

LOW INCOME, LOW EMISSIONS?

A BRIEFING EXPLORING WHETHER REDUCING THE EMISSIONS FOOTPRINT OF UK DIETS IS EQUALLY ACHIEVABLE FOR DIFFERENT INCOME GROUPS



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Contents

AN INTRODUCTION	4
PART ONE Reducing the environmental impact of diets	6
PART TWO How does meat and dairy consumption and food waste differ by socio-economic status?	10
PART THREE What alternatives to animal foods do we need to be eating more of?	13
PART FOUR Conclusion and Recommendations	19
REFERENCES	22

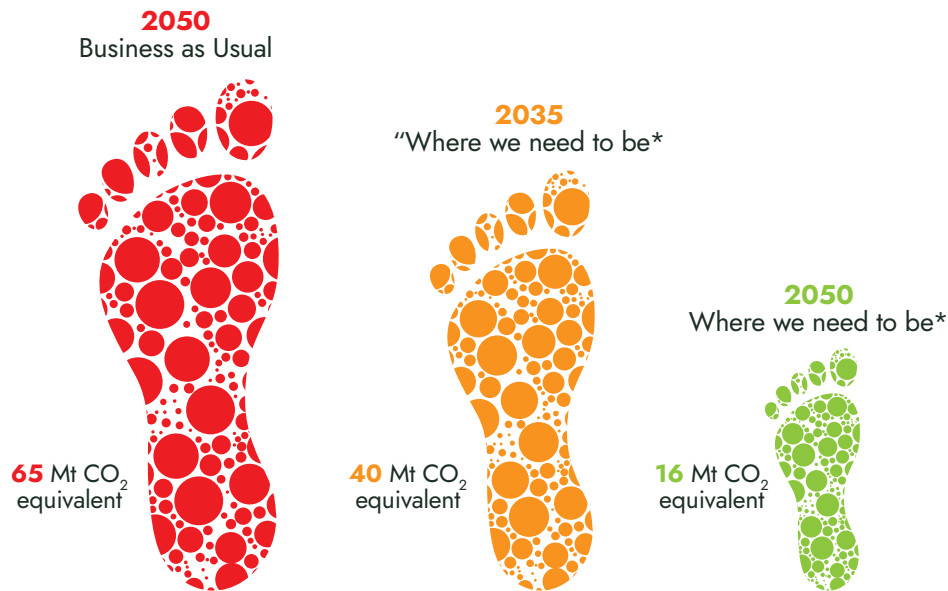


An introduction

To prevent the damaging impacts of climate change escalating further, we need to reduce the Greenhouse Gas emissions (GHGEs) associated with our diets. The world will simply not be able to successfully keep global temperature rises to below 1.5°C without tackling emissions from the food system (Clark *et al.*, 2020). These are estimated to contribute as much as 30% of global GHG emissions (IPCC, 2019) of which 57% come from the production of animal based food (Xu *et al.*, 2021).

In the UK, emissions from the food system account for 19% of our domestic greenhouse gas emissions (closer to 30% when emissions from imports are included) (National Food Strategy, 2021a). The Government has committed, in law, to achieve net-zero carbon emissions by 2050 (DEFRA, 2019). But emissions from food have fallen at only half the rate as emissions from the wider economy (National Food Strategy, 2021b) and if things continue as they are, emissions from the UK food system will in fact be four times higher by 2050 than the level that is needed for the UK to meet its Net Zero target (Figure 1).

FIGURE 1: THREE SCENARIOS FOR 2050, INCLUDING THE DIETARY CO₂ EQUIVALENT NEEDED BY 2050 IF THE UK IS TO MEET ITS NET ZERO TARGET (UK CLIMATE CHANGE COMMITTEE)



*includes 20% less meat consumption by 2035, 35% less meat by 2050, 60% less waste by 2050, and farmers using low-carbon practices.

Source: UK Climate Change Committee, Sixth Carbon Budget, 2020

The Climate Change Committee (2023) recommends that in order to reduce UK greenhouse gas emissions to Net Zero we need to urgently transition diets so that we are:

- A) Eating a healthy diet with less animal based food and**
- B) Eliminating food waste as far as possible.**

These two strategies are important given their impact on diet-related GHG emissions. In the UK, meat accounts for the largest proportion of GHGEs associated with diets (32%), with dairy products contributing 14% (Rippin *et al.*, 2021). Additionally, post farm gate food waste is estimated to contribute 25 million tonnes of CO₂, which is equivalent to around 5% of the UK's territorial GHGEs, with the majority (70%) of avoidable post-farm gate food waste generated in the home (WRAP, 2022a).

In this briefing we explore the extent to which the adoption of these two strategies are equally accessible for people living on a low income in the UK compared to those who are better off. This briefing focuses on reducing the GHG emissions associated with our food system, rather than other indicators of environmental sustainability such as water use or biodiversity.

THE KEY MESSAGES IN THIS REPORT

1 To tackle the **climate crisis** and meet the **UK's Net Zero target** there needs to be a strategy for reducing Greenhouse Gas emissions (GHGEs) from the food system. Specifically, there needs to be a reduction in the consumption of animal-based foods and in the amount of food wasted.

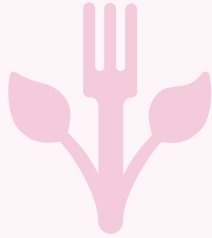


2 While modelling studies suggest that in theory low emission diets can be affordable, in practice such diets can be more costly than current diets

and are often **inaccessible for low income households.**



3 Plant based meat and dairy alternatives currently come with a price premium, while **vegetables are an expensive source of calories in comparison to animal foods.**

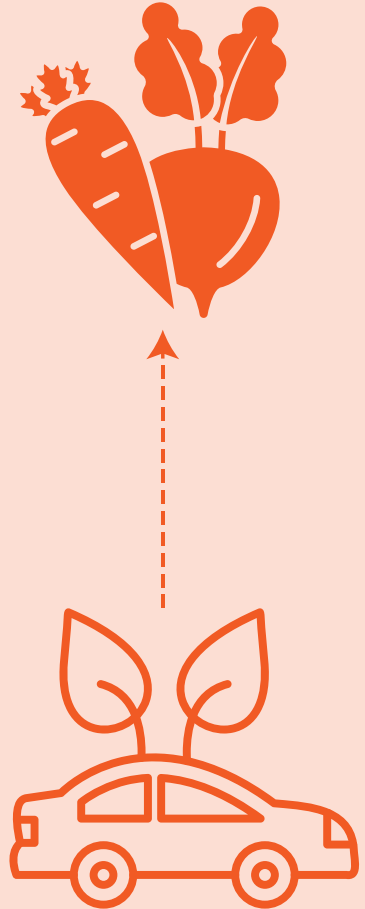


4 **Pulses and legumes** offer an **affordable, lower emission alternative** to meat, with purchases not patterned by socio-economic status. The main barrier to increased consumption of pulses is a lack of appeal and accessibility.



