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Veg Facts

A briefing by the Food Foundation

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PLEASURE • PRODUCERS • PRICES • PRODUCTS • PLACEMENT •

Peas Please
Making a pledge for more veg

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"The Esmée Fairbairn Foundation aims to improve the quality of life for people and communities throughout the UK both now and in the future. We do this by funding the charitable work of organisations with the ideas and ability to achieve positive change."

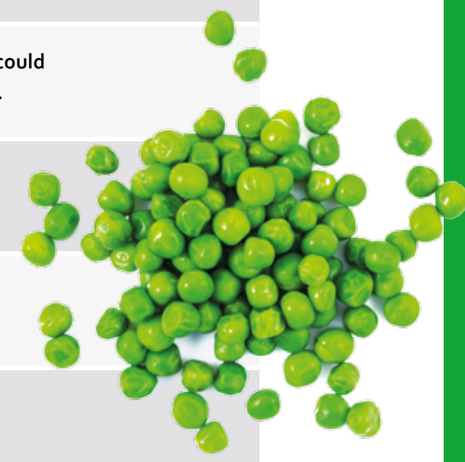
"The Nuffield Foundation is an endowed charitable trust that aims to improve social wellbeing in the widest sense. The Nuffield Foundation has funded this project, but the views expressed are those of the authors and not necessarily those of the Foundation."

We all know veg is good for us,

but we don't eat enough of it. There are lots of reasons for this. The Food Foundation, Nourish Scotland and WWF-UK are working together to identify the biggest food system barriers to veg consumption and to bring people together to overcome these barriers. This factfile marks the start of this process and presents the nature of the challenge ahead. It doesn't yet point to the solutions to tackle this challenge. These solutions will be identified with a wide range of actors through the course of our work together. We hope you will join us in this endeavour.

TOP TEN FACTS

1. **Everyone needs to be eating at least one extra portion of veg a day. Many of us, including children, are eating hardly any veg at all.**
2. **Our veg consumption is in decline and is no better than it was in the 1970s, in spite of the 5 A Day campaign.**
3. **More than a third of the veg children eat is highly processed, resulting in a situation where 17 per cent of children's veg comes from pizza and baked beans.**
4. **Diets that are low in veg are associated with more than 20,000 premature deaths across the UK.**
5. **Eating one more portion of veg while reducing meat consumption could reduce our diet-related greenhouse gas emissions by almost a fifth.**
6. **We throw away about half a portion of veg a day and more is wasted on the farm and in the supply chain.**
7. **A meagre 1.2 per cent of food advertising spend goes on veg.**
8. **Horticulture is the most labour-intensive agricultural sector, employing one person for every 10 acres but many of them are migrants whose future is now uncertain.**
9. **Our horticulture sector benefits least from agricultural subsidies even though it produces food that is healthy and is often low in carbon emissions.**
10. **Thirty years ago, 83 per cent of the veg we ate came from the UK. Now it is 58 per cent, partly because we eat more exotic veg. If we increased veg consumption in line with dietary guidance, the UK would have the chance to grow 1.5 million metric tonnes more veg a year.**



How much veg do we eat?

When asked about how many portions of veg their children consume, parents in England reported that one in four children ate none at all in the day preceding the survey.

However, a detailed nutrition survey which is conducted across the UK and which includes all the small amounts of veg eaten in other foods (e.g on pizza or in a ready meal) reveals the level of consumption is a little higher. This still leaves one in four secondary school children and 13 per cent of primary school children eating less than a portion a day. Half of adults eat less than the average (median) of 2.3 portions a day (see Annex 1 for more details).

If you're on a low income, you're likely to be eating on average half a portion less than those on a high income. People living in Scotland and Northern Ireland eat on average fewer portions of veg than those in England and Wales.

ONE PORTION OF VEG

ADULTS	CHILDREN
80g	50g

How much veg should we eat?

On average, we need to eat at least one extra portion a day, and many of us need to eat much more.

The government guidance combines fruit and veg and recommends we eat at least five portions a day. This guidance is consistent across all UK nations. If we assume that half should be veg and half fruit, this would result in 2.5 portions or 200g per day for adults and secondary school children, and 125g for primary school children. However, the latest Eatwell Guide, which captures all the current dietary recommendations, shows that 554g of an adult's diet should come from fruit and veg which actually amounts to seven portions (PHE, personal communication). Very few people of any age eat 3.5 portions a day (see below). To meet these new levels, on average adults need to eat an additional 100g of veg per day (just over one portion).

% EATING LESS THAN 3.5 PORTIONS PER DAY

ADULTS >16y	CHILDREN 11-16y	CHILDREN 5-10y*
80.1	95.5	79.1

*based on 50g portion size

What counts as veg?

We use the government guidance on 5 A Day to determine what counts as a portion of veg. Included are all fresh, frozen, dried and tinned veg, and those cooked as part of other dishes (such as soup). Juice up to 150ml is included. Pulses and beans are included, but are capped at one portion in terms of their contribution to the 5 A Day recommendation. Potatoes, yam, cassava and plantains are not included; sweet potatoes, parsnips, swede and turnips are (NHS 2016). A portion is 80g. For our calculations, we have used a portion size of 50g for primary school children based on guidance from the Children's Food Trust.

How do we eat our veg?

