FRUIT AND VEGETABLES POLICY BRIEF SERIES **2022**

SHEFS

POLICY BRIEF 3:

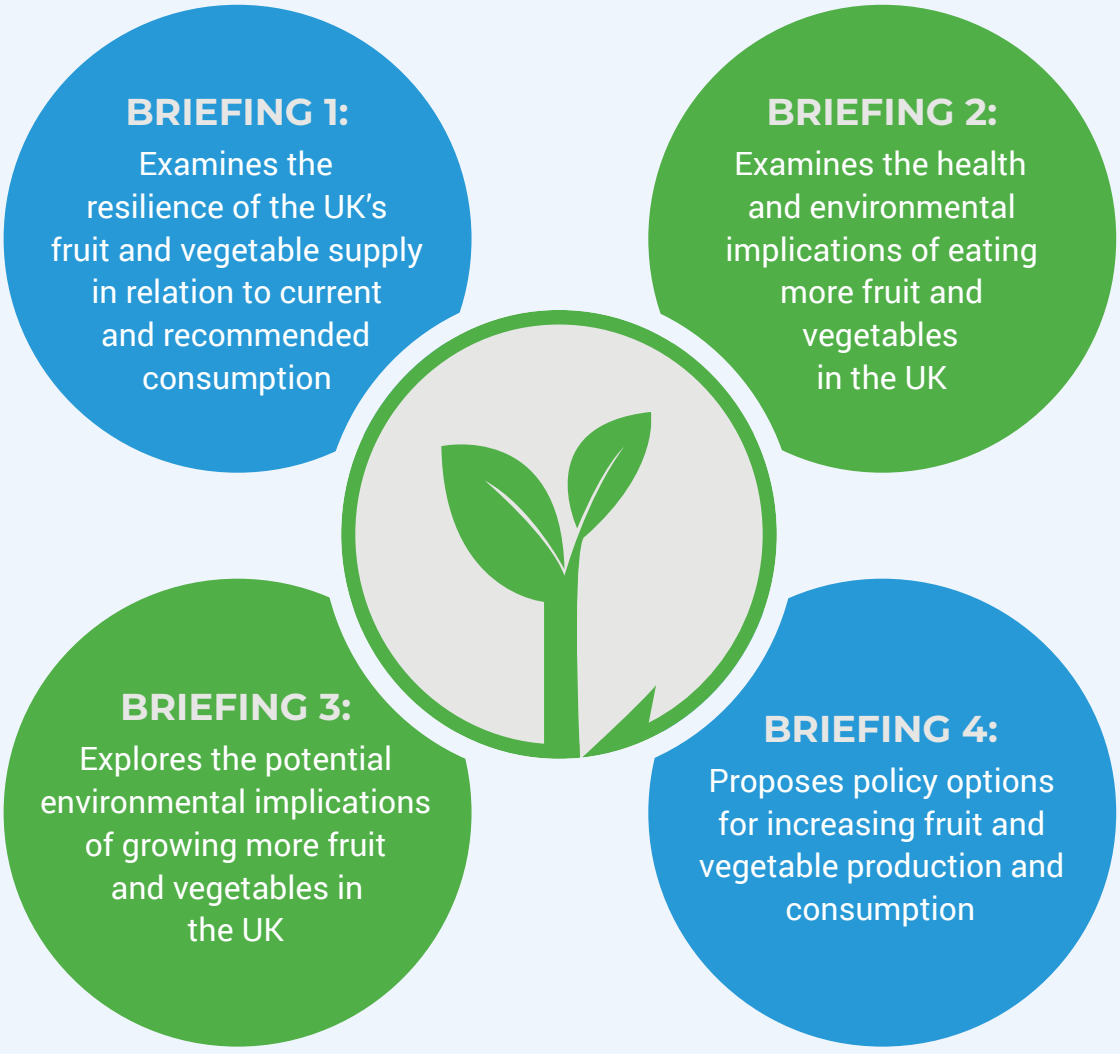
Pathways to Five-a-Day and Biodiversity

WHAT IS SHEFS?

SHEFS (Sustainable and Healthy Food Systems) is a global research programme using novel techniques to generate and synthesise evidence, and to help decision-makers create policies that deliver nutritious and healthy diets in an environmentally sustainable and socially equitable manner.