5 The **evidence on income level and food waste is weak**, and it is not clear to what extent household food waste is patterned by socio-economic status with further research required.

6 The government, businesses and investors all have a part to play in ensuring that a shift to **low emission diets does not further entrench existing health inequalities.**



PART ONE

REDUCING THE ENVIRONMENTAL IMPACT OF DIETS

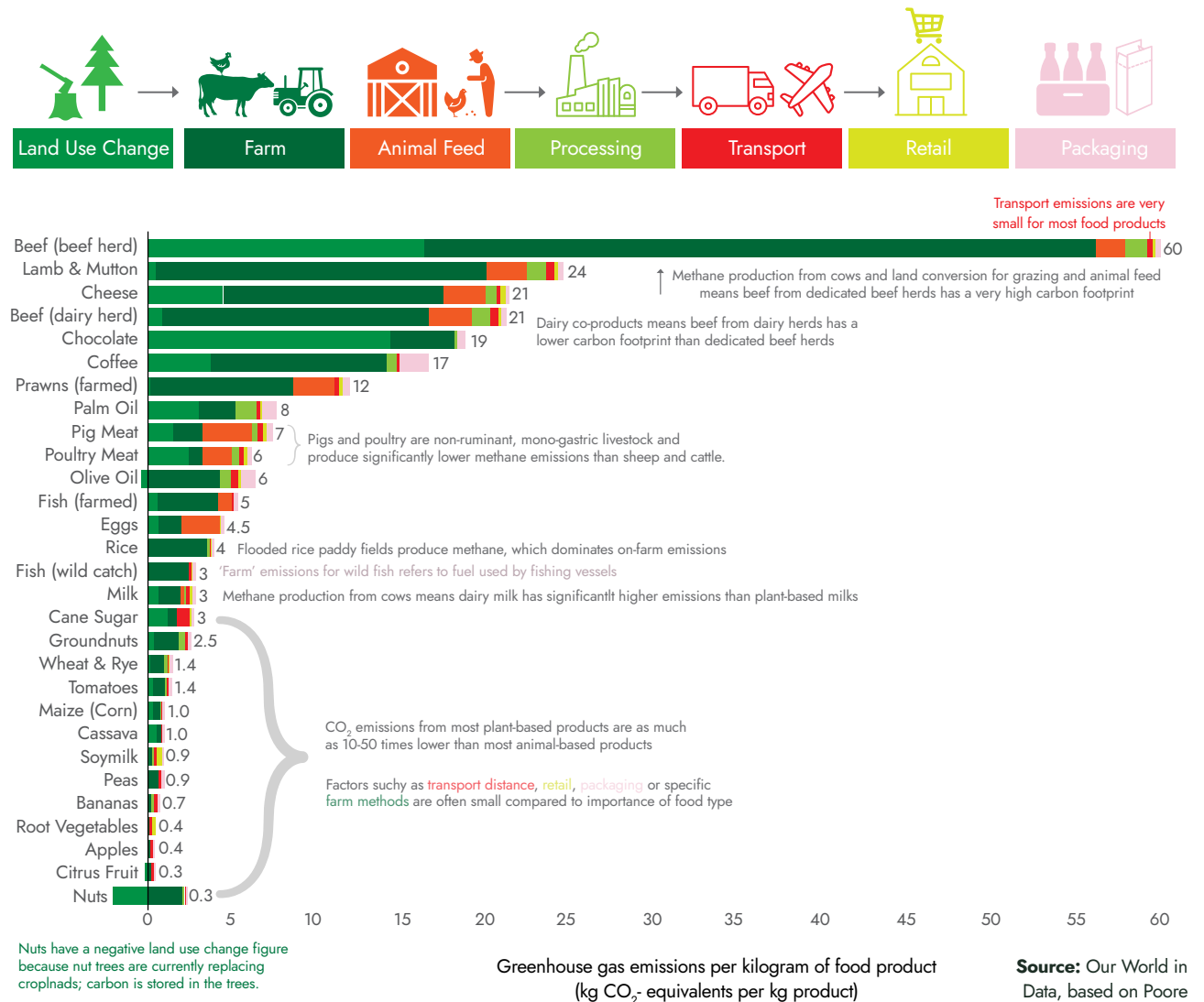
EATING LESS ANIMAL BASED FOOD

While changing how our food is produced is important, it is much less important than reducing consumption of animal based foods for reducing diet-related GHGE. Moreover, the distance which food is transported also plays a relatively small part. Most estimates place emissions associated with food miles at around 6-10% of total food system emissions (Sandström *et al.*, 2018), which is much less than the emissions associated with land use change and on-farm practices. **The largest contributions to diet-related GHGEs will come from animal products even when these are produced using more sustainable production practices (Figure 2 and Figure 3) (Clark *et al.*, 2022).**

This is largely due to the fact that livestock have much higher resource requirements than plant foods, using more land, water and energy. For most animal based foods, 80% of GHGEs result from land use change and farming practices such as the application of nitrogen fertilizers and the production of methane in the stomachs of ruminant animals (Ritchie, 2019).

The amount of meat eaten in the UK is over a third more than the global average (Our World in Data, 2022) and although meat consumption has been falling over the past decade (Stewart *et al.*, 2021), this is too slow a rate of change to meet climate targets.

