

7 April 2025

AFN Network+ webinar

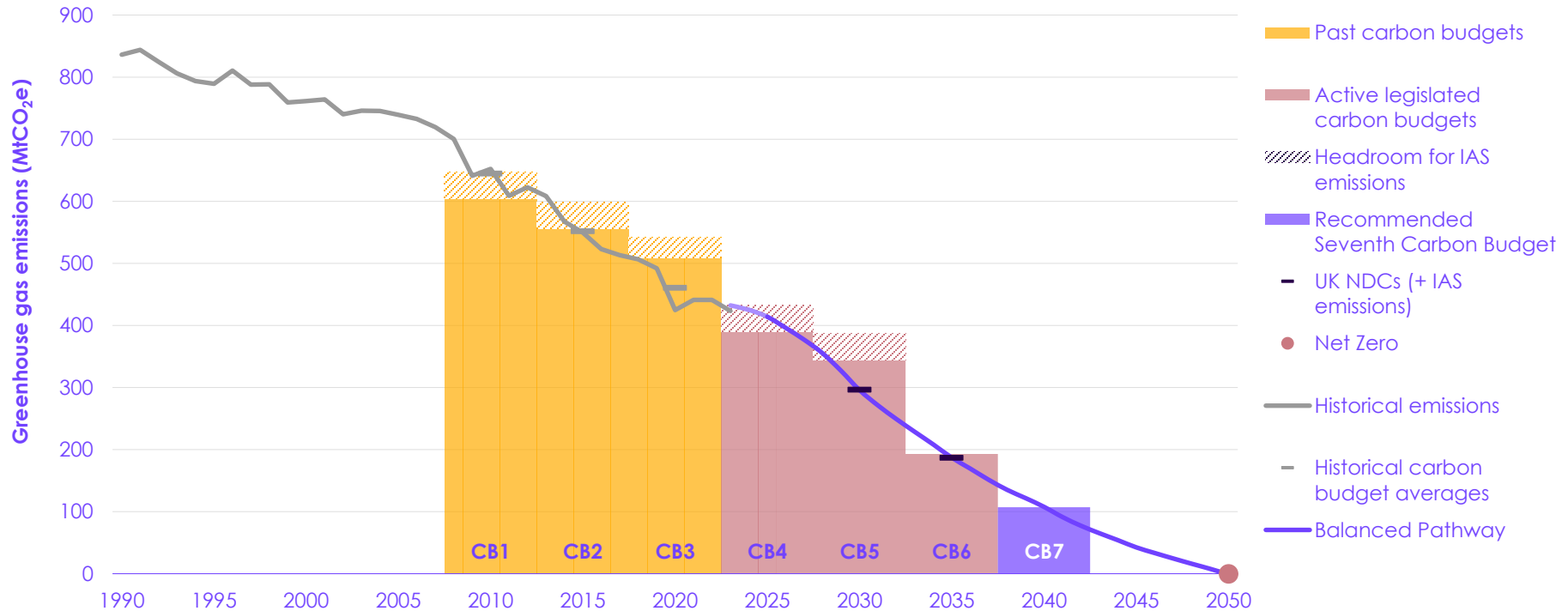
Net zero, farming, diets and land

Indra Thillainathan & Sandra Bogelein

Seventh Carbon Budget advice - overview

The recommended Seventh Carbon Budget

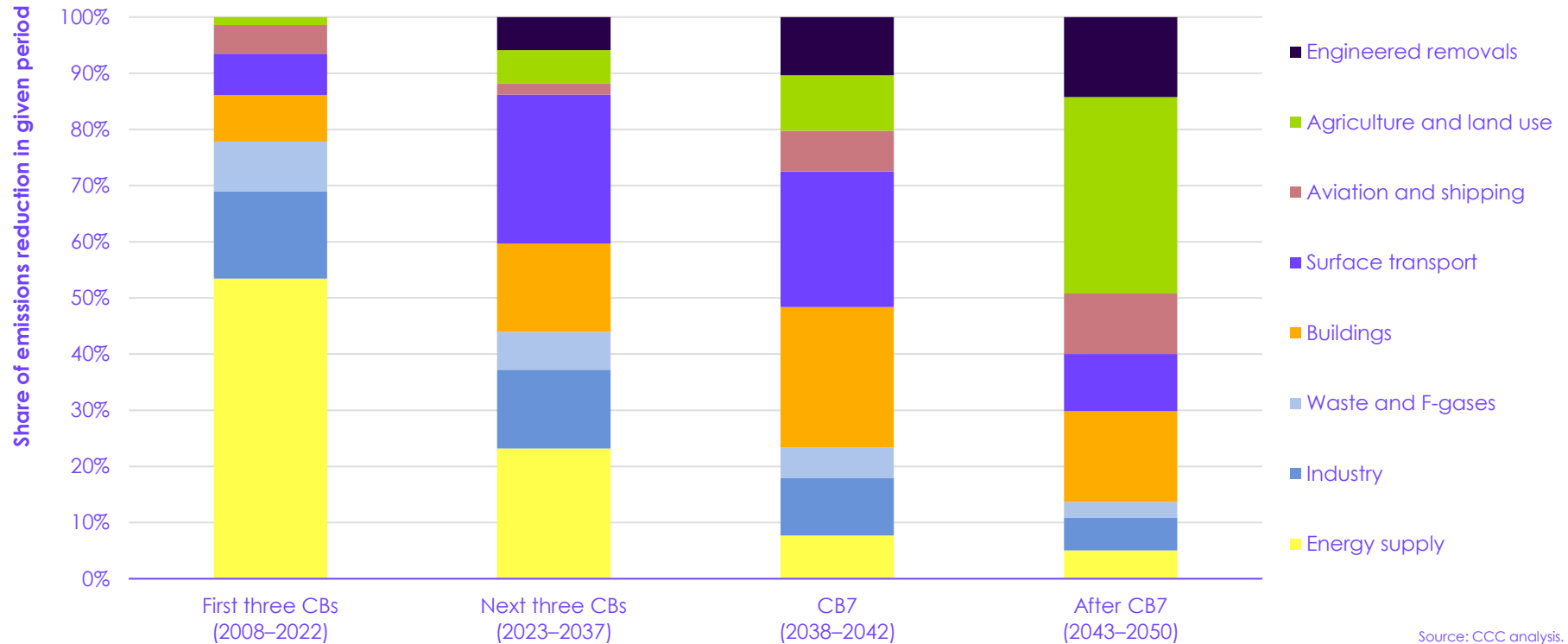
Our Balanced Pathway meets all existing carbon budgets, the UK's NDCs, and Net Zero



Source: CCC analysis.

