Good Hope, adding 10 to 20 days to shipping times, increasing transportation costs. The ability shown by traders to adjust to localised disruption by choosing alternative routes demonstrated some resilience in the supply chain.

The figures below set out global maritime chokepoints for important food imports and inputs to food production. While traders can find different routes in cases of disruption, the effects of disruption will depend on the level of concentration for different goods. Soybeans and rice passing through the Strait of Malacca and Phosphatic fertiliser passing through the Strait of Gibraltar show notably high levels of concentration. There is an evidence gap on implications of these chokepoints for UK supply.

**Figure 3.2.2c:** Annual maritime chokepoint throughput of maize, wheat, rice, and soybean as a share of global total trade, 2022

Source: Chatham House Maritime Analysis Tool; Chatham House (2022), [resource.trade.earth](https://resource.trade.earth) (2022 data)

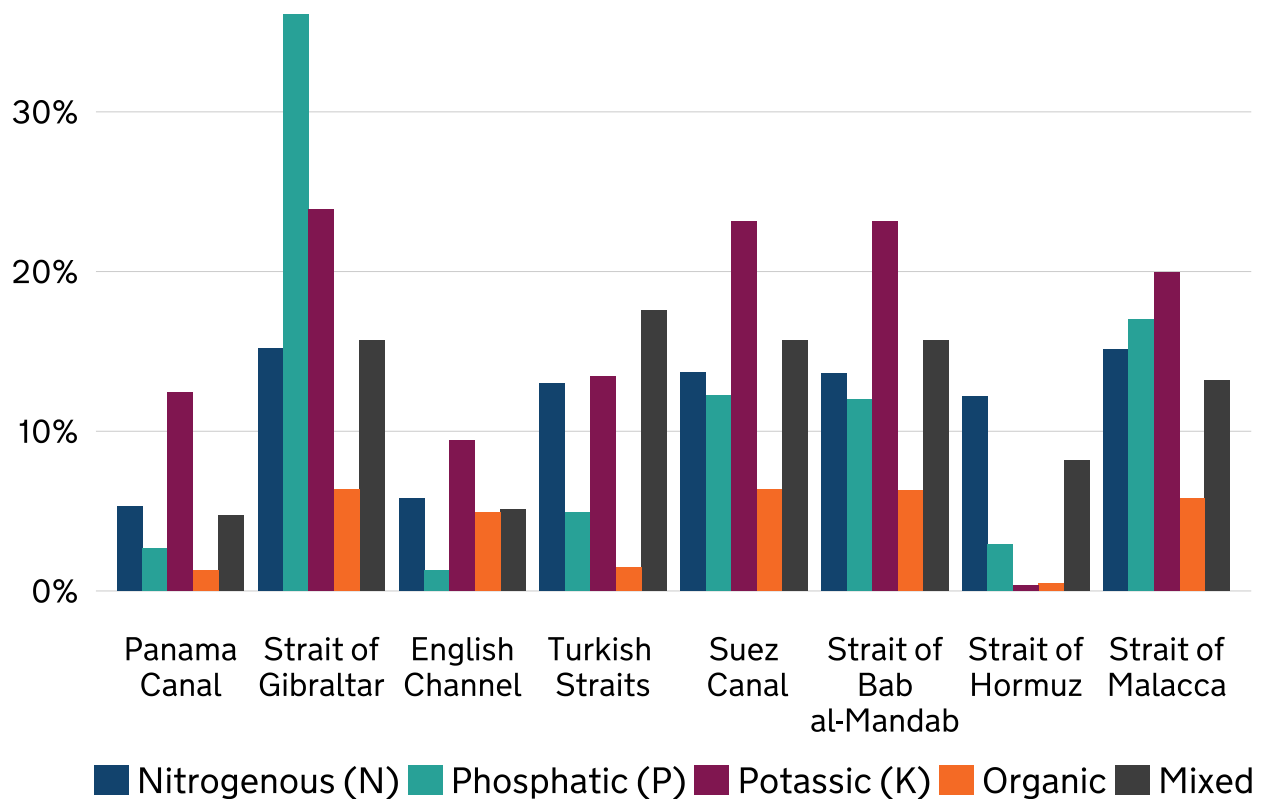


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<https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods>

**Figure 3.2.2d:** Share of global trade in fertilisers passing through key maritime chokepoints, 2022.

Sources: Chatham House Maritime Analysis Tool; Chatham House (2022), [resource.trade.earth](https://resource.trade.earth) (2022 data)



[Download the data for this chart \(ODS, 58.9 KB\)](#)

<https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods>

## Climate change impacts on UK ports

Climate change is expected to increase extreme weather events that could affect the functioning of ports. A notable recent example affecting ports was the 2022 February storms which led to the temporary closure of the port of Dover to all shipping ([Kendon and others, 2023](#) (<https://rmets.onlinelibrary.wiley.com/doi/10.1002/joc.8167>)). Storm surge events of magnitudes that have previously occurred in the UK are expected to affect larger areas of land in the future due in part to higher mean sea levels ([Bulgin and others, 2023](#) (<https://iopscience.iop.org/article/10.1088/1748-9326/acc6df/meta#erlacc6dfs3>)). The pattern of sea level rise is not uniform across the UK. The largest increases are projected for the southern UK (close to the global mean), while projections are much lower for northern parts of the UK ([Met Office, 2022](#) ([https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18\\_headline\\_findings\\_v4\\_aug22.pdf](https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18_headline_findings_v4_aug22.pdf))). Areas along the east coast, through the English Channel to north Devon are expected to experience the most significant increases in coastal risk based on sea-level rise and changing frequency of weather patterns ([Perks and others, 2023](#) (<https://link.springer.com/article/10.1007/s10584-023-03496-2#Abs1>)).

Government, ports, and many businesses have plans to reroute goods to other ports in this event, but the combined effect of rerouting all east coast traffic would likely cause delays and congestion at other ports. The JIT model of the supply chain makes it vulnerable to this kind of disruption, with



the greatest potential effects on availability of fresh produce. The projected opening up of Arctic sea routes offers opportunities for increased trade for the UK ([Challinor and Benton, 2021 \(https://www.ukclimaterisk.org/wp-content/uploads/2021/06/CCRA3-Chapter-7-FINAL.pdf\)](https://www.ukclimaterisk.org/wp-content/uploads/2021/06/CCRA3-Chapter-7-FINAL.pdf)), which could potentially increase resilience by diversifying the options available for shipping routes for imports and exports.

## 3.2.3 Import flows

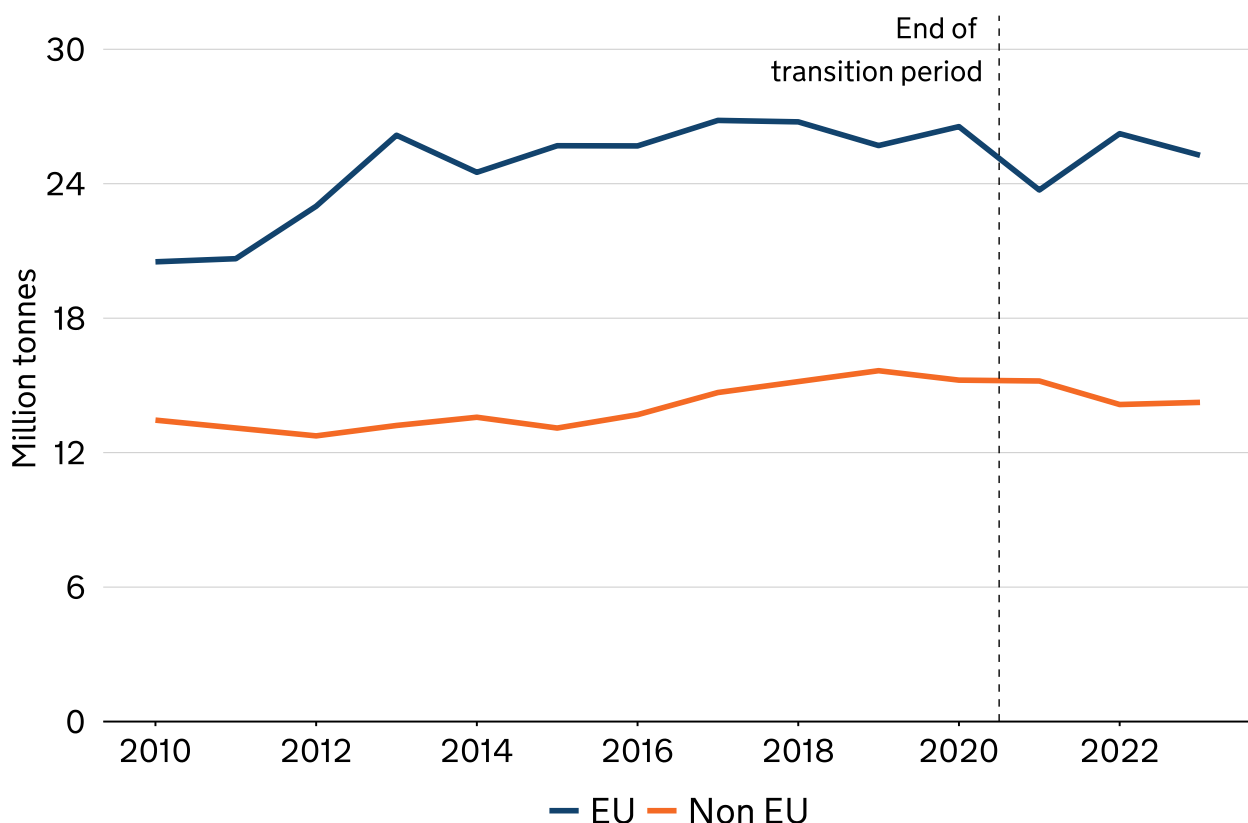
### Rationale

The ability of food to enter the UK is an important consideration for stability of the supply chain. This indicator tracks the volume of food, feed and drink feed imports into the UK to assess the stability of that flow and the effect of any disrupting factors or barriers to trade.