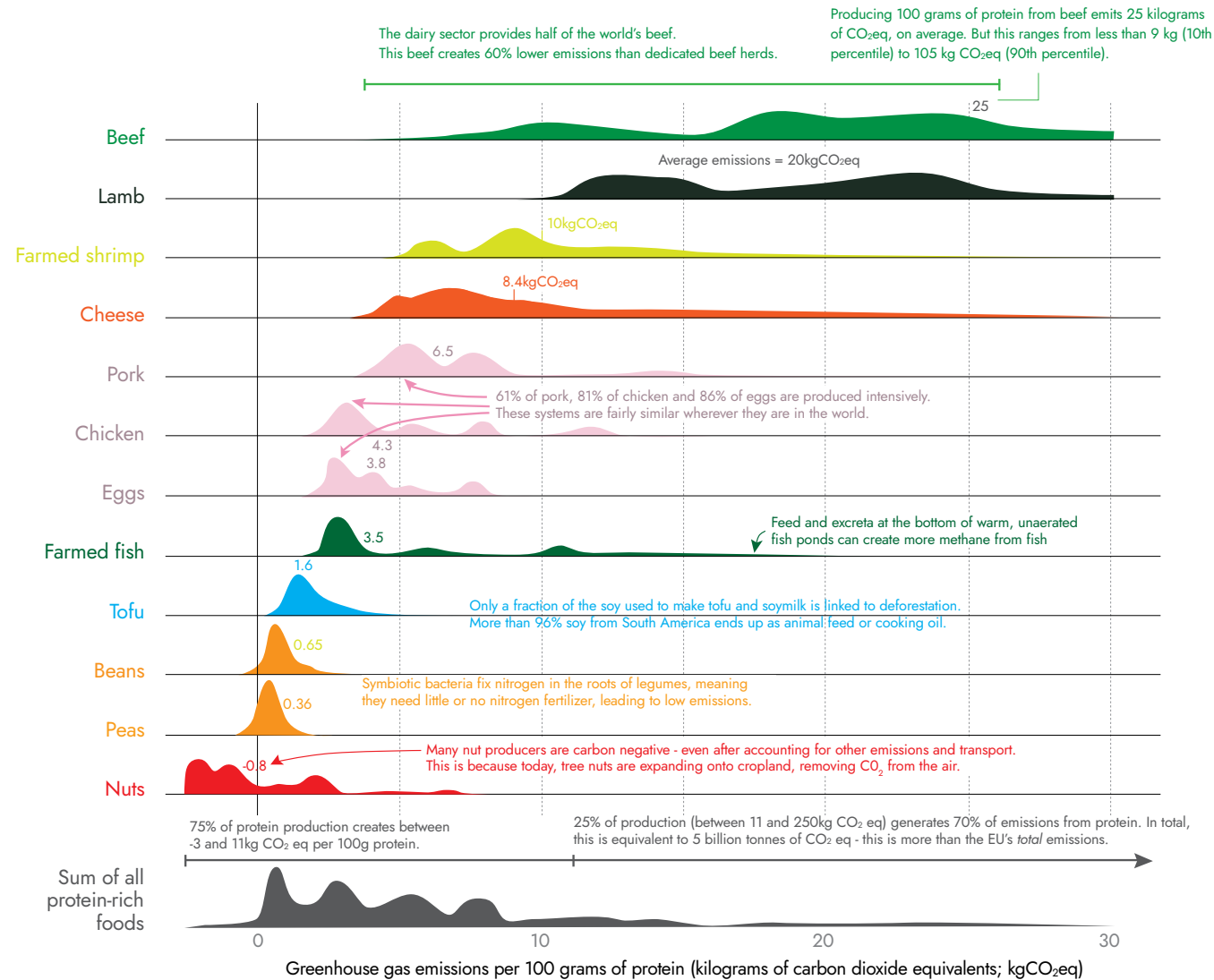
FIGURE 2: GREENHOUSE GAS EMISSIONS PER KG OF FOOD PRODUCT AT ALL STAGES OF THE SUPPLY CHAIN



HOW DOES THE CARBON FOOTPRINT OF PROTEIN-RICH FOODS COMPARE?

Greenhouse gas emissions from protein-rich foods are shown per 100 grams of protein across a global sample of 38,700 commercially viable farms in 119 countries. The height of the curve represents the amount of production globally with that specific footprint.

FIGURE 3: COMPARING THE GREENHOUSE GAS EMISSIONS OF PROTEIN SOURCES AND THE RANGE OF EMISSIONS ASSOCIATED WITH PRODUCTION PRACTICES



Source:
Our World in
Data, based
on Poore and
Nemecek (2018).



WASTING LESS FOOD

In the UK a quarter of all the food grown is never eaten. This wasted harvest accounts for between 6% and 7% of total UK greenhouse gas emissions. There is a lack of data for the amount of food wasted on farms, but post-farm gate food waste contributes 5% of the UK's total GHGs (WRAP, 2022a). The majority of avoidable post-farm gate food waste is generated in the home (6.6 million tonnes per year, or 70% of total post farm gate food waste) rather than by retailers or food service providers (WRAP, 2022a). Because **fruit and vegetables are highly perishable**, they are one of the most highly wasted foodstuffs (Armstrong *et al.*, 2021). The amount of fruit and veg wasted after leaving the farm is 2.7 million tonnes: 30.6% of the total available (Peas Please, 2021).

