# Is the UK ready for plant-based diets?



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This report should be cited as:

Sajeev E.P.M., Martin R., Waite C., Norman M. (2020). Is the UK ready for plant-based diets? Report produced for the Global Food Security Programme. December 2020. Available online at www.foodsecurity.ac.uk/publications

This report was edited and prepared by Carrie Bewick on behalf of the Global Food Security programme. Its findings originate from a Global Food Security Policy Lab, and do not necessarily reflect the policy positions of GFS or its individual partners.

### Executive summary

Driven by a range of factors, from increasing awareness of environmental sustainability, climate change and health concerns to social media influences and shifting societal norms, a sizeable proportion of the UK population are actively reducing their consumption of animal-based products. This shift in appetites towards more plant-based diets is one of the standout emerging food trends in the UK today and one with the potential to impact our food system in significant ways. In this Think Piece, we ask whether the UK food system is ready to adapt to a shift towards more plant-based diets, both in terms of capitalising on the opportunities and minimising the risks the trend presents. Given that we find ourselves at a crossroads in the food and agricultural policy landscape, we believe there will never be a better time to address this challenge and harness the potential economic, public health and environmental benefits.

The roles and consequences of meat and other animal-derived products in our society are the subject

of a highly polarised public debate, fuelled to an extent by the agendas of advocacy groups, cherrypicking of scientific evidence and unbalanced media coverage. Some see the plant-based movement not only as a challenge to the traditional diet enjoyed in the UK but also as an existential threat to the rural economies built around livestock. At the same time, whilst the evidence in support of plant-based diets is indeed growing, there is a risk that scientific research presents idealised solutions that would require an unrealistic upheaval of the food system. This Think Piece is therefore motivated by our concern that polarised echo chambers and siloed thinking stand in the way of constructive and pragmatic change. By calling on a diverse spectrum of experts and stakeholders for evidence and recommendations, we have aimed to bring both sides of the debate together in search of common goals and realistic compromises. We specifically focus on recommendations that are backed by successful case-studies and already have grass-root level support in the UK.



#### Are we ready?

This Think Piece asks whether the UK currently has policies in place to capitalise on the opportunities and mitigate the risks presented by a shift towards plant-based diets, assuming this trend continues. In particular, we focus on producers and consumers as the two stakeholder groups likely to be most significantly affected. In areas of 'unreadiness', we recommend possible interventions.

Agricultural and economic policy can help us minimise the risks to producer livelihoods and UK food security and capitalise on opportunities for a more sustainable and diverse food system, which may include increased production of protein crops, cultured meats and milk alternatives. Currently, producers face barriers to positive change, including a lack of knowledge, support, and necessary infrastructure for new practises, alongside strong economic disincentives in the form of subsidies and locked-in capital.

Our recommendations include:

- Rethink financial incentivisation to encourage more sustainable practises and enhance beneficial ecosystem services.
- Increase production and diversity of protein crops, fruit and vegetables in regions deemed most suitable for land-use changes.
- Expand support networks to allow farmers to share best practices and encourage more collaborations between researchers and practitioners.

We also suggest ways in which consumers can be provided with the skills and information to make healthier, more sustainable decisions about their diet. In this way, potential public health and environmental benefits can be maximised, while risks such as nutritional deficiencies are minimised. Currently, government dietary guidelines are neither effective nor up to date with scientific evidence. Informed adoption of a plant-based diet is further inhibited by cultural attachments to food and the highly polarised nature of the debate.

We recommend to:

- Make dietary health guidelines and education more accessible, up-to-date and relevant to a range of diets and values.
- Redesign public sector food environments to increase awareness and accessibility of healthy plant-based food choices.
- Leverage the potential of frontline healthcare in positive behavioural change via dietary counselling.
- Promote a better understanding of food system sustainability, allowing consumers to make informed buying choices.



## The challenge

The adoption of plant-based diets among the UK population is clearly on the rise. But are we ready to capitalise on the opportunities presented and mitigate any associated risks if this trend continues?

With 2020 seeing both a post-Brexit Agricultural Bill being debated in Parliament and a landmark National Food Strategy in development, it is clear that we are experiencing a fundamental rethinking of domestic agriculture. Furthermore, COVID-19 has not only forced major changes in our cooking, eating, and shopping habits but exposed weaknesses in our food system as a whole. A plantbased future is not necessarily a meat-free future. However, the UK food system, and our wider policy climate, is going to have to adapt to support the transition in a way that promotes public health, environmental sustainability, economic growth, and social justice.

#### Growth of plant-based diets in the UK

Plant-based diets are on the rise in the UK, with approximately a quarter of the population now adopting meat-free or meat-reduced diets (1-2% vegan, 5-10% vegetarian, 15-20% flexitarian)<sup>1-4</sup>. Approximately 60% of vegans and 40% of vegetarians have adopted their meat-free diets within the past five years alone<sup>5</sup>. The Vegan Society estimates the number of vegans to have grown from 150,000 in 2014 to 600,000 in 2019, with a record 400,000 non-vegans signing up to Veganuary in 2020. However, the trend is largely driven by meat-eaters and flexitarians who are trying to reduce, but not entirely eliminate, meat (Figure 1).

Key drivers of the trend include:

- Increased consumer awareness of negative environmental, health and animal welfare implications of meat and dairy consumption.
- Increased commercial investment in plantbased products and vendors, resulting in better-tasting and more varied plant-based alternatives.
- Social media and lifestyle 'influencers' as well as celebrity chefs making plant-based diets appealing and fashionable.

#### What is a plant-based diet?

In this report, the term 'plant-based' encompasses a range of diets, all with the common aim of reducing consumption of meat and other animal products and increasing the proportion of food derived directly from plants or fungi. Society and the media use various terminologies to refer to the different degrees to which consumers might reduce their consumption of animal products. Familiar terms such as vegetarian (avoiding meat and fish) and vegan (avoiding all animalderived products) are now used alongside newer terminology such as 'flexitarian', describing a non-exclusionary diet with reduced amounts of animal products.