### Headline evidence

**Figure 3.2.3a:** The volume of UK imports of agri-food (food, feed and drink), 2010 to 2023, MT

Source: [HMRC \(http://www.uktradeinfo.com\)](http://www.uktradeinfo.com)



[Download the data for this chart \(ODS, 58.9 KB\)](https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods)  
(<https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods>)

Note: Changes to data collection for EU to GB imports in 2021 and 2022 (including the impact of staged customs controls), mean that recorded imports may be lower than expected in 2021 and may be overstated in the first six months of 2022.

The total volume of imports of food, feed and drink (FFD) entering the UK has tended to reduce slightly between 2018 and 2023.

In 2023, the volume imported from both the EU and Non-EU countries was 6% lower than in 2018. While there was a sharp fall in imports from the EU in 2021, immediately after the end of the transition period for leaving the EU, these imports have since increased slightly, and the EU remains the UK's largest external supplier of food. In 2023, the EU accounted for 64% of the volume of UK imports.

Changes to trade flows, cannot be attributed to a single cause. The combined effects of COVID-19 national and international lockdown restrictions, border disruptions and changes to trade with the EU following the transition period and, implementation of [The UK-EU Trade and Co-operation Agreement \(TCA\)](https://www.gov.uk/government/publications/ukey-and-eaec-trade-and-cooperation-agreement-ts-no82021#full-publication-update-history) (<https://www.gov.uk/government/publications/ukey-and-eaec-trade-and-cooperation-agreement-ts-no82021#full-publication-update-history>) have all contributed to changes in UK and global trade including the sharp fall in EU food and feed imports in 2021. These and other factors will have an effect over a longer period.

## **Supporting evidence**

### **Changes to EU imports**

Goods between the EU and the UK were previously under the same customs arrangement. There was therefore no requirement for traders to complete sanitary and phytosanitary (SPS) and rules of origin (RoO) checks and documentation. The UK-EU Trade and Cooperation Agreement set out the terms of UK trade with the EU from 1 January 2021, [allowing zero tariffs and quotas on goods](https://www.gov.uk/government/publications/summary-the-uks-new-relationship-with-the-eu/summary-the-uks-new-relationship-with-the-eu#importing-and-exporting-goods) (<https://www.gov.uk/government/publications/summary-the-uks-new-relationship-with-the-eu/summary-the-uks-new-relationship-with-the-eu#importing-and-exporting-goods>) moving between the EU and the UK provided those goods meet the RoO. From 2021 imports from the EU are required to adhere to RoO measures.

GB goods exported to the EU are also subject to third country customs and SPS regimes. In comparison the UK Government has been phasing in border controls for goods imports from the EU since 2021. Customs declarations are now required for all imported goods and businesses must pre-notify imports of animals, plants, and high-risk food and feed.

Additionally, certain high-risk animals and plants require health certificates and checks. The planned introduction of the remaining controls has been postponed. These include health certification and SPS checks on all agri-food products, physical SPS checks on EU imports at designated Border Control Posts, and safety and security declarations ([House of Commons Library, 2023](https://commonslibrary.parliament.uk/new-customs-rules-for-trade-with-the-eu/) (<https://commonslibrary.parliament.uk/new-customs-rules-for-trade-with-the-eu/>)).

In August 2023, the UK government published its [Border Target Operating Model \(BTOM\)](https://www.gov.uk/government/publications/the-border-target-operating-model-august-2023/the-border-target-operating-model-august-2023) (<https://www.gov.uk/government/publications/the-border-target-operating-model-august-2023/the-border-target-operating-model-august-2023>), which set out the government's plan for introducing new rules and processes for imports into Great Britain, including from the EU. The BTOM has been gradually introduced over the course of 2024. The BTOM is designed to make better use of technology and data to reduce friction and the cost of border controls for businesses and consumers. This new approach has brought in biosecurity and food safety controls for goods coming from the EU, and uses a global risk-based model, data, and technology with the intention to reduce the burden on businesses while protecting consumers.

For high-risk and medium-risk goods, the BTOM retains health certification and border control post (BCP) inspection, albeit with frequently lower inspection rates than under the EU model. Documentary-only checks are performed remotely instead of all regulated goods having to present documents at a BCP. For low-risk animal products as a matter of routine the UK only requires electronic pre-notification. Low-risk plant produce (fruit and vegetables with no known specific disease or pest risk associated) have been removed from import health control requirements altogether. There are also no longer requirements for pre-notification, with enhanced inland monitoring and surveillance in place to monitor compliance with the UK's food safety and standards and to keep track of any issues. The Safety and Security import controls model under the BTOM is designed to minimise trader burdens and maintain border security while remaining aligned with international standards.

The UK has been a longstanding net importer of food. Although global prices drive the cost of imports, import requirements at the border contribute to the overall cost of imports. These requirements include tariffs, complying with sanitary and phytosanitary (SPS) and rules of origin (RoO) measures and other technical barriers to trade. There may therefore be a risk where increased frictions as a result of changes to border controls with the EU interact with wider inflationary pressures, leading to price increases.

[Modelling](https://assets.publishing.service.gov.uk/media/64f6e2629ee0f2000db7be8e/Final_Border_Target_Operating_Model.pdf) ([https://assets.publishing.service.gov.uk/media/64f6e2629ee0f2000db7be8e/Final\\_Border\\_Target\\_Operating\\_Model.pdf](https://assets.publishing.service.gov.uk/media/64f6e2629ee0f2000db7be8e/Final_Border_Target_Operating_Model.pdf)) suggests that the effect of the new border model on the costs of food and drink will not be significant, representing less than a 0.2 percentage point increase in total over 3 years. The

consequences of a major outbreak of a human, plant or animal disease on the economy could be far more severe.

Data on UK border control from the Border Target Operating Model (BTOM) was not ready to be published in this UKFSR.

### **NI-GB border changes**

From 2021 to 2023, the flow of goods between Northern Ireland (NI) and Great Britain (GB) were subject to the Northern Ireland Protocol. In February 2023, the UK and EU agreed the Windsor Framework, which provides a new set of arrangements to support the flow of trade within the UK internal markets. Regulatory divergence between the EU and the UK affecting trade has been limited to date. The Windsor Framework contains mechanisms to monitor and manage regulatory divergence as it emerges to limit the effect of future EU and UK rules changes on flow of trade. These include the Joint Consultative Working Group structured sub-group on agri-food and the new Special Goods Body. Risks to NI food supply are offset to a degree by smooth access to the EU market. There is currently a data gap to show trade flows at a product level between NI and GB.

## **Sub-theme 3: Food business**

### **3.3.1 Cyber security**

#### **Rationale**

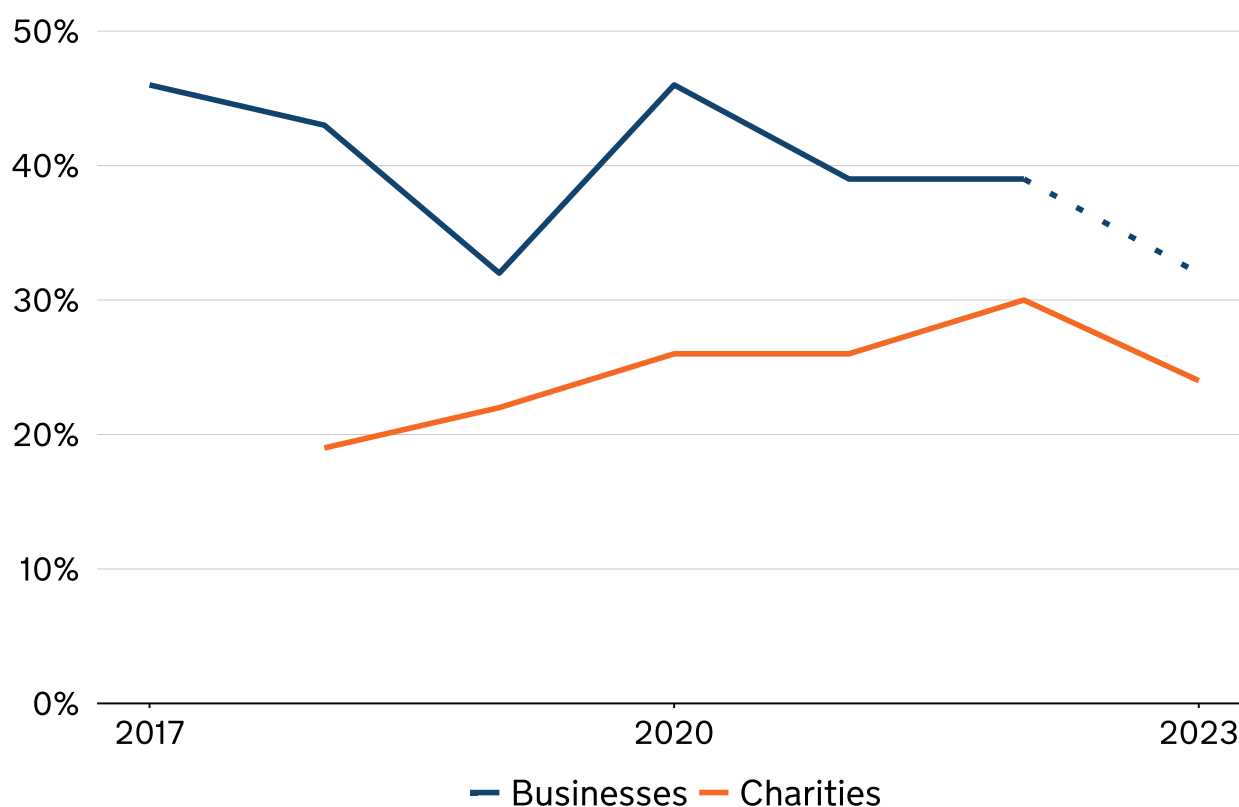
Cyber-attacks can target any point within the food system and other interlinked systems (such as water, energy, transport) with a multitude of end goals. They present potential disruption to the supply chain which poses a risk to food availability. Attacks may affect the ability of businesses to buy goods and services, move resources between locations, or sell goods and services. They can come in the form of espionage, hacktivist attacks, phishing, insider threat, ransomware, or another other type of criminal activity targeting the operations of a business.

