

# Food security and UK crop-based biofuel use: selected analysis in support of a limit to crop-based inputs

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## Summary

The UK has a target to incorporate renewable fuels, ie biofuels, into road transport. The target is inherited from the UK's membership of the European Union, set at a time before electric vehicles became cost effective.

In 2021, the government decided to increase the target to 9.6 per cent in 2022, rising to 14.6 per cent of fuel by 2032.<sup>1</sup>

Where biofuels are made from crops, they compete with food production. Where the food production is displaced elsewhere, it results in emissions from land use change, making some biofuels no better (or even worse) for the climate than petrol. Reducing the use of crop-based biofuels (while retaining waste-based biofuels) could increase global food security and reduce UK consumer costs.

Biofuels in the UK:

- Estimated land use of UK crop-biofuels 2021 (crops used to produce bioethanol): 107,300 hectares.<sup>2</sup>
- Estimated cost of the biofuels mandate for UK consumers buying petrol 2022-32: £23 billion
- Estimated number of people who could be fed, every year, if the UK ceased to use crop-based biofuels: 3.5 million
- Estimated additional people at risk of undernourishment globally each year due to the invasion of Ukraine: 8.1 to 13.1 million

This analysis suggests that a policy to limit crop-based inputs to the UK's biofuel targets could meaningfully reduce the impact of the invasion of Ukraine on world hunger, and that the UK, acting in concert with the EU and the US, could more than replace all Ukrainian cereals exports. If linked to policy promoting the greater uptake of electric vehicles, this could be achieved without harming the UK's climate goals and in a way that reduces consumer bills.

## Land used to produce UK biofuels

Taking crop-based bioethanol only (biodiesel consumed in the UK comes from waste products, so is excluded) analysis shows that producing the amount consumed in the UK requires at least 107,300 hectares of land.<sup>3</sup> This is almost the same as the area that is used to grow potatoes in the UK: 140,000 hectares.<sup>4</sup>

The UK's bioethanol comes from a range of food crops, including corn, wheat, sugar cane and sugar beet from countries such as Ukraine, the US, Canada, France and Sweden. The land used to grow these crops could otherwise be used to produce food. If the crops grown on 107,300 hectares were instead fed to people, they could have fed around 3.5 million people per year.<sup>5</sup>

Growing biofuel crops takes land out of food production in some of the key markets from which the UK also imports its food. Food security is enhanced by importing from a range of markets, hedging against an extreme weather event in one place affecting UK food supplies. Using land to produce biofuel crops impacts UK food security, whether they are grown domestically or elsewhere.

The amount of land used to grow wheat for biofuel in the UK in 2021 was 8,789 hectares. But most biofuel crops used in the UK were grown overseas. The UK imported 121 million litres of biofuel from Ukraine in 2021, using over 36,000 hectares of land there.

The area of land used for biofuels for other markets, such as the EU, China or the US, which use far higher volumes of biofuels, will be far greater than the UK's land footprint for biofuels. US biofuel consumption in 2020 was almost four billion litres (an order of magnitude greater than UK consumption).

A 2022 report estimates that the wheat used to make biofuels in the EU could instead be used to make around 15 million loaves of bread every day.<sup>6</sup>

There is strong evidence that global biofuel demand is a factor in the rising prices of many food crops.<sup>7</sup>

## Increasing food security by reducing crop-based biofuels

Before the invasion, Ukraine's grain exports fed around 125 million people: 37 million in Africa, 36 million in east and southeast Asia, 26 million in the Middle East, 14 million in the EU and eight million in South Asia.<sup>8</sup> This accounts for grain fed to livestock as well as that directly consumed by people.

