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The Net-Zero Challenge – What are the implications for land use?

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The government has committed to the UK becoming net-zero in terms of carbon emissions by 2050. With the agricultural sector a net contributor to climate change because of the level of greenhouse gases it produces, this will have implications for land use on farms and estates.

This poster summarises the recommendations of the Committee on Climate Change's report, *Land Use: Reducing emissions and preparing for climate change*. A number of its recommendations are very challenging for the industry and would lead to significant structural change. However, we feel that this is a significant report given the CCC's role as independent advisor to the government on how to prepare for climate and the increasing recognition that there is a climate and biodiversity crisis that needs to be addressed very quickly.

Topic	Current emissions (MtCO2e)	Potential fall in emissions (% change, by 2050)	Potential fall in emissions[2] (MtCO2e, by 2050)	Change in land use (Red is reduction, green increase)
Current agricultural emissions	46.5 - 53			
Livestock	28.5		6 - 14	Reduction of up to 3.8 - 4.5 m ha (26 - 36%) less grassland and rough grazing.
Biomass – Afforestation & forestry management	-14 to -24[5]		8 - 18	Increase of up to 1.5m ha of new tree planting.
Biomass – Bioenergy crops			2	Increase of up to 1.2m ha of new bioenergy crops.
Biomass – Agro-forestry & hedgerow planting				Up to 0.9m ha of agro-forestry and new hedgerows.
Peatland restoration	18[7]	24 – 42% (and up to 58% of net peatland emissions if partial rewetting is included)	4 - 11	Up to 0.7 - 1.1m ha of peatland restored.
Low carbon farming practices & soil emissions	12.7		2 - 3	Up to 1m ha out of cropland.
Improving sustainable agricultural productivity	4.3[9]			
Reducing food waste along the supply chain				
Potential emissions in 2050	11 – 33 Residual emissions	35 - 80%	20 - 40	

1. These measures should be rewarded if they go beyond a minimum standard that land-owners should already be delivering.
2. The range of fall in emissions shows the low to high level scenarios.
3. If current trends in agricultural productivity and diets continue, the area of cropland required to maintain current levels of per capita UK food production could increase by 15% by 2050, with 9.5 MtCO2e higher emissions, and there will be insufficient land (by 3%) to meet food demand.
4. The 'Eatwell Guide' is the government's official guide to achieving a healthy and balanced diet. Following the guidance would have significant impacts on the average adult diet compared with current eating patterns: a large reduction in the consumption of red meat, by 89% for beef and 63% for lamb, together with a 20% decline in dairy products; meat protein would be replaced with more pulses and legumes (up by 86%); and consumption of fruit and vegetables would also increase by around 54%. The costs of meeting the 'Eatwell' dietary requirements could be delivered at no extra cost to the householder.
5. UK forestry is a net carbon sink (of -14 (CEH calculation) or -24 (CARBINE model).

lications for land use?

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The main conclusion of the report is that **national goals for climate change mitigation and adaptation are unlikely to be met without fundamental changes to the way land is used and managed**.

It says that new land use policy should promote **transformational land uses** and **reward land managers for public goods** that deliver climate mitigation and adaptation objectives. New policies should also reflect better the value of the goods and services that land provides. **The changes that are needed will vary across the UK**, requiring careful policy implementation. Support should be provided to help land managers transition to alternative land uses.

A second report will be published by the CCC in 2019 to help develop a new land management system. Alternative approaches to reducing emissions from farming have been suggested by the NFU and others, which we are sure will be debated as policy develops.

What the CCC suggests in terms of changes to land use

- This is 10% of UK greenhouse gas emissions and this has hardly changed since 2008[3].

- Livestock offers the largest potential to deliver cuts in GHG emissions in agriculture.
- In 2016, cattle and sheep directly accounted for around 58% of agriculture emissions, while there are additional soil emissions associated with growing their feed (e.g. grass and cereals).
- Emissions savings at the upper end of the range rest on a shift in production away from cattle and sheep (-46% in numbers), partially due to promoting healthy eating[4], and improved productivity of livestock through better health, breeding and grazing practices.

- New carefully planned tree planting to increase tree cover from 13% of all UK land today to up to 19% by 2050, by planting up to 1.5m ha to store carbon. The ambitious scenarios assume 31,000 - 50,000 ha planted pa to 2050.
- The ability of existing forests to absorb carbon is expected to weaken in the future due to the ageing profile of trees. 80% of broadleaf woodlands to be sustainably managed[6].

- Planting up to 1.2m ha of bioenergy crops (compared to the current 10,000 hectares (England only) for miscanthus and short-rotation coppice).

- 5-10% of agricultural land area could be used for agro-forestry by 2050, which is up to 0.9m ha.
- Increased hedgerow planting of 30-40% by 2050.

- Based on increasing the area of restoration from the current 25% to 55-70% or 0.7 - 1.1m ha.
- Savings at the upper end of the range would involve the restoration of around 7% of agricultural land, and the partial rewetting of half of the remaining lowland peat area that remains in agricultural production.
- Although lowland cropland accounts for only 7% of peatland area in the UK, it is responsible for around 40% (7.5 MtCO2e) of UK peatland emissions or an average of 39 tCO2e/ha due mainly to carbon losses from drainage for growing crops and some N2O emissions from fertiliser use[8].

- More efficient use of nitrogen and the release of 10-17% of land out of cropland, driven by increases in crop yields and waste reduction that reduces overall nitrogen use.
- Diversification of arable farmland into different crops (sunflowers, grain maize, soya, fruits and vines).

- A small number of large farms (7%) produce 55% of output with just 30% of farmed area, with output per hectare nearly three times higher than among the smallest farms.
- Deep cuts in emissions can be achieved whilst increasing food output (by 20 - 45% by 2050 compared with 2016 levels on a gross value added (GVA) basis), while growing crops on a smaller area[10].

- 20-50% reduction in UK food waste.
- Individuals can reduce their household food waste, which accounts for 70% of overall UK food waste.

- Anticipatory adaptive decisions can lead to greater benefits (as well as more sustainable land uses) over time.
- Early action reduces the risk of irreversible changes.

6. GHG savings from forest sequestration and use of products in the energy and other sectors would deliver higher savings than solar PV or onshore wind by 2050 on an annual average basis.
7. All sources of peatland emissions are not currently fully accounted for in the GHG Inventory. This is expected by 2021/22. This could increase reported emissions by a further 18 MtCO2e, and abatement of these emissions will need to be reflected in the setting of future carbon budgets.
8. Lowland grassland peat is the second most carbon-intensive (30 tCO2e/hectare) accounting for around 30% of peat emissions and 7% of UK peatland area. Peatland restoration will eventually allow the peat to turn from a net source to a net sink in the long term.
9. These are emissions from stationary, mobile and lubricant combustion in engines.
10. Moving horticulture indoors will release a relatively small amount of land and would need a significant reduction in electricity costs before this production system could be considered a serious option.

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