This indicator uses government data to give high level picture of the risks to cyber security. The UK government is constantly reviewing the risk of cyber-attacks to the food system. [The Cyber Security Breaches Survey](https://www.gov.uk/government/statistics/cyber-security-breaches-survey-2023/cyber-security-breaches-survey-2023) (<https://www.gov.uk/government/statistics/cyber-security-breaches-survey-2023/cyber-security-breaches-survey-2023>) gathers data on cyber breaches and attacks to give an overview of national cyber resilience. Reporting cyber breaches is not mandatory and the data available is not broken down to show a food system specific picture. The survey was first published in 2017.

## Headline evidence

**Figure 3.3.1a:** The percentage of organisations identifying cyber breaches or attacks, in the UK, 2017 to 2023

Source: [Cyber Security Breaches Data Survey 2023, Department for Science, Innovation and Technology, Figure 4.3](https://www.gov.uk/government/statistics/cyber-security-breaches-survey-2023/cyber-security-breaches-survey-2023#chapter-4-prevalence-and-impact-of-breaches-or-attacks) (<https://www.gov.uk/government/statistics/cyber-security-breaches-survey-2023/cyber-security-breaches-survey-2023#chapter-4-prevalence-and-impact-of-breaches-or-attacks>)



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Note:

1. 1000 UK businesses per year; over 300 charities per year the weighting approach for businesses was changed for 2020, although this is expected

to have a negligible effect on comparability to previous years.

2. The sample frame for businesses was changed in 2023, although it is still intended to produce a representative sample of businesses. A dotted line has therefore been used for 2023 business trends.

There has been a decline in the proportion of businesses and charities reporting any breaches or attacks. In 2023, 39% of Businesses reported any breaches or attacks, compared to 32% in 2022 and 39% in 2021. This is a continuation of a downward trend since 2017, with the exception of 2019. 2023 was also the first year the number of charities reporting any breaches or attacks reduced, decreasing from 30% in 2022 to 24% in 2023.

The decline in breaches or attacks identified in the Cyber Security Breaches Survey is driven by micro and small businesses, down respectively from 36% and 48% in 2022, to 31% and 32% in 2023. The results for medium and large businesses are not significantly different from 2022. Standing at 59% for medium businesses and 72% for large businesses in 2022, and 59% and 69% respectively in 2023. This suggests that it is medium and larger businesses that are likely being targeted. However, there are a range of possible reasons for long term decline. For example, due to the self-reported nature of the data, smaller businesses may lack the resources to participate in the survey.

## **Supporting evidence**

Although the UK has seen a decline in reported cyber security breaches in the recent term, increased use of technology in agriculture is presenting new risks to security through threats such as malicious use of Artificial Intelligence (AI) and ransomware attacks.

Cyber security remains the responsibility of each actor within the supply chain. In the [2023 Annual Review](https://www.ncsc.gov.uk/files/Annual_Review_2023.pdf) ([https://www.ncsc.gov.uk/files/Annual\\_Review\\_2023.pdf](https://www.ncsc.gov.uk/files/Annual_Review_2023.pdf)), The National Cyber Security Centre (NCSC) highlighted a number of threats that may change the wider UK threat landscape, including malicious use of artificial intelligence, stating the following:

“Our adversaries – hostile states and cyber criminals – will seek to exploit AI technology to enhance existing tradecraft. In the short term, AI technology is more likely to amplify existing cyber threats than create wholly new ones, but it will almost certainly sharply increase the speed and scale of some attacks. There is now a significant amount of activity across the NCSC and wider government to assess and respond to the potential threats and risk posed by AI.”

The review also highlighted the risk from attacks via ransomware. Ransomware attacks make data inaccessible to the victim and/or their operating systems inoperable, until a ransom is paid. The now-normal

approach of stealing and encrypting data continues to be the primary tactic that cyber criminals use to maximise profits. However, data extortion attacks, in which data is stolen but not encrypted are a growing trend in the threat landscape. Additionally, some groups will encrypt data, and then threaten to leak the data as an escalation of the attack. [NCSC guidance \(https://www.ncsc.gov.uk/section/advice-guidance/all-topics\)](https://www.ncsc.gov.uk/section/advice-guidance/all-topics) recommends that all UK organisations take steps to protect themselves from this and other threats.

A NCSC assessment using the [Professional Head of Intelligence Assessment \(PHIA\) Probability Yardstick \(https://www.ncsc.gov.uk/report/commercial-cyber-proliferation-assessment\)](https://www.ncsc.gov.uk/report/commercial-cyber-proliferation-assessment) shows that it is almost certain (95% to 100% probability) that ransomware is the greatest disruptive threat to the food sector as it can be targeted at almost all levels of the food supply chain. It is also highly likely (80% to 90% probability) that the increased connectivity in the agri-food sector makes it a more accessible and therefore a more attractive target for threat actors. It is also likely (55% to 75% probability) that threat actors see the agri-food sector as particularly vulnerable to disruption or extortion due to its tight production timescales and reliance on high productivity during particular seasons. An example of a potential new threat by cyber-attack to the agri-food sector since 2021 is the [bricking \(https://www.csoonline.com/article/572811/remote-bricking-of-ukrainian-tractors-raises-agriculture-security-concerns.html#:~:text=The%20soldiers%20stole%2027%20pieces,the%20tractors%27%20embedded%20GPS%20technology.\)](https://www.csoonline.com/article/572811/remote-bricking-of-ukrainian-tractors-raises-agriculture-security-concerns.html#:~:text=The%20soldiers%20stole%2027%20pieces,the%20tractors%27%20embedded%20GPS%20technology.) of tractors used as a defensive tactic during Russia's invasion of Ukraine.

## 3.3.2 Diversity of food retailers

### Rationale

In the UK most of the population access food from the national network of food retailers. Retailers are a key link between producers (farmers, fishers, manufacturing, importing), intermediaries (such as wholesalers), and consumers.

The diversity and size of the food retail sector ensures its resilience; no individual retailer is responsible for feeding the nation. Additionally, by having a spread of retailers, this ensures that consumers have agency within the food system by giving consumers some control of where they procure their food. This indicator tracks diversity of retailers by analysing changes in retailers' market share. It also considers consolidation and

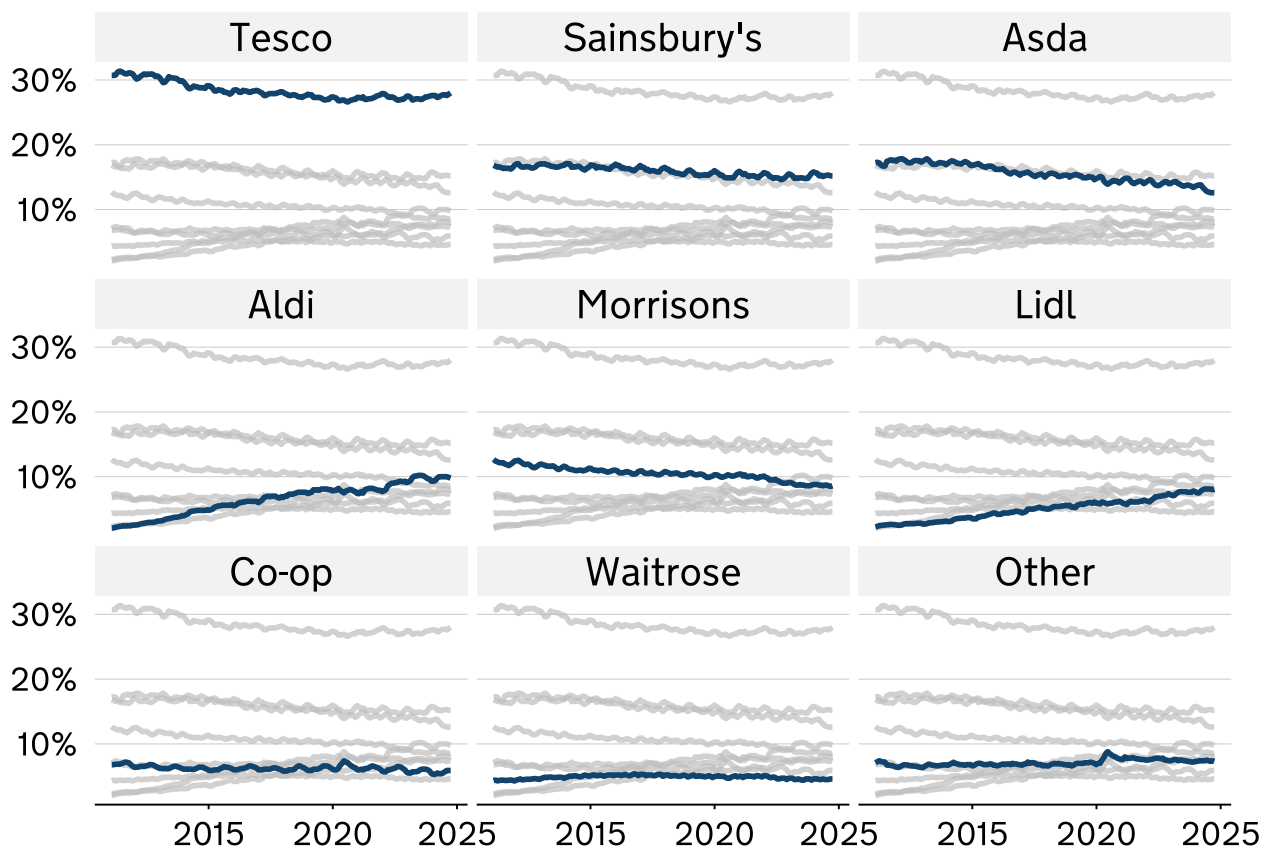


diversity in the wider food sector in the supporting evidence. Alongside retailers, convenience stores allow for greater access to food.