Distribution of emissions reductions during carbon budget periods

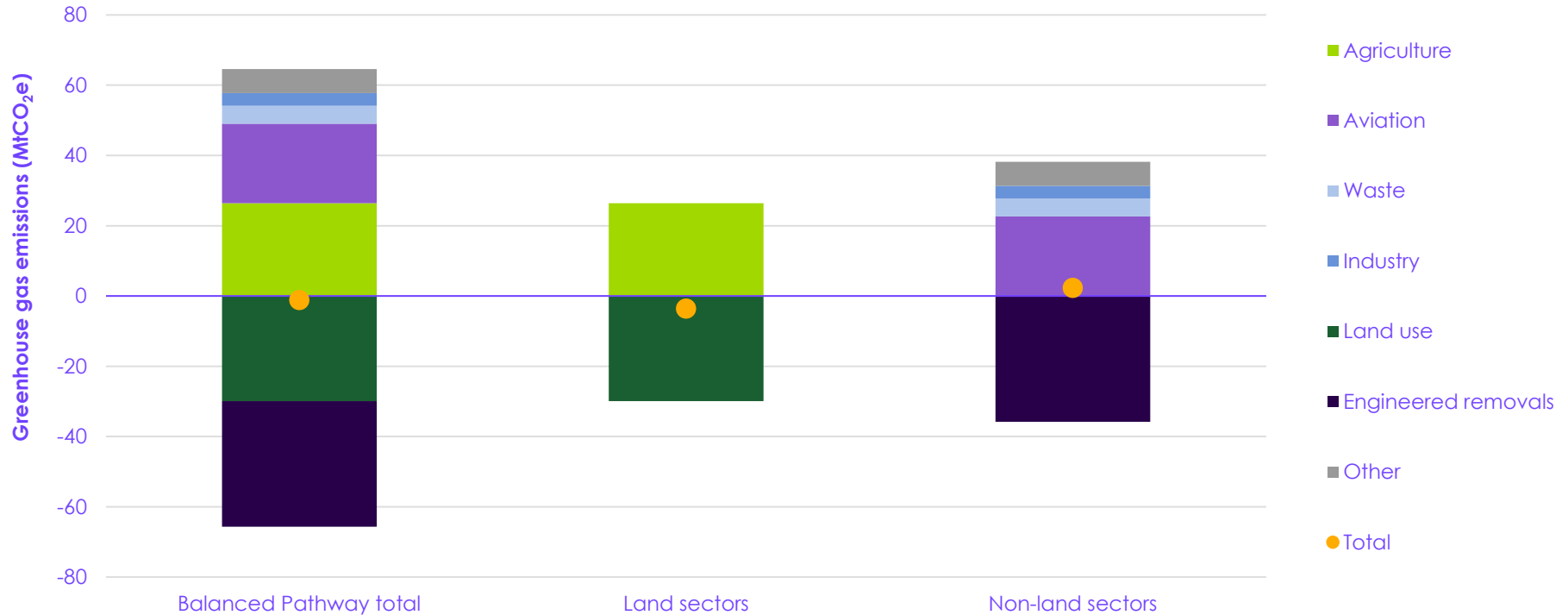
Achieving carbon budgets will require emissions reductions across a wider range of sectors



Source: CCC analysis.

Sources of emissions and negative emissions in 2050

We balance agriculture with land sequestration and other fossil use with engineered removals



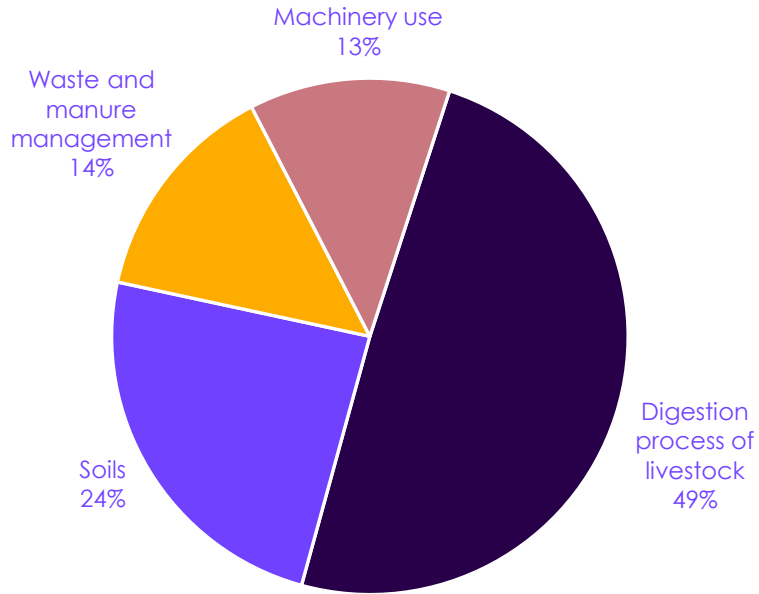
Source: CCC analysis.

Agriculture and land use

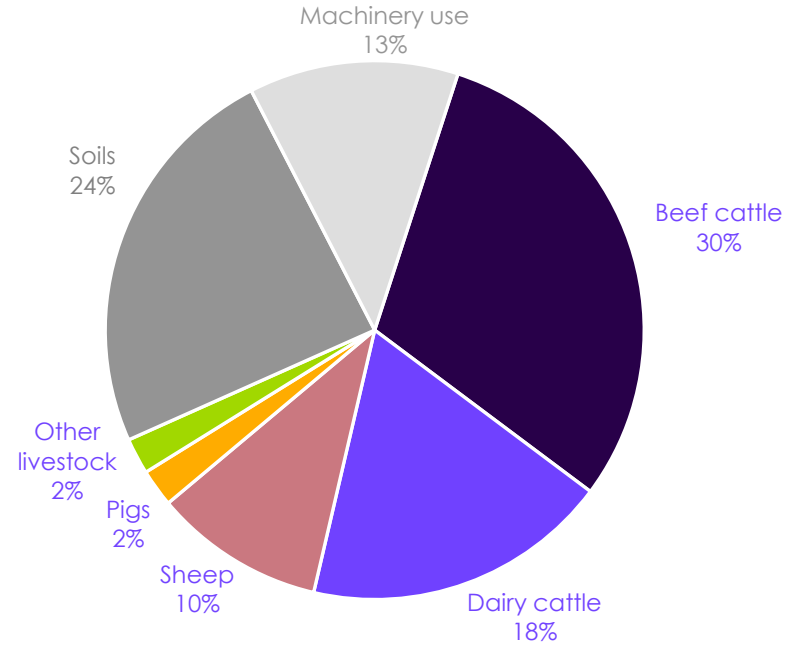
Livestock directly accounts for around 63% of agricultural emissions (2022)