Salad, tomatoes, carrots and leafy greens are our favourite vegetables, though of course there are hundreds of others available. A considerable proportion of the veg we eat is processed or ultra-processed (25% for adults, 37% for secondary school children). Together, baked beans and pizza contribute 17% of the veg in children's diets (see Table 1), although veg eaten like this may also come with added sugar and salt, which could act against some of the health benefits associated with this veg.

Children get more of their veg from eating at school or nursery than eating at home (Mak et al. 2012). When they're at home, though, they are more likely to eat veg if they're sitting at the table and eating with others.

Table 1: Top ten contributors to veg intake in adults and children

	ADULTS	CHILDREN
1	Other veg, including homemade dishes	Other veg, including homemade dishes
2	Salad and other raw veg	Baked beans
3	Raw tomatoes	Salad and other raw veg
4	Baked beans	Cooked carrots
5	Cooked leafy green veg	Cooked leafy green veg
6	Cooked carrots	Peas
7	Cooked tomatoes	Pizza
8	Peas	Cooked tomatoes
9	Soup manufactured/retail	Raw tomatoes
10	Beans and pulses including ready meal and homemade dishes	Soup manufactured/retail
	80% OF ALL VEG EATEN	**76% OF ALL VEG EATEN**

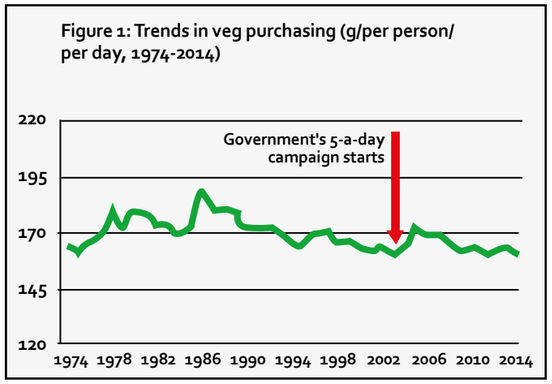
Source: (Public Health England 2014)

Are we eating more or less veg than in the past?

Despite the mounting evidence of the beneficial health effects, we now buy about the same amount of veg as we did in the mid-1970s (see Figure 1). Fruit purchasing (fresh and processed) has increased by over 50% over the same period, indicating that specific attention is needed on veg purchasing and consumption. In the last 10 years, purchasing of veg has fallen and the Government's 5 A Day campaign, which launched in 2003, has been very successful in raising awareness, but made no lasting difference to our veg consumption. In Wales, since the campaign began, consumption has fallen from 39% of people eating five a day to 32% (Dixon & Roberts 2016).

The three types of veg that have seen the biggest increase in purchases are vegetables in ready meals, stir-fry packs, and pumpkins and courgettes. The three types that have seen the biggest decrease in purchases are canned peas, fresh brussels sprouts and frozen beans (Open Data Institute 2016).

Figure 1: Trends in veg purchasing (g/per person/ per day, 1974-2014)



Sources: (DEFRA 2016b) Note: Adjusted National Food Survey data 1974 to 2000, Expenditure and Food Survey 2001–02 to 2007 and Living Costs and Food Survey 2008 onwards.

Why should we eat more veg?

Diets that are low in veg are associated with more than 20,000 premature deaths across the UK (IHME 2015) and eating one more portion of veg could reduce our greenhouse gas emissions by almost a fifth.

The latest evidence from the Global Burden of Disease project shows that diet is the biggest risk factor to death and disability in the UK. Combined with high body mass index, it can be attributed to more than 20% of all Disability Adjusted Life Years (a combined measure of death and disability). The UK has the second highest rate of obesity in Europe. One in four adults is now obese and half the adult population is predicted to be obese by 2050 (Butland et al. 2007). Diabetes now affects more than 4 million people in the UK and this figure is projected to rise to 5 million by 2025 (Diabetes UK 2015). The majority of cases (90%) are type 2, which is strongly associated with obesity. This diet-driven crisis is crippling the National Health Service. The costs associated with being overweight or obese are £6.1 billion every year for the NHS and £27 billion for the wider economy (PHE 2015).

Table 2: Percent of girls aged 11-18 years with intakes of micronutrients below the lower reference nutrient intake (LRNI) (Miller et al. 2016)

Vitamin A	**14***
Riboflavin	**21**
Folate	**8**
Iron	**46***
Calcium	**19**
Magnesium	**53***
Potassium	**33***
Zinc	**22***
Selenium	**46**
Iodine	**22**

*** Vegetables and potatoes contribute more than 10% of intakes**

Research shows that fruit and veg protect us against coronary heart disease (He et al. 2007; Dauchet et al. 2006), deaths from cardiovascular disease and deaths of all-causes (Wang et al. 2014; Nguyen et al. 2016; Leenders et al. 2013). A greater level of veg consumption and an increased variety of both fruit and veg may also protect against type 2 diabetes (Cooper et al. 2012). The relationship with cancer is less clear (Leenders et al. 2013) and may be specific to the kinds of fruit and veg consumed and types of cancers (Kanker & Fonds 2007). For example, an increased variety of fruit and veg has been linked to a decreased risk of a type of oesophageal cancer, irrespective of the quantity of fruit and veg consumed (Jeurnink et al. 2012)
Fruit and veg are an important source of fibre, which is associated with reducing blood pressure and a lowering incidence of cardiovascular disease, coronary events, stroke and type 2 diabetes, and colorectal cancers (Scientific Advisory Committee on Nutrition, 2015; Whelton SP, 2005; Streppel MT, 2005).