## Headline evidence

**Figure 3.3.2a:** Grocery market share, Great Britain, 2011 to 2024

Source: [Kantar Worldpanel](https://www.kantarworldpanel.com/en/grocery-market-share/great-britain) (<https://www.kantarworldpanel.com/en/grocery-market-share/great-britain>)



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(<https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods>)

The most notable trend in the retail landscape in the last decade has been the increase of market share for 'discount' retailers, notably Aldi and Lidl. Their respective market share has both increased from around 2% in 2011 to around 10% (Aldi) and 8% (Lidl) respectively in 2023. This has generally been at the cost of the biggest four retailers. However, market concentration has not changed greatly. Kantar market share data is for Great Britain only. The combined market share of the largest four food and drink retailers in GB accounted for about two thirds of the overall market in 2024, unchanged from 2021. The top four companies were different, with Aldi replacing Morrisons at number 4. Tesco continued to command the largest market share at 27.9%. In [Northern Ireland](https://neighbourhoodretailer.com/northern-ireland-grocery-market-accelerates-kantar/#:~:text=%E2%80%9CTesco%20maintained%20its%20position%20as,with%20sales%20up%20by%2012.8%25.) (<https://neighbourhoodretailer.com/northern-ireland-grocery-market-accelerates-kantar/#:~:text=%E2%80%9CTesco%20maintained%20its%20position%20as,with%20sales%20up%20by%2012.8%25.>), Tesco, Lidl, Sainsbury's and Asda are the

main companies in food retail with Tesco also holding the largest share of the market.

Comparatively high levels of concentration in the UK agri-food supply chain have created some wider concerns about effective competition and effect on consumers, following the rise of food prices since Covid-19. The Competition and Markets Authority (CMA) conducted analysis in [2023](https://assets.publishing.service.gov.uk/media/64b80adaef5371000d7aeefb/Competition_choice_and_rising_prices_in_groceries.pdf) ([https://assets.publishing.service.gov.uk/media/64b80adaef5371000d7aeefb/Competition\\_choice\\_and\\_rising\\_prices\\_in\\_groceries.pdf](https://assets.publishing.service.gov.uk/media/64b80adaef5371000d7aeefb/Competition_choice_and_rising_prices_in_groceries.pdf)) and [2024](https://assets.publishing.service.gov.uk/media/66a3326dab418ab055592d95/Groceries_2.pdf) ([https://assets.publishing.service.gov.uk/media/66a3326dab418ab055592d95/Groceries\\_2.pdf](https://assets.publishing.service.gov.uk/media/66a3326dab418ab055592d95/Groceries_2.pdf)) to determine whether any failure in competition was contributing to prices being higher than they would be in a well-functioning market. The CMA concluded that they did not find widespread evidence of weak competition between retailers contributing towards higher food prices during recent times of disruption.

## **Supporting evidence**

### **Wider retail sector**

Throughout the UK there are other outlets (1.8% of market share) and independents (1.5% of market share) who provide consumers with access to alternative supply chains. For example, there are box schemes with a focus on UK-grown produce and/or short supply chains and Community Supported Agriculture. These direct sales can provide an [alternative retail route](https://landworkersalliance.org.uk/wp-content/uploads/2020/10/LWA-Direct-Sales-CASE-STUDIES-.pdf) (<https://landworkersalliance.org.uk/wp-content/uploads/2020/10/LWA-Direct-Sales-CASE-STUDIES-.pdf>) for UK producers.

Convenience stores continue to be a fundamental part of food shopping for many people, especially in rural and suburban areas. A convenience store is defined as any retail premises that is under 3000 square feet in size. [According to the Association of Convenience Stores \(ACS\) 2024 report](https://www.acs.org.uk/research/local-shop-report) (<https://www.acs.org.uk/research/local-shop-report>), the convenience store sector has expanded considerably in the last 10 to 15 years, primarily due to supermarket entry and expansion. The majority (around 70%) of convenience stores are independently owned or operating under a symbol group (such as Nisa). These stores represent a lower share of sales volume ([CMA, 2023](https://assets.publishing.service.gov.uk/media/64b80adaef5371000d7aeefb/Competition_choice_and_rising_prices_in_groceries.pdf) ([https://assets.publishing.service.gov.uk/media/64b80adaef5371000d7aeefb/Competition\\_choice\\_and\\_rising\\_prices\\_in\\_groceries.pdf](https://assets.publishing.service.gov.uk/media/64b80adaef5371000d7aeefb/Competition_choice_and_rising_prices_in_groceries.pdf))). The role of convenience stores in offering additional access to food for consumers was demonstrated during Covid-19 ([Rybczewska, Sulkowski and Bilan, 2021](https://www.researchgate.net/publication/352860313_Covid-19_Pandemic_and_Independent_Convenience_Stores_in_the_United_Kingdom) ([https://www.researchgate.net/publication/352860313\\_Covid-19\\_Pandemic\\_and\\_Independent\\_Convenience\\_Stores\\_in\\_the\\_United\\_Kingdom](https://www.researchgate.net/publication/352860313_Covid-19_Pandemic_and_Independent_Convenience_Stores_in_the_United_Kingdom))).

At the same time, the food retail landscape has been transformed by the emergence of online food retailers like Ocado (1.9% of market share) and Amazon Fresh. In 2023, an estimated 11.2% of all UK grocery sales were completed online ([Mintel](https://store.mintel.com/report/uk-online-grocery-) (<https://store.mintel.com/report/uk-online-grocery->

[retailing-market-report](#)), 2024). Although this figure is slightly down from its peak during lockdown restrictions in 2021, it represents a significant increase from pre-pandemic levels and reflects how consumers have diversified their shopping habits. The physical and digital access to food shops is covered substantially in Theme 4 (see Indicators 4.2.1 Physical access to food shops and 4.2.2 Online access to food shops).

## Consolidation

Diversity is important to food security across the food system; a concentration or hot spot at any point in the supply chain presents a potential vulnerability, whether through cyber-attacks, climate change or other factors. While there is risk in concentration, there are also some benefits. Large retailers in the UK benefit from economies of scale, greater infrastructure, and access to resources, which can give them flexibility in response to shocks and mean that they are less likely to go out of business. Similarly, consolidation in the food manufacturing sector has also generated benefits, with larger companies better positioned to invest in innovations and technology to increase efficiency.

Consolidated sectors may facilitate an imbalance of market power. Some market actors can strongly influence the terms of trade with other market actors, affecting the prices paid for commodities ([Clapp, 2022](#) ([https://www.researchgate.net/publication/365767722\\_The\\_rise\\_of\\_big\\_food\\_and\\_agriculture\\_corporate\\_influence\\_in\\_the\\_food\\_system](https://www.researchgate.net/publication/365767722_The_rise_of_big_food_and_agriculture_corporate_influence_in_the_food_system))). Concentration also affects consumer choice. Often the products that appear in food retail are similar because different brands are owned by the same food processing conglomerates. Equally, large food retailers typically own multiple grocery chains within concentrated domestic markets, giving the false appearance of choice to consumers ([Clapp, 2022](#) ([https://www.researchgate.net/publication/365767722\\_The\\_rise\\_of\\_big\\_food\\_and\\_agriculture\\_corporate\\_influence\\_in\\_the\\_food\\_system](https://www.researchgate.net/publication/365767722_The_rise_of_big_food_and_agriculture_corporate_influence_in_the_food_system))). There is limited public data on levels of consolidation in the intermediate stages of the supply chain, such as food processing and manufacturing.

