Food Research Collaboration

Horticulture in the UK: potential for meeting dietary guideline demands[i]

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Executive Summary

Public health analysis suggests that many lives can be saved if the UK population actually followed dietary guidelines on fruit and vegetable daily intake. The Government's Eatwell Plate suggests that more than a third of UK daily diets should comprise fruit and vegetables and yet currently less than a quarter of diets are taken from this source. A UK debate on the status of the horticultural industry and its potential to meet a recommended increase in consumption is long overdue.

This paper, largely based on secondary sources of data, presents current national levels of fruit and vegetable production and consumption. It outlines the origins of what horticultural produce is consumed here and the potential for meeting demand should diets adapt to those suggested by government guidelines. The Briefing provides a summary of key facts on UK horticulture based on information that is publicly available. An FRC seminar is planned to take account of non-documented industry views in order to complete or correct the picture presented here but our current objective is to outline the situation as it appears from published data:

- There has been a big decline in area given to horticultural production. From 1985 to 2014, there has been a decline of 27% for fruit and vegetables combined. The area growing vegetables has declined by 26% and the area growing fruit by 35%.

- Fruit and vegetables are by far the greatest source of imports in the UK food system. The trade gap in horticulture has risen to £7.8 billion a year, about 37% of the UK's total food trade gap of £21 billion in 2014. Although some growers have extensive growing operations in Southern Europe and further afield, this makes sense for them as commercial enterprises but still does not resolve the serious lack of UK horticultural output. This is important to meet the 21st century challenge of increasing production for health everywhere and to ensure that rich consumer societies do not excessively distort international trade for their purposes.

- Some imports (e.g. pineapples, avocados) could not be grown in the UK (or not yet) but others which could be UK grown (e.g. brassicas, mushrooms, lettuce) have seen massive drops in production.

[i] The request for this Briefing was made early in the FRC's life when health and consumer CSOs expressed the desire to know more about the state of UK fruit and vegetable production, and academics working on both supply and demand also wanted an up-to-date focus. This Briefing Paper is designed to help the exchange of knowledge on a sector which suffers too much of a 'Cinderella' syndrome.

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- The proportion of the adult population (over 16 years) in the UK consuming five or more portions of fruit and vegetables per day stood at only 26% in 2013.
- Only 16% of children achieved an intake of 5-a-day or more in 2013.
- The Consumer Price Index for food items as a whole has shown a significant increase of 35% in 2007-2013. Within this, the price of vegetables has increased by 27% and fresh fruit by 26%, less than the average for the food sector as a whole.
- Horticulture is unevenly distributed across the country, partly for climatic reasons, but areas that used to have sizeable sectors (e.g. the South West) have seen a heavy decline. A 're-boot' of regional strategies is overdue to incorporate a review of planning and financial regulations and to rebuild bioregional resilience where appropriate.
- Land used for horticulture is highly productive. Only 3.5% of UK croppable land is down to horticulture, yet producing £3.7 billion worth of produce. For every one hectare of land under fruit and vegetables, 4.5 hectares are used for wheat for animal feed- with the inevitably slower and less efficient energy conversion rates.
- Horticultural wages for seasonal workers are low, not helped by the abolition of the Agricultural Wages Board. Horticulture occupies only 2% of the farmed area in England yet employs 12% of the agricultural labour force and at least 35% of the UK's casual farm labour force.

The Briefing makes a series of recommendations:

- The Government (DEFRA) forthcoming 25 year Food Strategy should apply a 'health lens' to its proposed focus on 'Brand Britain'
- Government, growers, land use specialists, industry and regional bodies should begin to plan the infrastructure needed for a massive reinvestment in, and policy support for, horticulture.
- Both academics and civil society should examine the scope for encouraging demand for more home produced, sustainable horticulture and higher consumption of fruit and vegetables in the UK
- Public health and environmental analysts should work more clearly on how to narrow the gap between supply of, and demand for, fruit and vegetables. Modelling studies as well as practical investigations should be funded.
- A new research strand should be set up by the Government Research Councils into how to build demand for more sustainable home production.
- A new more unified voice between all parties is needed to champion the British horticultural sector; this lack should be the subject of linked (or even joint) inquiries by the Parliamentary Health, Environmental Audit, BIS, and Environment, Food & Rural Affairs Committees

1. Introduction

The purpose of this paper is to contribute to a debate which is long-overdue yet slow to take off. It concerns the state of UK horticulture. This sector ought to be central to contemporary thinking about the future of food. Horticulture is the production of fruit and vegetables - the 'good news' in food policy – yet strangely receives little attention from civil society, media nor academics, let alone the politicians and policy makers who ought even now to be accelerating a renaissance in horticulture.

In the late 2000s, in the wake of the 2007-08 agricultural commodity crisis, when prices spiralled and the rich world realised the fragility of the global food system, the UK state began an interesting refocus on horticulture setting up a Fruit & Vegetables Taskforce(1), as requested to the Secretary of State at DEFRA by the then Council of Food Policy Advisors (abolished by the Coalition Government on taking office). The taskforce reported but the policy support had evaporated in Government by then.

This paper therefore presents a reminder of why horticulture is so important – for health, work, trade and political economy – and why it deserves to be a central concern in public policy on food. There is strong public health evidence of the benefits of fruit and vegetables. Not only are they good for us, their increased consumption could actually save the NHS money. Yet the data show that UK current consumption of horticultural produce falls below that advised by the WHO and far below that promoted by countries where '7-a-day' is more commonplace than the UK's weaker '5-a-day'. Attempts to boost consumption have had too little impact.

What is even more alarming is the lack of UK research into what could happen to farming, the food economy and trade, if consumers were to take on board current advice and en masse increase their fruit and vegetable intake. This would certainly highlight a problem where demand has increasingly been for horticultural produce from overseas and demand for home-produced horticulture has weakened. This failure of demand and resultant overseas supply is a reminder that, despite some progress, UK food culture, not just food policy, is in an undesirable place. Fruit and vegetables are essential ingredients in a good culinary culture as well as public health nutrition profile (confirmed by the new Public Health England Eatwell Guide(2), yet this Briefing gives the evidence that consumption is patchy, highly divided socially, and subject to price and income sensitivities. Providing advice, or '5-a-day' guidance, is neither working for consumers nor is it resuscitating appropriate horticulture. Market dynamics are externalising costs onto health and society. This is policy failure. In everyday language, this is a missed opportunity to grow good food, create good jobs and reduce a dreadful and unnecessary food trade deficit. The DEFRA 25 year food plan, so far, shows little recognition of how applying a 'health lens' to its focus on Brand Britain and exports actually requires a massive reinvestment and policy refocus on horticulture.

This Briefing provides a summary of what UK production currently looks like, based on DEFRA horticultural statistical data, in order to help wider discussion. Many questions follow. Given the strong evidence collected by Government itself, for example, it is legitimate to ask why Government and those who claim to pursue evidence-based policy are not listening. How can this deficit be rectified? What will it take for consumers, food chains and government to unlock the current lock-in of deficient supply and consumption?

One step called for by this Briefing Paper is an investigation of micro-level decision making amongst diverse UK horticultural producers to understand better what shapes their current market situation. Modelling work to investigate how the UK could meet an increased domestic demand is recommended. The paper also calls for a policy review into how the British could both grow and consume more of their own horticultural production.