Also (indirect) emissions from fertiliser use on grassland and land to grow animal feed

Main sources of agricultural emissions



Direct livestock emissions by animal type



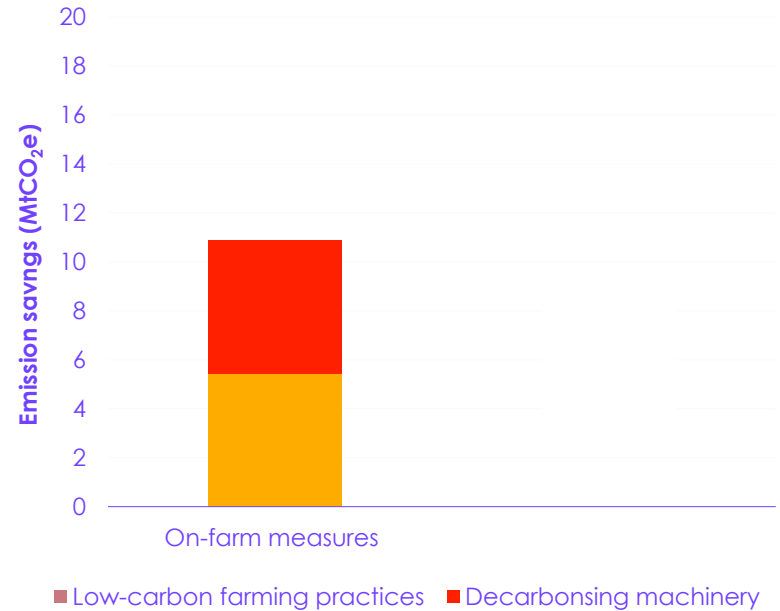
Key drivers of emissions reduction in agriculture

Based on current technology, non-energy GHG reductions from on-farm measures is limited.

1. On-farm measures and technologies to reduce non-CO₂ and energy use emissions:

- Decarbonising machinery
- Low-carbon farming measures and practices

Figure Emission reduction in the agriculture sector (2040)



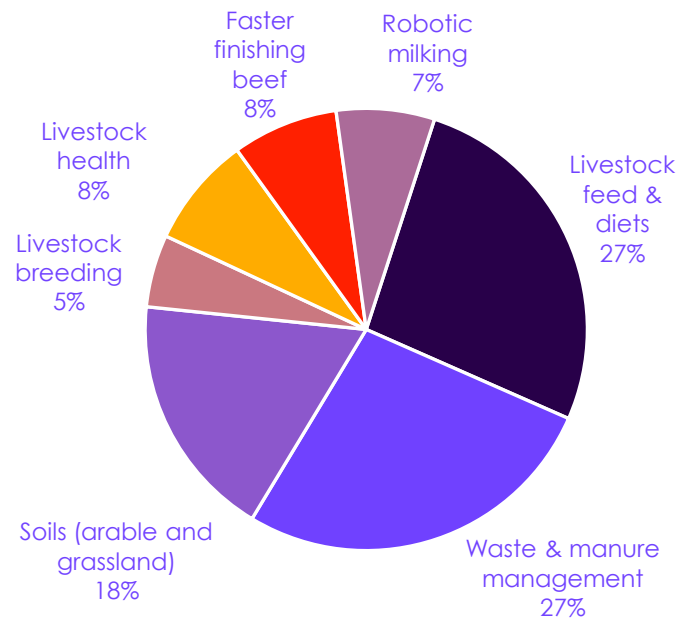
Source: SRUC, CCC analysis

Low-carbon farming measures & practices

Emissions reduction driven by feed, manure and waste management measures.

Category of measure	Measures
Livestock feed & diets	<ul style="list-style-type: none"> • 3NOP (dairy, beef), nitrate feed additive (dairy, sheep), precision feeding (dairy).
Waste and manure management	<ul style="list-style-type: none"> • Biogas flaring (beef, pigs, dairy), impermeable slurry cover (beef, pigs, dairy), AD (pigs), slurry acidification (beef, pigs, dairy).
Soils	<ul style="list-style-type: none"> • Cover crops, reducing N excess, grass-legume mix, triticale, variable rate nitrogen.
Livestock breeding	<ul style="list-style-type: none"> • Genomics breeding (dairy, beef), lower emission breeding goal (dairy, beef), current breeding goal (sheep).
Livestock health	<ul style="list-style-type: none"> • Cattle, sheep.
Other	<ul style="list-style-type: none"> • Robotic milking parlour, faster finishing beef.

Figure Share of low-carbon farming by 2040



Source: SRUC, CCC analysis

Key drivers of emissions reduction in agriculture

Scope to reduce emissions further by farmers diversifying land use and diet change

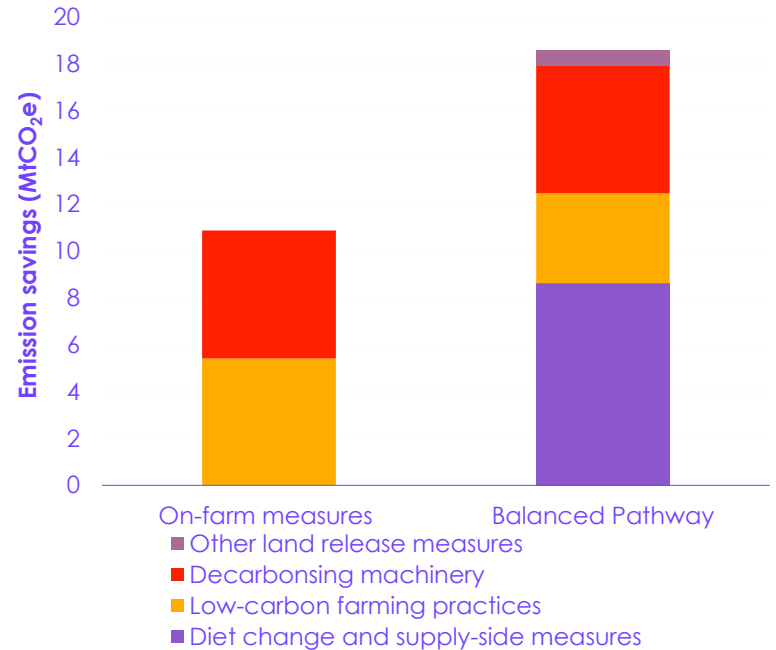
1. **On-farm measures and technologies** to reduce non-CO₂ and energy use emissions:

- Decarbonising machinery
- Low-carbon farming measures and practices

2. Supply and demand-side measures to support **diversifying land use and a reduction in livestock numbers**:

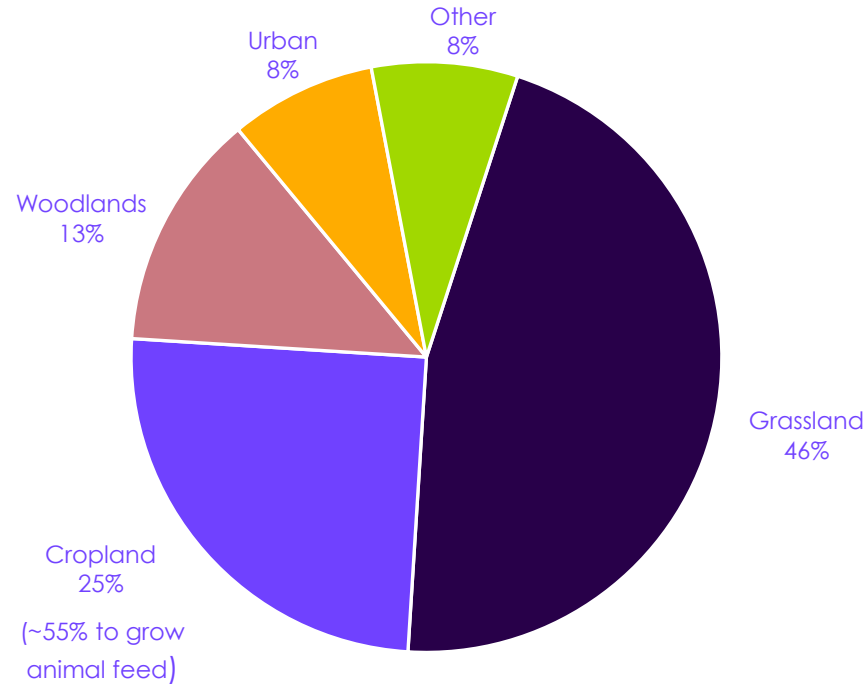
- Diet change and supply-side policies
- Other land release measures

Figure Emission reduction in the agriculture sector, with and without land release measures(2040)



Source: SRUC, CCC analysis

Diet change is important for releasing land out of agriculture and into other uses
Around 71% of UK land area is used for agricultural production

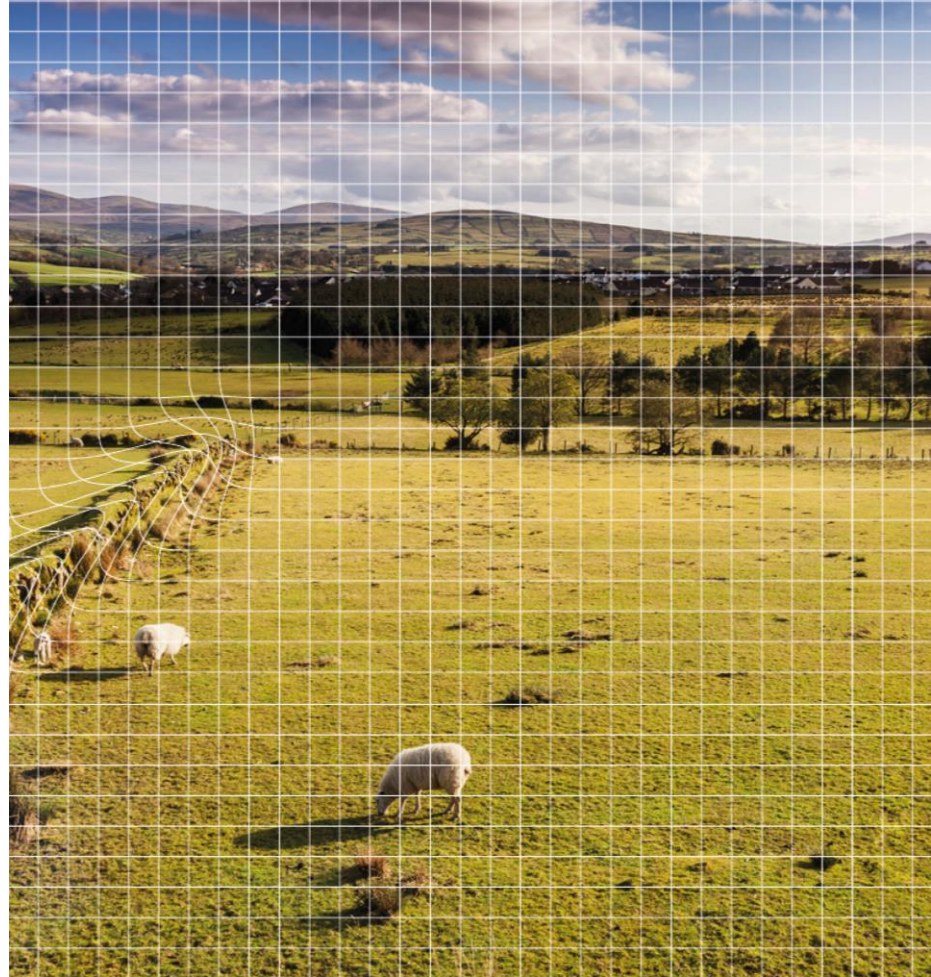


Land use actions in the transition

Requires 14% of agricultural land by 2050.