Our research shows that almost all adults and older children in typical British families and three quarters of primary school aged children do not eat enough fibre (Food Foundation 2016).

Phytochemicals, including plant sterols, and flavonoids and other antioxidants, may also play a role in regulating cholesterol levels and other mechanisms that could decrease the risk of atherosclerosis (Heiss C, 2010; Amir Shaghaghi M, 2013). Fruit and veg contribute important vitamins and minerals to our diets, and these help to prevent deficiencies that cause a range of diseases. Teenagers and pregnant women, two groups with elevated nutritional needs, are at risk of deficiencies, which not only pose a risk to their own health, but also the development of future offspring (see Table 2). Moreover, food purchasing data suggests our consumption of vitamins and minerals is declining (Manning 2016). This seems hardly surprising, given that typical families in Britain rely on ultra-processed foods for more than half of the calories in their diet (Food Foundation 2016) and these foods are often high in calories, and low in nutrient density. Moreover, teenagers have the worst levels of veg consumption (see above).

In addition to the protective health effects, eating more veg will also help us protect our planet. We urgently need to reduce our greenhouse gas emissions to prevent world temperatures from rising to dangerously high levels, and one of the key ways we can do this is by eating a bit less meat and eating more veg. In the UK consumption of meat and meat products accounts for an estimated 48% of the UK's dietary emissions (Macdiarmid et al. 2011). Eating an extra portion of veg, as part of shifting towards a healthier diet, and eating a little less meat would reduce the UK's diet-related greenhouse gas emissions by 17% (Green et al. 2015).

Is our veg becoming less nutritious?

While veg provides an invaluable access to nutrients in the diet, a renewed focus on nutrition within breeding and growing programmes could offer further health benefits. There is some evidence that the nutritional quality of veg has seen marked reductions over time (Mayer 1997; Thomas 2007; Miller et al. 2016; Davis 2009), particularly affecting minerals such as calcium, magnesium and copper. The reasons for this are not certain, but researchers suggest it could be due to crop breeding that focuses on yield (contributing to nutrient dilution), perishability, disease resistance and cosmetic factors, rather than nutritional quality; changing sources of food (imported veg may be grown in a wide variety of conditions); changes in storage and ripening; and the increasing use of soil-less growing techniques (hydroponics).

An opportunity for veg: evidence that we're willing to eat less meat

Mintel reports that 35% of people in Britain identify themselves as semi-vegetarian and that flexitarians are set to rise by 10% by the end of 2016 (Forum for the Future 2016). An estimated 1.2 million people in the UK are vegetarian and 1.9 million are partly vegetarian (Public Health England 2014), and Mintel reports that 20% of 16- to 24-year-olds follow a vegetarian or vegan diet (Mintel 2014). Attitudes towards vegetarianism seem to be changing: in a 2014 YouGov survey, a fifth of UK adults reported cutting back on the amount of meat they had eaten in the previous year, with 35% of respondents willing to consider eating less meat in the future. This provides a great opportunity for veg to come to the fore. After all, we are all eating much more protein than we need (Food Foundation 2016). According to Mintel, vegetarian claims were made on 12% of global food and drink products launched in 2013, an increase from 6% in 2009 (Mintel 2014).

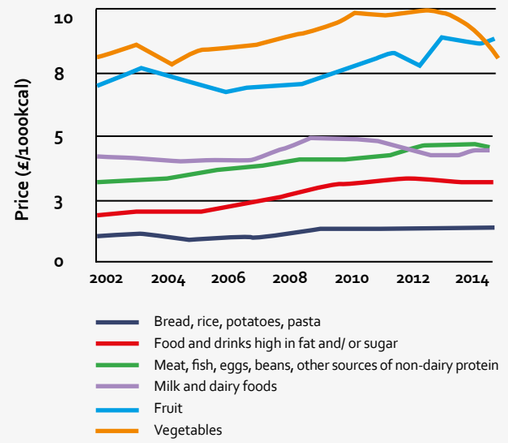
Is veg unaffordable for some?

Many studies report that low-income consumers find price a key barrier to consuming more fruit and veg (John & Ziebland 2004; Dibsdall et al. 2003; Cox et al. 1998; Pollard et al. 2002). In 2014, those in the lowest income decile spent on average £1.66/person/week on fresh and processed veg for household consumption (excluding potatoes), while those in the richest decile spent £3.83/person/week. This amounts to 8.1% of the food budget of the poorest group and 11.5% of the richest group (ONS DEFRA 2015).

Loughborough University estimates that a family needs to spend £2.82 each on veg per week to meet nutritional standards. If the poorest households doubled their expenditure, an averaged-sized household would need to find an additional £3.80, which is the equivalent of 20% of their weekly fuel bill.