#### A third of meat-eaters are actively trying to cut down on meat



#### "I am actively trying to reduce my meat consumption"

Figure 1: Of consumers who identified as meat-eater or flexitarian, one third stated that they would like to cut down on the amount of meat they eat. Survey results were drawn from a sample population including 73% meat-eaters and 14% flexitarians.

Consolidated figures were adapted from YouGov's analysis<sup>4</sup>

Whilst these causative drivers look set to persist, the trend may be further amplified by natural demographic change as young people are more likely to adopt plant-based diets than older groups<sup>4</sup>. It is estimated that vegetarians and vegans will make up 25% of the UK population by 2025, and flexitarians just under 50%<sup>3</sup>.

Current and future global challenges will also shine additional light on health and environmental issues and could influence consumer behaviour. The COVID-19 pandemic made a vegan diet more appealing to a quarter of 21 to 30-year-olds<sup>6</sup>. As emerging zoonotic pathogens can often be linked to livestock production, the risks associated with an animal-based diet may be forefront in the minds of future consumers.

#### **Our approach**

UK food and agricultural systems will need to adapt to the continuing trend towards more plant-based diets. In this Think Piece, we have looked to identify the key impacts of this trend on public health and the environment, as well as the opportunities and risks it presents for producers and consumers.

The UK food system spans multiple industries, employing one in eight of the national workforce<sup>7</sup>. Given this size and complexity, a whole system approach must be taken to understand the real impacts of trends and narrow down the most effective policy interventions. Through in-depth interviews, we draw on the expertise of 29 relevant food system stakeholders, from farmers and industry experts to policy advisors and advocacy groups.

We focus our scope on producers and consumers specifically, since we consider these stakeholder groups to be facing more substantial risks than other components of the food system such as manufacturers and retailers, who may be less affected by the trend or more able to adapt to change. Critically, we sought to assess the readiness of these two groups and explore how policy could support them through the transition to a more plant-based food system whilst ensuring food security, good public health and environmental sustainability. We note that the UK agricultural system provides many vital products and services beyond food, such as textiles, timber and pharmaceuticals. Whilst these are outside the scope of this Think Piece, we recommend that they should be considered in discussions of agricultural policy more widely.



### State of the UK food system



Estimated cost of eating according to the Eatwell Guide vs. average food spend by the least affluent 10% of the UK population (£/person/day)National Food Strategy (2020)

72% of UK land is utilised

DEFRA (AUK 2019)

20%

crops

52%

agricultural land



Only 25% of people eat 5-a-day fruit and veg National Food Strategy



Percentage of people who are overweight or obese in the UK NHS (latest data, 2018)



Percentage of UK consumption from UK production DEFRA (AUK 2019)

#### Public Health England Dairy Poultry £34,000 Subsidies £11,800 Cereals Agriculture and diversified income £39,000 Horticulture £4,300 Grazing Pigs £15.000 Grazing Ó

Proportion of profit from subsidies in different farm types DEFRA (Farm Business Income by type of farm in England, 2018-19)

### Potential impacts

**Health** is a key motivator for consumers transitioning to plant-based diets. But reducing animal product consumption doesn't automatically make a diet healthy. What are the risks and opportunities associated with plant-based diets for individuals and society as a whole?

Alongside other socio-economic and lifestyle factors, there is no doubt that diet impacts health, both at individual and population levels. Poor diet is responsible for one in seven deaths in the UK<sup>8</sup>. With obesity shown to be a key risk factor for COVID-19 mortality, the relationship between diet and public health has been thrust into the spotlight. While the growing trend towards plant-based diets poses specific challenges for both individuals and the health sector, recent scientific evidence suggests there are likely significant positive public health opportunities that come with reducing meat consumption and choosing plant-based alternatives.

#### **Nutritional deficiencies**

A primary concern regarding some plant-based diets is that the complete exclusion of animal-sourced foods can result in nutritional deficiencies that can only be remedied, if at all, by very careful diet management and supplementation. According to YouGov<sup>43</sup>, 44% of the UK population believe meat is a critical source of protein and therefore has a protective health benefit. In reality, the UK consumes far more protein than needed<sup>9</sup>, while the requirement for a complete amino acid spectrum can safely be met via a balanced mix of plant-based protein sources, including legumes, nuts and whole grains<sup>10</sup>. Considering many individuals



consume excess protein, a reduction in meat intake to recommended levels would still provide ample protein, requiring no replacement with plantbased proteins.

Beyond protein, minerals typically associated with animal products such as calcium, iron, zinc and iodine can also be obtained from plant-based sources (Figure 2a)<sup>11</sup>. However, due to the variable levels of enrichment or bioavailability of nutrients in different foods, careful dietary planning, and higher consumption of specific foods, may be necessary to satisfy nutritional requirements. Food products can also be fortified with nutrients, as is the case for calcium in plant-based milk alternatives, and B group vitamins and iron in breakfast cereals. Vitamin B-12 is the only essential nutrient that cannot be obtained directly from conventional plant-based sources, currently necessitating vegans to take a tablet supplement or consume fortified food. More recent technologies such as biofortification (breeding crops to produce specific nutrients) have also been suggested as a general approach to meeting nutritional needs<sup>12</sup>.

Overall, looking across all diets, the latest National Diet and Nutrition Survey (NDNS) of eating habits across the UK suggests that the average population intake of iron, calcium, zinc and iodine is well below guideline levels (Figure 2b)<sup>9</sup>. Therefore, whilst a diet that completely excludes meat and dairy products requires attention to specific micronutrients, the same is also true for many omnivores. This highlights the need for accessible and appropriate guidance that accounts for the nutritional challenges posed by different diets, especially those increasing in prevalence, for good public health.