The Briefing also raises but has not the space to address many big questions about horticulture. For a country blessed with a fine climate and soils for producing good fruits and vegetables, the reality of vast importation of produce which could be grown here suggests that UK policy is tacitly a kind of 'soft' food imperialism - using others' land and labour rather than one's own. What horticulture there is in the UK relies heavily on imported labour. Why is this and does this matter? And if, as is often said, an impediment is working conditions (including the challenge of working outdoors in all weathers, something that may not appeal to British workers) and pay in horticulture, what could improve these? And what would a good horticulture with decent pay and conditions look like and cost? Does it matter, indeed, if good land

here is not being used for growing healthy produce? Does it matter if a country relies on others to be fed? These are old policy questions, highlighted in times of war but requiring a good airing now at a time of climate change and food system stress. Currently, a trading perspective dominates UK policy; it doesn't matter what is grown where or how, as long as supplies are available. This is an out-of-date perspective. Food analysts are moving towards a position of arguing that food and land policies should be framed not by input-outputs or trade balances alone but by indicators such as how many people are fed adequately per hectare(3), and by indicators of appropriate sustainable land use(4). At a time of widening recognition of conflicts over land use but also of the need to reconfigure diets to meet both environmental and health demands, this Briefing therefore calls on civil society and academia to engage in these debates and to provide a more coherent public championing of the sustainable horticulture needed for the 21st century.

2. The public health evidence

The current World Health Organisation recommendation is to consume over 400 grams of fruit and vegetables per day, as part of a healthy diet low in fat, sugars and sodium, in order to improve overall health and reduce the risk of certain non-communicable diseases(5). Evidence of such health benefits abounds. Oyebode et al(6) use data from the Health Survey for England (HSE) to show fruit and vegetable consumption significantly linked to reductions in cancer and cardiovascular disease (CVD) mortality, with increasing benefits being observed as consumption rises to, and beyond, 7 portions daily per person.

In their modelling work, Scarborough et al (7,8) show that around 33,000 deaths per annum would be avoided if UK dietary recommendations were met. Over 15,000 of these would be due to increased consumption of fruit and vegetables. O'Flaherty et al(9) estimate the potential reduction in CVD deaths in the UK for two dietary policy scenarios – one with a modest change to diet, including an increase per capita of one portion of fruit or vegetables per day, and one with a more dramatic dietary change encompassing three additional daily portions of fruit or vegetables[v]. Under these scenarios, the modest dietary change leads to 12,500 fewer CVD deaths per year and the more aggressive dietary change leads to 30,000 deaths prevented.

Globally, Springmann et al (10) find that a predicted 4% per capita decline in fruit and vegetable availability due to climate change compared with the baseline (no climate change scenario) leads to 534,000 climate-related deaths. Of these, approximately 140,000 are as a result of coronary heart disease, 160,000 a result of stroke and 230,000 due to cancer.

The scientific evidence is therefore unequivocal that fruit and vegetable consumption is a cornerstone of a healthy diet and that a population level increase in intake is highly likely to reduce diet-related mortality.

3. Current dietary guidance

3.1 Current dietary guidelines in the UK

Current UK guidelines on fruit and vegetable intake are based on the WHO recommendation, interpreted as the '5 a day' campaign, adopted by the UK government in 2003(11). The importance of fruit and vegetables in the diet has also been consistently stressed in the Eatwell Plate where the suggestion until the new Guide was that 33% of the diet (by weight) should come from these foods. The

[v] The modest dietary change assumes diets will continue to see trends to 2012 continuing to 2015 i.e. small reductions in intake by 0.5% of total energy for trans fat; by 1% of total energy

Eatwell Guide issued by Public Health England in March 2016 advises that 39% of energy should come from fruit and vegetables(2).

Eating more plant-based foods, including at least five portions of fruit and vegetables per day, was one of the eight messages coming out of the 2012 DEFRA sponsored Green Food Project to encourage more healthy and sustainable diets(12). This also recommended that choosing produce which has travelled less far can result in lower transport emissions (where production, processing and distributions systems are similar). Although this environmental advice has not been adopted by Government with the vigour it deserves or its advisors seek, we can conclude that there are good formal public health signals to increase uptake of fruit and vegetables in the UK.

3.2 Does the UK meet dietary guidelines?

Despite the various official, voluntary and professional efforts to encourage fruit and vegetable consumption in the UK (e.g. NHS Live Well, NHS Change 4 Life, Eat in Colour, Food Dudes), intake rates are still low.

The European Food Information Council(13) presents data to show that the UK is ranked fifteenth out of nineteen European countries in terms of mean fruit and vegetable intake per country with a rate of 258 grams per person per day (pppd). Poland ranks the highest in this list at 577 grams pppd and Iceland the lowest at just 196 grams[vi] pppd.

The proportion of the adult population (over 16 years) in the UK consuming five or more portions of fruit and vegetables per day increased from 22% for men and 25% for women in 2001 to a peak of 28% and 32% respectively in 2006. There has however been a decline in this since with only 25% of men and 28% of women achieving the target in 2013 (see Table 1)(14).

Table 1: **Average daily consumption of fruit and vegetables by men, women and children in 2013 (14)**

	2013 % consuming within each portion size group			
	Men[vii]	Women	All adults	All children
None	8	5	7	7
Less than 1 portion	3	3	3	4
1 portion or more but less than 2	18	14	16	19
2 portions or more but less than 3	17	18	17	21
3 portions or more but less than 4	17	18	17	20
4 portions or more but less than 5	13	14	13	12
5 portions or more	**25**	**28**	**26**	**16**
Mean portions (number)	**3.5**	**3.7**	**3.6**	**3.0**

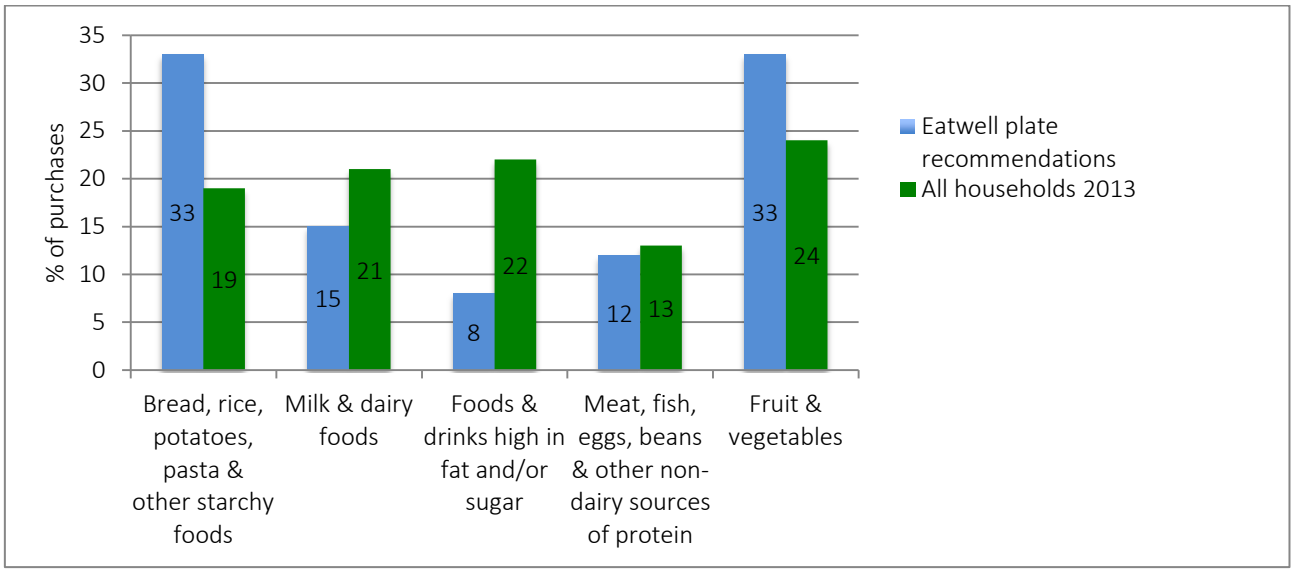
Looking at the rates of success with meeting Eatwell Plate guidelines finds similar results. The recommendation has been that 33% of the diet is taken from fruit and vegetables but in 2013 actual intake reached 24% for all households. Foods and drinks high in fat and/or sugar occupied a disproportionately large percentage of the diet purchased.

for saturated fat; by 1 g per day for salt and one additional daily portion of fruit or vegetables. The more aggressive dietary change assumes more substantial dietary improvements – reductions by 1% of total energy for trans fat; by 3% of total energy for saturated fat; by 3 g per day for salt and three additional daily portions of fruit or vegetables.