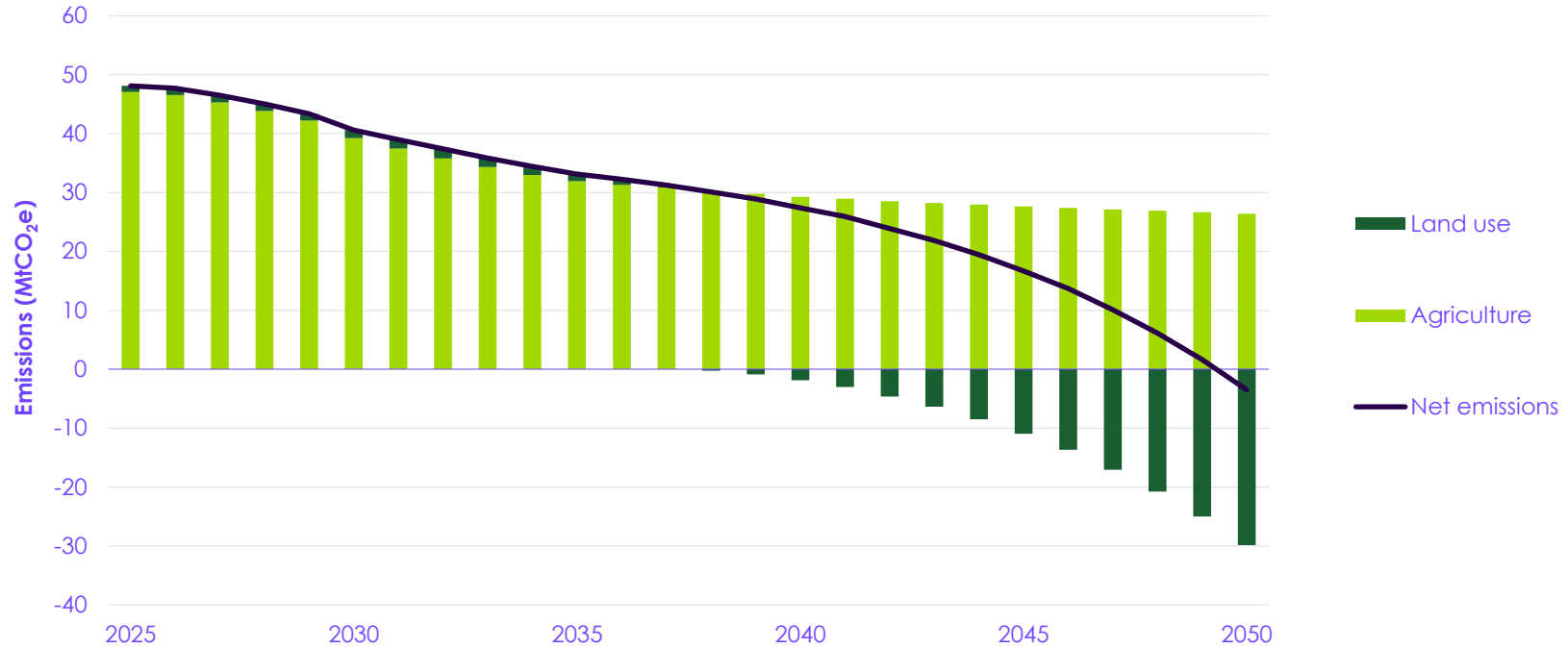
Key land-based measures to sequester carbon or reduce emissions are:

- Peatland restoration and management
- Energy crops
- Agroforestry and hedgerows
- Woodland creation and sustainable management



The combined agriculture and land use sectors reach Net Zero by 2050

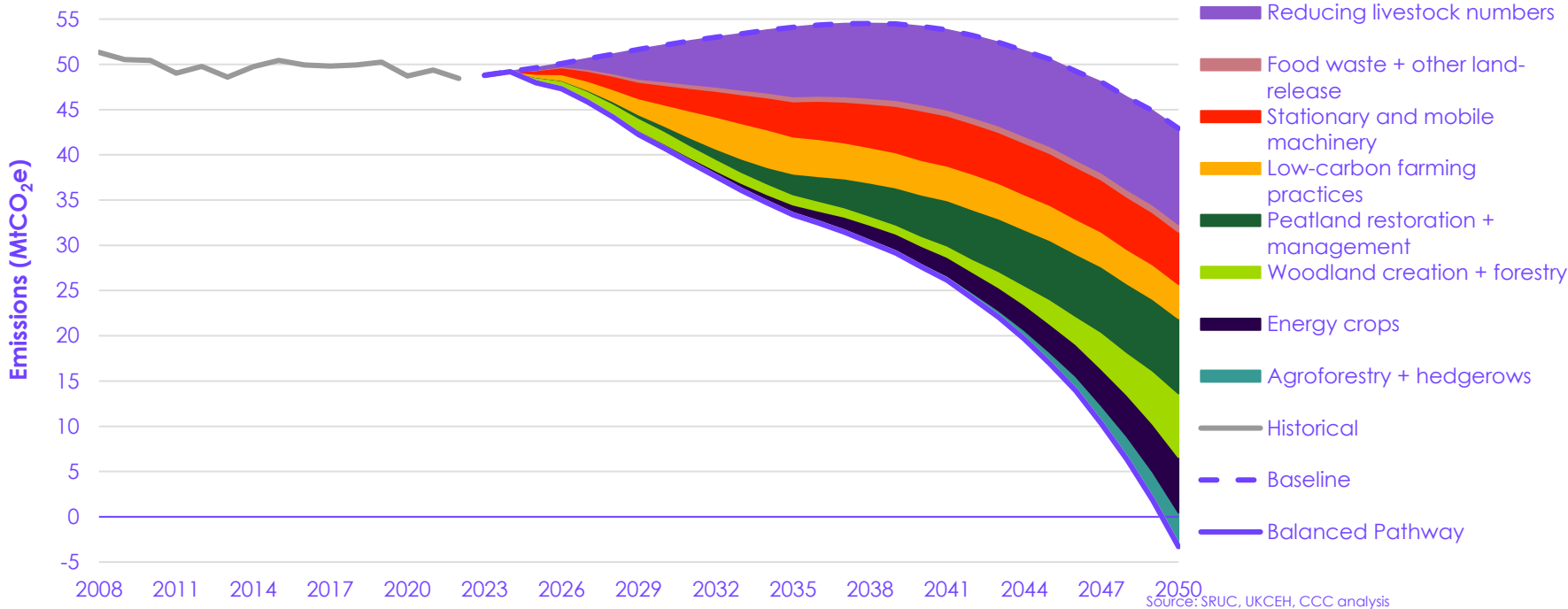
Actions guided by policy, but delivered by farmers and land managers, will interact across both sectors.



Source: SRUC, UKCEH, CCC analysis

Key elements in the Balanced pathway for agriculture and land use

Early action by farmers to diversify use and management of land use is crucial.