The war in Ukraine will reduce Ukrainian production by about a fifth, although it will probably still produce enough grain for large scale export (assuming physical export infrastructure is intact).<sup>9</sup>

The UN's Food and Agriculture Organisation (FAO) estimates that reduced food exports due to the war will see between 8.1 million (moderate scenario) and 13.1 million (severe scenario) additional people suffer undernourishment over the next three years.<sup>10</sup> In 2020, 768 million people faced undernourishment.<sup>11</sup>

If the UK ceased use of crop-based biofuels, and the crops grown were used to feed people instead, this would feed around 3.5 million people a year.<sup>12</sup> This alone would lower the impact of the war in Ukraine on global undernourishment by 25-40 per cent, based on FAO's undernourishment estimates.

If the UK acts in concert with the US and the EU to halve their collective use of crop-based feedstocks for biofuel production, sufficient grain would be freed up to replace all the grain exported from Ukraine.<sup>13</sup>

### **The cost to the UK consumer**

The cost of biofuels per litre of petrol is 12.37 pence, including the 2022 increase.<sup>14</sup> This includes a 0.5 pence per litre increase due to the higher biofuels target in 2022. By 2032, government modelling shows there will be a further 1.1 pence per litre increase in pump prices due to biofuels (a total 1.6 pence per litre increase 2022-32).<sup>15</sup>

Based on RAC figures for UK petrol consumption by cars per year, this means that, in 2022, the biofuel mandate for petrol could cost consumers £2 billion.<sup>16</sup>

Cumulatively, after 2022-32, the cost of the biofuel mandate for petrol to consumers will be around £23 billion.

The Department for Transport estimates that biofuels provide emissions savings at a cost of £165-170 per tonne of greenhouse gas.<sup>17</sup> By comparison, the Climate Change Committee estimates that battery electric vehicles provide a £59 saving per tonne of greenhouse gas.<sup>18</sup>

### **Climate and nature impact of biofuels**

Crop-based biofuels have long been known to have questionable climate benefits or even to result in an increase in emissions relative to fossil fuel petrol and diesel.

The main cause of this is the land use change associated with biofuel crops. It can result in the displacement of food production to other places and, therefore, changes to land use elsewhere. Land use change associated with farming is the main cause of deforestation globally, and species loss both globally and in Europe (including the UK).

This ‘indirect’ land use change is a major source of emissions that means many biofuels are in reality more polluting than petrol or diesel, or provide at best modest emissions savings.

According to analysis for the European Commission the emissions caused by land use change mean that biofuels made from wheat, corn, sugar beet and sugar cane may sometimes provide an emissions saving, compared to petrol, but they are not carbon neutral.

However, a 2022 study in the US found that emissions from corn ethanol have previously been underestimated. The increase in corn prices due to ethanol production (30 per cent higher) has resulted in more corn being grown overall, using more fertiliser and water, resulting in higher greenhouse gas emissions. As a result, biofuel from corn may be 24 per cent more carbon intensive than petrol, providing no reduction in emissions at all.<sup>19</sup> The UK imports significant quantities of corn-based biofuel from the US.

The indirect land use change emissions are not accounted for in the government’s calculations of the climate benefit of biofuels.

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**For more information, contact**

Dustin Benton, policy director, Green Alliance  
[dbenton@green-alliance.org.uk](mailto:dbenton@green-alliance.org.uk)

## Endnotes

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<sup>1</sup> Department for Transport, July 2021, *Targeting net zero – next steps for Renewable Transport Fuels Obligation*, [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/1020709/targeting-net-zero-next-steps-for-the-renewable-transport-fuels-obligation-government-response.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1020709/targeting-net-zero-next-steps-for-the-renewable-transport-fuels-obligation-government-response.pdf)

<sup>2</sup> This figure, which draws on bioethanol conversion efficiency and average crop yields, is very likely a lower bound.

<sup>3</sup> Department for Transport, May 2022, *Renewable fuel statistics 2021: Fourth Provisional report*, [https://www.gov.uk/government/statistics/renewable-fuel-statistics-2021-fourth-provisional-report?utm\\_medium=email&utm\\_campaign=govuk-notifications-topic&utm\\_source=52cc9a80-e6e4-492d-953b-49d66dc95b60&utm\\_content=immediately](https://www.gov.uk/government/statistics/renewable-fuel-statistics-2021-fourth-provisional-report?utm_medium=email&utm_campaign=govuk-notifications-topic&utm_source=52cc9a80-e6e4-492d-953b-49d66dc95b60&utm_content=immediately) (this is provisional and incomplete data for 2021; final figures could be higher) Using simple conversion factors and average crop yields for each crop from each country, the production of biofuels from crops for the UK required 107,300 hectares of land in 2021.