[vi] The list of countries included, in order of consumption rates, highest to lowest, is Poland, Italy, Germany, Austria, Hungary, Estonia, Ireland, Belgium, France, Denmark, Netherlands, Slovakia, Bulgaria, Norway, UK, Finland, Czech Republic, Sweden and Iceland.

[vii] Men, women and all adults refer to those aged 16 and over.

Figure 1: **Eatwell plate guidance compared with purchase rates for all households(15)**



3.3 Reasons for the consumption gap

When the public health benefits of fruit and vegetable consumption are so clear, it may seem strange that uptake falls short of the recommended amounts. This may partly be explained by a lack of clarity and understanding as to what a portion comprises(16,17). This is not helped in the UK by the confusing labelling used by different supermarkets for the same product in different formats and packaging sizes(18).

EUFIC(13) summarise other reasons identified in the literature to explain the gap between recommended and actual fruit and vegetable intake:

Income and education: lower income groups tend to consume fewer fruits and vegetables than higher income groups – although the perception that prices are high may restrict intake by all income groups. More highly educated groups consume more vegetables, perhaps because of the link to higher incomes but maybe also due to a greater awareness of the health benefits of consumption.

Gender and age: girls and women consume larger amounts of fruit and vegetables than boys and men. Reasons are unclear; it may be females prefer these to males but, again, there is no clear reasoning. In children and adolescents, consumption falls with age. In adulthood, consumption increases with age. This may be related to income and increased knowledge with age but also to social activities, social eating habits, increased sensitivity to the importance of health, and time available for cooking.

Accessibility and availability of fruit and vegetables: poor access and/or availability limits uptake.

Family factors and social support: there is increased intake of fruit and vegetables in married couples, particularly in men, perhaps because of the traditional role of the female in food sourcing and preparation. Children's consumption is related to the quantity their parents eat.

Preferences: food habits are affected by childhood experience. Low consumption and unfamiliarity can be self-reinforcing and if vegetables are poorly cooked they are unlikely to be enjoyed and therefore relished.

Knowledge: nutritional knowledge is a strong predictor for fruit and vegetable consumption. Lack of skills to prepare fruit and vegetables may limit quantities

purchased. There may be gender differences in nutritional knowledge with females more likely to associate a healthy diet with eating more fruit and vegetables.

Psychological factors, attitudes, beliefs and perceived barriers: strong evidence exists that self-efficacy is a strong predictor for fruit and vegetable intake in adults, as well as self-esteem and perceived healthiness of fruit and vegetables. People may also believe they eat a healthy diet and this can act as a barrier to further fruit and vegetable uptake. Lack of time to shop for and prepare vegetables may prevent further uptake.

3.4 Evidence on potential impact of a shift to meet dietary guidelines

The picture summarised above has led some analysts to argue that better marketing is required. The horticulture board chairman of the National Farmers Union (NFU) has said: "we need more innovative ways of packaging and promoting our produce, to make it easier for consumers to know what a portion size is and how they can incorporate it into their diet. And we need retailers to stock more fruit and veg in snack packs in store, in prominent positions that might encourage impulse buying"(19).

While marketing has a role to play – not least to counter the flood of advertising and marketing promotion of highly processed, sugary, fatty, salty foods – we think the under-consumption of fruit and vegetables requires a multi-pronged approach. There is no single 'silver bullet' for reversing low consumption. If the UK is to shift towards a recommended healthier diet centred on fruit and vegetables, this will certainly require a shift in resources and policy attention, not least to rebuild horticulture. This will have implications for land use, employment in the food industry and the balance of food trade. And tackling all of these will have effects on prices for both inputs and final products. The transition to a more plant-based diet implies considerable economic adjustment, a scenario which has not been well investigated in the UK. Most research into the economic impact of increased demand for fruit and vegetables comes from the USA.

Land use, production and trade impacts

For the UK, one study has been identified, by Arnoult et al in 2010(20) This modelled the land use, production and landscape effects of a shift to recommended diets in England and Wales, based on data from DEFRA's Expenditure and Food Survey (EFS) for 2003-2004. Diet changes modelled include a reduction in the consumption of red meat and a significant increase in the consumption of fresh fruit and vegetables. Such a shift in demand is shown dramatically to affect production patterns. In the model, the total net margin of England and Wales agriculture rises due to the expansion of production of higher margin horticultural enterprises and the contraction of lower economic margin enterprises such as beef and sheep. But this aggravates regional differences as any benefits from dietary change would mainly be seen in more agronomically-favoured areas while those regions dependent on beef cattle and sheep production would lose markets for existing enterprises and receive lower prices.

Other modelling has been conducted in the USA. Buzby et al(21) showed that if Americans were fully to meet the 2005 Dietary Guidelines for Americans for fruit, they would need to increase daily consumption by 132%. The additional demand could require US producers to more than double harvested fruit acreage to 7.6 million acres. US fruit production is constrained by land, labour, and climate, making it likely that imports would continue to increase as a share of the total US fruit supply.

Another US study(22) using the 2010 US dietary guidelines shows that meeting recommendations for fruit would require total availability (domestic production + imports – exports) to increase by 133%, including an increase of 131% in domestic production. For vegetables, total availability would need to increase by 114% to meet 2010 recommendations. This would most likely necessitate an increase in imports, having a resultant impact on domestic markets in supplying countries.

More recently, the US Union of Concerned Scientists(23) has calculated that for the US population to meet US MyPlate dietary recommendations for fruit and vegetable intake, demand for fruits, vegetables and nuts would need to increase by 173%. Such an increase in demand would increase production on US farms by 88%; farm acreage for fruit and vegetables would increase by 50%, from 10.7 million acres to 16.1 million acres; and, imports of fruit and vegetables would increase by 120%[viii]. The authors note the higher consumer prices for fruit and vegetables in supplying countries that such an increase in American demand could cause.

Employment impacts

Regarding employment, in a study of Michigan state in the USA, Conner et al(24) estimated that almost 2000 jobs and $200 million in new income would be created in the state from increased production of fruit and vegetables to fill the gap between current and recommended levels if diets included more horticultural produce. At the national level, the Union of Concerned Scientists estimate an increase in demand for labour in the US fruit and vegetable sector of 121% for both skilled and unskilled labour if US diets met recommendations.

Health impacts

Any shift in diets to encompass more fruit and vegetables here in the UK must surely lead to reduced costs for the NHS if healthier diets necessitate less medical intervention. A team at the Nuffield Department of Population Health, University of Oxford, is currently developing a model to estimate the potential savings. Abdullah et al(25) have calculated the economic cost savings in the US and Canada if populations were to follow a Mediterranean-style diet. If between 5% and 50% of the Canadian or US populations followed such a diet, an estimated CAD $41.9 million to $2.5 billion (Canada) or US$ 1.0 to $62.8 billion in the United States, would be saved in direct (medical) and indirect (lost productivity due to mortality, illness and disability) costs. This range represents the run of pessimistic to best-case scenarios when looking at potential diet adoption rates. It will be interesting to see if the potential savings in the UK from a more horticulture-based diet could be as valuable as those suggested for north America.

Environmental impact

Increasing fruit and vegetable consumption can have a positive environmental impact. The WWF Livewell campaign states that “to avoid climate change, conserve the ecosystems on which we depend and protect our lifestyles”, one thing consumers can do is to “eat more fruit, vegetables and cereals (especially regionally grown, in season)”(26) and to cut back on meat intake because of the environmental impact in its production. Green et al(27) show that by shifting UK diets in line with WHO recommendations, a 17% reduction in GHG emissions could be achieved. This diet, lower in red meat and much lower in dairy products and eggs, requires an increase in the consumption of cereals and consumption of vegetables (including potatoes, beans and pulses); the consumption of fruit is also increased.