FRUIT AND VEG WASTED

2.7
million
tonnes

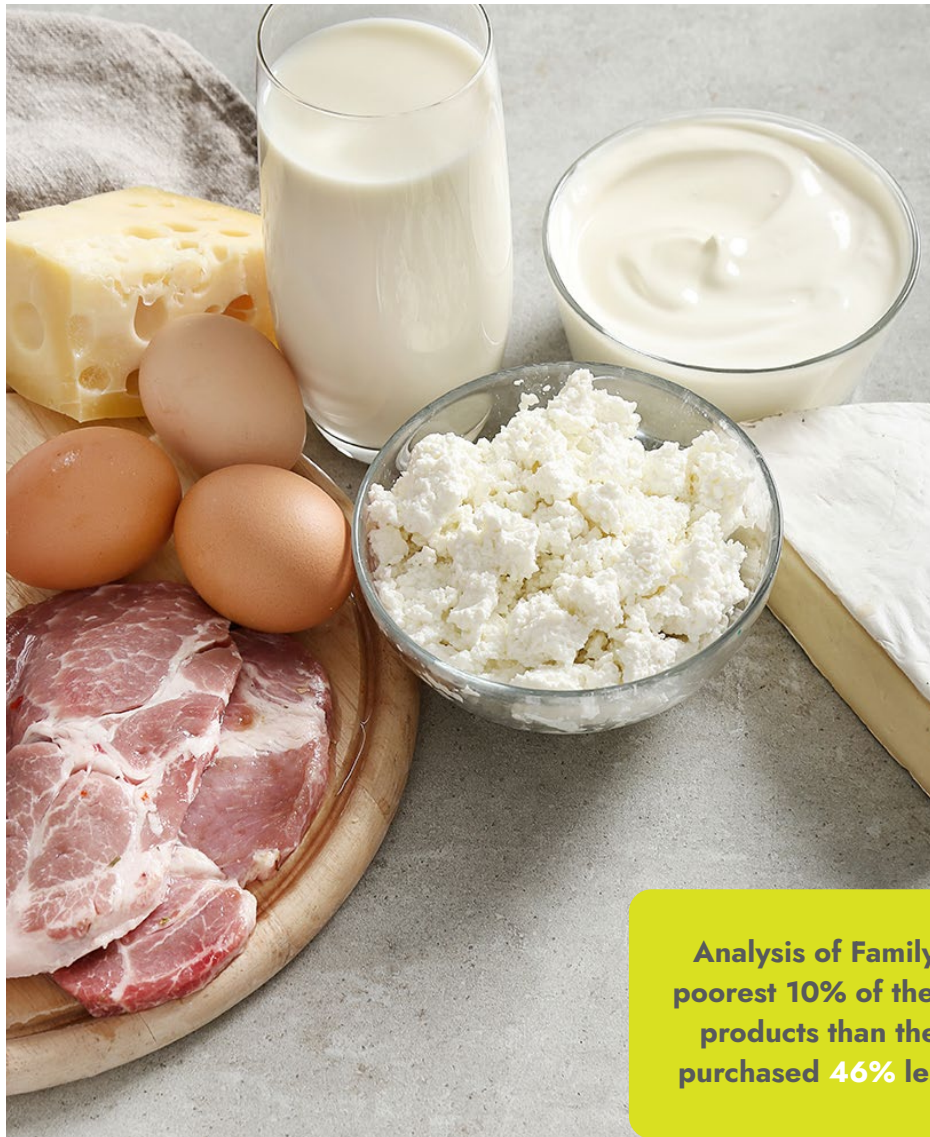


30.6%
of the total
available



PART TWO

**HOW DOES MEAT AND DAIRY CONSUMPTION
AND FOOD WASTE DIFFER BY SOCIO-ECONOMIC
STATUS?**



CONSUMPTION OF MEAT AND DAIRY ACROSS SOCIO-ECONOMIC GROUPS

While total meat consumption in the UK is not patterned by socio-economic status (Stewart *et al.*, 2021), some data show that consumption of red and processed meat is. On average lower income groups eat more than higher income groups with intake associated not just with income, but also with level of education and occupation.

NDNS data shows that the lowest-earning households consume 15.7 g/d more red and processed meat than the highest-earning households (Maguire and Monsivais, 2015).

This briefing found a lack of data on dairy consumption across socio-economic groups. Purchasing data can, however, be used as a proxy for consumption and show that there is a **trend towards low income groups purchasing higher amounts of milk and milk products than higher income groups**. However,

Analysis of Family Food Survey data shows that the poorest 10% of the population bought 16% more milk products than the wealthiest 10%. In contrast they purchased 46% less cheese than the wealthiest 10%.

low income groups buy smaller amounts of cheese compared to higher income groups, with cheese having a much greater environmental impact relative to milk given that large quantities of milk are required as part of the production process. Analysis of Family Food Survey data by the Food Foundation found that the poorest 10% of the population bought 16% more milk products (other than cheese) than the wealthiest 10%. In contrast they purchased 46% less cheese than the wealthiest 10%.

PUBLIC ATTITUDES AND ASSUMPTIONS AROUND SHIFTING TOWARDS LOW EMISSION DIETS

There is only limited research into what drives a willingness to reduce consumption of meat and dairy across socio-economic groups. Government surveys tracking public attitudes toward behaviour change find that low proportions of people report reducing their meat and dairy consumption to mitigate climate change (9% and 5% respectively) with those in higher social grades more likely to be making more changes (BEIS, 2020). Higher socio-economic groups tend to show a greater awareness of the environmental rationale for doing so, but this difference does not emerge strongly in studies looking at actual behavioural outcomes rather than stated intentions to change (Gillison *et al.*, 2021).

There is evidence that low income families would like to move towards more environmentally sustainable diets but cost is a barrier. While people across all socio-economic groups show concern about issues such as health, climate change, the environment and ethics, **low income groups report feeling that it is sometimes difficult to align their food choices with their own values due to the high prices of these foods** (Connors *et al.*, 2022).

Modelling studies using price data often suggest that eating more sustainable diets would have little effect on the price of diets, with more healthy and sustainable

dietary patterns offering potential cost savings in high income countries (Springmann *et al.*, 2021). **Modelling studies using UK diet and price data suggest that it is possible for costs to remain within existing food budget constraints were diets to transition towards lower emissions** (Reynolds *et al.*, 2019; WWF, 2023). However, such studies are often based on averages, despite the changes required for low-income groups being greater than for high-income groups (Reynolds *et al.*, 2019). For example, low-income households whose diets consist of a greater proportion of processed foods will experience a cost burden if they start replacing these foods with fruit and vegetables.

LEVELS OF FOOD WASTE ACROSS SOCIO-ECONOMIC GROUPS

There is some evidence that higher income households waste more food than lower income households (Britton *et al.*, 2014), but socio-economic differences do not appear to be very significant, and self-reporting of **waste may be biased by lower income and food insecure families being more conscious of waste than higher income families** (Armstrong *et al.*, 2021). Population level interventions targeting household food waste may therefore be effective without segmenting households by income level. WRAP models suggest that interventions which focus on changing behaviours and increasing awareness of food waste are likely to be more effective in reducing waste than factors which affect the affordability of food (Britton *et al.*, 2014). Further real-world research is required to better understand how socio-economic status impacts on food waste behaviour in the home.