While these amounts may appear small, there are an estimated 8.4 million people in Britain who live in households that face periods when they are too poor to eat and as a result skip meals or resort to the cheapest source of calories (Taylor & Loopstra 2016). Calorie for calorie, processed foods that are high in fat and sugar are 2.5 times cheaper than veg (see Figure 2) and are

Figure 2: Mean price of foods per 1000kcal by food group, 2002–2015



This data has been compiled by the Cambridge Centre for Diet and Activity Research and uses food price data from the Office for National Statistics UK Consumer Price Index (CPI) and matches items to the National Diet and Nutrition Survey (NDNS). 'Healthiness' of food is defined using the Food Standards Agency's nutrient profiling model based on energy, saturated fat, total sugar, sodium, fibre, protein, and fruit, vegetable, and nut content.

more likely to be on promotion (Which? 2016), although, of course, veg is usually much more nutrient dense. For these households, the relative price of veg, compared with cheap, processed foods that are very calorie rich, may be a barrier to consumption. For others, however, there maybe a perception that veg is too expensive rather than cost being a real barrier.

Analyses of the Consumer Price Index by the Food Research Collaboration and the Centre for Diet and Activity Research show that the price of veg increased from 2007 to 2013. Although the percentage increase of veg prices between 2007 and 2013 is less than the average of all food products (18% compared with 26%), in absolute terms the change in price for fruit and veg was more than the increase in price for all foods (£1.84/1000kcal compared with £0.73/1000kcal). Since 2013, the price of veg has fallen. This is likely because of the highly competitive retail environment and the focus that the discount supermarkets, which have seen a big rise in market share over this period, have given to their fresh produce. These price reductions are likely to have been met through reduced producer prices, as well as smaller retail margins.

In terms of future prospects, a continued decline in retail price is unlikely – indeed, there is early evidence of an increase in inflationary pressure. The implications of the Brexit negotiations are highly significant for food prices in general, but more so for sectors that rely heavily on imported produce. This is due to the strength of sterling affecting the cost of imported goods, including inputs such as fuel needed for food production and manufacturing.

A range of factors affect price

- **The cost of production.** The cost of raw materials (seeds, inputs etc.) needed as well as labour costs, rent price and subsidies received all contribute to the cost of production. The average price of farmland in the UK has increased more than threefold in the past decade and agricultural rents are also increasing (Devlin 2016). Horticulturalists are more likely to be tenant farmers and receive the smallest amounts from subsidies (CAP Pillar 1 and 2) of all farmers (Food Foundation 2016) (see Table 3). Labour costs are particularly important for horticulture, although there is increasing investment in automation and robotics, which, over time, may reduce the reliance on labour. While the abolition of the Agricultural Wages Board in England has had important implications for the bargaining power of agricultural labourers, the introduction of the National Living Wage will have an impact on costs (Devlin 2016).

- **Farmgate price.** In 2015, UK farmers received 40% of the retail value of a basket of both vegetable and non-vegetable staples of agricultural production. In comparison, in 1988 – prior to the dominance of supermarket supply chains now seen in the UK's food system – farmers received 47% of the retail value of this basket. The farmgate share for the retail price of tomatoes fell from 48% to 27% over this same period. However, farmers receive, in proportional terms at least, more for onions and carrots now than they did in 1988 (DEFRA 2016a).

- **Retail price.** The evidence on relative prices of veg in different store types is mixed in its conclusions, but considerable price variations can be found throughout UK, between and within market stalls, convenience stores and larger outlets (White 2010; Dawson 2007).

Table 3: Average annual farm income from subsidies

Horticulture	£5,300
Dairy	£19,400
Meat	£16,075
Cereals	£40,900

Source (DEFRA ONS 2015)

Is it easy to eat veg if you want to?

Our food environment is a dynamic space in which a range of food options open up to us based on food availability, accessibility, affordability and appeal (Global Panel for Agriculture and Food Systems for Nutrition 2014). The food environment is part of the wider food system. Food environments affect our dietary preferences – though advertising, food manufacturers and retailers can promote certain foods at the expense of others or lead us to associate particular products with particular personality traits and lifestyle choices. However, food environments can also contain barriers preventing us from consuming particular foods – even those we have a preference for eating. This can occur through, for example, poor availability – of stores in a local area or of particular food types within stores – or unaffordable prices.

Advertising

The Food Foundation analysed data on advertising spend in the UK from January 2010 to June 2016 (Nielsen AdDynamix, 2016). We found that the amount of money spent on promoting veg was negligible, especially when compared with that spent on foods high in sugar, fat or salt such as cakes, biscuits and soft drinks. The proportion of all food and drink (non-alcoholic) advertising spend on promoting veg remained roughly the same between 2010 and 2015, at 1.2%, while that spent on potatoes peaked at 2.5% in 2013 and has since decreased to 0.7% in 2015. The proportion spent on advertising cakes, biscuits, confectionery and ice creams has, by contrast, increased from 18.8% in 2010 to 22.2% in 2015. In 2015, the amount spent on advertising veg was £12m, the same as on biscuits; the amount spent on advertising potatoes alone was £7m, but nearly £87m went on promoting soft drinks.

EXAMPLES OF GOOD PRACTICE

The Olympic Games and other sporting events are often used by advertisers to promote food products. While campaigners described the most recent Olympic Games as a "carnival of junk food marketing", the supermarket Aldi used its tie-in with Team GB to promote its veg and fruit ranges (Bulluz 2016).

In the store

The information available in, and the physical structure of, the retail environment influences the way choices are made, known as 'choice architecture' (Manning 2016). While chocolate bars, sweets and other foods that are high in fat, salt and sugar are regularly promoted at multiple points within a supermarket store, veg is often presented in one or two sites, in a way that does little to promote the pairing of veg with other products or encourage the perception that they are convenient products. The availability of veg within processed food also affects consumers' diets. The Food Foundation's analysis of ready meals showed that only 20% of those on offer contained no meat or fish (Food Foundation 2016).