As with all goods, the environmental impact of horticultural produce can be affected by how the food is grown and the full lifecycle of consumption. Air-freighted fruit and vegetables can be unnecessarily high in their carbon footprint. Generally, however, more plant-based diets are lower in CO_2 equivalents (28). Worryingly, Table 10 below shows that avocados, pineapples and other exotics (for example, mango, papaya and kiwi) have been highly favoured in net imports in recent years: this highlights an issue of potentially competing health, trade and environmental policy objectives.

[viii] To meet this increased demand for imports, production of fruit and vegetables would increase by 26% in NAFTA countries (Canada and Mexico), 15% in banana-exporting equatorial countries (Columbia, Costa Rica, Ecuador, Guatemala, Honduras, and Panama), 10% in southern hemisphere countries (Argentina, Australia, Brazil, Chile, New Zealand, South Africa, and Peru) and 2% in the rest of the world.

Even where horticultural produce is home produced, this can have negative environmental impact. The Campaign for the Protection of Rural England (CPRE) has raised concerns about, for example, the increased use of polytunnels, arguing that these have dramatic impacts on landscape appearance, if large areas are covered(29). They can also cause damage to soil conditions and create severe drainage problems[ix]. Whilst CPRE does not rule out their use, recognising the need to expand UK self-sufficiency in horticultural produce, it does ask that decisions about their construction should be made transparently, taking into account the wider public interest. CPRE also supports a reduction in the use of peat in the horticulture sector[x] as in England just 5% of the original lowland bog habitat remains[xi], an environment that is very important for rare species of carnivorous plants, insects and mosses.

This paper now gives a more detailed account of the current state of consumption of fruit and vegetables in the UK at the product level. It then turns to the current status of production, jobs and skills in the sector, before considering the weak state of public policy on the sector.

4. UK consumption, production and trade in fruit and vegetables

4.1 Consumption

UK fruit and vegetable consumption is below the amounts recommended by dietary guidelines, but what quantities are consumed and how has this changed over time? Table 2 shows that over the period 2007-2013, overall consumption of fruit and vegetables per person has declined by 8.5%, although in the last year of this series there has been a slight upturn in events. Consumption, by weight, is split roughly 50:50 between fruit and vegetables, although there has been a higher decline in the consumption of fruit over the 2007-13 period.

Table 2: Household purchases of fruit and vegetables(30) (UK, grams per person per week)

	2007	2008	2009	2010	2011	2012	2013	% change since 2007
Fresh and processed fruit and vegetables excluding potatoes	2421	2317	2246	2240	2240	2193	2216	-8.5
Of which:								
Fresh and processed fruit	1281	1199	1143	1133	1150	1107	1114	-13.0
Fresh and processed vegetables	1140	1118	1103	1107	1090	1086	1102	-3.4

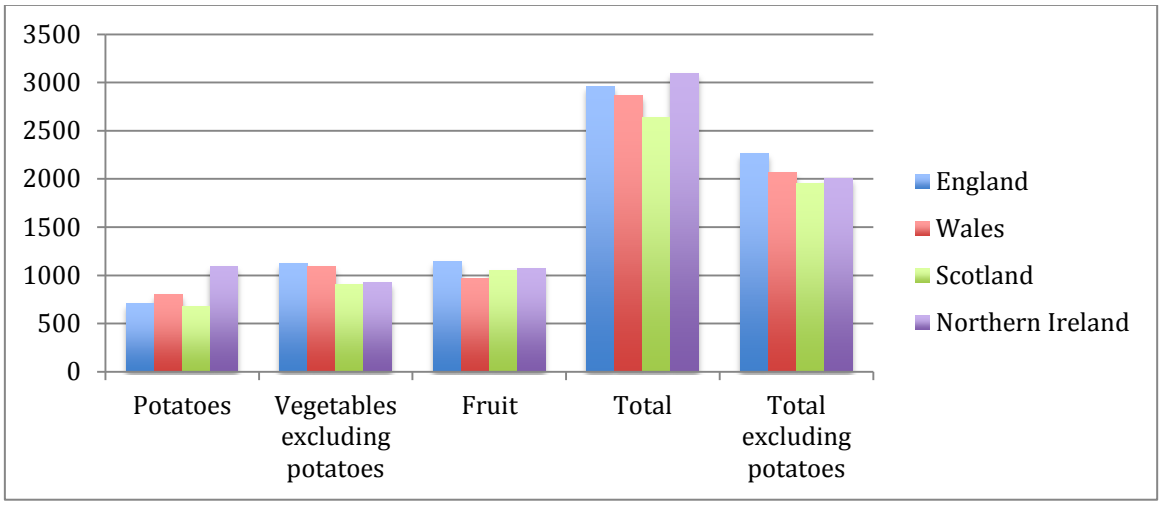
As Figure 2 shows, in the UK, Northern Ireland is the largest consumer of fruit and vegetables per person when potatoes are included. Excluding potatoes, England is the highest UK consumer followed by Wales, then Northern Ireland and lastly Scotland (86% of England's weekly consumption). In Northern Ireland, potatoes account for 35% of weekly fruit and vegetable consumption; this figure is around 10% lower for the countries of England, Wales and Scotland. Excluding potatoes, there is a roughly 50:50 split between fruit and vegetable consumption in all countries.

[ix] The counter argument here, according to AHDB(59), is that there are great advantages to farmers and consumers from tunnel production including much less pesticide use and better quality fruit for a longer season. Discussion is needed on a balance between these issues.

[x] This is being replaced by alternatives such as coir and wood fibre.

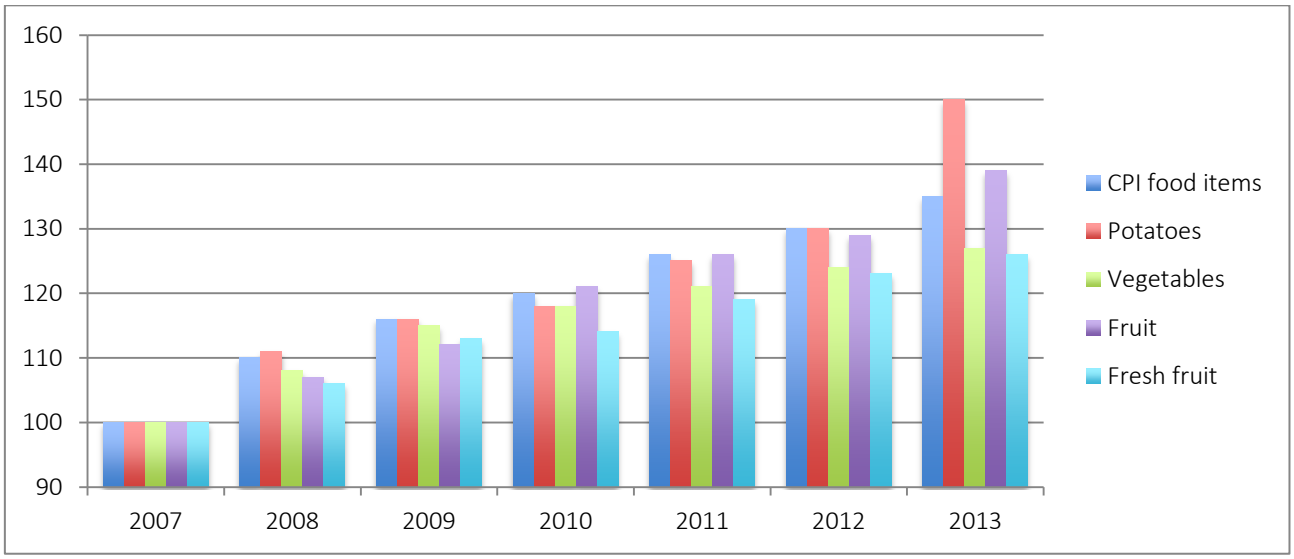
[xi] Much of the peat in use in the UK is not of UK origin (AHDB, personal communication).