<sup>4</sup> Department for Environment, Food and Rural Affairs, July 2021, *Agriculture in the United Kingdom 2020*, <https://www.gov.uk/government/statistics/agriculture-in-the-united-kingdom-2020>

<sup>5</sup> Based on standard calories per tonne nutritional information and a 2,500kcal/day diet.

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- <sup>6</sup> Transport & Environment, March 2022, *Food not fuel*, [https://www.transportenvironment.org/wp-content/uploads/2022/03/202203\\_Food\\_not\\_Fuels-1.pdf](https://www.transportenvironment.org/wp-content/uploads/2022/03/202203_Food_not_Fuels-1.pdf)
- <sup>7</sup> Transport & Environment, March 2022, *Food not fuel*, [https://www.transportenvironment.org/wp-content/uploads/2022/03/202203\\_Food\\_not\\_Fuels-1.pdf](https://www.transportenvironment.org/wp-content/uploads/2022/03/202203_Food_not_Fuels-1.pdf)
- <sup>8</sup> Average Ukrainian exports over the past three years for which there is data: 2018-19 to 2020-21.
- <sup>9</sup> Against Ukraine's 5 year average production. Estimates from Defence Intelligence ([https://twitter.com/DefenceHQ/status/1518697070294671360?ref\\_src=twsrc%5Etfw](https://twitter.com/DefenceHQ/status/1518697070294671360?ref_src=twsrc%5Etfw)) and geoanalytics company Kayrros (<https://www.kayrros.com/blog/ukraines-wheat-harvest-to-drop-by-one-third/>).
- <sup>10</sup> Food and Agriculture Organisation of the United Nations, *Sustainable Development Goals*, <https://www.fao.org/3/cb9014en/cb9014en.pdf>
- <sup>11</sup> Food and Agriculture Organisations of the United Nations, *Sustainable Development Goals*, <https://www.fao.org/sustainable-development-goals/indicators/211/en/>
- <sup>12</sup> Green Alliance analysis. Detailed figures available on request.
- <sup>13</sup> Princeton University analysis by Oliver James and Tim Searchinger. Detailed figures available on request.
- <sup>14</sup> RAC, *Petrol and diesel prices in the UK*, <https://www.rac.co.uk/drive/advice/fuel-watch/>
- <sup>15</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/1015590/em-to-the-draft-rtfo-amendment-order-2021.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1015590/em-to-the-draft-rtfo-amendment-order-2021.pdf)
- <sup>16</sup> The RAC Foundation, January 2022, *Fuel duty decline*, [https://www.racfoundation.org/wp-content/uploads/Fuel\\_duty\\_decline\\_Lam\\_January\\_2022.pdf](https://www.racfoundation.org/wp-content/uploads/Fuel_duty_decline_Lam_January_2022.pdf)
- <sup>17</sup> Department for Transport, September 2021, *Cost benefit analysis for: Targeting net zero – next steps for the Renewable Transport Fuels Obligation*, [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/1014962/cost-benefit-analysis-for-targeting-net-zero-next-steps-for-the-rtfo.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1014962/cost-benefit-analysis-for-targeting-net-zero-next-steps-for-the-rtfo.pdf)
- <sup>18</sup> The Climate Change Committee, July 2019, *Net zero costs data*, <https://www.theccc.org.uk/wp-content/uploads/2019/07/Net-Zero-costs-dataset.xlsx>
- <sup>19</sup> PNAS, February 2022, *Environmental outcomes of the US Renewable Fuel Standard*, <https://www.pnas.org/doi/10.1073/pnas.2101084119>

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