## 3.3.3 Business resilience

### Rationale

Significant parts of the food supply chain are owned and operated by thousands of private businesses. The food supply chain is therefore dependent on the economic and financial health of food businesses that allows them to survive and adapt through shocks and be prepared for future

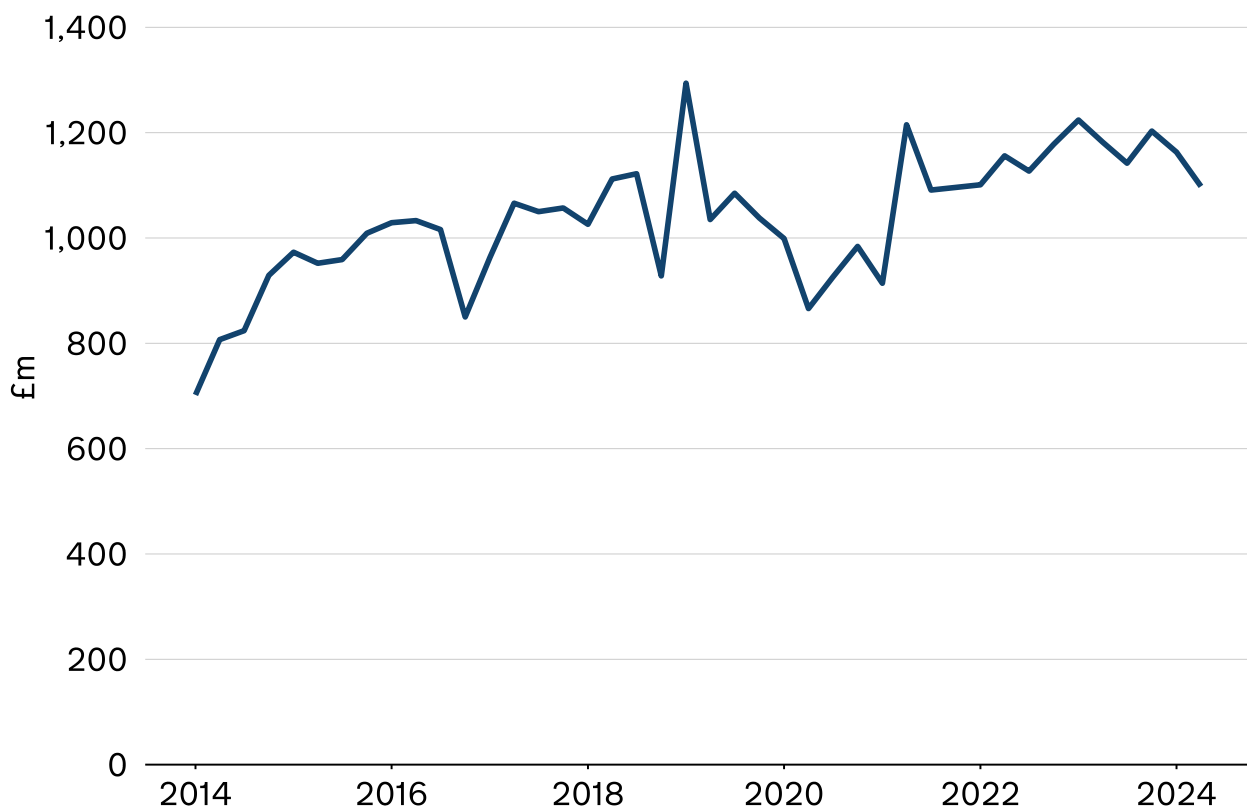
risks. Over the long-term business health can help businesses invest and be prepared for future risks, whereas business uncertainty and low confidence can be a barrier to making changes towards greater resilience and sustainability – what has been called a food system ‘lock-in’. There is no single metric for business stability and resilience. Consequently, this indicator tracks various statistics both at the micro (firm) level and the macro (economy) level. These include the level of business investment, the entry and exit of firms in the food sector, total factor productivity, farmer income and confidence.

## Headline evidence

**Figure 3.3.3a:** Business investment quarterly figures (real value) – food, drink, and tobacco, UK, Q1 2014 to Q2 2024

Source: [ONS, 2024](https://www.ons.gov.uk/economy/grossdomesticproductgdp/timeseries/ds4t/cxnv)

<https://www.ons.gov.uk/economy/grossdomesticproductgdp/timeseries/ds4t/cxnv>



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Note: Chained volume measures (CVM) show real terms value of quarterly business investment in food, drink, and tobacco from 2014 to 2024. This removes the effect of inflation. Tobacco is minimal, representing about 4% of the total.

Business investment means net capital expenditure by businesses, including spending on machinery, building work, transport equipment and computer hardware. Investment is an indicator of businesses confidence in future viability and opportunities to grow, while low investment indicates low business confidence and uncertain conditions. Investment levels can also indicate the extent to which businesses are taking steps to ensure future resilience and preparedness for risks.

From 2014 to 2019, investment levels in food, drink and tobacco generally increased, with the exception of 2016 (EU referendum), where they dipped. Investment levels recovered and reached their highest point in 2019 (£1.294m), before dropping to £866m in 2020 following COVID-19. Investment levels increased again in 2021 to £1.215m and then fluctuated in 2021 and 2022 during the period of the UK leaving the EU and Russia's invasion of Ukraine. In 2023, business investment trends suggested a broadly stable picture, with total investment increasing by 5.7% in 2023 compared to 2022. Investment levels as of quarter 2 in 2024 remain lower than pre-2021 levels suggesting that the sector is still recovering.

The dips in investment levels correspond with the effects of shocks and could explain the subsequent uncertainty they caused. Although investment has remained below pre-disruption levels, the trend of recovery following each period of uncertainty indicates some resilience within the food supply chain. [Industry reports \(https://www.fdf.org.uk/globalassets/business-insights-and-economics/fdf-state-of-industry-survey/si-q1-2024.pdf\)](https://www.fdf.org.uk/globalassets/business-insights-and-economics/fdf-state-of-industry-survey/si-q1-2024.pdf) suggest that uncertain economic conditions may deter future investment. The increased need to respond to short term shocks risks diversion away from investing in long-term resilience to international market competition and shocks. Long term investment may build capacity and flexibility in manufacturing supply, to bolster the sector's resilience ([OECD, 2024 \(https://www.oecd.org/en/topics/resilience-in-agriculture-and-food-systems.html#:~:text=A%20proactive%20approach%20focused%20on,after%20a%20shock%20has%20occurred.\)](https://www.oecd.org/en/topics/resilience-in-agriculture-and-food-systems.html#:~:text=A%20proactive%20approach%20focused%20on,after%20a%20shock%20has%20occurred.)).

[The World Economic Forum Global Risk Perception Survey 2023/2024 Survey \(https://www.weforum.org/publications/global-risks-report-2024/digest/\)](https://www.weforum.org/publications/global-risks-report-2024/digest/) gives an indication of the risks which businesses perceive in the short and long term, which may be affecting levels of confidence. The 2023/2024 survey results suggest that misinformation and disinformation are perceived as the risks which are most likely to have an effect in the next 2 years. Economic risks were also prevalent in the top ten short term perceived risks, with inflation (number 7) and economic downturn (number 9). Over the longer term the perceived risk landscape changes. In the next 10 years environmental and technological risks are among those expected to worsen, with all environmental risks such as extreme weather (number 1), critical change to earth systems (number 2), biodiversity loss and ecosystem collapse (number 3) and natural resource shortages (number 4) ranked in the top 10 perceived risks.

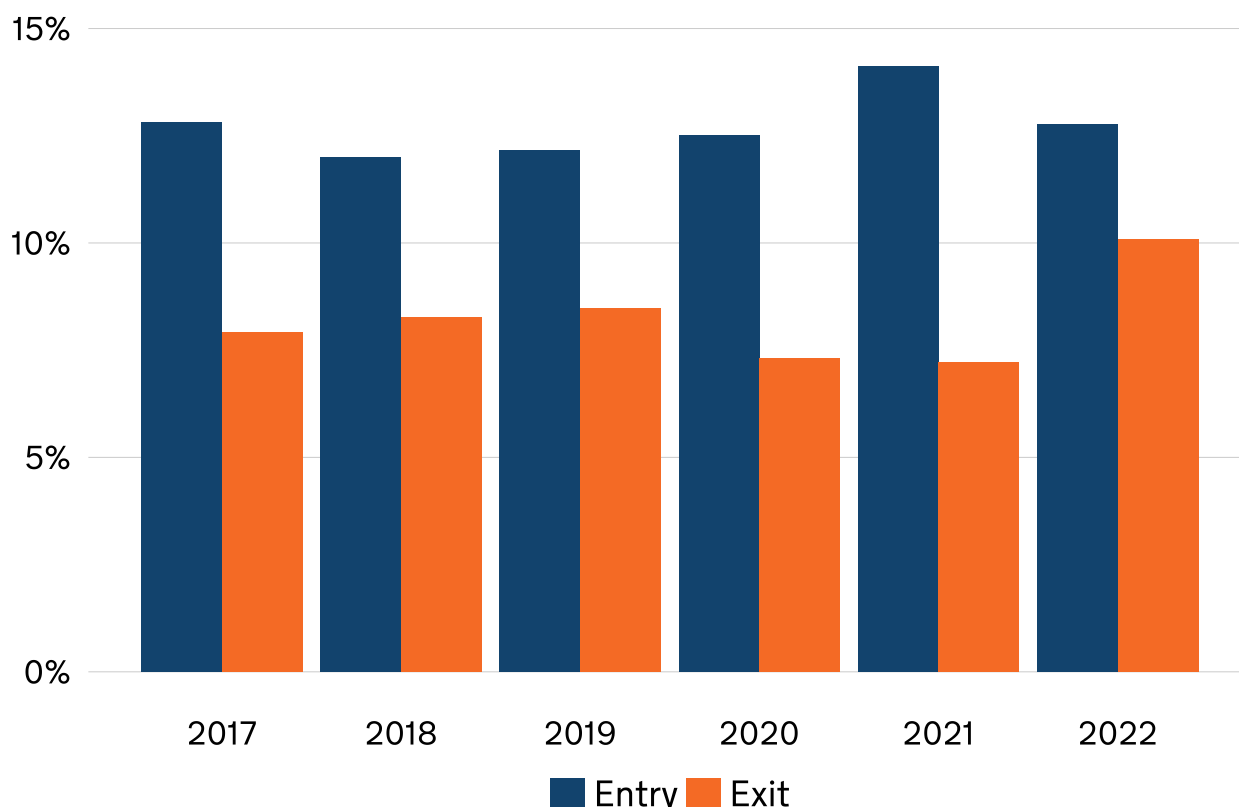
## Supporting evidence

### Business entries/exits

**Figure 3.3.3b:** Entry and exit of firms as percentage of firms in the food and drink manufacturing sector, UK, 2017 to 2022

Source: [ONS Business Demography](https://www.ons.gov.uk/businessindustryandtrade/business/activitysizeandlocation/bulletins/businessdemography/previousreleases)

(<https://www.ons.gov.uk/businessindustryandtrade/business/activitysizeandlocation/bulletins/businessdemography/previousreleases>)



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As with investment, the entry and exit of firms in a sector can give an indication of business confidence, as well as competitiveness and economic stability. In combination, high levels of entry and of exit can be indicative of a highly dynamic and competitive sector. It suggests that positive prospects are incentivising companies to enter the sector, and at the same time high levels of competition are pushing poor performers out of the sector.