Figure 2: Household purchases of fruit and vegetables by UK country – 3 year average(30)(grams per person per week)



The Consumer Price Index for food items as a whole has shown a significant increase of 35% over the period 2007-2013. Within this, the price of vegetables has increased by 27% and fresh fruit by 26%, less than the average for the food sector as a whole. Potatoes tell a different story, showing a 50% increase in price from 2007 to 2013.

Figure 3: Price evolution for fruit and vegetables in the UK (2007=100)(30)



However, being a staple food in the UK, the response to such a large increase in the price of potatoes is not reflected in the smaller 18% reduction in purchases over the same period. Purchases of fresh fruit have fallen by 13% but vegetables by only 3.4% (see Table 3).

Table 3: Consumers' response to food price rises between 2007 and 2013(30)

	% price rise 2007-2013	% change in quantity purchased All households
Food	+35	-6.1
Potatoes	+50	-18
Vegetables (excluding potatoes)	+27	-3.4
Fruit	+39	-13
Of which fresh fruit	+26	-13

4.2 Production

The area planted to fruit and vegetables in the UK amounted to 161,000 hectares in 2014 of which 82% was accounted for by vegetables, and 18% by fruit. What stands out, however, is the percentage decline in areas planted to fruit and vegetables over the near-30 year period from 1985 to 2014. There has been a decline of 27% for fruit and vegetables combined, with a 26% reduction in the area of vegetables and a 35% reduction in the area of fruit[xii].

Table 4: Area planted to fruit and vegetables in the UK[xiii] 1985-2014(31)('000 hectares)

	1985	1990	1995	2000	2005	2010	2014[xiv]
Total vegetables	178	182	156	138	121	134	132
Total fruit	45	41	34	31	28	29	29
Total fruit and vegetables	222	224	190	168	149	163	161

Despite the decline in areas under production, the data in Table 5 show that output has held up reasonably well. From 1995 to 2014, the volume of output of vegetables has shown a decline of only 1% and fruit has shown a 7% increase after a decline to 2000. Total supply to the UK (production plus imports, less exports) has risen by 25% and 44% respectively meaning that home production as a percentage of total supply has fallen. This is most dramatic in the case of vegetables where home production contributed 73% of total supply in 1995 but dropped to 58% of total supply in 2014. While it is good news for health that total horticultural supplies to the UK have increased substantially, in economic terms, there is a downside: the

[xii] It is worth noting here, however, comments from the AHDB (personal communication). It is important to look beyond the pure hectarage data. There has been enormous consolidation and specialisation in the industry and this is still continuing due to enormous price pressure on the industry. Also, the bald figures mask a lot of detail, for example:

- the decline in (mainly protected) lettuce production marked a move away from butterhead lettuce production to iceberg, and also a very significant shift out of wholehead lettuce into higher value baby leaf/mixed leaf salad packs which require much less crop area. This has completely altered the structure of the salad industry.
- The mushroom industry has consolidated to the extent that production is now dominated by one company (Monaghan Mushrooms, based in Ireland). However, recently, G's have made a major investment in a new mushroom growing facility) in Cambridgeshire (as well as taking over other companies) in response to client demand for UK grown mushrooms. This demonstrates that where growers can see the market growth potential and the opportunity for reasonable returns, they will make the investment.
- Soft fruit production has been revolutionised in the last 15 years through the introduction of semi-protected cropping and (for strawberries) table-top production systems. This is now being extended into asparagus, cherries etc. so more is being produced from a smaller area. The season has been extended, percentage of UK market has increased and fruit quality has improved. There is also an increasing area of strawberries being grown under glass in fully protected systems.

[xiii] Excluding potatoes

[xiv] All 2014 figures are provisional

UK's share in this total supply has declined, contributing to the Food Trade Gap. The rise is mostly from imports, even in foods which could be grown here.

Table 5: Supply of fruit and vegetables in the UK 1995-2014(31) ('000 tonnes)

	1995	2000	2005	2010	2014
Vegetables					
Production	2,823	2,923	2,738	2,784	2,798
Total supply	3,873	4,097	4,610	4,572	4,858
Self-sufficiency %	73	71	59	61	58
Fruit					
Production	403	309	364	424	434
Total supply	2,730	2,984	3,543	3,523	3,941
Self sufficiency %	15	10	10	12	11

At the crop level, the area planted to orchard fruit (apples, pears, plums and cherries) steadily declined from 30,000 hectares in 1985/86 to just under 19,000 hectares in 2010/11, before a very slight upturn in 2014/15, (see Table A1 for further details). Areas of soft fruit have similarly declined from 14,000 hectares in 1985/86 to 9,400 hectares in 2014/15. The product group showing substantial growth (albeit from a low base) is glasshouse fruit, which accounted for 225 hectares in 2014/15 compared with 24 hectares in 1985/86.

Regarding fruit output, the 36% decline in orchard area is also reflected in a 24% decline in marketed output of orchard fruit. Total soft fruit output is however, seen to increase from a low in 2000 of 65,000 tonnes to 143,000 tonnes in 2014, thus lessening to a degree the decline in total fruit production (see Table A2).

For vegetables, despite a 27% reduction in area planted there has been only a 7% reduction in output, caused largely by a steady increase in output of roots and onions, particularly carrots, parsnips and dry bulb onions (see Tables A3 and A4).

Lastly, it is worth looking in detail at the supply situation for individual fruit and vegetable crops, in order to see where the changes in production have occurred.

The full data for fruit are available in Table A5 at the end of this briefing paper, with a condensed version shown here in Table 6. What might be surprising to the public (but not growers or traders) is the UK's low degree of self-sufficiency in apples, pears and plums, supplying respectively only 36%, 13% and 16% of total supply in 2014[xv]. For the soft fruit, strawberries and raspberries, the UK shows a much higher degree of self-sufficiency, at 68% and 62% respectively (though note the decline in self-sufficiency for raspberries).

[xv] Market security for UK growers is an issue here. It takes 5-7 years to bring a new apple orchard into full production so this is an enormous risk for growers. Production cannot adjust to meet changing consumer demand overnight. A longer-term approach by policy makers is needed to give growers and investors confidence.

Table 6: Supplies of apples, pears, plums, strawberries and raspberries in the UK(31) ('000tonnes)

	1990	2014	Change 1990-2014
Apples			
Production	338.9	242.3	-96.6
Total supply	785.6	670.0	-115.6
Self sufficiency %	43.1	36.2	down
Pears			
Production	34.1	25.9	-8.2
Total supply	129.7	191.5	61.8
Self sufficiency %	26.3	13.5	down
Plums			
Production	7.2	11.7	4.5
Total supply	34.3	71.0	36.7
Self sufficiency %	21.0	16.4	down
Strawberries			
Production	50.8	104.4	53.6
Total supply	69.7	152.4	82.7
Self sufficiency %	72.9	68.5	down
Raspberries			
Production	28.4	17.8	-10.6
Total supply	28.3	28.5	0.2
Self sufficiency %	100.5	62.5	down

For vegetables, the self-sufficiency picture is more mixed (see Tables 7 and A6 for more detail). Cauliflowers have experienced a 29% reduction in total supply and the UK's share of production in this has fallen from over 90% to 39%. Carrots have seen an increase in total supply (52%) and the UK has become self sufficient in the provision of these. Mushrooms have also seen an increase in total supply but the UK's share of production has declined from 77% in 1990 to 39% in 2014. Lettuce has seen an increase in total supply and a significant reduction in the UK's contribution to this. Tomatoes have increased in total supply by 45%: UK supply has fallen by 27% bringing its share of total supply to just 19%. Table 7 shows the rapid decline in self-sufficiency in some produce.

