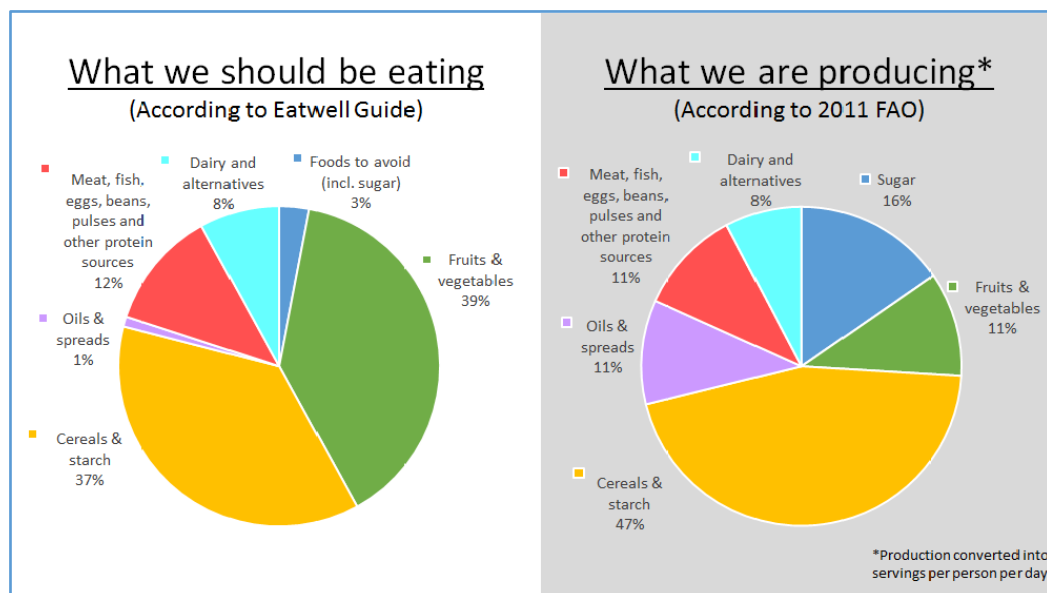


Background- Supplementary Document

Poor diet is the biggest risk factor for early deaths worldwide, leading to 1 in 7 deaths in Britain every year¹, and significantly increasing the risk of being overweight and suffering from obesity, type 2 diabetes, heart attacks, stroke and some cancers. Human biology and behaviour is failing to keep pace with the increasingly obesogenic food environment, with foods that are high in fat, sugar and salt now making up just over half of all meals consumed in the average UK household.² Most studies suggest that our diets lack oily fish, fibre from wholegrains, fruit, vegetables, nuts and seeds³ and we often consume unhealthy amounts of meat⁴.

If diets and levels of activity continue along the current trajectory, it will increase pressure on our health and care systems and the environment, leading to economic and social instability. In England, 61% of women and 67% of men were classified as overweight or obese in 2017⁵, and low micro-nutrient status, for example iron, is persistent in the UK population and particularly in vulnerable groups.⁶ Diet-related chronic disease accounts for £6.1 billion of annual NHS spend (around 9%) and generates a wider economic loss of more than £54 billion per year (3% of UK GDP).⁷

Unhealthy consumption patterns are a product of our current food system (see **Figure 2**). Globally, more grains, sugars and fats are produced than are needed for healthy diets, but not enough fruits and vegetables.⁸ These grains, sugars and fats are often highly subsidised, and when refined and combined in manufacturing, then promoted via marketing and sales promotions, lead to cheap and unhealthy products that permeate our food environments. These patterns of supply and demand lead to over-consumption, poor nutrition and health that are distributed unevenly across society and across the geography of the UK.



¹ GBD 2017 Diet Collaborators (2019). Health effects of dietary risks in 195 countries, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017. The Lancet doi.org/10.1016/S0140-6736(19)30041-8

² Monteiro, C., Moubarac, J., Levy, R., Canella, D., Louzada, M., & Cannon, G. (2018). Household availability of ultra-processed foods and obesity in nineteen European countries. Public Health Nutrition, 21(1), 18-26. doi:10.1017/S1368980017001379

³ [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(19\)30041-8/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(19)30041-8/fulltext)

⁴ www.chathamhouse.org/sites/default/files/publications/research/CHHJ3820%20Diet%20and%20climate%20change%2018.11.15_WEB_NEW.pdf

⁵ Statistics on Obesity, Physical Activity and Diet. NHS (2017)

⁶ www.nutrition.org.uk/nutritioninthenews/new-reports/ndnsyears7and8.html

⁷ McKinsey Global Institute. Overcoming Obesity: An initial economic analysis. (2014).

⁸ Krishna Bahadur, KC et al, Plos One, (2018) doi.org/10.1371/journal.pone.0205683

Figure 2. An indicative representation of the mismatch between what we should be eating for health (adapted from PHE's The Eatwell Guide) and what we actually produce worldwide (the latter represents food for direct human consumption and excludes animal feed).