EXAMPLES OF GOOD PRACTICE

Convenience stores often have a much smaller range of fresh produce and much more can be done to improve their fresh veg offer. Healthy Living Neighbourhood Shops – a project run in the mid-2000s in Scotland involving Scottish grocers working in partnership with NHS Scotland and the Scottish government – found that moving the placement of fruit and veg inside small stores increased sales by 62%. Six hundred stores across Scotland improved their range, quality and stock of fresh fruit and veg as a result of the programme (Department of Health 2010).

In the takeaway

- **Fast food** – often with little if any fresh veg on offer– can have harmful effects on the health of communities with high concentrations of such outlets (Burgoine et al. 2016). Food Foundation analysis of the core menu of McDonald's (the quick-service restaurant with the largest market share in the UK) demonstrates why this finding should not come as a surprise: only 18 of the 57 food items on the menu and five of the 23 beverages contained levels of fat, sugar, or salt low enough to allow them to be advertised to children, while only seven main-course items do not contain meat (Food Foundation 2016).

- **The out of home sandwich market** also contains a limited veg offer. A 2016 survey of 535 sandwiches from 12 major retailers (supermarkets and high street chains) found that only 4% were plant-based, with fillings based primarily on vegetable or pulse ingredients. In 2015, less than 3% of surveyed sandwiches were plant-based (Eating Better 2016).

EXAMPLES OF GOOD PRACTICE

Recent initiatives demonstrate that supermarket retailers can make positive changes to the choice architecture of their stores. Sainsbury's has recently piloted an in-store 'vegetable butcher' to assist consumers in identifying more opportunities to include veg in household meals. Customers can buy their favourite loose vegetables, then take them to the counter for a preparation of their choice (ribbon cut, spiralised, mandolin sliced, wave-cut and julienne) at no additional cost. Meanwhile, Asda's 5kg family wonky veg boxes are 30% cheaper than standard product lines and are aimed at helping to cut food waste and keeping it affordable.

EXAMPLES OF GOOD PRACTICE

Local authorities can limit the proliferation of fast-food premises in communities – for example, by placing limits on the opening of new stores near schools. However, quick-service restaurants can and have been able to change their in-store food offers to better deliver vegetables and other healthier produce. McDonald's Free Fruit Fridays (where free fruit is offered with other purchases on the first Friday of every month) and Pret a Manger's 'Veggie Pret' store pilot demonstrate the industry's willingness to improve its fruit and veg offer.

At school and nursery

The School Food Standards for lunches state that there must be one or more portions of veg or salad offered as an accompaniment every day, and at least three different vegetables offered each week (School Food Standards 2015). However, in the absence of close monitoring of the standards, the extent to which schools are applying and going beyond the standards to help children to increase their veg consumption – through, for example, the layout of canteens or the creation of environments where children are encouraged to experiment with new tastes etc. – will be highly variable. Moreover, after Key Stage 1 when school meals are free, uptake declines, although data on uptake is scarce for this age group and for secondary schools. The Children's Food Trust has shown that those primary and secondary school children who eat school lunches eat more veg than those who bring a packed lunch. Unlike schools, nurseries have no mandatory food standards and research shows 30% of nurseries don't serve veg daily (Neelon et al. 2015).

EXAMPLES OF GOOD PRACTICE

The Soil Association's Food for Life (FFL) partnership works with schools and local authorities to support the delivery of healthy school meals, great lunchtimes and food education. The evaluation of the scheme has shown that children in schools that have received a FFL award are significantly more likely to eat fruit and veg both in school and at home (Jones et al. 2015). Fifty per cent of primary schools in the UK now have a FFL award, although "Wales has been something of a desert for the FFL model compared with England and Scotland" (Morgan 2016).

At home

Lack of time to prepare food and lack of confidence in the kitchen can all get in the way of eating veg. Making veg more convenient to prepare can help with this, as can food education in schools to ensure children learn basic cooking skills, while community growing projects support people to grow their own veg. A survey in the US showed 26% of consumers purchase pre-cut fruit and veg due to the convenience of these items, and 20% of consumers would like to see more ready-to-eat, single-serve fruit and veg offerings become available on the market (cited in (Manning 2016). However, some people will never want to cook from scratch and for them the challenge is to make sure there is more veg in ready-to-eat foods such as ready meals and cook-in sauces.

EXAMPLES OF GOOD PRACTICE

Incredible Edible began in 2007 and is now made up of more than 100 groups stretching beyond the UK to Canada and New Zealand. These groups work together to grow produce, provide training on growing and cooking, and support local commerce.

At work

Work patterns can get in the way of veg consumption, particularly for people who rely on unpredictable work or shift work when normal eating patterns may be disrupted. However, workplaces can support employees to eat veg during the working day. These initiatives could include educational (e.g. healthy-eating workshops), behavioural (e.g. assistance with meal planning) and/or environmental (e.g. free or subsidised offers on particular products) interventions. Moreover, around 15% of the UK's total workforce are employed within the food system (ONS 2016a) and these people are in disproportionately lower-waged work (ONS 2016a) and are therefore more likely to be affected by low veg consumption (see above). If businesses in the food system made efforts en mass to increase veg consumption among their employees, this would constitute a far-reaching population-level impact.