Table 7: Supplies of cabbages, cauliflowers, carrots, mushrooms, lettuce and tomatoes in the UK(31) ('000 tonnes)

	1990	2014	Change 1990-2014
Cabbages			
Production	392.6	232.0	-160.6
Total supply	420.1	249.0	-171.1
Self sufficiency %	93.5	93.1	minimal change
Cauliflowers			
Production	306.1	94.1	-212.0
Total supply	336.0	239.0	-97.0
Self sufficiency %	91.1	39.4	down
Carrots			
Production	485.7	786.3	+300.6
Total supply	511.3	775.3	+264.0
Self sufficiency %	95.0	101.4	up
Mushrooms			
Production	110.9	79.0	-31.9
Total supply	144.6	205.2	+60.6
Self sufficiency %	76.7	38.5	down
Lettuce			
Production	247.1	135.5	-111.6
Total supply	273.1	316.5	+43.4
Self sufficiency %	90.5	42.8	down
Tomatoes			
Production	134.2	98.5	-35.7
Total supply	350.1	508.3	+158.2
Self sufficiency %	38.3	19.4	down

The National Farmers Union (NFU) has identified four categories of home produced fruit and vegetables, characterised by their performance over the period 2000-2010(32). These are:

Growing: production, consumption and self-sufficiency have all increased over the ten-year period. Includes strawberries, pears, asparagus, sweet peppers, plums and apples.

Potential: production is moving in the right direction, but has not been able to keep pace with a more rapid rise in consumption; therefore self-sufficiency is stable or lower than ten years ago. Includes blackberries, raspberries, celery and broccoli.

At risk: production is falling at a faster rate that consumption, resulting in a lower self-sufficiency as produce is imported to meet consumer demand. Includes Brussels sprouts, cauliflower, lettuce, leeks.

Endangered: domestic production has fallen significantly despite a rise in consumption; self-sufficiency is lower and will continue to fall if production continues to decline in a growing market. Includes cucumber, salad onions, broad, runner and dwarf beans, tomatoes and mushrooms.

4.2.1 Horticulture in the regions

Of the 161,000 hectares of horticultural crops grown in the UK, approximately 96% was located in England(33), 2% in Northern Ireland (not including potatoes)(34), 1% in Wales(35) and 1% in Scotland(36). Hence the focus here is on English horticultural regions.

In order to give an idea of the distribution of horticultural production throughout England, Tables 8 and 9 show the area and value of horticultural production. The East of England is certainly the most significant region with 69,000 hectares of horticultural production and output valued at £802 million in 2013. The South East has a much smaller horticultural area but a high value of output, being a large producer of plants and flowers. The East Midlands are also very important in terms of area (47,000 hectares) and value (£566 million) in 2013.

Table 8: Area of potato and horticultural production in the English regions 2013(33) ('000 hectares)

	East	East Midlands	Yorks	West Midlands	South East	South West	North West	North East
Potatoes	34	16	17	16	4	8	8	1
Horticulture[xvi]	35	31	16	17	20	14	6	1
Total	69	47	33	33	24	22	14	2

Table 9: Value of horticultural output in the English regions 2013(33) (£million in current prices)

	East	South East	East Midlands	West Midlands	South West	Yorks	North West	North East
Fresh vegetables	324	134	276	103	88	145	70	8
Potatoes (incl. seeds)	219	26	117	83	38	95	46	10
Fruit	65	212	5	127	65	6	5	1
Plants and flowers	194	283	168	128	142	87	98	13
Total value	802	655	566	441	333	333	219	32
Total value in 2000	488	329	377	223	167	225	127	22

This raises the question when considering policy towards horticulture going forwards as to whom the relevant policy makers are. Horticulture is of high economic importance in the East yet of much less significance in the North East. Should the policy focus be on the 'Englishness' or 'Britishnesss' of horticulture or would regional level initiatives be more appropriate? And could the Regions deliver this? Unfortunately the Regional Development Agencies, which were beginning to address food matters, were abolished in 2010 and replaced by looser Local Enterprise Partnerships. More attention is needed onto what administrative structures could help build sustainable regional production. Given the strong public interest in 'local' foods, this policy failure should be rectified.

4.3 Trade

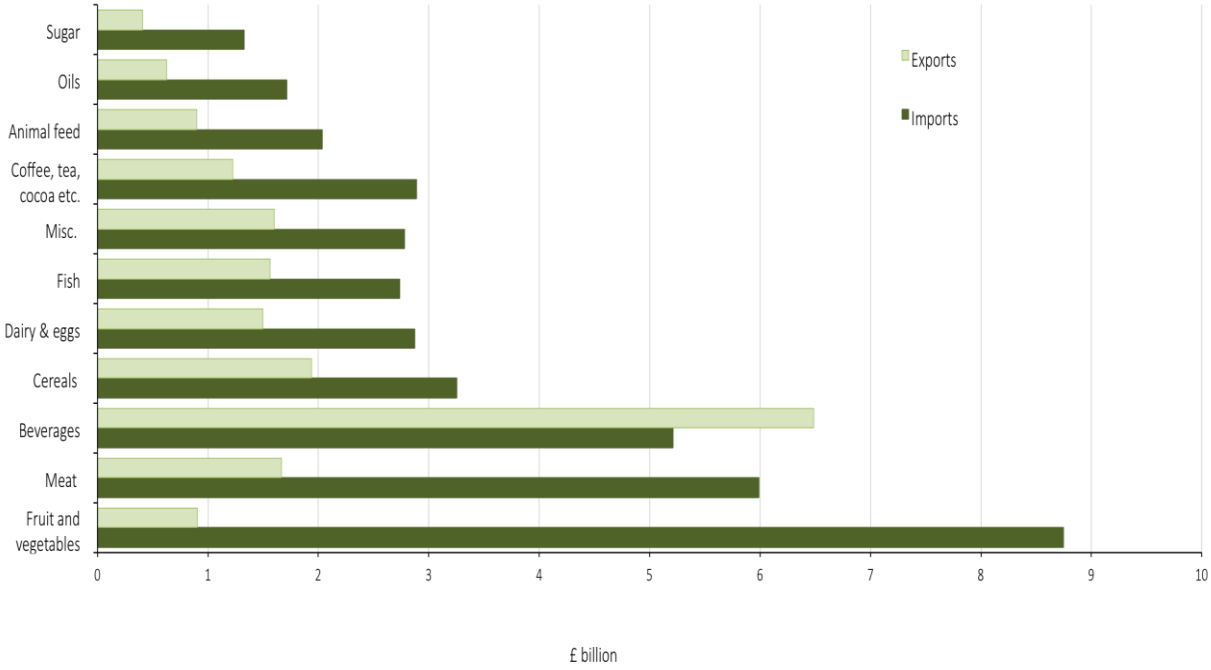
The UK engages in trade in horticulture as importer, exporter and re-exporter. Its overall self-sufficiency in terms of value of produce is greater for vegetables than for fruit. In 2014, for example, total supply in the UK of vegetables (home production + net imports) stood at £3,170 million (see Table A7). Of this, the UK produced 39% by value. For fruit, of a total supply worth £3.5 million, the UK itself supplied 18% by value. For both fruit and vegetables, these percentage figures have remained roughly similar since 2005 but for vegetables this represents a sharp decline in home production contribution to total value of supply since 1995 when home production accounted for 58%.

demonstrates that where growers can see the market growth potential and the opportunity for reasonable returns, they will make the investment (personal communication, AHDB).

[xvi] Includes plants and flowers

It is shocking to look at the data in Figure 4 regarding the UK's trade gap for the main food groups and horticulture's place within this. As DEFRA itself states ((37) p. 26), "'Fruit and vegetables' has the largest trade deficit. In 2014 imports cost £8.7 billion while exports were worth £0.9 billion, giving a trade gap of £7.8 billion". It is clear from this that the UK is heavily dependent on other countries for supplies of fruit and vegetables.