The relationship between the supply of food and its consumption is complex. In some instances healthy options are not available to large segments of the public, and even when they are, consumer preference is often for unhealthy alternatives, with a wide range of socio-economic and biological factors influencing behaviour. The regulatory and economic environment of food production has generated a situation where there is an inverse relationship between the energy density of foods and cost (i.e. high calorie foods, which are often high in sugar, fat and salt, and therefore highly palatable- often present the lowest cost and are therefore the most attractive option to the consumer). Similarly, one of the key resource constraints poor people face relates to time, and 'fast food' is often lower quality. Socio-economic factors also influence the local availability of healthy food, with urban "food deserts" reducing the options for healthy eating. A variety of socio-economic and cultural factors influence diet, the intake of energy-dense foods, and the relationship between calorie intake and how many calories are exerted. These factors are often cumulative which contributes towards significant health inequalities and a disproportionately greater incidence of overweight and obesity in the most deprived groups in society⁹ (recognising there are health challenges for all socioeconomic groups).

The barriers to a healthy diet therefore go beyond price and may include social/cultural factors, preferences and desires, time availability, patterns of travel, convenience, the behaviour of food producers and retailers and differences in how people buy, store and prepare meals. Changes in society have also seen rapid expansion of foods and meals eaten outside the home. Solutions to the over-consumption of nutritionally sub-optimal diets are clearly complex and will require major changes in a range of behaviours of actors across the food system, from production and supply to consumption and food environments.

An increased consumption of plant products, and reduction in some animal products, is broadly recognised to have benefits for both the environment and human health. Developing ways to realise these benefits through healthy diets that deliver all the nutrients required by the general population and sub-groups such as pregnant women or young children is a key consideration and should also take into account existing advice on supplementation for some groups (such as folic acid and women of child bearing age).

In parallel to the health challenges described above, food production systems that supply UK diets are unsustainable, using 70% of all fresh water withdrawals, producing around a third of all GHG emissions, and contributing to biodiversity loss, soil degradation and harming aquatic ecosystems. Biodiversity is essential to food production and agriculture, but is declining in the UK and globally and has serious consequences for food security. Food production is not only supported and impacted by biodiversity, but the impact of agriculture and food production can negatively affect the health of ecosystems.

The UN Intergovernmental Panel on Climate Change (IPCC) suggests we have 12 years to avoid climate change catastrophe, which the food system contributes to, but action is required now. Climate change will affect our ability to produce food in the future through extreme weather events, regional climatic changes and changing patterns of pests and diseases, as well as potential impacts on trade.

Changing temperatures are predicted to have different effects. Higher temperatures in the UK may provide a climate for a different range of crops to be grown, however climate

⁹ www.foodsecurity.ac.uk/publications/insight-issue-five-overconsumption-influences-diet.pdf

change will directly impact the UK's imports of foods needed for a healthy diet. Climate change may also reduce the nutritional content of crops, making it more challenging to achieve healthy diets¹⁰. Climatic changes will not only be felt on land; marine ecosystems are set to change. For example, cod stocks in the Celtic and Irish Seas are expected to disappear under predicted temperature changes by the year 2100, while those in the southern North Sea and Georges Bank will decline.

Although much effort has been made to reverse negative impacts of some recent agricultural practices in the UK there is still significant scope, and an urgent need, for change, particularly when combined with transformation of diets for health. Agri-environment schemes, catchment sensitive farming, precision agriculture techniques and agro-ecological methods have been adopted by many farmers to address different problems, including declining biodiversity, diffuse water pollution, high resource inputs and declining soil health. There is an opportunity for more research on the interaction between all farming systems (including agro-ecological systems) alongside a shift to more balanced diets. The UK's countryside, as we know and value it, is a product of farming and grazing systems, providing added value for mental health, physical activity and health, biodiversity and other public goods when managed appropriately.

Sustainable intensification has been widely discussed and promoted in recent years, with the focus on increasing productivity and profitability. Technological innovation, big data and robotics are also rapidly developing in the agricultural arena. It is clear, however, that changes in agricultural production can no longer be addressed in isolation; we also need to consider the role of regulation and changing patterns of demand in driving our production systems. This research programme seeks to understand these complex interactions and advance knowledge on how much food and what types of food we need to produce, manufacture and import in the future and which foods and activities we should prioritise.

Understanding the interplay between shifts in production, dietary changes and the impact on agri-environment outcomes and land use (and pressures) is equally important. This has to include consideration of socio-economic impacts and drivers. Understanding where trade-offs and balances are - including consideration of the economic impact to rural and urban economies, and the impact of any unintended consequences (and how they can be avoided or mitigated) – is essential in identifying where innovations are needed to support transformative change.

It is increasingly recognised that we need to move away from a 'calories per hectare' approach to one that considers the 'number of people fed healthily and sustainably per hectare'. This interplay between production and demand, and environment and health, is the type of holistic systemic research we are looking to support through this programme. Consideration of the whole system from production through to consumption and health provides a unique opportunity for change.

¹⁰ Impact of anthropogenic CO₂ emissions on global human nutrition *Nature Climate Change*, Vol 8, 834-839, 2018