#### The rise of ultra-processed plantbased products

The emergence and increasing popularity of plant-based meat



#### Figure 2.

a. Most necessary dietary nutrients can be sourced from plant-based ingredients. Deficiency in several of these nutrients is widespread irrespective of diet, as highlighted by the percentage of the population satisfying Reference Nutrient Intake (RNI) levels according to 2018 NDNS survey data. (ND: no data for this nutrient).

b. When compared to the healthy reference diet proposed by the EAT-Lancet Commission, European nations are even worse than the global average at fulfilling recommended intake (100%) of key food groups, notably overconsuming red meat and under consuming plant-based ingredients (2016 data). in particular in ready-meal and fast-food contexts, has raised concerns about the possible adverse health consequences associated with the consumption of highly processed foods. Processed plant-based products are readily marketable and, due to their animal welfare and perceived environmental benefits, have proved very popular among individuals with non-health motivations for replacing animalderived products.

substitutes,

This is a potentially widespread problem given that most meat-substitute meals are consumed by omnivores or flexitarians. In general, processed foods incorporate higher levels of sugar, salt, and fat, alongside a reduction in fibre and beneficial nutrients, and are a risk factor in most plant-based and omnivore diets. The National Food Strategy review highlights that more than three-quarters of manufactured food products sold in the UK are deemed unhealthy based on qualitative nutrient profiling systems<sup>13</sup> and a continued trend towards diets high in these foods has been linked to a significant global disease burden<sup>14</sup>. A dietary preference for unrefined and minimally processed whole-foods (whole grains, fruit, vegetables, legumes and nuts), alongside a reduction in processed food intake, significantly reduces the risk of some diseases<sup>15,16</sup>.

With respect to meat substitutes specifically, a recent study has suggested that plant-based foods may not elicit the same health risks as the meat-based foods they are designed to mimic, with like-for-like replacement leading to a reduction in key disease risk factors, namely lower levels of a key biomarker linked to cardiovascular disease (trimethylamine N-oxide), blood cholesterol and weight gain<sup>17</sup>. The growing diversity and popularity of meat-alternative products will no doubt stimulate further research into their health impacts.

### Opportunities for individual and public health improvements

There is a rapidly growing body of epidemiological evidence that replacing animal-sourced foods, in particular red and processed meat, with plant-based foods, either completely or in part, leads to overall positive health impacts. In general, these positive impacts stem from both (a) the direct benefits of consuming a wide range of health-promoting plants and (b) the subsequent crowding out of the harmful components of animal-based products.

Extensive cross-sectional and prospective cohort studies, in which otherwise equivalent groups of vegetarians and non-vegetarians were recruited from the same populations to control for nondietary factors, have associated vegetarianism with decreased risk of diabetes, heart disease and overall cancer incidence<sup>18,19</sup>. Given associations with increased risk of colorectal cancer, in particular, the International Agency for Research on Cancer (IARC) regards processed meat as a carcinogen<sup>20</sup>, a link that has been further confirmed through a large-scale assessment of UK Biobank data on dietary intakes and follow-up cancer incidence<sup>21</sup> among many other cohort studies<sup>22</sup>. Several studies focused on a particularly healthy population in the US make the striking observation that even a low level of red and processed meat consumption can increase the risk of certain diseases and overall mortality<sup>23</sup>. At the same time, regular consumption of fruit, vegetables, nuts and legumes has been correlated with reduced disease risks<sup>24,25</sup>. Overall, the evidence produced thus far suggests that the long-term health of vegetarians is generally good. But more research is required with respect to vegan diets specifically<sup>18</sup>.

The 2019 EAT-Lancet report suggests that a balanced flexitarian diet, including minimal meat and dairy intake, is sufficient to convey public health benefits to almost the same extent as vegetarian and vegan diets. Moreover, the international scientific and clinical consensus reached by the EAT-Lancet Commission was that adoption of a guideline-driven diet (mainly consisting of vegetables, fruits, whole grains, legumes, nuts, and unsaturated oils, with moderate amounts of seafood and poultry and low quantities of red meat, added sugar, refined grains and starchy vegetables and no processed meat) could avert close to two million deaths per year across high-income countries, 97% of the estimate for number of deaths averted with an equivalent vegan diet<sup>14,26</sup>. The maximum intake of red and processed meat recommended by the UK Department of Health is 70g per day, equivalent to two rashers of bacon, which is close to the UK average level of consumption. However, fulfilling the balanced diet proposed by EAT-Lancet would require a sizeable reduction to less than 15g red meat per day. Reducing red meat consumption in such a way could be singly responsible for preventing many diet-related deaths in high-income countries such as the UK<sup>27</sup>.

The **Environment** is at the heart of many consumers' decisions to adopt a plant-based diet. But are plant-based diets always best from an environmental perspective, or is there a role for livestock in a sustainable food system?

There is no doubt that the intensity and extent of modern food production has had detrimental impacts on the environment. These impacts include greenhouse gas emissions, air and water pollution, deterioration of soil health, biodiversity decline and irreversible changes to landscapes. The UK is committed to reducing many of these impacts as part of the move towards 'net zero' by 2050<sup>28</sup>. A transformative change in British farming incorporating environmental improvements is also at the heart of the 2020 Agricultural Bill<sup>29</sup>.

#### **Environmental impacts**

Plant-based products have a higher resource and nutrient conversion efficiency than animal-based products. Translating these conversion efficiencies to environmental impacts shows that emissions, land use, water use, and other environmental impact metrics (per calorie and gram of protein) are generally higher for animal-sourced foods relative to plant-based (Figure 3).



Acidifying potential Acidifying potential  $(g SO_2 eq)$ (g SO, eq) 37% 37 % Eutrophication potential Eutrophication potential (g PO, 3-) (g PO<sub>2</sub>3-) 30% Freshwater use (L) Freshwater use (L) Land use (m<sup>2</sup>) Land use (m<sup>2</sup>) 16% **GHG** Emissions GHG Emissions  $(g CO_2 eq)$ (g CO<sub>2</sub> eq) 28% 100 % 100 % 40 60 40 60 80 0 20 80 0 20

b. Environmental impact of total calories.

d. Environmental impact of total proteins.