Figure 4: UK trade gap for food groups 2014 (37)



This Fruit & Veg Trade Gap is partly a reflection of changed marketing and imports, and partly of consumer tastes shifting to accept year-round produce, and partly the eradication of seasonality in the market. Food cultural norms have been altered. For example, there is a limited UK season for UK asparagus, and although enterprising growers have developed new techniques to extend that season, there cannot be year-round UK produced supply. In winter, asparagus on sale in supermarkets is largely of asparagus spears from Peru. Similarly for salad production, winter production comes from Spain, some of it by the Spanish operations of UK growers, but this appears as imports in the trade balance. There are important environmental consequences of such changes in consumer demand and culinary culture.

Table 10 contains data on net imports into the UK over the period 1990-2014 of a variety of individual fruit and vegetables. These are ordered in increasing degree of change in volume of imports over the period. It is interesting to look at the recent trade history of these different fruit and vegetables: the 7-fold increase in imports of pineapples to 2014 is an interesting statistic as is the demand for other exotics such as mango, pawpaw and kiwi. Imports of sweet peppers and lettuce have shown a remarkable increase in imports to the UK and even cauliflower (and broccoli) in which the UK was previously 90% self-sufficient has seen a dramatic import surge.

Table 10: Net imports (imports less exports and re-exports) of fruit and vegetables into the UK ('000 tonnes)[xvii] (31)

Fruit	1990	2014	% change 1990-2014
Oranges	374	252	-33
Peaches and nectarines	91	86	-5
Apples	447	428	-4
Pears	96	166	73
Lemons and limes	56	117	109
Melons	112	236	111
Grapes	118	252	114
Plums	27	59	119
Dates and figs	10	22	120
Small citrus fruit	132	291	120
Bananas	469	1,127	140
Strawberries	19	48	153
Cherries	7	19	171
Avocados	14	52	271
Other exotic fruit (e.g. mango, pawpaw, kiwi)	25	104	316
Pineapples	21	140	567
TOTAL	**2,124**	**3,507**	**65**
Vegetables			
Tomatoes, fresh or chilled	229	410	79
Onions	175	400	129
Cucumbers	51	151	196
Mushrooms	34	126	271
Cauliflowers and broccoli	37	145	292
Sweet peppers	27	181	570
Lettuce	26	181	596
TOTAL	**726**	**2,061**	**184**

Further insights into the reasoning behind these trends would be useful, and of their economic, cultural and environmental consequences. Clearly, consumer tastes have been changing (eating more exotic fruits which the UK cannot produce competitively or indeed, at all, given its climatic situation). But why has production of more traditional products such as apples, pears and plums declined, and not developed a comparative advantage? Are UK production costs simply too high? Or are skills lacking and returns too low? Are skilled and committed growers simply dying off?

Close attention is needed to the drivers of these figures, while looking to see how home consumption of horticultural products could be expanded to improve public health. The current Government seems committed mainly to export more foods to compensate for imports but we think that a sustainable food policy would be more nuanced, taking a strategic approach to indigenous supply for a variety of reasons – economic, cultural and land use. Any increase in demand (to improve health) could, in theory, be supplied from overseas but this would increase the UK trade gap. The environmental consequences and impacts on low income or exporting countries supplying the UK also need to be considered.

[xvii] We have left discussion of the nuts and seeds sector, recognised as very important in current public health debate, for a further Briefing Paper.

5. The status of horticulture within the UK agricultural sector

The horticultural industry is a significant financial contributor to the UK agricultural economy. Output from the industry in 2014 was valued at approximately £3.7 billion, of which £1.2 billion came from fresh vegetables, £0.7 billion from potatoes and £0.6 billion from fresh fruit(38). The analogous value of production for all cereals in the same year was slightly lower at £3.5 billion.

5.1 Land use for horticulture in the UK

Despite its large financial contribution, horticulture uses very little land space. It is highly efficient in terms of 'people fed per hectare'(3). Of the total UK agricultural area in 2014, 25% (4,722,000 hectares) was cropped and of this, 96.5% was arable and only 3.5% horticultural. In the UK as a whole, cereals were the largest land user accounting for 67% of the cropped area.

Table 11: Land use on agricultural holdings in the UK on 1 June(39) ('000 hectares)

	2012	2013	2014	% of total agricultural land
Total agricultural land	**18 349**	**18 449**	**18 456**	**100**
Total croppable area	**6 258**	**6 310**	**6 278**	**34**
Total crops	**4 748**	**4 665**	**4 722**	**25**
of which:				% of total crops area
Horticultural crops	172	163	164	3.5
Arable crops	4576	4502	4559	96.5
of which:				% of arable crops area
Cereals	3142	3028	3179	70
Oilseeds	785	752	691	15
Potatoes	149	139	141	3
Other arable crops	500	582	548	12

5.2 Land use for horticulture in the UK vs. land use for animal feed

There is much discussion in the UK about the environmental, animal welfare and public health benefits of a reduction in the quantity (and improvement in the quality) of meat in the diet[xviii], supplemented by an increase in fruit and vegetable intake. It is possible roughly to calculate the current land use in the UK for the production of cereals for livestock feed and then to compare this with land use for horticulture to inform a debate over the distribution of UK land by usage.

Table 12 shows the quantity of wheat, barley and oats used in animal feed in the UK[xix]. Approximately 10 million tonnes of these three cereals are used for animal feed, of which 63% is wheat, 34% is barley and 3% is oats.

Table 12: Cereals usage for animal feed production in the UK(38) ('000 tonnes)

	2013	2014 (provisional)
Wheat	6,632	6,365
Barley	3,336	3,487
Oats	306	310

[xviii] See Eating Better http://www.eating-better.org

[xix] Maize is also used but the quantity used solely for animal feed is not readily available from DEFRA: this is likely to be a quantity similar to, or less than, that given for oats.

Given the UK average yields for cereals, it is possible to calculate the land area required to produce the cereals needed for animal feed. For wheat, this is 740,000 hectares, for barley 55,000 hectares and for oats, 52,000 hectares (see Table 13).

Table 13: Converting cereals usage (tonnes) to land requirements for feed production

	Cereal yields in UK in 2014(38,39)(tonnes per hectare) (a)	Hectares required for 1 tonne (b=1/a)	Cereal usage for animal feed 2014[21] ('000 tonnes) (c)	Land required to produce total feed usage requirements in UK ('000 hectares) (d=b x c)
Wheat	8.6	0.11627	6,365	740
Barley	6.4	0.15625	3,487	555
Oats	6.0	0.16667	310	52

As Table 14 shows, approximately 43% of land used for cereal in the UK (excluding land used for maize) is to produce cereal for animal feed. 38% of both wheat and oats land areas is to supply the animal feed sector and 51% of all land used for barley supplies the sector.

Table 14: UK land under cereals for animal feed use

	'000 hectares in UK(38) 2014 (provisional)	Land required to produce total feed usage requirements in UK ('000 hectares)	% of land under cereal used for animal feed
Wheat	1,936	740	38%
Barley	1,080	555	51%
Oats	137	52	38%
TOTAL	**3,153**	**1,347**	**43%**

Table 15 compares this with the land area used for horticultural crops. For every one hectare of land under fruit and vegetables, 4.5 hectares are used for wheat for animal feed. For barley, the ratio is 1 to 3.4 and for oats, 1 to 0.3.

Table 15: Ratio of horticultural land area to land used for the production of animal feed

	Area in UK 2014 (provisional)	Land required to produce total feed usage requirements in UK ('000 hectares)	Ratio Horticultural land use area: land used for animal feed
Horticultural crops	164		
Wheat	1936	740	1 : 4.5
Barley	1080	555	1 : 3.4
Oats	137	52	1 : 0.3

This calls for a discussion on the relative proportions of land used for arable and horticulture in the UK, taking into account the end use of the crops produced: there is currently a tendency towards supplying an industry where consumption exceeds recommended levels while one where consumption is less than that suggested by public health experts uses very little land area.

5.3 Labour use for horticulture in the UK

Labour is a further factor contributing to horticultural production in the UK with large numbers employed on a seasonal and casual basis. The focus here is on England given that 96% of land space for horticulture in the UK is located here.