EXAMPLES OF GOOD PRACTICE

While much of the research is focused on white collar worksites there is good evidence that workplace interventions can have a positive effect on dietary habits. A systematic review of six workplace dietary modification interventions found, for example, that such schemes can increase consumption of veg by up to half a portion a day (BDA 2015).

Do we want to eat veg?

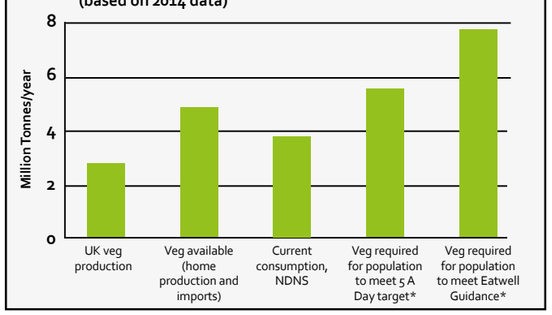
Unless veg tastes good, we won't want to eat it. Some veg can be cooked so badly that it comes completely undesirable. Some veg can be grown with the primary purpose of producing the largest quantity, at the lowest price and the longest shelf-life, and may not taste as good as it could. The challenge is to make veg so delicious that taste enables rather than inhibits our consumption, and to achieve this at a price point that makes it an affordable choice in the supermarket or take-away.

Although we are born with a genetic preference for sweetness over bitterness, our experience of these tastes varies. These genetic predispositions can interact with our environment to influence our preferences – for example, how frequently we're exposed to a particular food and whether we receive encouragement to eat it. We develop our taste preferences early in life and, while its possible to modify these, teaching young children to taste and enjoy veg is hugely important if we are to turn into a nation of veg lovers.

Are we producing enough veg?

In the last 30 years, the area planted to veg in the UK has declined by 26%. It now stands at 131,000 hectares, which is less than 1% of the UK's total utilised agricultural area (DEFRA 2014b; DEFRA 2014a). Land planted to veg in Scotland has however doubled over this period and is now 16,672 hectares (Scotland Government 2015). Wales grows veg on 617 hectares (Welsh Government 2015), 34% more than 10 years ago, but still only 0.04% of total agricultural land. Not surprisingly, this has resulted in a decline in total agricultural output from veg from 3 million metric tonnes (MT) to 2.8 million MT per year (DEFRA 2014b). Over the same period, our reliance on imports has increased sharply, largely driven by demand for a wider range of veg that can't be grown in the UK. The contribution of UK-grown veg to total supply has fallen from 83% to 58% of total supply (DEFRA 2014b). The major crops grown are shown in Figure 4.

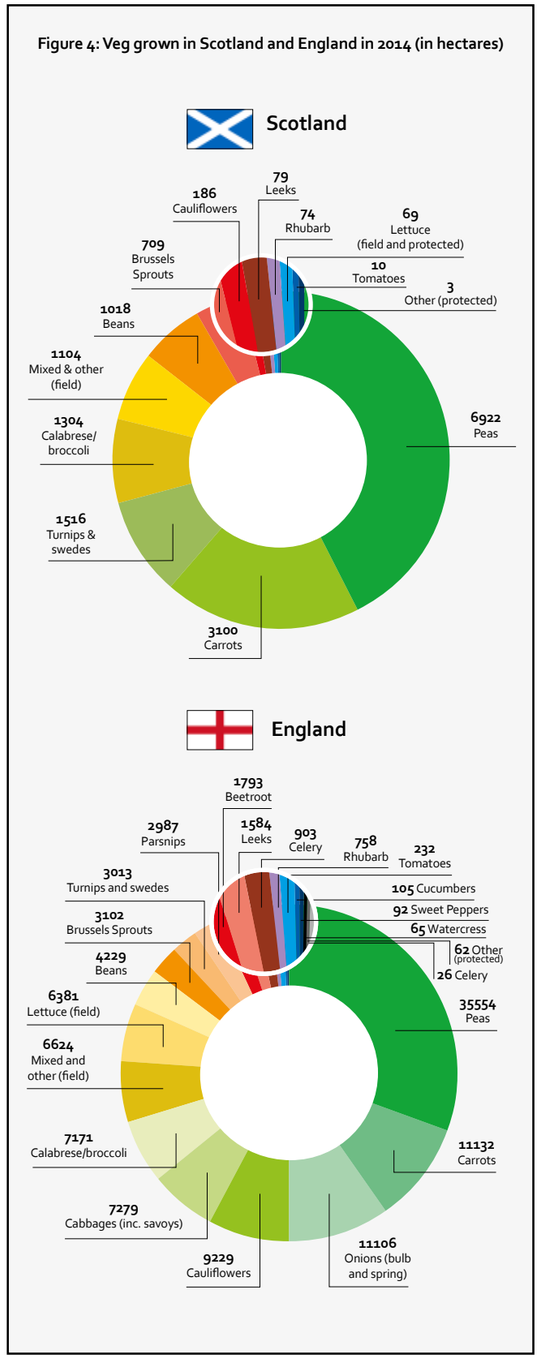
Figure 3: UK vegetable production and requirements (based on 2014 data)