Figure 3: (a) and (c) show the total contribution of plant and animal sources to calorie and protein supplied in the UK for the year 2017<sup>30</sup>. (b) and (d) illustrate the environmental impact of total calories and proteins supplied to the UK in 2017 broken down by plant and animal sources.

Environmental impacts for the UK were calculated using estimates from Poore and Nemecek<sup>31</sup>.

However, these analyses are often not balanced for dietary nutrient scores, agricultural production capabilities, and region-specific resource constraints<sup>32</sup>. Interestingly, studies that account for some of these factors show that a health-focused flexitarian diet driven by dietary guidelines can reduce negative environmental impacts to a greater extent than an environment-focused diet in which all animal-derived nutrients are replaced with alternative plant-based sources<sup>26,33</sup>. This is attributed to the efficient utilisation of land and use of human-inedible products as animal feed, without competing for land with food crops<sup>34</sup>.

#### Land-use change and soil health

A transition towards plant-based diets will likely lead to a decrease in domestic demand for UK livestock products. While the resulting reduction in livestock production would generally yield positive environmental outcomes, the situation in the UK which is typically complicated since livestock production is predominantly based on pasture or grassland, which is typically unsuitable for cropping. A shift to plant-based diets might require the UK to increase plant-based outputs through intensification and expansion of existing cropped land. However, further intensification of crop production on existing cropped areas through continuous intensive monocropping or the use of synthetic fertilisers could lead to land degradation. Recent estimates show that around 38% of cropped land in the UK is already degraded<sup>35</sup>, with a cost of over £1 billion a year. Putting more pressure on this land would affect the productivity and nutrient quality of crops, further limiting domestic food supply from cropping systems. Diverse cropping practices such as underplanting or

agroforestry could help to reduce land degradation but may struggle to compete on production efficiency with intensive systems and potentially would need to be supported by economic policies.

An alternative option is to divert land used for livestock towards cropping systems. In the UK, around a third of the cropped area is used to produce animal feed (calculated using AHDB estimates<sup>36</sup>). Reducing livestock could enable conversion of much of this land towards food crops with positive environmental outcomes. However, converting pasture or grazed livestock land to cropland could have severe implications since livestock grazing provides a host of ecosystem services. Conversion of grasslands to cropping systems could lead to a reduction in biodiversity, significant loss of topsoil, higher run-off of nutrients, low soil organic carbon, and loss in soil porosity and water retention capability<sup>37</sup>. Furthermore, ploughing grasslands for crops releases stored carbon, contributing to greenhouse gas emissions in the short term.

While a transition to plant-based diets is often considered environmentally favourable, constraints on land-use, land capability, and soil health might hinder a transition of UK agriculture from livestock to cropping systems or a further intensification of existing crop production. A third scenario, therefore, might see the majority of pasture or grass-based UK livestock production systems maintained but a higher proportion of our livestock products exported. This could reduce the need to convert additional land to pasture elsewhere in the world.

#### Changing trade patterns

A shift towards plant-based diets will have implications for trade and its associated environmental impacts. Nearly half of the greenhouse gas emissions associated with UK food consumption are produced abroad<sup>38</sup>, as are many other negative social and environmental consequences of food production. These so-called negative externalities are not consistently accounted for in official estimates of the UK's emission footprint.

A shift towards plant-based foods could reduce global environmental impacts by reducing the demand for UK imports of meat, dairy, and animal feed. However, given fruits and vegetables constitute a bulk of our imports, a shift to plant-based diets, without leveraging domestic production, could lead to higher imports of some plant-based products that are not produced to rigorous environmental standards.

Indeed, many plant-based meat alternatives currently require the import of products such as soy which are not grown widely in the UK and have substantial impacts in the regions where they are produced, particularly with respect to deforestation. Having said this, at least 70% of global soy is currently used for animal feed, so a transition to plant-based diets could allow redirection of soy from animal feed to human consumption. Environmental assessment of any trade policy that increases food imports is usually complicated by the fact that overseas impacts are hard to monitor, verify, and mitigate. Therefore, estimates of the environmental effects, positive or negative, that may result from changing trade patterns for animal-based and plant-based commodities are beyond the scope of this report but should be carefully considered in policy decisions.

#### Alternate food production systems

Both the trend towards plant-based diets and calls for more sustainable systems are likely to increase demand for food produced in novel ways. Mixed farming systems could provide livestock farmers with an opportunity to integrate crops with animals. These systems can work very well together through an exchange of inputs and outputs. For instance, the addition of particular rotation crops can add vital plant-based nutrients, improve soil fertility, and provide animal feed through crop residues<sup>39</sup>. This, combined with circular and regenerative approaches like the use of animal manure as a fertiliser, can significantly reduce the dependence on external inputs, thereby lowering the overall environmental footprint of food production<sup>40</sup>. Increased demand for plant-based foods could also be met in part by an expansion of novel production techniques such as hydroponics-based vertical farming, which would reduce the need to intensify conventional agriculture further. However, given high energy and capital costs, the use of these systems is currently limited to specialist crops, such as leafy greens and herbs, and their economic viability for staple food crops needs to be evaluated<sup>41</sup>.

Technological and scientific advances have also given rise to a surge of alternative food products and production technologies which differ vastly from conventional methods. Plant-based milk and meat alternatives can be fortified with nutrients to provide a nutritionally equivalent alternative to animal products with lower environmental impacts, although care should be taken to source raw materials sustainably and consider any potential externalities. Similarly, recent breakthroughs in lab-based or 'cultured' meat production have also been touted as an alternative to traditional livestock products. These systems have shown early success and can be efficiently designed to circumvent environmental impacts from biological and production processes associated with conventional meat products. However, while this is true at a labscale, the commercial scale-up of these technologies could be energy-intensive depending on the energy mix<sup>42</sup>, the environmental implications of which will need to be carefully considered.



### Is the UK ready?

Many **consumers** have already committed to a plant-based diet, and many more are likely to do so. Do they have the knowledge, skills and support they need to make this change in a way that is healthy for themselves and the environment? And how can public policy capitalise on opportunities for the wider population?