Elevated levels of business exit without elevated business entries births could indicate poor business performance. Elevated business birth without elevated exits could indicate high business confidence and economic stability because of the inherent risk of starting a new business, but the lower exits could signal weak competition.



Figure 3.3.3b above shows the entry and exit rates of firms in the food and drink manufacturing sector (FDM) from 2017 to 2022. The data suggests that the sector is highly dynamic and competitive, with high levels of entries and exits. Furthermore, business birth rates have consistently been above death rates, and the FDM sector appears relatively healthy in terms of business demography compared to other sectors of the economy. The business birth rate for FDM stood at 12.8% in 2022, which was higher than the UK average of 11.5%, and the business death rate was lower than the UK average at 10.1% compared to 11.8% ([ONS, 2021](https://www.ons.gov.uk/businessindustryandtrade/business/activitysizeandlocation/bulletins/businessdemography/previousreleases) (<https://www.ons.gov.uk/businessindustryandtrade/business/activitysizeandlocation/bulletins/businessdemography/previousreleases>)). 2020 and 2021 were two years of decline in business death rates, which could reflect the financial support offered by the government during the Covid-19 pandemic. In 2022 there was an increase in business exits, which may reflect effects from the spike in input prices. As a result, the gap between entry and exit narrowed substantially in 2022.

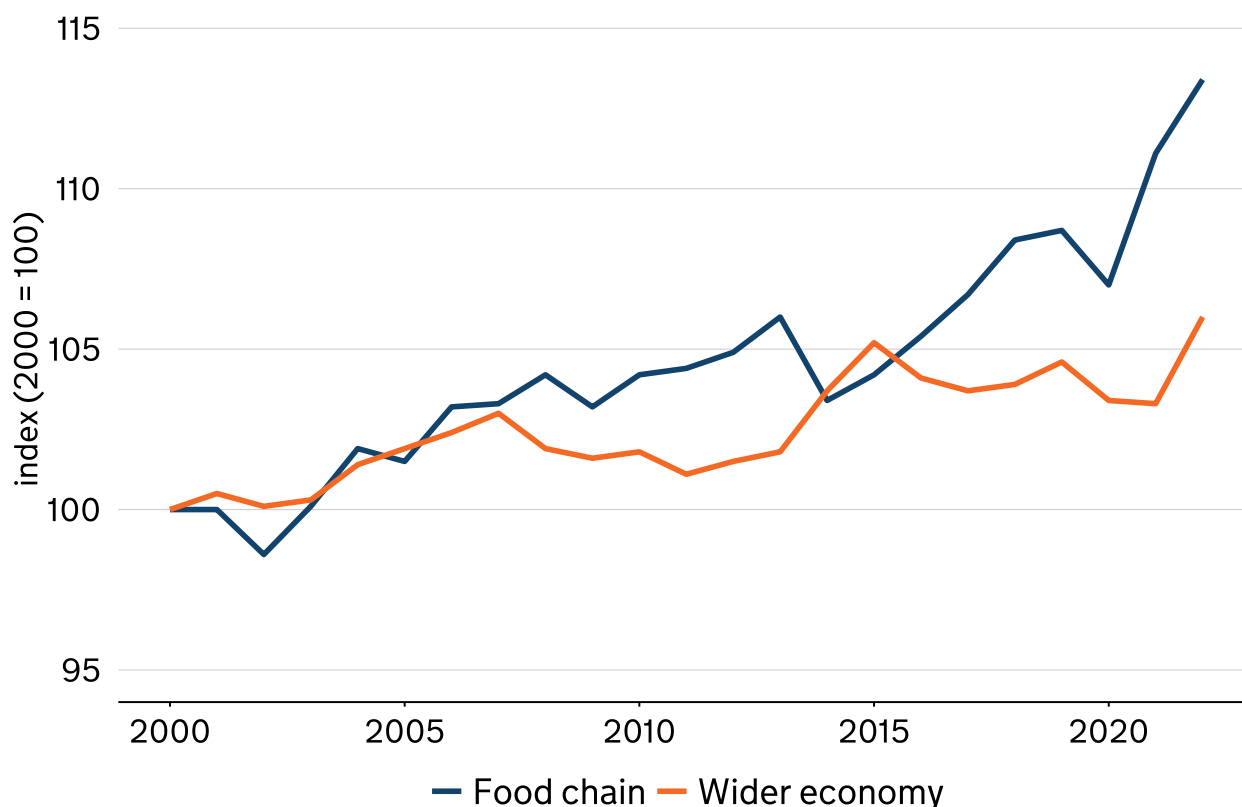
Overall, the persistent high levels of entries as well as the healthier performance (in terms of business demography) compared to other sectors, and the high levels of churn (firm turnover) suggest that FDM continues to be an attractive, competitive, and dynamic sector for businesses. Yet, the trend in death rates seems to show vulnerabilities to shocks and uncertainty within the sector. Vulnerability is further suggested by the number of food manufacturing [insolvencies](https://www.gov.uk/government/collections/insolvency-service-official-statistics) (<https://www.gov.uk/government/collections/insolvency-service-official-statistics>) increasing from 75 in 2017 to 190 in 2023, while drink manufacturing insolvencies increased from 23 to 85 over the same period.

### **Total factor productivity**

Total factor productivity reflects the sector's ability to adapt and innovate to enhance efficiency. It is also explored in Theme 2 (see Indicator 2.2.3 Agricultural productivity). The statistic is a measure of relative efficiency of converting inputs to outputs (through, for example, new product development). Maintaining and recovering productivity during and after shocks to the sector indicates business resilience. Additionally, productivity growth in the food sub-sectors can be a catalyst for economic growth by ensuring an enabling environment for private sector investment.

**Figure 3.3.3c:** Total factor productivity in the food chain, in comparison to the wider economy, UK, 2000 to 2022

Source: [Food chain productivity, Defra](https://www.gov.uk/government/statistics/food-chain-productivity) (<https://www.gov.uk/government/statistics/food-chain-productivity>)



[Download the data for this chart \(ODS, 58.9 KB\)](#)

<https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods>

**Figure 3.3.3d:** Total factor productivity across the different sectors of the food chain; agriculture, manufacturing, wholesale, catering, retail. UK, 2000 to 2022

Source: [Food chain productivity, Defra](#)

<https://www.gov.uk/government/statistics/food-chain-productivity>



[Download the data for this chart \(ODS, 58.9 KB\)](#)

<https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods>

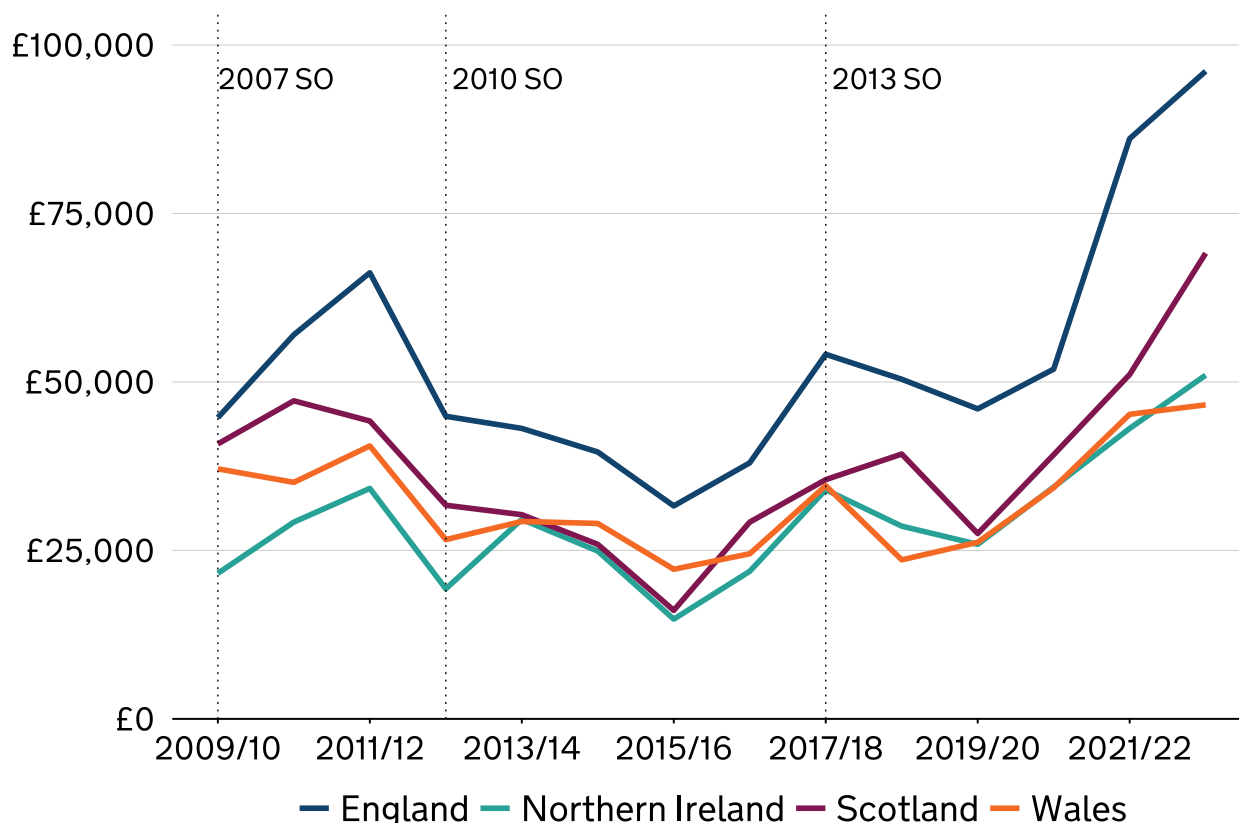
Figure 3.3.3c above shows a general upward trend in total factor productivity (TFP) in the last 10 years for both the food chain and wider economy. Productivity fell in 2014 due in part to declines in the manufacturing and retail sector, and in 2020 due to the Covid-19 pandemic which affected the catering sector heavily. In 2022, the productivity of the food chain increased by 2% from 2021 while the productivity of the wider economy increased by 2.6%. Both index values demonstrate recoveries since the end of the Covid-19 pandemic. In the 10 years prior to 2022, the average annual growth rate of the food chain was 0.8% while the wider economy's average annual growth rate was 0.4%.