ABOUT THIS SERIES

This series of four policy briefings draws on research conducted by the SHEFS consortium funded by the Wellcome Trust. It explores the potential health and environmental benefits of increasing our consumption of fruit and vegetables in the UK, explores the biodiversity impacts of growing more fruit and vegetables in the UK, and examines the resilience of our fruit and vegetables supply chains in light of climate change. It ends by considering the mix of policies that should be considered to support fruit and vegetable consumption and production in the food and agriculture strategies of all four UK nations.



POLICY BRIEF 3: PATHWAYS TO FIVE-A-DAY AND BIODIVERSITY

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Five-a-day consumption a win-win-win: possible positive outcomes for biodiversity on top of public health and carbon footprint

SUMMARY

- Briefing 1 in this series showed that fruit and vegetable consumption in the UK is below the recommended five-a-day and that a considerable proportion of fruit and vegetables consumed are imported from countries vulnerable to the effects of climate change.
- Briefing 2 showed that increasing intake to five-a-day (while reducing meat and sugar consumption on a per kcal basis) would lead to significant health and environmental benefits.
- The best pathway to five-a-day identified, in terms of increased life expectancy and reduced carbon footprint, was named Veg Same – this involved increasing vegetable intake (rather than both fruit and vegetables) and sourcing these from other countries as well as the UK (in the same ratio as at present). The second best pathway, in terms of carbon footprint reduction, was named Veg UK – here the increase in vegetable consumption would come from UK vegetables only.
- This Briefing 3 takes these two pathways, Veg Same and Veg UK, and models their potential impact on biodiversity in the UK.
- Since producing meat requires more land per kcal than vegetables, replacing consumption of meat with vegetables would reduce the land use footprint of the average diet. We find that both pathways would be better for biodiversity than current diets (the baseline). For Veg UK, an estimated net of 407 species would gain habitable area (of more than 10%) and for Veg Same an estimated net 536 would gain this.
- The benefits would mainly come from decreasing meat consumption and in turn reducing the land requirement for meat production, and re-focussing this land on to species-diverse habitats like natural land covers. Current horticultural land has low levels of biodiversity, but both pathways see a net gain in biodiversity. This is because they require a relatively small amount of land for horticulture (533,495–1,043,067 hectares) while releasing a much larger amount of grazing land to natural land covers (733,909- 1,100,864 hectares).
- Climate change over the next 40 years is likely to impact UK biodiversity negatively. This modelling shows that climate change without land use change might lead to 626 species losing habitable area (of more than 10%).
- To achieve possible benefits to biodiversity on top of public health and carbon footprint, strategies to increase veg consumption and reduce meat consumption should be encouraged in tandem with incentives for farmers to make shifts in land use that might enhance biodiversity.

This briefing paper is based on the findings of the paper by UCL CBER; UCL Stats; LSHTM and Food Foundation: 'Potential for positive biodiversity outcomes under diet-driven land use change in Great Britain' by Henry Ferguson-Gow, Owen Nicholas, Charlotte Outhwaite, Rosie Green, Pauline Scheelbeek, Patricia Eustachio Colombo, Amber Wheeler, Anna Taylor, Alan D. Dangour, Georgina Mace and Richard Pearson.

Why biodiversity?

As well as being important in its own right, biodiversity is recognised as being a fundamental contributor to our need for food security, medicines, fresh air and water, shelter, and a clean and healthy environment in which to live[1]. According to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, 1 million animal and plant species globally are now threatened with extinction and a significant portion of this threat has been caused by land use changes associated with food production[2]. Some claim we are entering the sixth age of extinction[3].

At the 2020 United Nations Summit on Biodiversity political leaders from countries across the world committed to reversing biodiversity loss by 2030. The UK reinforced this commitment by producing the Nature Positive report that commits UK Governments to reverse the decline in nature by 2030[4].