*Assuming 50% reductions in current levels of household (29%) and supply chain waste (12%). (DEFRA 2015b; Wrap 2012a; Wrap 2016; DEFRA 2014b; ONS 2016b; Public Health England 2014)

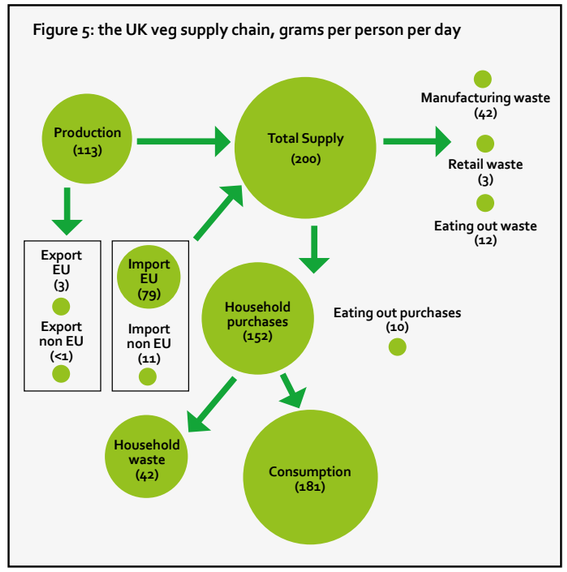
The quantity of veg grown and imported into the UK is close to that needed for the whole population to meet its 5 A Day target. However, currently around 30% of total supply is lost through household waste (avoidable and unavoidable), and supply-chain waste diminishes supply by a further 10% (Wrap 2016; DEFRA 2015b; Wrap 2012a). If this level of waste continues, increasing UK veg consumption to meet the new Eatwell Guidance (equivalent to 3.5 portions of veg) would require an extra 4.9 million MT. Reducing our supply chain and household waste by half, in line with the Sustainable Development Goals, would, however, lower this requirement to 2.7 extra million MT. If we maintain the current ratio of imports while reducing waste in line with the Sustainable Development Goals, this represents an opportunity for UK growers to produce more than 1.5 million MT of extra veg per year.

Figure 4: Veg grown in Scotland and England in 2014 (in hectares)



Sources: (Scotland Government 2015) and England (DEFRA 2016c).

Figure 5: the UK veg supply chain, grams per person per day

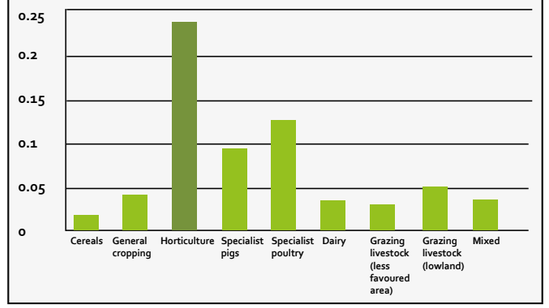


Sources: Production, Exports and Imports: (DEFRA 2015a; DEFRA 2014a; DEFRA 2014b), Purchases: (DEFRA 2016b), Waste: (Wrap 2012a; Wrap 2013; Wrap 2016; Wrap 2012b), Consumption: (Public Health England 2014)
Population estimates: (ONS 2016b)
Note: The above diagram shows the veg supply chain in the UK. It uses a range of data sources, each with particular methodological challenges described in Annex 1 of this report. Therefore, vegetable weights do not sum perfectly as one moves through the diagram.

If we produced more, would it support economic growth? Researchers from the University of Reading modelled the potential impact of increased consumer demand for fruit and veg to the level needed to meet dietary recommendations. They showed that if farming patterns shifted to meet the demand for healthy diets (involving a decline in meat and dairy production, and an increase in fruit and veg), the net margin from agriculture in England and Wales would increase by 143%, as meat and dairy tend to be lower-margin enterprises (Arnoult et al. 2010).

Increased horticultural production would also lead to increased demand for workers. Horticulture is already a labour-intensive industry, employing 12% of England's agricultural labour force and at least 35% of its casual/seasonal labour force, which is heavily reliant on migrant workers (Schoen & Lang 2016). No more than a sixth of seasonal work is undertaken by British workers (Devlin 2016). Sustaining this labour force in the context of Brexit is a major priority for the horticulture sector in Britain and political uncertainties surrounding migrant labour may, in fact, threaten the survival of some horticulture businesses.

Figure 6: Labour intensity of different farm types (number of jobs per hectare)



Source: (Devlin 2016)

Conclusion

Eating more veg offers a triple win: a win for the economy, a win for our health and the NHS, and a win for our carbon footprints. All three are in need of urgent action. Our economy is facing a series of significant threats following our decision to leave the European Union. Our NHS is facing an unprecedented rise in the number of cases of type 2 diabetes linked to obesity and is in urgent need of effective prevention strategies. The carbon footprints caused by our diet will have to shrink if we are to meet our targets for reducing greenhouse gas emissions and prevent dangerously high rises in global temperatures.

However, while the case for action is irrefutable, there are many thorny issues to overcome. From the age of six months, our children need to be taught to taste and take pleasure from eating delicious veg. Our advertisers, retailers, manufacturers and fast-food purveyors all need to position veg more strongly to compete with high-fat -sugar and/or -salt foods when we are looking for a tasty snack, and compete with meat for centre stage on our plates. Our producers need to continue to innovate to meet this growing demand, but at the same time continue to safeguard our biodiversity and soil quality. Most importantly, this needs to be supported by government policies that incentivise and support this action.