PART THREE

**WHAT ALTERNATIVES TO ANIMAL FOODS
SHOULD WE BE EATING MORE OF?**

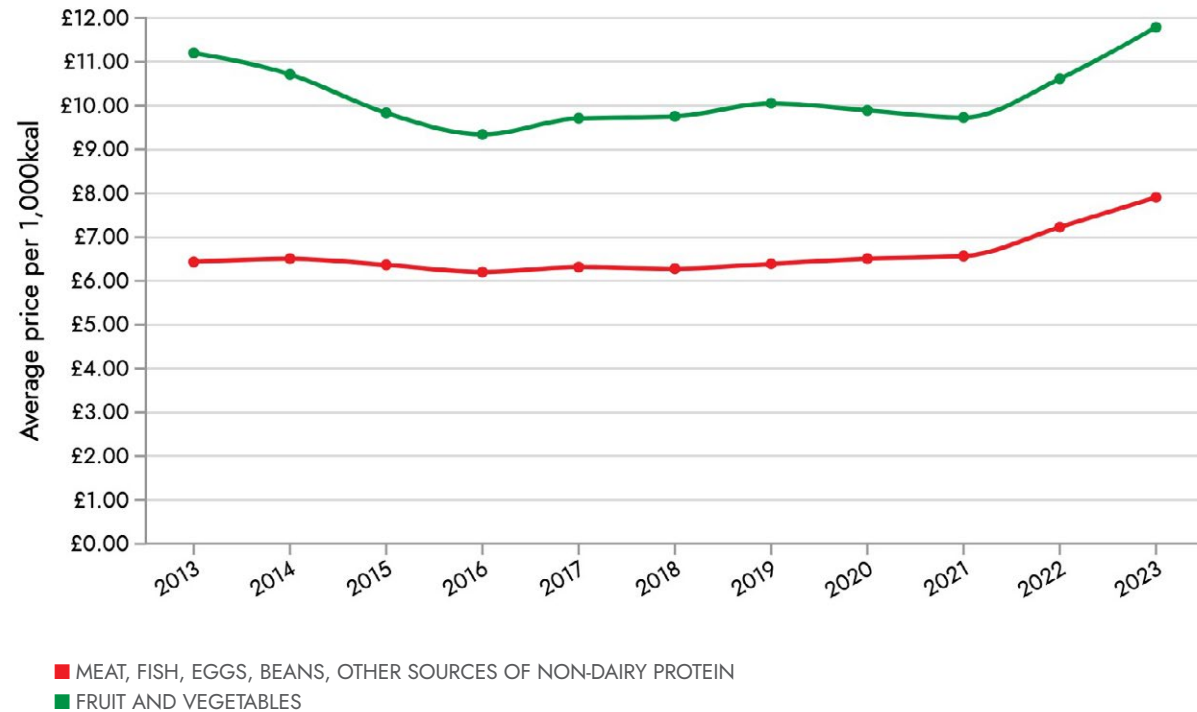
Dietary patterns associated with low levels of greenhouse gas emissions include substantially more fruits, vegetables, wholegrains, nuts, pulses and legumes than are eaten on average in the UK (BDA, 2020; National Food Strategy, 2021b). Adhering to the Government's Eatwell Guide recommendations is estimated to result in a 30% reduction in greenhouse gas emissions, yet currently only 0.1% of the UK population eat in line with the recommendations (Scheelbeek *et al.*, 2020).

While current levels of total meat and dairy consumption are not markedly different between higher and lower income families, the alternatives to eating meat and dairy vary in their degree of accessibility to low income households. There are three main substitution groups for meat: vegetables, pulses and alternative meats.

VEGETABLES

Currently vegetable consumption is highly patterned by socio-economic status. Low income families eat at least a portion less per person per day than high income families, pointing to multiple barriers for these households (Peas Please, 2021). **Only 58% of households in the lowest income decile reach dietary recommendations for fruit and veg compared to 88% of those on higher incomes** (National Food Strategy, 2021). Vegetables are a more expensive source of calories than meat and fish, and often require more preparation and cooking time, as well as skill to prepare. Fruit and vegetables are the most expensive Eatwell Guide food category by a significant margin, costing on average £11.79 per 1,000kcal (**Figure 4**).

FIGURE 4: THE AVERAGE PRICE OF FOOD AND DRINK PER 1,000 CALORIES BY EATWELL GUIDE



Source: The Broken Plate report, 2023

IN ADDITION TO COST, LOW INCOME FAMILIES FACE A NUMBER OF ADDITIONAL BARRIERS IN ACCESSING AND COOKING VEGETABLES.



- Appliance poverty and limited cooking and storage facilities.** Eating more vegetables and pulses can often involve more cooking. However, in the UK **1.9** million low-income households are without a cooker and **2.8** million without a freezer (Turn2us, 2020). The current cost-of-living crisis is leading to increasing numbers of people turning off fridges and freezers in response to increasing energy costs (The Food Foundation, 2022a).
- Limited availability of low emission foods in deprived communities.** In the most deprived fifth of local authorities **31%** of places to buy food are defined as fast-food outlets compared to **22%** in the least deprived fifth of local authorities (Food Foundation, 2022). Such outlets often have menus that are dominated by dishes centred around animal based foods (Huang *et al.*, 2022).
- Limited bandwidth and time.** A greater amount of time spent on home food preparation is associated with an increase in vegetable consumption (Monsivais, Aggarwal and Drewnowski, 2014). However, people working in low-paid jobs often have the least amount of protected time, with unpredictable shift patterns and less autonomy over working hours (Resolution Foundation, 2022).

Beyond barriers specific to low income households, alternatives to animal based foods such as vegetables and pulses are often perceived to be less appealing and desirable, with food advertising and promotions skewed in favour of higher emission foods. Approximately **9%** of food advertising is spent promoting meat and dairy, compared with just **1%** spent on fruit and vegetable promotion (Food Foundation, 2023). A 2021 study found that four of the UK's largest supermarket chains use multi-buys or price reductions to sell greater volumes of meat (Haan *et al.*, 2022).