Figure 3.3.3d above shows that since 2020 the productivity of all sectors has grown at varying rates. All sectors with the exception of retail and wholesale experienced a dip between 2019 and 2020 following Covid-19. Catering was particularly affected. Following the dip in 2019 and 2020, the productivity of disrupted sectors bounced back to pre-2019 levels. In contrast, retail sector TFP increased in both 2020 and 2021 before falling slightly in 2022 (down 0.6%). TFP of the agricultural industry in the UK decreased by 5.1% between 2022 and 2023. This was driven by a decrease in the volume of outputs and a slight increase in the volume of inputs. TFP for agriculture is covered in Theme 2 (see Indicator 2.2.3 Agricultural productivity).

## Farm Business Income

**Figure 3.3.3e:** Farm Business Income by UK country, all farms, 2009/10 to 2022/23

Source: UK Farm Business Surveys



[Download the data for this chart \(ODS, 58.9 KB\)](#)

<https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods>

Note:

1. The Farm Business Survey does not include farms below a threshold of €25,000 for England, Scotland, and Wales. For Northern Ireland, the threshold is €15,000.
2. Additionally, for Northern Ireland, results are presented for farms with a Standard Labour Requirement of at least 0.5 (see glossary).
3. The breaks in series indicate changes in the Standard Output (SO) coefficient base years.

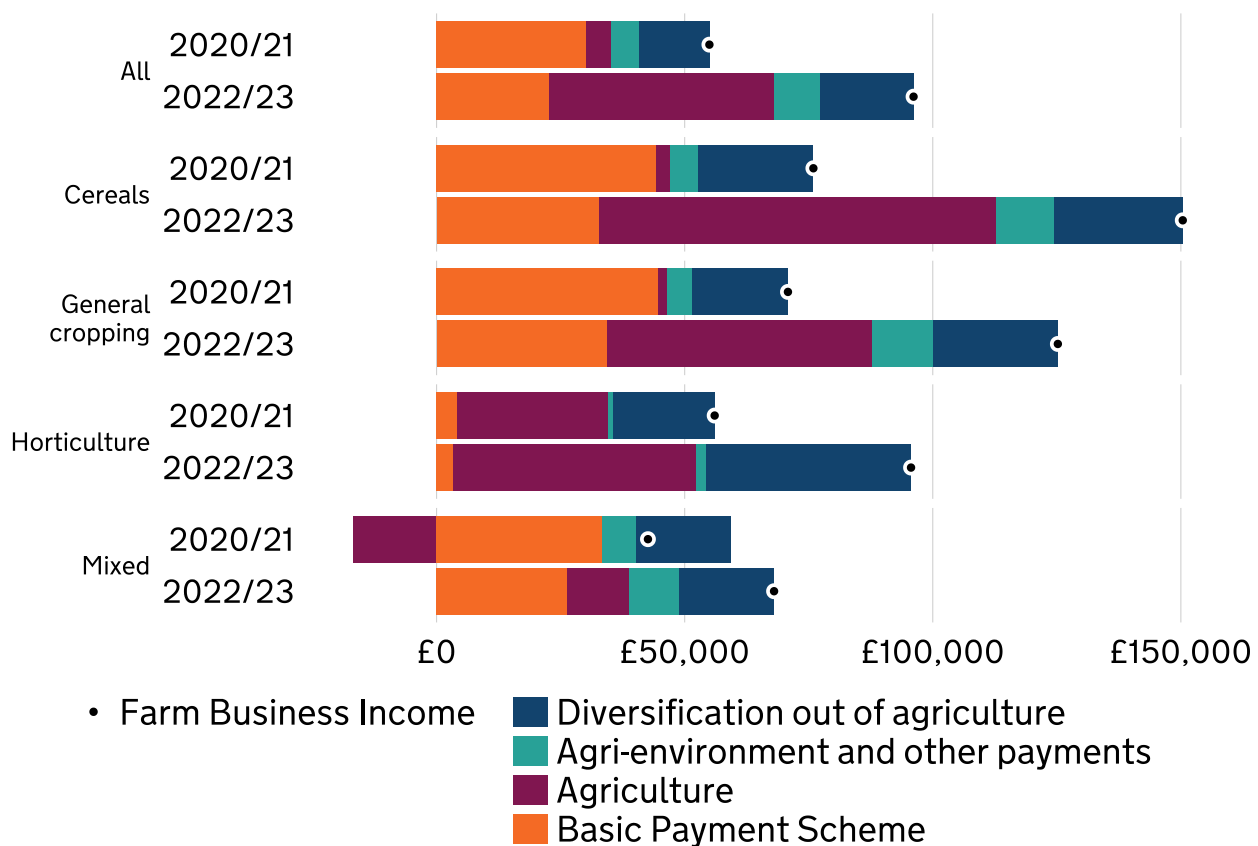
Farm Business Income (FBI) is the output generated by the farm business minus total farm costs. Figure 3.3.3e above shows that Farm Business Income in the UK has generally increased over since 2009/10, with the largest increases in England and Scotland. However, this has not been a stable trajectory. In some years income decreased across the UK by notable proportions in the range of around 5 to 30%. For example, in 2012, extremely poor weather affected food production across the UK, leading to

lower outputs and therefore lower overall FBI. 2021 showed a sharp rise in FBI across the UK due to a range of factors for example, improved return on agricultural activities in [England](#)

(<https://webarchive.nationalarchives.gov.uk/ukgwa/20231101173940/https://www.gov.uk/government/statistics/farm-business-income/farm-business-income-by-type-of-farm-in-england-202122>), favourable growing conditions in [Wales](#) (<https://www.gov.wales/sites/default/files/statistics-and-research/2023-01/farm-incomes-april-2021-march-2022-673.pdf>) and higher output prices in [Scotland](#) (<https://www.gov.scot/publications/scottish-farm-business-income-annual-estimates-2021-2022/pages/average-farm-income-at-a-record-high/>) and [Northern Ireland](#). (<https://www.daera-ni.gov.uk/news/northern-ireland-agricultural-incomes-2021#:~:text=Farm%20level%20incomes&text=This%20is%20a%20representative%20sample,DAERA%20website%20in%20March%202022.>) The most recent data for 2022/2023 (not in the chart) shows a mixed picture.

**Figure 3.3.3f:** Average Farm Business Income (£ per farm) on cropping farms by cost centre, (real terms), England 2021/2022 to 2022/2023

Source: [Monitoring the agricultural transition period in England, 2022/23](#), Defra (<https://www.gov.uk/government/statistics/monitoring-the-agricultural-transition-period-in-england/monitoring-the-agricultural-transition-period-in-england-202223>)

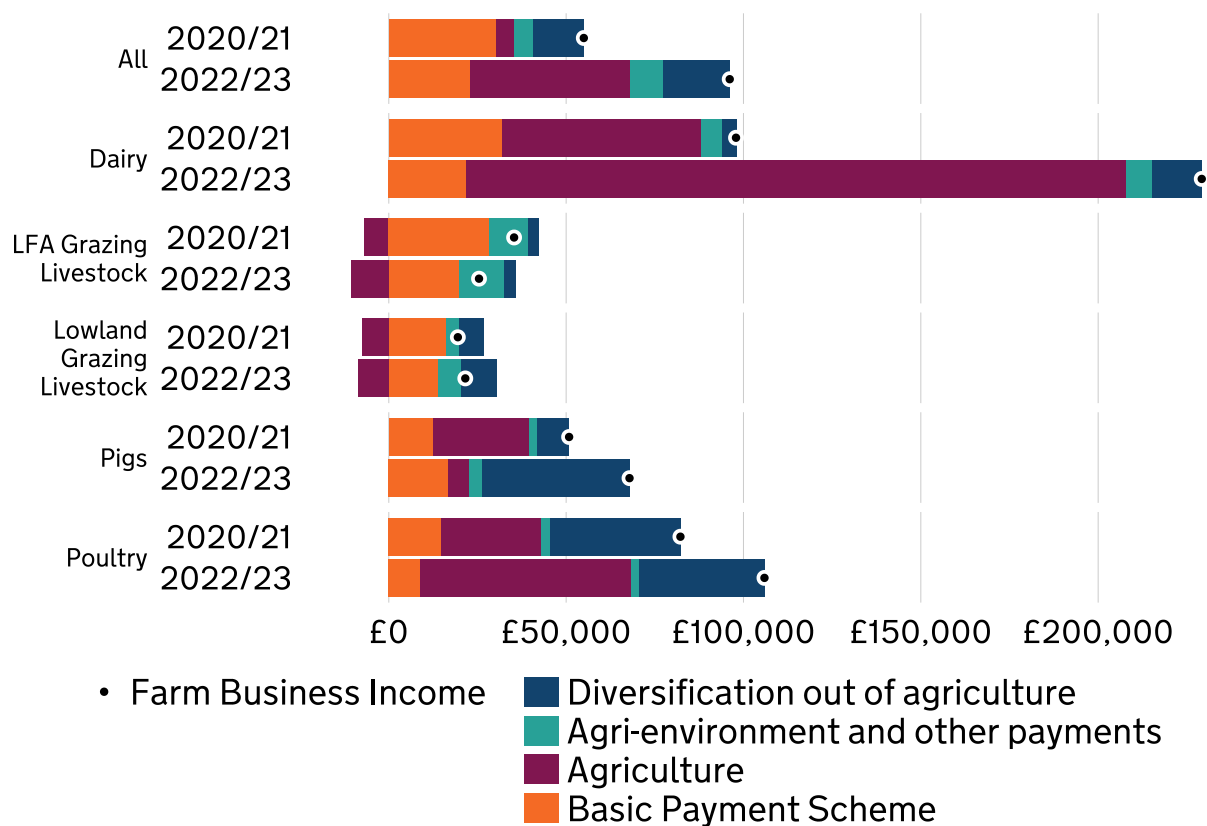


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**Figure 3.3.3g:** Average Farm Business Income (£ per farm) on livestock farms by cost centre, (real terms), England 2021/2022 to 2022/2023