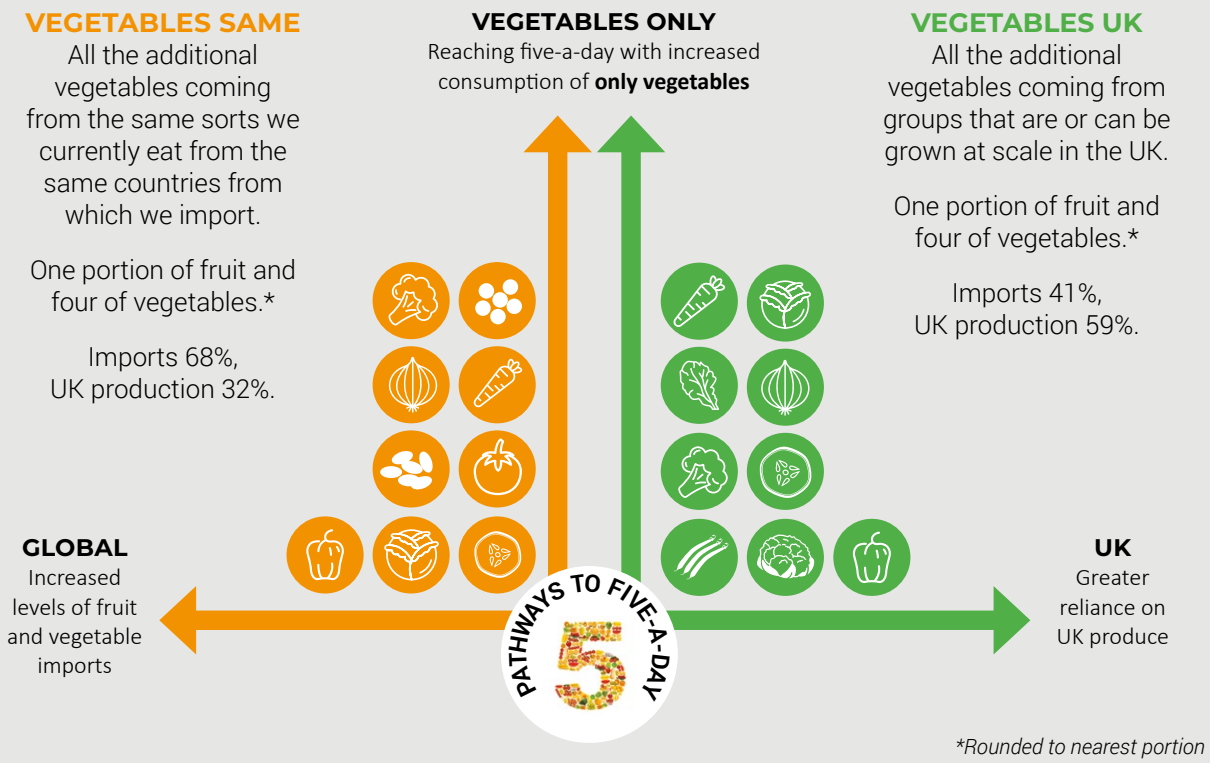
The most recent UK Biodiversity Indicators Assessment shows that of all short term indicator measures, 62% have insufficient data to reveal a trend, show little or no change, or show deterioration[5]. This highlights that much still needs to be done to enhance biodiversity in the UK.

Biodiversity is the variety of all life on Earth: genes, species and ecosystems. It includes all species of animals and plants, and the natural systems that support them[10].

Pathways to five-a-day and the impact on biodiversity

This brief looks at what impact changing diets might have on biodiversity in the UK. It takes the two increased vegetable consumption pathways from this series' Brief 2 and models their potential impact on biodiversity. Both of these pathways involve increasing vegetable intake at the same time as decreasing meat intake (on a per kcal basis), but in one pathway – Veg Same – the additional vegetables eaten would come from the current mix of sources, that is a combination of imported and produced in the UK, while in the other pathway – Veg UK – all extra vegetable consumption would come from UK-produced vegetables only. This would mean that more than half of our fruit and vegetable supply would be home-produced as opposed to around a third currently.

FIGURE 1: Pathways to five-a-day



In the original Veg Same and Veg UK pathways the extra vegetable consumption comes from replacing meat (beef, lamb, pork and poultry) with vegetables on a per kcal basis. Because of the lower calorie density of UK vegetables compared to imported vegetables, greater consumption would be required to replace meat calories in the Veg UK pathway compared to Veg Same. This means that less meat production is needed for the Veg Same pathway, contributing to its slightly lower carbon footprint.