#### **Opportunities**

Reducing consumption of animal products can have substantial health benefits for consumers if the plantbased diet is carefully planned and low in processed foods. Government interventions supporting healthy dietary changes could help capitalise on the public health opportunities presented by this trend and minimise the risks associated with poorly managed dietary change. Even a moderate reduction in the number of red and processed meat servings per week could result in thousands fewer cardiovascular disease and diabetes cases, among others<sup>18,27</sup>, which would subsequently reduce strain on the NHS.

More support for consumers who want to transition to plant-based diets would allow the 26% of meat-eaters and 69% of flexitarians who want to reduce their meat consumption to transition to a diet that better aligns with their values, subsequently improving areas like animal welfare and environmental sustainability.

#### Barriers to healthy, sustainable change

#### Availability of balanced, accurate information

Only 40% of prospective meat-reducers surveyed in 2018 cited health reasons for their decision to consume less animal products<sup>4</sup>, with these individuals more likely to belong to the most highly health-literate segment of the population<sup>43</sup>. The UK is lacking in government-endorsed and well-publicised health guidance specifically aimed at the growing subsection of the population considering a more plant-based diet. A key component of UK dietary guidance is the Public Health England (PHE) Eatwell Guide, which outlines the recommended proportional intake of various food types for a balanced and nutritionally complete diet. However, despite the inclusion of plant-based alternatives in all nutritional sections of the Eatwell Guide, 44% of the wider population still believe that meat serves as an essential source of protein, with concerns that exclusively plant-based diets are

nutritionally inadequate being one of the most cited reasons for maintaining levels of meat consumption<sup>43</sup>. Clearly, there is a need for better communication of information regarding healthy plant-based diets.

Social media has played a massive role in propagating ideas about plant-based diets, although the most vocal parties tend to be those with the most extreme views. There is a risk that consumers are being exposed to emotive content but not balanced, accurate information with which to make decisions. A culture of 'side-taking' in this space may further inhibit open discussion or prevent consumers being informed of more intermediate diets such as the planetary health diet recommended by the EAT-Lancet Commission, which has both environmental and health benefits and may appeal to consumers who would otherwise continue to eat an unsustainable diet.

An ongoing issue in modern food production is the disconnect between consumers and the production of their food. For example, a consumer motivated by environmental sustainability may be unaware of the externalities of soy production, or the seasonality of local versus imported produce. Various environmental certifications that manufacturers can display on packaging can be confusing for consumers and can allow companies to 'greenwash' or highlight only the positive aspects of their production systems. Sixty-three percent of consumers support the idea of a recognisable 'carbon label' to demonstrate that products have been made with a commitment to measuring and reducing their carbon footprint<sup>44</sup>. This could be the basis of a standardised sustainability label which would replace the many confusing certifications currently in place but would also have to carefully consider nutritional density and non-carbon impacts. Advances in digital technologies have the potential to improve traceability, accountability and access to supply chain information, which could help

consumers make informed choices, particularly in light of the recent expansion of online grocery shopping.

#### Cultural attachments to food

While there is a place for an occasional Sunday roast, traditional festival meal or full English breakfast in a predominantly plant-based or flexitarian diet, a large-scale transition will require a shift in mentality away from the traditional 'meat and two veg' approach to constructing a meal. Replacing meat with a plant-based meat alternative in everyday meals can encourage people to shift their cooking habits gradually. But some traditional meals may rely on the flavour of meat and be less appealing when made with plant-based alternatives. Alternatively, exposing people to new recipes that are appealing in their own right, rather than by imitating animal products, in contexts such as schools and hospitals could be effective. Some consumers may face additional barriers to a healthy transition in their reluctance or inability to take regular dietary supplements, such as vitamin B12 or iron if needed.

#### Lack of dietary flexibility

Healthy, tasty plant-based food using whole-food ingredients rather than processed alternatives can require significant time and skill to prepare. As a result, households who need quick, easy food that their children will accept might be more likely to resort to highly processed plant-based food if changes to food pricing or availability mean they lose access to their regular diet. It is estimated that eating based on the Eatwell Guide costs £5.99 per day, which is similar to the average UK spend on food but more than double that of the poorest 10% of the population<sup>13</sup>. Food security, and allowing consumers to make healthy,



sustainable diet choices, starts with a robust social security system that gives people the flexibility to make changes to their lifestyle. Additional taxes on unhealthy or unsustainable food products could contribute to the funds needed for new social and food security initiatives<sup>70</sup>.

#### Are we ready?

Many consumers demonstrated their ability to adapt healthily and sustainably to new food environments during the COVID-19 lockdown. Part I of the National Food Strategy published in 2020 reported that 39% of consumers were cooking from scratch more often during COVID-19 lockdown, 27% were eating healthier meals, and 32% were wasting or throwing away less food<sup>13</sup>. However, children and disadvantaged adults, in particular, ate more unhealthy snacks and less fruit and veg, highlighting the need for better food education for these groups alongside social and welfare mechanisms that give everyone the opportunity to make positive changes.

In order to make healthy, sustainable choices, consumers need accurate information that is relevant to their personal lifestyle choices, presented in an accessible way and supported by economic mechanisms and changes to the food environment that makes those choices easy. Some steps have been taken in the public and private sectors to make plant-based products and meals healthy, accessible and tasty. However, more education and better public health messaging will be vital in ensuring that consumers do not make a change that puts them at risk of nutritional deficiencies. The National Food Strategy is a positive start to a reform of the UK food system and should align guidance across government departments, making it easier for stakeholders to act responsibly and making key messages more transparent for consumers.