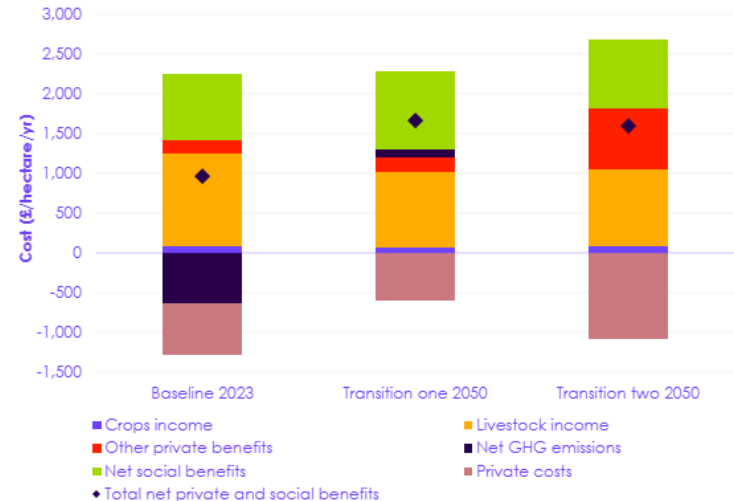
Opportunities to diversify income streams

Relies on farmers being sufficiently rewarded to deliver the range of social benefits.

Costs and benefits of transitioning a representative intensive grassland archetype in south-west England and Wales, by 2050:

- **Transition one:** productive conifer planting, hedgerows and agroforestry.
- **Transition two:** higher ambition for agroforestry, hedgerow creation, restoration of natural habitats, energy crop planting and ground-mounted solar installation. No woodland creation.
- **Compared to the baseline**, both transitions provide a net increase in private and social benefits, ranging £630-£700/hectare by 2050.

Figure Costs and benefits of a land use transition on an intensive grassland landscape.

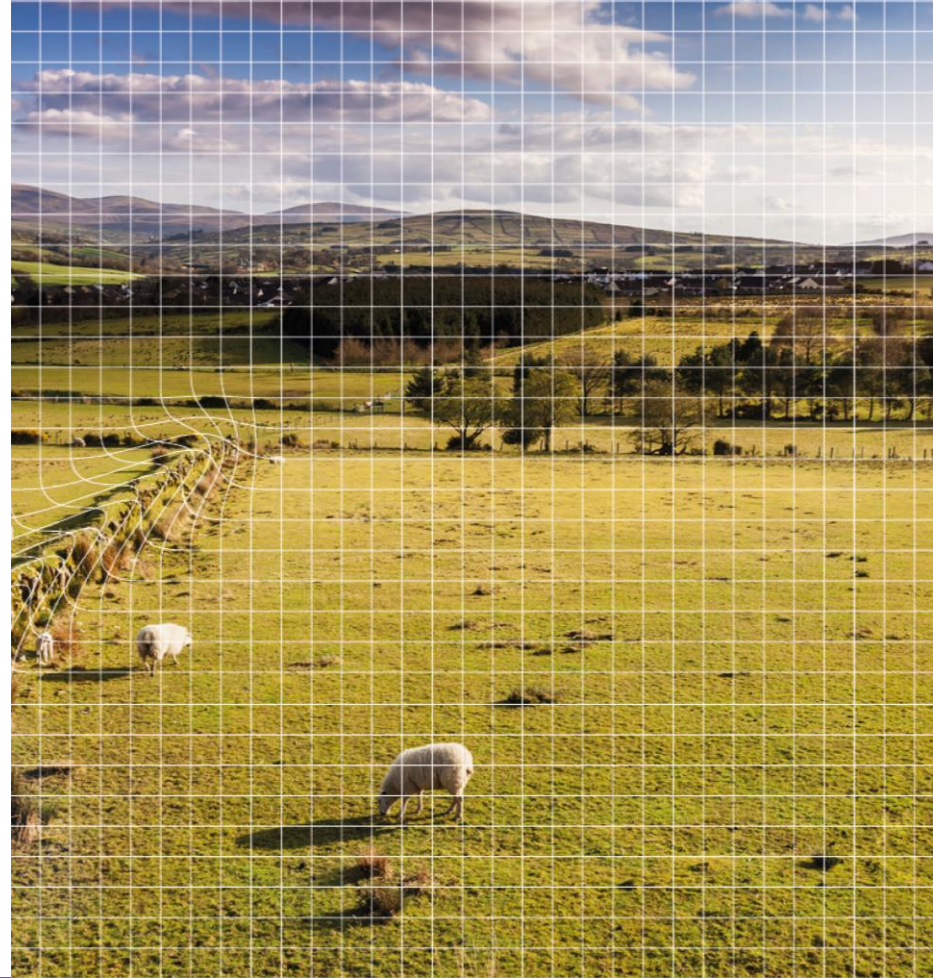


Source: UKCEH, Eumonia, CCC analysis

Research and data gaps

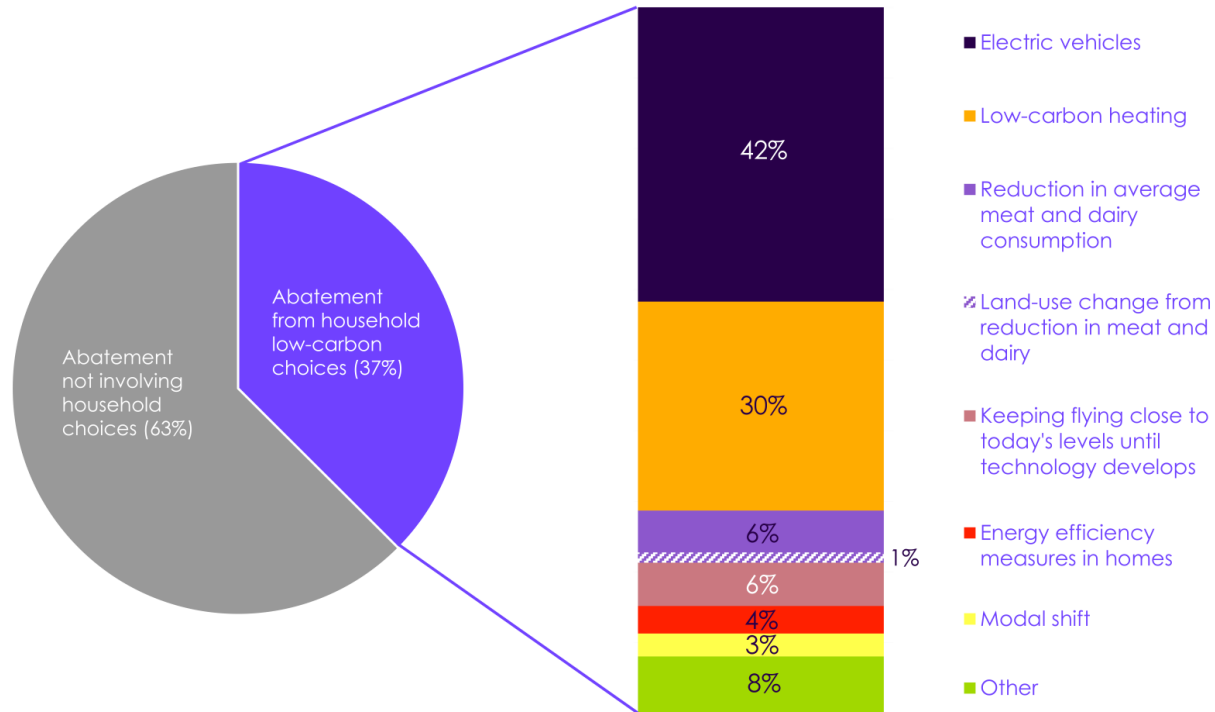
Better evidence required before can be included