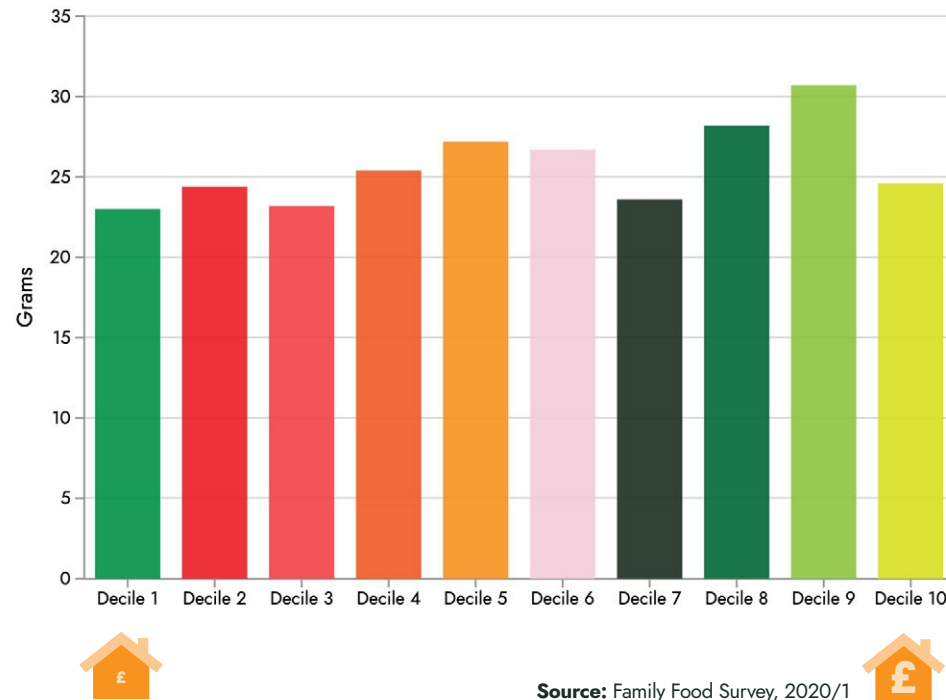
PULSES

Consumption of pulses does not appear to vary significantly by socio-economic group. Average household pulse purchases in the UK are low across all socio-economic deciles (**Figure 5**) with individuals purchasing an average of just 28g per person per week (DEFRA, 2023). Pulses offer a cheaper protein alternative to meat and could offer welcome opportunities for cost savings for low income families when there are not additional barriers to cooking. In addition, pulses are often purchased in dried and tinned forms meaning that they often have a longer shelf-life than fresh foods, which can help to reduce food waste.

There is some evidence to suggest that low levels of purchasing and consumption predominantly result from the poor availability of pulse-based food options as well as low levels of familiarity and social acceptability with these products. Time, knowledge, and the perceived difficulty of cooking with pulses are the main barriers to increased consumption rather than price (Henn *et al.*, 2022).



FIGURE 5: AVERAGE PURCHASE OF PULSES PER DECILE PER WEEK PER PERSON



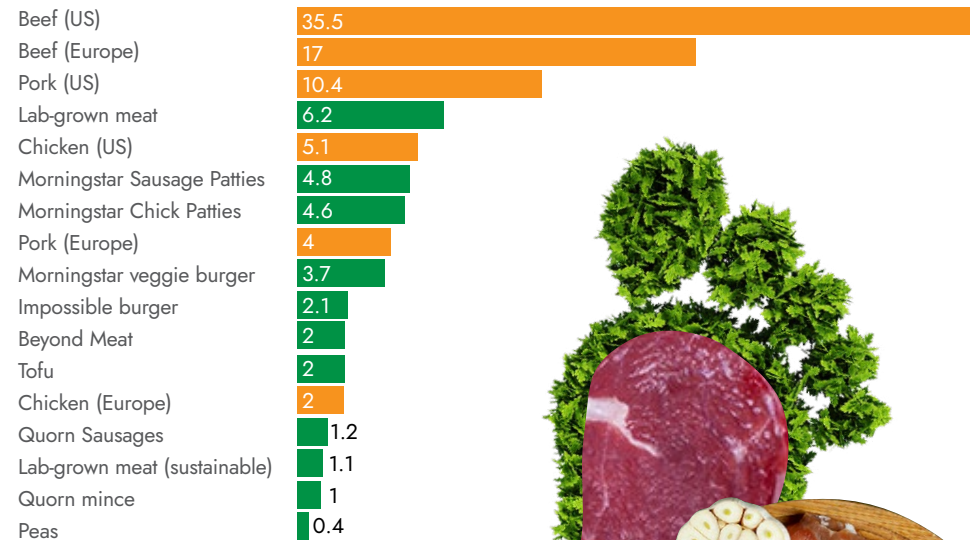
Note: We categorised the following as pulses in our analysis, including pulses, legumes and beans; fresh peas and beans, canned peas and beans, dried pulses, frozen peas and beans.

ALTERNATIVE PLANT BASED MEAT PRODUCTS

While a shift towards less processed, plant foods ought to be the ultimate goal of strategies to reduce diet-related GHGs given the co-benefits for health, the market for plant based meat alternatives has grown exponentially in recent years with a multitude of meat alternatives now available. The vast majority of these come with significantly reduced GHGs, (Figure 6) although their nutritional profile is highly variable.

FIGURE 6: THE CARBON FOOTPRINT OF MEATS AND POPULAR MEAT SUBSTITUTES

Emissions based on life-cycle analyses which include agricultural production, animal feed, raw materials, processing, transport and packaging. This is measured in kilograms of carbon dioxide-equivalents per 100 grams of protein.



■ PLANT-BASED AND MEAT SUBSTITUTES
 ■ MEAT AND DAIRY



Source: Hannah Ritchie, 2022, Substack

PART THREE

WHAT ALTERNATIVES TO ANIMAL FOODS SHOULD WE BE EATING MORE OF?

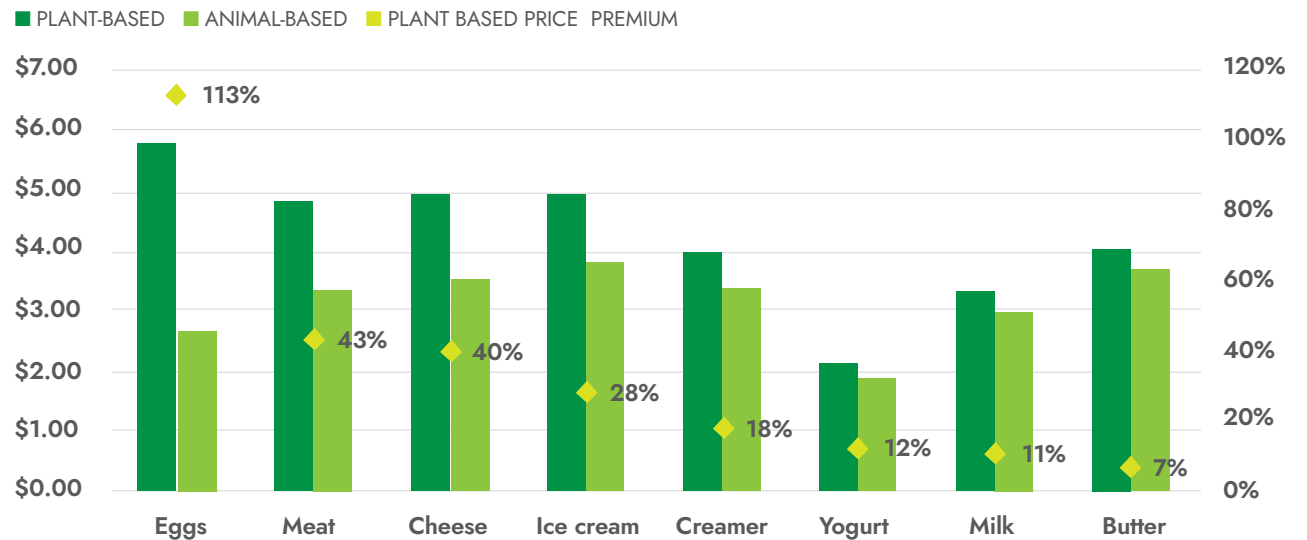
Plant based meat alternatives are products made from plant proteins such as soy, pea, nuts, oats and mycoproteins that are designed to imitate the taste and texture of their animal-based equivalents. A key advantage of plant based meat alternatives is that they avoid the feed-to-food conversion loss typically associated with animal protein. It is estimated that **1.3 kg** of arable crops are needed to produce **1 kg** of plant-based meat compared with **7-10 kg** of feed per kg for beef (Frezal, Nenert and Gay, 2022). Meat alternatives can also act as a helpful bridge for citizens whose usual diets are centred around meat, encouraging them to reduce the amount of meat they are eating without having to radically shift their habitual cooking and eating patterns. However, the health and nutrition profile of such products can vary considerably, with some containing higher levels of salt and saturated fat than their animal based equivalents (Alessandrini *et al.*, 2021; Frezal, Nenert and Gay, 2022). Further research into the nutrient profile of plant based meat alternatives is required to ensure that there aren't unintended consequences for public health in promoting them.