The private sector is embracing change to some extent, with significant investment in plant-based products (such as Danone's \$10.4 billion acquisition of Alpro) leading to improvements in the taste, quality and variety of products available to consumers. Indeed, UK sales of products containing meat substitutes are expected to be over £1.1 billion by 2024<sup>2</sup>. Furthermore, some companies such as Oatly are already highlighting the environmental impact (in this case, climate impact expressed in carbon dioxide equivalents per kg) of their products via labelling to allow consumers to make a more informed choice that aligns with their values. While this is a positive start, labelling may eventually need to consider nutritional



density, since impact per kg of product can be misleading in some cases, or additional environmental metrics.

Attempts are also already being made to modify aspects of food environments such that plantbased foods are more familiar and accessible. The Vegan Society's 'Catering for Everyone' campaign is advocating the mandatory provision of plant-based meal options in public services including hospitals, schools and workplaces, and the Public Sector Catering 100 recently pledged to reduce meat on their menus by 20%. Several private institutions, such as universities, have also embraced the provision of more plant-based meal options. Exposure to a range of plant-based meal ideas and recipes, which are accessible to consumers with limited time, equipment or cooking skills, should help reduce reliance on highly processed products<sup>45</sup>. Despite some steps in the right direction, much more work is needed. NDNS data suggest that, as a nation, we mostly fail to meet dietary recommendations. Many people's consumption of red and processed meat is still well above national and international guideline levels, while less than a third of the population meet the well-publicised five-a-day recommendation for fruit and vegetable consumption. This suggests that current methods of communicating dietary guidelines are neither sufficiently accessible nor lead to positive changes in behaviour and that the content and delivery of public health messaging need to be improved for widespread adoption of positive changes. Research suggests that while awareness of negative health consequences can lead to self-reported intentions to modify behaviour, this rarely leads to long-term sensible decision making. Strategies, such as supported self-monitoring and lifestyle counselling, may be more effective where possible<sup>46</sup>.

The UK health system currently does not widely disseminate nutritional guidance for individuals choosing to transition to a more plant-based diet nor recommend such a change to mitigate the risk and chronic severity of several diet-related diseases among the wider population, despite recommendations by the EAT-*Lancet* Commission, World Health Organisation (WHO) and Food and Agriculture Organisation of the United Nations (FAO), among others. This may be due to a perceived lack of clinical evidence, which is required for standard practice to be updated.

#### Learning from Finland to reverse diet-related disease burden

Finland's North Karelia Project was a successful joined-up national public health programme which led to an 80% drop in mortality from diet-related cardiovascular disease and could be an appropriate model for a similar initiative in the UK. The project included a combination of large-scale public health campaigns (via both official channels and mass media), food industry regulations, updated dietary guidelines and diet counselling training for frontline healthcare professionals<sup>47</sup>.

"...you have to do as many of the things that might work at the same time. You need to get stuck in. Get your boots deep in the mud. The whole environment had to change: The food industry, restaurants, cafeterias, supermarkets. We had to make sure that the healthy choices became the easy choices." Pekka Puska, previous director of the National Institute of Public Health, Finland

In 2020 the UK government unveiled a new Obesity Strategy, which promised similarly forward-thinking, joined-up dietary interventions including wholesale changes to food environments, such as bans on adverts and promotions for unhealthy food, and a role for the NHS in weight management<sup>48</sup>. The strategy, while positive in its own right, also represents a framework within which some of the recommendations presented in this report could be introduced.

Additional dietary education for GPs and other patient-facing healthcare professionals, who are generally held in high regard, may play a crucial role in the UK becoming ready to capitalise on the public health opportunities associated with this trend and mitigate the risks associated with people making drastic changes to their diet without proper guidance. Organisations such as Plant-based Health Professionals UK, for example, are already taking steps to support healthcare providers who are looking to better understand the role of diet in disease.

#### Recommendations

- Update official UK healthy eating guidelines to account for the current evidence base on sustainable diets (e.g. EAT-Lancet, WHO) and better cater to plant-based diets. Communicate these guidelines in accessible and engaging ways.
- Commission UK-led clinical trials to provide a robust evidence base on the health impacts of varying degrees of plant-based diets.
- Raise awareness of the positive health benefits of plant-based dietary choices among the

healthcare profession, via training and advocacy, and introduce diet assessment, monitoring and guidance as part of frontline prevention and treatment interventions for chronic diet-related diseases.

- Regulate and/or redesign public sector food microenvironments to increase the procurement and accessibility of healthy whole-food plant-based options, particularly in place of highly processed options.
- Promote a better understanding of food systems, externalities and local agriculture through education and standardisation of sustainability labelling, allowing consumers to make informed choices that align with their values.
- Establish robust social security mechanisms that reduce reliance on food banks and give consumers the flexibility to make healthy and sustainable choices. Taxes or pricing initiatives could help to incentivise healthy, sustainable options and fund food security programmes.



Agricultural **producers** may need to adapt to match the changes in consumer demand associated with the trend towards plant-based diets. How flexible is farming, and how can agricultural change be supported in areas where it is beneficial for the economy and the environment?

#### **Opportunities**

As the trend towards plant-based diets continues, farmers may look to transition from livestock to crop-based systems as a way to 'future proof their farm'. Protein crops such as peas, beans and lentils are one key opportunity and, as consumers look for meat-alternative sources of protein, demands for these crops will increase. Furthermore, nitrogen-fixing leguminous crops, if carefully incorporated into a crop rotation, can both improve soil fertility and decrease the need for nitrogen fertilisers<sup>39</sup>. Other opportunities include new crops which are ideal for UK climates such as heritage barley for food consumption, as well as crops such as naked oats and lupin beans (as an alternative to soy), which are potential candidates for alternative milks<sup>49</sup>. Research and support for horticultural crops also present opportunities to improve UK self-sufficiency and provide a wider range of fruit and vegetables than currently grown<sup>50</sup>.

This trend has also allowed new kinds of producers to emerge. Stakeholders in molecular biosciences are now turning their attention to food production and developing technologies to produce lab-grown cultured meat, as well as using techniques such as microbial fermentation for alternative sources of proteins<sup>51</sup>. As of January 2020, 60 companies have been founded with their primary aim to produce cultured meat<sup>52</sup>. Whilst none are yet to reach the UK market, products are expected to emerge within the next few years<sup>53</sup>.