- **Natural regeneration of woodlands and scrub**
- **Blue carbon**
- **Regenerative agriculture**
- **Soil carbon increase on agricultural mineral soils**



Shift to lower carbon food

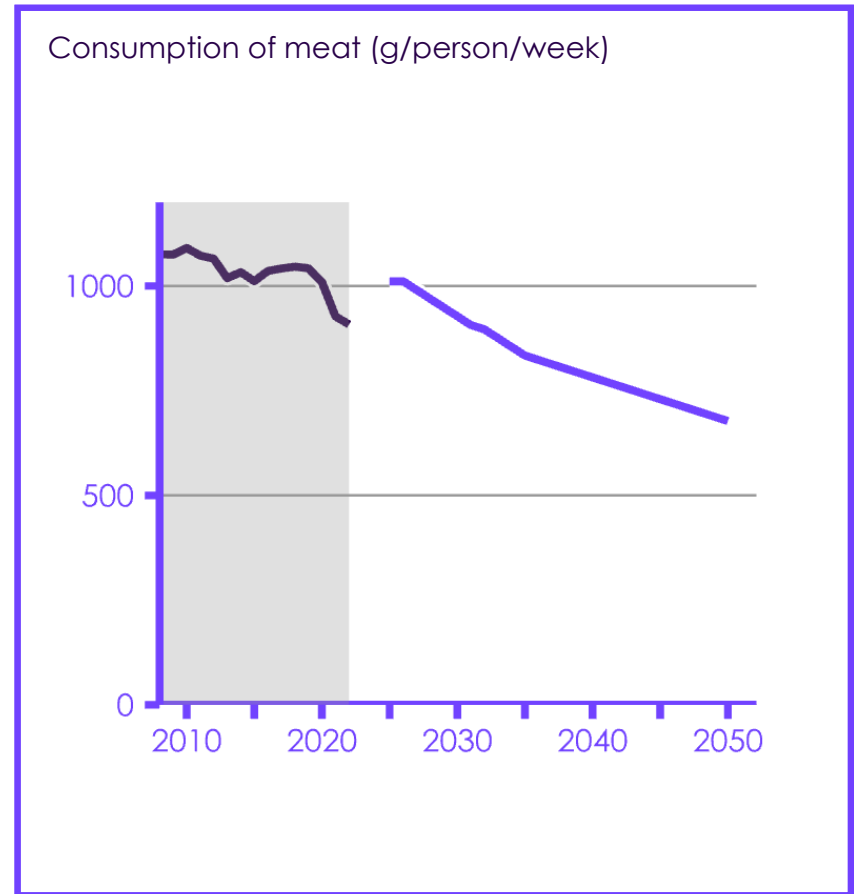
Households contribute to around a third of emissions reduction in 2040 72% of that is from just two actions: switching to an EV and a heat pump



Source: CCC analysis.

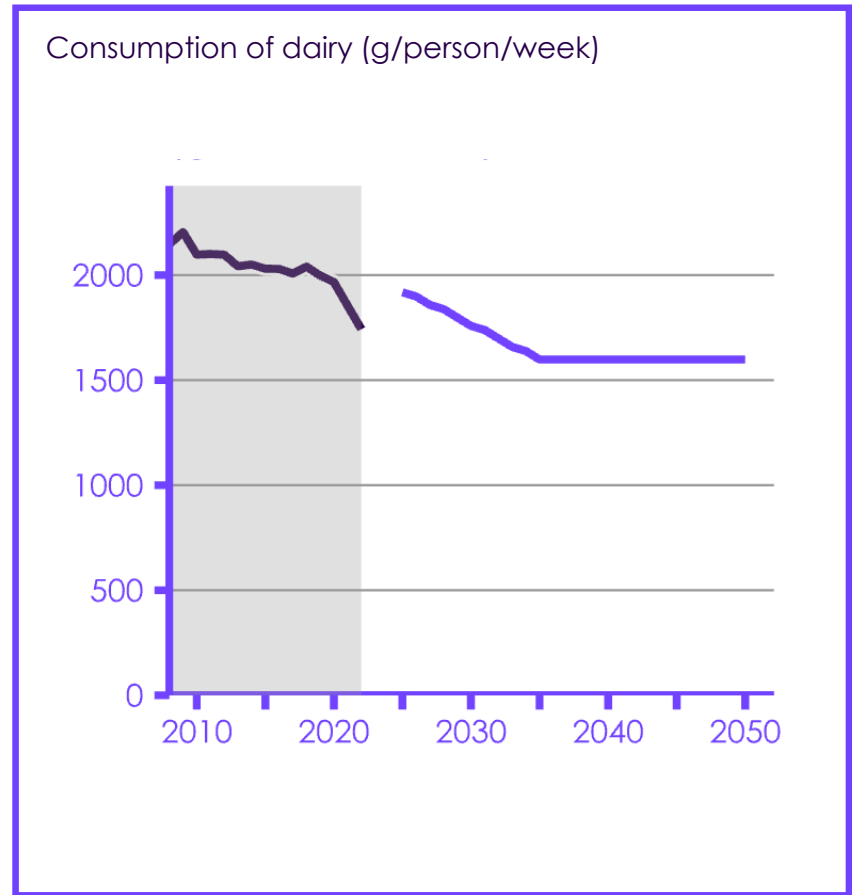
Reduction in average total meat consumption in the Seventh Carbon Budget

- Average total meat consumption (compared to 2019 levels) decreases
- It remains to be seen whether recent trends of more rapid reduction in meat and dairy consumption will sustain.
- We assume a steeper reduction in red meat consumption compared to white meat consumption.