In the UK plant based meat products are currently priced at a premium - approximately **32%** higher than their meat alternatives (Good Food Institute, 2021) (**Figure 7**). Eating Better's sandwich survey showed plant based sandwich options were the most expensive (**£3.25** on average) (**Figure 8**), while vegetarian sandwiches were the cheapest at an average of **£2.48** (Eating Better, 2022b). However, their surveys of ready meals show that prices of plant based products have been declining relative to meat based products which is promising (Eating Better, 2021). Nonetheless, of the major UK retailers the Co-operative Group is currently the only one with a commitment to cutting the cost of its plant-based range to match the price

of equivalent meat and dairy-based products (Whitfield, 2021). Prices are expected to decline as the market grows, and growth appears to be rapid; in the UK, the proportion of people consuming plant based alternatives doubled between 2008/2011 and 2017/2019 (from **6.7** to **13.1%**) (Alae-Carew *et al.*, 2022). However, the price premium may put these options out of reach for many on lower incomes, with research already suggesting that in the UK, high income households are more likely to purchase plant based alternatives (Alae-Carew, 2021) than those on a lower income.



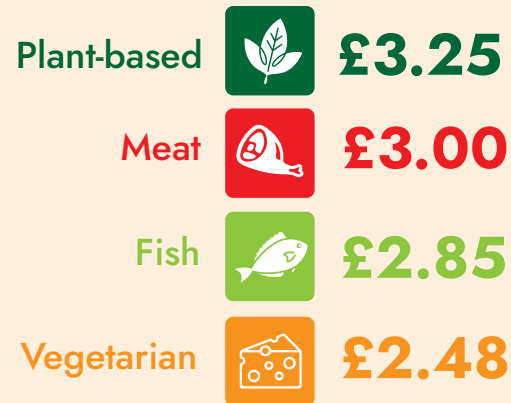
FIGURE 7: THE AVERAGE UNIT PRICE OF PLANT BASED VS. ANIMAL BASED PRODUCTS BY FOOD CATEGORY



Source: The Good Food Institute

Note: Not controlled for variable unit sizes. The data is based on custom GFI and PBFA plant-based categories that were created by refining standard SPINS categories. Due to the custom nature of these categories, the presented data will not align with standard SPINS categories. Source: SPINscan Natural Enhanced Channel, SPINS Conventional Multi Outlet Channel (powered by IRI) 52B weeks ending 12-27-2020

FIGURE 8: THE AVERAGE PRICE OF SANDWICHES SOLD IN UK SUPERMARKETS

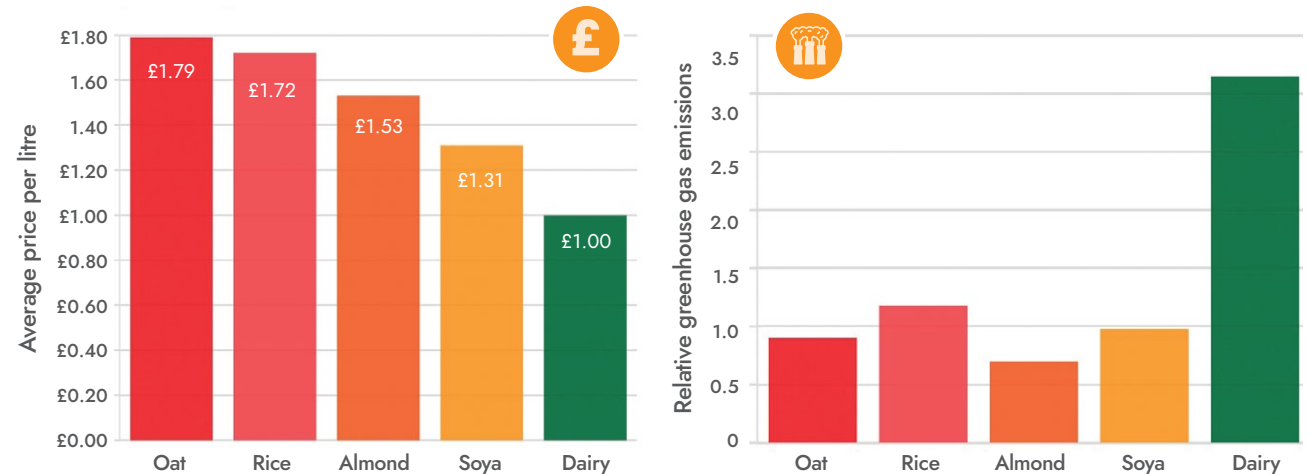


Source: Eating Better (2022)

DAIRY ALTERNATIVES

The main option for reducing dairy consumption is to switch to plant based equivalents. Like alternative meats, these products come with a significantly smaller carbon footprint than their dairy counterparts and, if fortified, largely match dairy's content of calcium, iodine and vitamin B2 (although they tend to be lower in vitamin B12). Like alternative meats, plant based milk alternatives in the UK are more expensive than dairy milk (The Food Foundation, 2022) (Figure 9). **Oat and rice are the most expensive alternatives at £1.79 and £1.72 per litre respectively.** Soya is marginally more affordable at £1.31 per litre. By contrast, **dairy milk is just £1.00 per litre** on average based on cow's milk sold in 2 pints. Again, the market is growing rapidly and so prices can be expected to fall; an estimated one in three people in Britain are now drinking plant-based milks (Mintel, 2021).