Systems such as mixed farming, or circular farming, where animal feed is derived from food waste or where animal manure is used as fertilisers, also present opportunities for farmers to develop a more sustainable business, which aligns with consumer values. These circular and other agroforestry approaches can also be extended to arable and horticultural systems. One example is Tolhurst Organics where soil fertility is maintained through a combination of weeds and woodchip (green manure), instead of livestock manure or artificial fertilisers (stock-free)<sup>54</sup>.

#### Barriers to healthy, sustainable change

#### Locked in capital and lack of infrastructure

Many livestock farmers lack the necessary infrastructure to diversify or transition their production systems towards plant-based alternatives, since a bulk of their capital is often locked in with previously purchased equipment. This is compounded by the fact that many farms are not hugely profitable. Estimates show that a lowland livestock farmer only makes around £12,000 profit in a good year<sup>55,56</sup>. As such, it is incredibly difficult for farmers to invest in the equipment or infrastructure needed to grow or process new crops. Protein crops, for example, can require special milling facilities to ensure the product is suitable for human consumption (e.g. pulse flours)<sup>57</sup>.

Geographical constraints can also limit farmers looking to transition towards plant-based products. In particular, many livestock farmers own marginal land with poor soils, which are unsuitable for growing crops and can lead to yields lacking the required nutritional quality for human consumption. Land used for livestock, such as sheep, is also often hilly, rugged and in areas inaccessible to agricultural machinery.

Meanwhile, for emerging producers, whilst markets such as cultured meat look promising<sup>58</sup>, to be market-ready they will need the support and cooperation of stakeholders at every stage of the food supply chain to ensure the 'meat' successfully gets from lab to fork.

#### Lack of knowledge and support

Over many years, UK agriculture has become siloed, with many farmers focusing on only one type of production. This can mean farmers lack fundamental knowledge in how to diversify and may have become divorced from changes in modern production systems that could facilitate a change in their business. Changing to a new crop is always a significant risk for farmers, and they need to know the best farming method to ensure good crop yields. Currently, this information for new crops is difficult to access, and few support networks exist to help.

Over the last decade, billions of pounds have been invested in agricultural research. Despite this, big improvements in productivity and sustainability are yet to emerge<sup>50</sup>. Farmers also describe a disconnect between the UK agricultural research landscape and farming practitioners. According to Innovative Farmers, a non-profit network for farmers and growers, less than 1% of agricultural research was farmer-led in 2017<sup>59</sup>. This can sometimes mean research projects are not aligned with the real problems farmers face. Defra's planned 'innovation accelerator' fund aims to address this gap<sup>60</sup>. However, it is unclear how the ongoing academic research in the UK will respond to this.

For some farmers, certain crops are simply not suitable for the land they own. Farmers require region-specific information regarding what they can grow on their farm sustainably and profitably, and have access to reasonable and practical research to help them maximise crop yields. Forming new regional networks, or strengthening existing ones, could also help farmers establish collectives which can minimise the risk when investing in new crops or production systems.

#### Poor economic incentives

Transitions in agricultural systems can be slow and take years to become profitable. Hence significant financial incentives and guaranteed support over long time periods are critical if farmers are to make successful changes to their business. With the disruptions from COVID-19 and the uncertainty of Brexit, farmers need decisive long-term policies more than ever to enable them to plan and adapt their businesses effectively.

Many farmers are hugely dependent on subsidies provided by the EU's Common Agricultural Policy



(CAP) to stay afloat<sup>55,56</sup>. This disconnect between farmers' income and what they grow has not only insulated farmers from changes in UK consumption but has also been a poor driver for improvements in productivity and innovation. Brexit provides an opportunity to drastically change this subsidy system to be inclusive of emerging trends such as plant-based transitions. For instance, subsidies could be directed towards the growth of crops such as protein-rich peas and legumes. Diversity is vital in crop systems, and subsidies could also be used to encourage farmers to grow a greater variety of crops (beyond the three currently specified in the CAP). For farmers with locked-in capital, subsidies like these could be vital in providing initial funding to help them transition. In particular, crops which are suitable for the UK's climate and land-use capability, which also match consumption and nutritional demands need to be encouraged.

#### Are we ready?

The year 2020 has given UK farming the "biggest stress test since the Second World War"<sup>13</sup>. Whilst the COVID-19 pandemic exposed some weak links within UK agriculture, it has also demonstrated how adaptable the food system can be in response to changes in supply and demand<sup>61</sup>. As the UK negotiates its exit from the EU, some important trade deals need to be made not only to allow free trade but to also help protect the high environmental and welfare standards of our UK farmers.

UK livestock is already considered to be more sustainable than many other global livestock production systems<sup>62</sup>. The National Food Strategy<sup>13</sup> refers to the concept of comparative advantage, which describes the idea of countries aligning their production capabilities with what they can produce best. In the context of food, this means areas in the UK should not only produce what is cheapest, but also what can be produced with the lowest amount of damage to the environment (e.g. carbon footprint, soil health, and biodiversity).

That said, a drastic revamp is still needed. As the plantbased trend continues and the UK strives to meet its 2050 net-zero carbon goal<sup>28</sup>, agriculture will need to adapt. Some steps in the right direction have already been taken. As part of the 2019-21 Agricultural Bill, the Environmental Land Management Scheme (ELMS) looks to rectify some of the issues discussed here and change how farmers are paid to be better aligned with 'public benefit'<sup>63</sup>. Under this scheme, farmers will be subsidised for services that enhance the environment and awarded grants to invest in equipment that promotes more sustainable practices. However, more can still be done. For instance, financial incentives need to be put in place that not only encourage sustainable farming but also eventually render unsustainable practices unviable. Finally, subsidies based on ecosystem services could be expanded to support the rewilding of unprofitable marginal land, and the retraining of farmers to manage their farmland for environmental benefit rather than production<sup>64</sup>.