We cannot hide from the fact that the price of veg is likely to start to climb as the effects of Brexit take hold. While these increases will impact on all of our imported food, we know from past experience that when prices go up, our fruit and veg consumption often suffers. This may deliver an economic advantage for British-grown veg, but at the same time the particular reliance on migrant labour within horticulture poses some unique risks to the sector and its sustainability.

In these challenging times, the Food Foundation, Nourish Scotland and WWF-UK are committed to leading a process for delivering change. We have convened leaders across the food system to consider which aspects of the supply chain could benefit most from changes in policy and practice and to agree the scope of change needed. Together we will weigh up the merits of different changes in terms of their feasibility and potential impact, and work to secure wider commitment to these changes. This will lead to a major summit on 7 June 2017 where government and business leaders will be asked to commit to act.

Please join us in this challenge.

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Annex 1: Statistics on consumption

1) Health Survey for England (HSE) asked about the quantity of vegetables eaten in the last 24 hours (it used mostly tablespoons when interviewing as a guide for portion sizes). The responses were then coded into portions sizes following the Department of Health Guidance (i.e. one portion of pulses only). Figures for the number of portions in the table below are based on the vegetable portion variable in the HSE dataset. The vegetable intakes in g/day in the table are therefore only estimates based on an 80g portion size for adults and a 50g portion size for younger children. The participants were asked about portions of vegetables eaten so, in theory, the estimates are based on a methodology that takes into account waste, but respondents were not specifically asked about leftovers.

2) National Diet and Nutrition Survey (NDNS) used a detailed four-day food diary. Portion sizes were estimated using household measures (e.g. four tablespoons of peas) or using weights from labels (e.g. 420g tin of baked beans). NDNS estimates should be higher than the HSE, as the NDNS better captures vegetables from composite foods. Although participants did not record leftovers separately, they were asked to take into account leftovers when recording how much they consumed.

The NDNS doesn't contain a variable for vegetable portion sizes. It calculated fruit and vegetable portion sizes (for those aged over 11 years only), taking into account PHE recommendations. Vegetable-only portion sizes were therefore calculated using the same methods as the NDNS to calculate portions of fruit and vegetables, excluding the contribution of fruit.
• Daily consumption of baked beans and other pulses was capped to 80g – one portion.
• Daily consumption of tomato puree was multiplied by five to account for effects of concentration.
• Total weight of vegetables was divided by 80 to arrive at the number of vegetable portions. The NDNS didn't calculate portion sizes for children aged 10 years and younger, as the 80g portion size is likely to be too large for younger children. We decided to calculate a portion size for children aged between five and 10 years using the same method as above, but instead using 50g as one portion (as recommended by Children's Food Trust).

3) Family Food Survey is a voluntary survey of private households using diary records of expenditure for two weeks. Quantities were recorded where possible for household food and drink. For meals eaten out, the diary keeper recorded itemised list of meal components. DEFRA then used standard portion sizes to estimate quantities. The vegetable portions for the Family Food Survey in the table are estimates based on an 80g portion size of vegetables. The Family Food Survey estimates are based on purchases and therefore do not take into account waste.

Annex Table 1: Daily vegetable intake estimates from HSE, NDNS and Family Food

	AGE			INCOME (aged over 11)		GEOGRAPHY (aged over 11)			
	Adults (aged >16)	Secondary School age children (11–16y)	Primary school age children (5–10y)	Poorest 20%	Richest 20%	England	Scotland	Wales	N Ireland
HSE (2013)									
Mean intake (g)[1]	128	88	88/55	120	152	NA	NA	NA	NA
Mean # portions	1.6	1.1	1.1	1.5	1.9	NA	NA	NA	NA
% eating <1portion	28.6	43.5	43.2	31.8	19.5	NA	NA	NA	NA
NDNS (2008/9–2011/12)									
Mean intake (g)	181	107	102	161	196	179	153	171	134
Median intake (g)	166	95	92	132	167	151	131	140	105
Mean # portions	2.6	1.7	2.5	2.3	2.7	2.5	2.2	2.5	2.0
Median # portions	2.3	1.5	2.3	2.1	2.5	2.3	2.1	2.2	1.8
% eating <1 portion	10.0	24.8	13.3	16.2	7.1	10.3	15.7	12.7	24.3
Family Food Survey (2014)									
Household mean intake g/person based on volume purchased	152[2]/162[3]			137[3]/143	181[3]/195[4]	156[3]/167[4]	131[3]/137[4]	137[3]/145[4]	133[3]/138[4]
Household mean # portions [4]	1.9/2.0			1.7/1.8	2.3/2.4	2.0/2.1	1.6/1.7	1.7/1.8	1.7/1.7
% eating <1 portion	NA			NA	NA	NA	NA	NA	NA

[1]Estimated by multiplying # portions variable by 80 (adults and secondary school children) and 80/50 (primary school children).
[2]Includes only vegetables purchased for household consumption (e.g. at the supermarket). Does not include vegetables eaten out.
[3]Includes vegetables for household consumption and salads and vegetables eaten out. NB excluded non-veg based salads (e.g. tuna salad) and vegetable dishes (e.g. vegetable cannelloni) from calculations so likely to be slight underestimates.
[4]Estimated by dividing household mean intake (g) by 80.