We looked at the reduction in beef and lamb consumption only and the reduction in grazing that this might involve. The model does not take into account land use impacts of the reduction of other feed fed to cows, such as cereals, nor chicken and pig feed and their land use footprints. Some of this feed would be produced outside the UK and would have a biodiversity impact elsewhere. While this impact is important to consider it was not modelled in this study because the focus was on the UK only.

Consumption change to land use change

BASELINE	HECTARES
Grazing land (assumed meat-associated land)	10,050,954
Natural land covers	4,077,277
Horticulture	240,338
VEG SAME	
Grazing land (assumed meat-associated land)	7,073,911
Natural land covers	5,178,141
Horticulture	533,495
VEG UK	
Grazing land (assumed meat-associated land)	7,726,494
Natural land covers	4,811,186
Horticulture	1,043,067

Note the baseline numbers differ from official Defra statistics which estimate UK fruit and vegetable horticulture to cover 163,000 hectares[6]. This is due to timings of the data collection, methods used and how land uses were classified. While the baselines differ, the general effect of the pathways on biodiversity would be similar.

VEG SAME

UK horticulture production **INCREASES** by **123%**

Natural land cover **INCREASES 27%**

Meat production (grazing only) **DECREASES** by **30%**

VEG UK

UK horticultural production **INCREASES** by **334%**

Natural land cover **INCREASES 18%**

Meat production (grazing only) **DECREASES** by **23%**

Land change impacts on biodiversity

For the modelling process the UK was divided into 4km^2 blocks. We distinguished 25 different land use classes; a specific land use class was assigned to each block (representing the predominant land use of that block). Biodiversity records from the Biological Records Centre were used to model expected biodiversity for each of the land use classes. 814 species were considered, selected from those defined by the Joint Nature Conservation Committee (JNCC) as pollinating insects and priority species with declining populations. This provided an estimated number of species for each of the land use classes, which was used to project changes in habitable area for the 814 species and in turn provide an estimated impact on biodiversity from the changes in land use of the two pathways.

Horticulture and biodiversity

Our modelling suggests that UK horticultural land has a low number of species. This is likely to be related to horticulture generally utilising relatively intense production methods. However, the horticultural land area needed for the five-a-day pathways is relatively small (533,495 to 1,043,067 of 17,532,000 hectares of utilised agricultural land[6]) and so overall the impact on biodiversity from expanding production is low. This can be compared to the larger areas of grazing land that could become available (2,324,460–2,977,043 hectares) for increasing species numbers if meat consumption is reduced as per the pathways. To explore the potential positive impacts on biodiversity, we examined what happens when the land taken out of grazing (temporary and permanent grassland and rough grazing) is converted to natural land covers containing larger numbers of species.

FIGURE 2: Species losing or gaining with land cover changes for scenarios

Grazing land conversion scenario – percentage of grazing land converted to horticulture or natural land covers	Number species increase*	Number species decrease*	Net number of species gaining*
NO LAND CONVERSION — No change – same as current			
VEG UK — **5%** to horticulture, **18%** to natural land covers	**485** *467-504	**-78** *65-91	**407** *402-413
VEG SAME — **3%** to horticulture, **27%** to natural land covers	**599** *583-615	**-63** *52-74	**536** *531-541

*Range of uncertainty. *More than 10% habitable area.

More biodiversity

For both pathways the majority of species show an increase in estimated habitable area.

Veg Same produces a better result for biodiversity than Veg UK as it requires less new horticultural land to be added into the landscape, as more vegetables are being imported, and results in a greater conversion of grazing land to natural land cover. However, it is possible that the impact on biodiversity of vegetable production expansion in other countries would mirror the projected impact in the UK. This needs further investigation – the UK should not be exporting negative biodiversity impact to other countries.

In general, turning grazing land into horticulture has a negative effect on biodiversity as horticulture typically has lower species diversity than combined grassland types. Turning grazing land into natural land cover significantly increases biodiversity.