Reduction in average total dairy consumption in the Seventh Carbon Budget

- Average total dairy consumption (compared to 2019 levels) decreases
- It remains to be seen whether recent trends of more rapid reduction in meat and dairy consumption will sustain.



Policy interventions will likely be necessary to achieve the required shift to lower-carbon foods

- The reduction would require going beyond long-term trends. This means policy interventions are likely needed.
- Policies are a choice for government.
- Clear and consistent information is a pre-requisite.
- Other promising levers include adjusting how much meat is in pre-prepared meals, and improving the availability of meat and dairy alternatives.



People will replace meat and dairy mostly with existing and new alternative proteins

- We expect that a large proportion of the reduction in meat and dairy products will be processed meat and dairy products.
- People may replace meat with plant whole foods (e.g. legumes and pulses).
- We assess that the majority of replaced meat and dairy products will be replaced by existing alternative proteins.
- In later years there may be a role for more novel alternative proteins, which utilise technologies such as precision fermentation or cultivated protein.



Our pathway is compatible with a healthy and nutritionally balanced diet

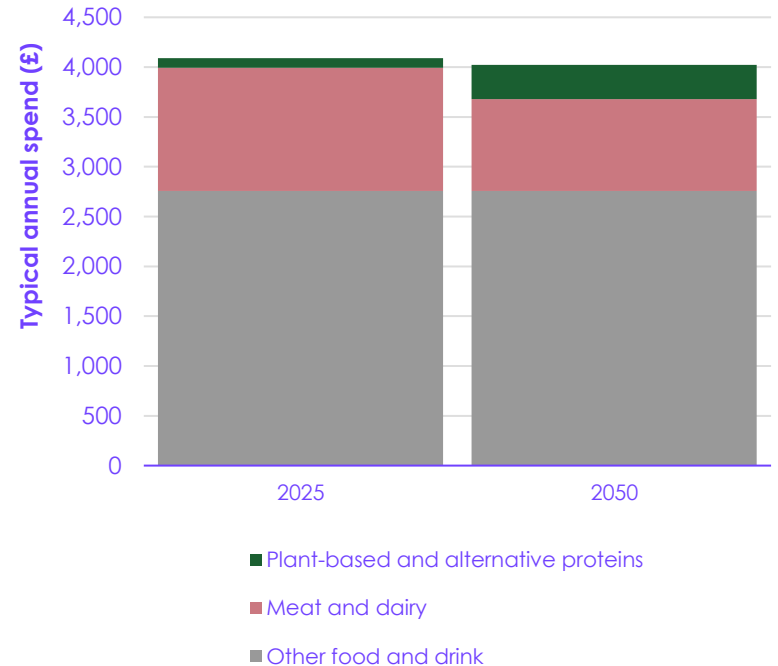
- A reduction in average meat and dairy consumption is compatible with a healthy and nutritionally balanced diet and has the potential to bring positive health impacts.
- Negative nutritional impacts of a reduction in meat consumption only occur where a diet is unbalanced, and meat products are not well substituted.



Impact on household costs

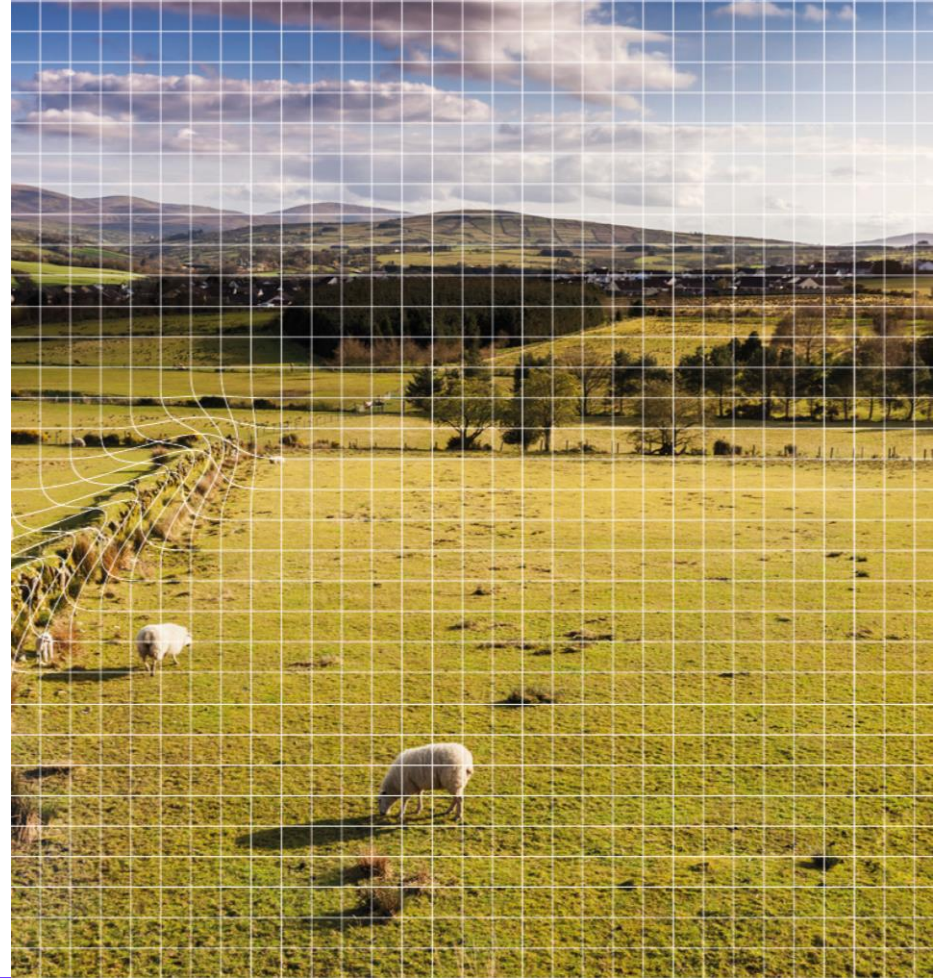
- Emissions from meat and dairy consumption show little variation by income on average.
- Replacing meat and dairy products with plant whole foods is often already cheaper.
- We expect that alternative proteins will become cheaper than meat and dairy products in the future.
- This means that over the transition a shift from meat and dairy to lower-carbon foods will save households money.

A 'typical' household's annual spend on food in 2025 and 2050



Research and data gaps

- **Meat and dairy consumption data**
- **Supermarket studies**
- **UK based meat and dairy alternative studies**
- **Policy proposals (e.g. reformulation, choice environment)**



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