FIGURE 9: THE AVERAGE PRICE OF DAIRY MILK COMPARED TO PLANT-BASED ALTERNATIVES (LEFT), AND THEIR RELATIVE GREENHOUSE GAS EMISSIONS



Source: The Broken Plate report, 2022

What are the solutions to wasting less food and how available are they?

This briefing found a lack of real-world, empirical evidence measuring the impact of different solutions for reducing household food waste (Kandemir *et al.*, 2020). Despite levels of food waste falling during the early months of the Covid-19 pandemic, household food waste levels quickly rebounded as routines returned to normal (WRAP, 2022b).

Messaging, citizen engagement, and changes in packaging and labelling by retailers ought to be developed with the specific needs of different socio-demographic (as well as socioeconomic) groups in mind, based on an understanding of the constraints different groups of people might face. The Waste and

Resources Action Programme (WRAP) currently work with retailers and manufacturers on changes to food product design, labelling, and packaging to support households to reduce food waste. Strategies include implementing clear and consistent date labelling and storage guidance, removing best before dates, improving freezing instructions and developing more appropriate pack sizes and formats – for example offering more loose produce (Quested and Luzecka, 2014). More research into levels of food waste among different socio-economic groups and the factors that influence this is required in order to produce make informed recommendations, but there is certainly a need for the retail sector to better support all consumers in reducing food waste.

PART FOUR

CONCLUSION AND RECOMMENDATIONS

CONCLUSION

If the UK is to meet its Net Zero target emissions from the food system will need to be reduced. This will need to involve a reduction in the consumption of meat and dairy products. This briefing finds that low-income households confront a range of barriers in accessing and affording both plant-based meat and dairy alternatives and plant foods such as vegetables. These barriers include food prices, low incomes, appliance and fuel poverty and the physical food environment. Pulses are an exception, offering a low cost and low emission alternative to meat. There is a real opportunity in the UK to champion and better promote pulses in order to increase their appeal and availability. Reducing levels of household food waste will also be required in order to reduce food system related emissions, but further research is required into socio-economic patterns and drivers of food waste.



RECOMMENDATIONS

Action from multiple stakeholders will be necessary in order to make sure that the required shift away from animal source food and a reduction in food waste by all households, including those on a low income, is possible. Specifically:

1 Make low emission foods such as vegetables and pulses more affordable, available and appealing for everyone

GOVERNMENTS SHOULD:

- Recognise the need to transition UK diets towards less meat and ensure a strategy for achieving this forms part of the government's Net Zero strategy. Currently the government's Net Zero strategy includes support for decarbonising the agriculture sector by supporting farmers to take up low carbon practices and technologies, but there is no acknowledgement of the need to shift diets, in contrast to the independent Climate Change Committee's recommendations.
- Strengthen government procurement rules for schools, hospitals, prisons, and other public spaces where food is served through a review of the Government Buying Standards for Food. This should be in line with the four key dietary shifts identified within the National Food Strategy and ensure two portions of vegetables with every meal. The current requirement for schools to serve meat twice a week should be removed.

- Support the production and increased consumption of fruits, vegetables, and legumes. Specifically, there should be a strategy in each of the devolved nations for an expanded, vibrant, and thriving horticulture sector.
- The forthcoming Land Use Framework must ensure that UK agricultural land produces more low emission foods. It should acknowledge that dietary change, including a move towards less but better meats, offers the biggest opportunity to release land for carbon sequestration (such as the planting of more trees) and nature.
- Improve the appeal of low emission foods. For example, by restricting marketing for meat-based HFSS foods and removing the loophole in the HFSS regulations which currently excludes red and processed meat from falling within scope of location based promotions for HFSS foods.
- Introduce mandatory reporting for large food businesses to de-risk business investment in more healthy and sustainable food offerings. This ought to include a consistent set of metrics for measuring and reporting on food waste, the proportion of animal versus plant-based protein sales, the proportion of sales from healthier foods, and the proportion of fruit and vegetable sales.

BUSINESSES AND INVESTORS SHOULD:

- Support mandatory reporting and the government's Food Data Transparency Partnership, to agree consistent metrics for tracking food waste and sales of fruit and vegetables and plant-based proteins.
- Invest in advertising of fruit, vegetables and pulses.

2 Make meat and dairy plant based alternatives more affordable, available and appealing for everyone

GOVERNMENTS SHOULD:

- › Use fiscal incentives to rebalance the cost of the basket, for example extending the removal of VAT from plant based milk alternatives to plant-based meat alternatives too (meat and dairy are currently VAT exempt) and looking at tiered VAT rates on low emission food served in the out of home sector.

BUSINESSES AND INVESTORS SHOULD:

- › Improve and invest in the appeal, affordability, taste, and nutritional profile of plant based meat alternatives. This ought to include product reformulation, point of sale measures, and increased promotion of plant based foods through advertising and marketing.
- › Offer plant based alternatives at price parity with animal based food alternatives.



3 Make waste reduction easier for everyone

BUSINESSES AND INVESTORS SHOULD:

- › Engage in collaborative industry initiatives such as WRAP's work on food waste and GHGEs to accelerate progress in supporting households to reduce food waste.

RESEARCH GAPS

This briefing has highlighted significant data gaps. There are opportunities for research organisations, NGOs and civil society organisations to address these, including conducting:

- An up-to-date analysis of the purchasing decisions of low-income households, including a review of purchasing drivers across all socio-economic groups.
- Analysis of drivers and patterns of food waste across socio-economic groups.
- An analysis of the sustainability impacts (including GHG and land-use impacts) of typical diets across all socio-economic groups, the costs of these diets, and assessment of how diets across each socio-economic group will need to shift to meet the UK governments net zero commitments. Any analysis should include a review of the acceptability of healthy, sustainable diets in the context of social norms.
- Qualitative studies on the experiences of low-income households in relation to dietary shifts and their barriers which will inform behaviour change strategies for sustainable food systems.

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