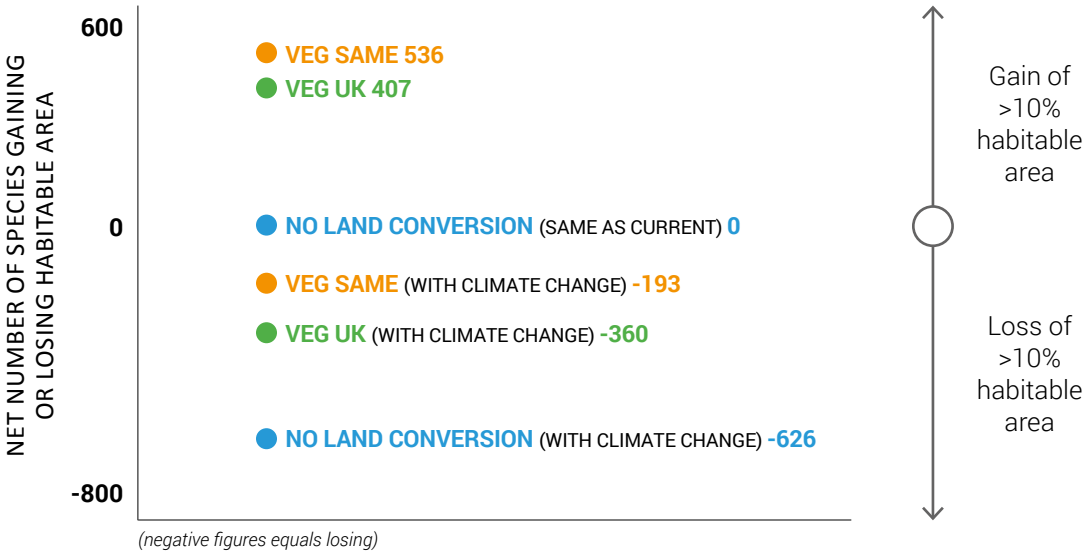
Biodiversity and climate change

The impacts of climate change on biodiversity were also modelled, and are likely to be severe. The land use changes associated with both pathways, particularly Veg Same, could help mitigate these impacts, however. Converting more land to natural land covers from grazing could make a contribution to maintaining or restoring biodiversity levels.

FIGURE 3: Species losing or gaining with land cover changes for scenarios plus climate change	Grazing land conversion scenario with climate change	Number species increase*	Number species decrease*	Net number of species losing*
NO LAND CONVERSION (with climate change)	No change – same as current	**23** *16-30	**-649** *641-658	**626** *625-628
VEG UK (with climate change)	**5%** to horticulture, **18%** to natural land covers	**125** *112-138	**-485** *469-500	**360** *357-362
VEG SAME (with climate change)	**3%** to horticulture, **27%** to natural land covers	**213** *199-228	**-406** *392-420	**193** *192-193

*Range of uncertainty. *More than 10% habitable area.

FIGURE 4: Impact of pathways, with and without climate change, on species gaining or losing habitable area



(negative figures equals losing)

Production methods

An assumption in our modelling is that horticultural production methods remain unchanged; however, there is evidence that they could be enhanced to improve biodiversity. Other research shows that agroecological practices such as polycropping, crop rotation and a general movement away from monoculture have a positive impact on biodiversity[7].

It should be noted that grazing pastures can also be managed to increase species diversity and rare grassland plants[8].

Agroecology is based on applying ecological principles to optimise the relationships between plants, animals, humans and the environment[9]

Conclusion

The previous briefs in the series highlighted the health and environmental benefits of pathways to five-a-day that involve reducing meat consumption at the same time as increasing vegetable consumption. This brief shows the result of modelling the biodiversity impacts of those possible pathways. Our modelling suggests that shifts to diets containing more vegetables and less meat could result in potential gains to biodiversity in the UK that could contribute to the UK Government fulfilling its commitment to reverse the decline in biodiversity by 2030. These biodiversity gains would not come from the expansion of horticulture, which currently has low biodiversity levels, but from reducing the land requirement for meat production. This land could then be moved into species-diverse habitats such as natural land covers. Our modelling also shows that climate change is likely to impact UK biodiversity negatively but that the effects could be mitigated, to some degree, by the land use changes potentially associated with a shift of dietary patterns towards less meat and more vegetable consumption.

To achieve these co-benefits, strategies to increase veg consumption and reduce meat consumption should be encouraged in tandem with incentives – through Environmental Land Management Schemes, such as the Sustainable Farming Incentive, Local Nature Recovery and Landscape Recovery – for farmers to make shifts in land use that enhance biodiversity.

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