Other mechanisms to support healthy, sustainable change in UK agriculture are already in place, but still require additional support to allow them to work at scale. These include Innovative Farmers, which, through collaborations with researchers, helps empower farmers to carry out research trials on their farms<sup>65</sup>. Set up in 2015, this network of farmers has been able to work directly together to design new trials and share findings amongst each other on how to operate their farm/business best. Rothamsted Research's 'FarmInn' initiative similarly aims to help better connect farmers and researchers so that they can co-develop solutions to address real-world farming problems together<sup>66</sup>.

There has also been a considerable focus of publicly funded research into this area, highlighted by UKRI's £90 million project fund to 'Transform Food Production', as part of their Industrial Strategy Challenge Fund<sup>67</sup>. In 2020 GFS also launched Transforming the UK Food System for Healthy People and a Healthy Environment Strategic Priorities Fund (SPF) programme which looks at adopting a systemsbased approach to re-shape the UK food system with a focus on health and the environment<sup>68</sup>. In addition, Defra is building on their 2013 Agri-Tech Strategy to better coordinate UK research across the sector<sup>60</sup> as well as releasing a Countryside Productivity Small Grants scheme<sup>69</sup>, which provides funding for farmers to invest in new and innovative equipment. With some of the schemes due to be put in place in 2022, this is positive progress in helping unify UK agricultural research and better engage practitioners with ongoing research. As key drivers of the farming landscape, this is a promising start from important players such as Defra and UKRI.

One thing's for sure, UK farming is set to undergo some significant changes over the next few years. Following Brexit, the UK government has stated ambitions to create a more dynamic, self-reliant agriculture industry in which British farmers are both



more productive and more sustainable<sup>63</sup>. This could provide support structures to ensure UK farming is better aligned to cope with emerging food trends such as plant-based diets. A survey by the Royal Society of Arts showed 83 % of farmers planned their business 1-5 years in advance, and in which farmers with the most long-term plans in place (5-10 years) said they had the greatest flexibility to make changes<sup>50</sup>. Government policy and financial aid, therefore, need to be long term and provide guaranteed support to help farmers successfully adapt to emerging food trends.

#### Recommendations

- Expand regional-based support networks for farmers looking to transition towards plant-based farming. This could include UK wide databases to allow farmers to share best practices and data on how to maximise yields.
- Develop strategies to foster collaborations between research institutions and practising farmers and

introduce more funding opportunities for farmerled research projects.

- Provide financial incentives/entry schemes for particular plant crops (protein crops and horticultural crops where the UK is not selfsufficient) and encourage farmers to grow a greater diversity of crops.
- Internalise the environmental costs of food production through taxes/charges for unsustainable practices such as for the amount of nitrogen fertiliser used by a farm.
- Commission land capability and management studies to classify and categorise land that can be used for cropping or livestock farming systems.
- Integrate farming, food, and trade policies to prevent environmental leakage and retain high import standards.

### Hodmedod, leading the way with homegrown food and research engagement

Hodmedod, set up in 2012, is leading the way with UK British grown pulses, seeds and grains. Tapping into the market for provenance and locally grown food, Hodmedod now works with a group of around 25 farmers to supply whole and minimally processed foods across the UK. The company emerged from a community project that asked whether Norwich could feed itself from surrounding farmland and looked at the dietary and agricultural changes that would be required to do so. Initially, packets of fava beans, widely grown but not really eaten in the UK, were distributed through community groups and local shops to test for demand. Hodmedod is currently involved in the EU supported DiverIMPACTS (www.diverimpacts.net/) programme, which aims to achieve the full potential of diversification of cropping systems for improved productivity, delivery of ecosystem services and resource-efficient and sustainable value chains.

"This (DiverIMPACTS) was a really powerful way to help farmers feel more engaged and allowed us to spend money on unusual approaches to telling our story. Small businesses like ours are often very nimble and creative, we can achieve some incredible things with very small amounts of money." Josiah Meldrum, Co-founder, Hodmedod

This is an excellent example of a collaboration between practitioners and researchers. As part of this

collaboration, Hodmedod was given a small discretionary budget. The money funded a Swedish exchange trip to collaborate with a similar network of farmers, has supported research into new crops for the UK, and is being used for artistic projects focussing on connecting people with food.



### Conclusions

'Is the UK ready for plant-based diets?' is a complicated question to answer. On one hand, the UK food system as a whole is unlikely to collapse as a result of the consumer trend towards plant-based diets. Trade can correct imbalances in domestic supply/demand in the short term, health outcomes may be generally positive at a population level even with minimal interventions, and a transition towards plant-based products can, in most cases, lower the environmental footprint of agri-food systems. Having said this, if zero interventions are made, certain stakeholders look to be severely impacted, and potential opportunities will be missed.

In particular, in this report, we highlight many proactive steps that policy can take to reduce harm to

certain stakeholders – farmers who might see reduced demand and not have the capabilities to transition/ diversify their farm, or consumers who might make drastic, ill-informed dietary changes, for example.

In the longer term, this trend presents opportunities for the UK food system to emerge healthier, more sustainable and more self-sufficient if steps are taken to support positive change. However, this requires moving away from polarised echo chambers and siloed thinking to finding synergies and common goals and making realistic compromises across the spectrum of stakeholders involved in agri-food systems. Such collaborative and proactive policymaking can ready the UK food system not only to manage this trend but to thrive as a result of it.



## Acknowledgements

This Think Piece was funded by the Global Food Security (GFS) programme as part of a GFS Policy Lab. It was informed by interviews with, and reviews from, a variety of stakeholders, recognised below. It was also critically reviewed by Dr Rosemary Green (London School of Hygiene & Tropical Medicine), Dr Elliot Meador (SRUC) and Dr Neil Stephens (Brunel University London). We gratefully acknowledge their excellent contributions and feedback. However, this Think Piece does not necessarily reflect the views or policy positions of individuals or their institutions.

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This report does not necessarily reflect the policy positions of the Global Food Security programme's individual partners.

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