Source: [Monitoring the agricultural transition period in England, 2022/23, Defra \(https://www.gov.uk/government/statistics/monitoring-the-agricultural-transition-period-in-england/monitoring-the-agricultural-transition-period-in-england-202223\)](https://www.gov.uk/government/statistics/monitoring-the-agricultural-transition-period-in-england/monitoring-the-agricultural-transition-period-in-england-202223)



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[\(https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods\)](https://assets.publishing.service.gov.uk/media/6756c6a1a63e1781efb87778/FSR-theme3-241211.ods)

### Farm Income at a farm level

Figures 3.3.3f and 3.3.3g use data on England to give both an indication of recent variation in FBI across different farm types for 2022/2023, and an indication of the immediate effects of Russia's invasion of Ukraine. There was an overall increase in total income for this period, with high rises for some sectors outweighing losses for others. The variation across farm types is due to a number of factors including production costs, farm size, farm location and soil type on the farm. For some farming sectors such as cereal and dairy farms, FBI increased because output costs offset increased input costs due to factors such as high prices and a good harvest. In contrast, FBI decreased for a number of farming sectors such as general cropping, grazing livestock, both lowland and those in Less Favoured Areas (LFA), poultry and mixed farms. The [latest FBI data \(https://www.gov.uk/government/statistics/farm-business-income/farm-business-income-by-type-of-farm-in-england-202324\)](https://www.gov.uk/government/statistics/farm-business-income/farm-business-income-by-type-of-farm-in-england-202324) was published November 14, 2024.



FBI fell for all farm types in 2023/24 except for pig farms and poultry farms. The decrease varied across farm type and should be viewed in context of longer-term trends as the fall in income followed exceptional highs for some farm types in 2020/21 and 2022/23.

### Basic Payment Scheme reduction in England

Across all farm types in England, the average Basic Payment Scheme (BPS) payment received decreased from approximately £28,400 (55% of total FBI) in 2020/21 to £22,700 (around 25% of FBI) in 2022/23, which was a 20% reduction. The importance of the BPS income varies considerably across individual farm types. In 2022/23 BPS income made up 24% of total FBI, with grazing livestock and mixed farms being the most reliant on the payments in both 2020/21 and 2022/23. Figures 3.3.3f and 3.3.3g above show that for some years for these farm types, BPS income can be the difference between profit and non-profit. Following the [\[2024 Autumn Budget](#)

[, direct BPS payments in England are now being phased out between 2021 and 2025, \(previously between 2021 and 2027\). Reductions are being applied to the total payment in each year during this period and this includes the BPS payments. Additionally, from 2024, the BPS will be \[\\[delinked \\(https://www.gov.uk/guidance/delinked-payments-replacing-the-basic-payment-scheme\\)\\]\]\(#\) from land.](https://defra.sharepoint.com/teams/Team1791/Food%20Security%20%20Coordinati on/Food%20Security%20Report%202024/Editing%20and%20Drafting/Theme%203/Archive))

### Other income streams (agri-environment and diversification)

The implications of reduced BPS income are uncertain. Attempts to recoup income could involve a range of other income streams. As BPS payments reduce during the agricultural transition period, other payments and grants are being introduced. These are designed to focus on environmental outcomes and supporting investment on farms. Agri-environment payments to some extent mitigate the loss of income from BPS payment reductions, but do not fully substitute that form of income. The payment equated to around 10% of total FBI in 2022/23 which was the same proportion as in 2020/21. For farm types such as Less Favoured Area (LFA) grazing livestock farms, payments associated with agri-environment activity equated to almost a third of total FBI in 2020/21 and around half of total FBI in 2022/23. At the all-farm level, income from payments associated with agri-environment activity showed a 73% increase to £9,200 per farm in 2022/23 compared to the pre agricultural transition level of 2020/21 before basic payments began to be phased out. Some farm businesses may look to stabilise overall income through increased diversification to activities with higher revenues ([Berry, Vigani and Urquhart, 2022](#) [\). 69% of farm businesses in England had some \[diversified\]\(#\)  \[activity in\]\(https://www.gov.uk/government/statistics/farm-accounts-in-england/chapter-5-diversification--2#proportion-of-farms-engaging-in-diversified-activities\)\)](https://www.tandfonline.com/doi/epdf/10.1080/17445647.2022.2072242?needAccess=true))

the period 2022 to /2023, an increase of approximately 12 percentage points from 2013/14.

## Liabilities

Another measure of farm business resilience is the level of indebtedness, as measured by their total [liabilities](https://www.gov.uk/government/statistics/balance-sheet-analysis-and-farming-performance-england/balance-sheet-analysis-and-farming-performance-england-202223-statistics-notice#liabilities) (<https://www.gov.uk/government/statistics/balance-sheet-analysis-and-farming-performance-england/balance-sheet-analysis-and-farming-performance-england-202223-statistics-notice#liabilities>). Liabilities are the total debt (short-term and long-term) that the farm business holds, including mortgages, long-term loans and monies owed for hire purchases, leasing, and overdrafts. A farm with high levels of liabilities will require consistent income flows to ensure that interest payments can be met. In the last 10 years the average level of debt across all farms has generally been increasing in current terms from £172,100 in 2013/14 to 294,600 in 2022/23. At a sectoral level, most farm types saw an increase in their levels of liabilities between 2021/22 and 2022/23. The highest level of average liabilities in 2022/23 was seen in specialist pig and poultry farms. The largest rise in average levels of debt was seen in horticulture farms, which increased by 52% to £271,300 per farm in 2022/23. Measures such as liabilities can be considered alongside [other indicators](https://www.gov.uk/government/statistics/balance-sheet-analysis-and-farming-performance-england/balance-sheet-analysis-and-farming-performance-england-202223-statistics-notice#net-worth) (<https://www.gov.uk/government/statistics/balance-sheet-analysis-and-farming-performance-england/balance-sheet-analysis-and-farming-performance-england-202223-statistics-notice#net-worth>) of financial health such as net worth, gearing ratio, liquidity, net interest payments as a proportion of FBI and return on capital employed.

## Confidence

The National Farmers' Union's (NFU) Farmer Confidence Survey and Defra's [Farmer Opinion Tracker](https://www.gov.uk/government/collections/farmer-opinion-tracker) (<https://www.gov.uk/government/collections/farmer-opinion-tracker>) show confidence in the agricultural sector for 2023 to 2024. They show sharp increases in uncertainty due to shocks and change. The NFU survey for both short-term (1-year) and mid-term (3-year) confidence levels were at their lowest levels recorded since the survey began in 2010. The leading concern in the short term was the effect of extreme weather, while the phasing out of the Basic Payment Scheme, the price of inputs, and regulation and legislation were the top three concerns for 2024.

Defra's [Farmer Opinion Tracker](https://www.gov.uk/government/collections/farmer-opinion-tracker) (<https://www.gov.uk/government/collections/farmer-opinion-tracker>) also asks respondents how they feel about their future in farming, considering the changes to existing payments or regulations and future schemes that will become available. In April 2024, farmers on 40% (down 13% from April 2021) of holdings felt positive about their own future in farming (very positive 6%; somewhat positive 34%). Approximately 51% (up 13% from April 2021) indicated that they are not at all positive and the remaining 9%

(no change from April 2021) are unsure how they feel about their own future in farming.

## About the UK Food Security Report

The UK Food Security Report (UKFSR) sets out an analysis of statistical data relating to food security in the UK. It fulfils a duty under [Part 2, Chapter 1 \(Section 19\) of the Agriculture Act 2020](#) (<https://www.legislation.gov.uk/ukpga/2020/21/section/19/enacted>) to prepare and lay before Parliament at least once every three years **“a report containing an analysis on statistical data relating to food security in the United Kingdom”**.

The UKFSR examines past, current, and future trends relevant to food security to present a full and impartial analysis of UK food security. It draws on a broad range of published data from official, administrative, academic, intergovernmental and wider sources.

The UKFSR is intended as an independent evidence base to inform users rather than a policy or strategy. In practice this means that it provides government, Parliament, food chain stakeholders and the wider public with the data and analysis needed to monitor UK food security and develop effective responses to issues.

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We want to understand the uses that readers make of this report. To help us ensure that future versions are better for you, please answer our short questionnaire to send us [feedback](#) (<https://forms.office.com/r/pCvTma56Ke>).

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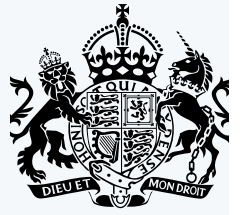
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