Table 16: Labour use on horticultural farms in England(40)

	Farmers, partners, directors and spouses full-time	Farmers, partners, directors and spouses part-time	Managers	Regular workers full-time	Regular workers part-time	Casual workers	Total workers
2014							
Horticulture	4,075	3,472	1,717	9,703	3,569	14,996	37,533
England (total farm labour)	87,858	85,839	10,611	46,773	27,643	43,036	301,760
Horticultural workforce as % of England total	4.64%	4.04%	16.18%	20.74%	12.91%	**34.85%**	12.44%

Of the 302,000 people employed in agriculture in England in 2014, 12% were employed on specialist horticultural farms. What is notable here is that 35% of casual workers employed in agriculture are working on horticulture and 5% of the total agricultural labour force in England consists of casual horticultural workers[xx]. Horticulture occupies only 2% of the farmed area in England(40) and yet uses at least 35% of the casual labour force.

Regarding wages and working conditions of these employees, in 2011, an investigation by *The Ecologist*(41) uncovered allegations that "working conditions for some migrant workers employed in Britain's fields, greenhouses and packing plants remain poor, with exploitative practices continuing". In autumn 2015, a television news programme(42) reported allegedly dreadful living conditions for Romanian apple pickers and an overly aggressive and demanding approach in the workplace. Recent reporting(43) also describes the Gangmasters Licencing Authority revoking the licence of a labour supplier to the Cambridgeshire fresh produce industry following serious breaches of GLA conditions including transporting workers in unsafe vehicles, housing them in substandard accommodation and not paying minimum wage.

Until its abolition in England in October 2013, agricultural workers' pay and conditions were agreed and set out by the Agricultural Wages Board. This set minimum rates of pay but also a detailed set of pay rates and working conditions. These included: overtime rates, recognising the very high rates of overtime worked in the industry; a sick pay scheme, that was more generous than Statutory Sick Pay, recognising the very high rates of accidents in the industry and the need for a full recovery before returning to work; holiday pay and so on. Under the AWB, wage rates were determined by collective bargaining and it was suggested by the government that after the abolition of the AWB, this would be replaced by individual bargaining between employer and employee.

[xx] In fact these figures will under-estimate numbers employed in horticulture in England. DEFRA classifies farms according to the enterprise producing the greatest output per hectare and horticulture farms in Table 16 refer to those where horticulture is the most productive enterprise. Farms where other enterprises dominate will not be included. Hence there will be labour used for horticulture on non-horticultural specialist farms that is not included here ((33) Metadata).

Since the abolition of the AWB, new employees are all subject to the national minimum wage whilst workers whose contracts pre-dated abolition, should still receive the rates stipulated in the last AWB Order for England and Wales issued in 2012.

However, a postal survey undertaken by Unite in April 2014 of all its Rural and Agricultural members in England to find out what was happening to pay after October 2013 found that more than a third of those responding to the survey had been covered by the AWB and, of these:

- Only 56% had had a pay rise since October 2013. All would have had a pay rise on 1 October 2013 if the AWB had not been abolished.
- The median pay rise was 2%, lower than the whole economy median of 2.5%
- The average pay rise was lower than the whole economy average
- 82% of respondents had had their pay rise imposed by their employer rather than being the subject of negotiation, as agreed pre-abolition
- Workers on existing contracts should have seen their AWB terms and working conditions unchanged. However, responses to the survey included, "no sick pay, working 40 hours instead of 39 before overtime" and "working more hours for no more money". Such behaviour by employers is actually not legal, being breaches of TUPE (Transfer of Undertakings (Protection of Employment) Regulations 1981).

Generally within the agricultural sector, Unite the Union notes that two practices are widespread:[xxi]

- under-payment - simply not paying people what they are due. This includes not paying the proper hourly rate, not paying holiday pay, not paying overtime, not paying sick pay etc.

- unlawful deductions - this is especially the case for migrant seasonal workers who may be organised in gangs by gangmasters or through agencies. Deductions will include for transport (the mini-bus to and from the field) or accommodation (the caravan, hut).

Unite also notes that agriculture and horticulture are not unique in this kind of under-payment and tendency to make unlawful deductions. It cites a 2010 report by the Equality and Human Rights Commission (44) into the treatment of workers in the meat and poultry processing sector. This report states (p. 10) that there is, "no evidence to suggest that supply chain practices in the meat processing sector are more detrimental to workers than in any other sector that makes significant use of low-paid, agency migrant labour" and it finds evidence of practices that:

- contravene the various legal requirements governing agencies, employment rights, health and safety, and equality
- breach minimum ethical trading standards and basic human rights, and
- treat agency and migrant workers in ways which, while not necessarily unlawful, are an affront to dignity and in some cases exploitative.

The problem is that if one treats workers badly, they will not choose to work in the sector. British Summer Fruits Chairman warned in 2014 that, 'labour will be one of the main issues that will hold us back'(45) largely because of the abolishment in 2013 of the Seasonal Agricultural Workers' Scheme (SAWS) which allowed migrant

[xxi] Personal communication with Unite research department, Unite the Union, 24 June 2015

workers from Bulgaria and Romania to stay in the UK for up to six months and work only on farms. With free movement within the EU now for European workers, the concern is that, unless pay and conditions are satisfactory and compare well with other sectors, would-be seasonal horticultural labourers will be drawn to work in other sectors, often indoors and away from the unpredictable outdoor elements. By way of example, Tesco now pays £7.39 per hour(46) for shop floor staff, Lidl is committed to paying the Living Wage(47) and is paying £8.20 per hour and Nestle UK has also committed to the Living Wage(48,49).

If seasonal horticultural labourers are not treated well, then maybe it is not surprising that horticulture is undervalued in terms of the potential role it can play in terms of diet and public health. The policy goal ought to be good food from decent conditions and well-rewarded work. Retailers need flexibility in what and how they purchase from farms to meet with daily customer demand but it may be useful to open a debate to review the conditions under which those supplying the retailers are working. A start might be a review of horticultural workers' pay and conditions.

5.4 Skills in UK horticulture

There is a shortage of skills in the horticultural sector and a lack of interest in the sector from young learners. This could be linked with the changing pay and working conditions alluded to above since the abolition of the AWB. A 2011 Lantra report(50) shows that 18% of production horticulture businesses responding to a survey reported a skills gap (i.e. the extent to which employers perceive current employees to be less than fully proficient for their current job) compared with 15% across the agricultural and land based sector as a whole. Lantra reported:

1. relatively few enrolments on qualifications and training courses in the area of production horticulture

2. production horticulture is an area often included within more generic horticultural qualifications

3. the low number of enrolments in this area is due to lack of demand by students so that colleges are not delivering these qualifications.

One training specialist comments that, "careers in horticulture are undervalued and perceived as suited to those who have failed academically" and questions how this can be changed(51). Three suggestions are to: (i) Engage directly with young people – opportunities need to be highlighted via effective careers advice so that young people know the options available to them; (ii) Celebrate success in the industry; and (iii) Seek that government takes up a responsibility to properly fund land based colleges and training providers so that they can properly invest in resources and technology to support training delivery.

It was also reported(52) in 2013 that 72% of horticultural businesses surveyed could not fill a skilled vacancy; a survey of 1,000 people revealed that 70% of 18 year olds believed that horticultural careers should only be filled by people who have 'failed academically' and nearly 50% of under-25s think that horticulture is an unskilled career. This is a serious problem of image that has not adjusted to the reality of the situation in 2016 where modern horticultural businesses require a range of skills from accountancy to marketing to agronomy and can offer rewarding careers.

Horticulture Matters does have a programme in place to try to improve the situation in the UK and is having some success in terms of educational programmes and attitudes towards horticulture as a career. They continue to strive to increase accurate awareness of the industry amongst young people, to deliver appropriate public information about horticulture and to provide educational resources for schools and businesses to be able to promote the sector more widely. They also continue to lobby government for support and appropriate funding for the sector.

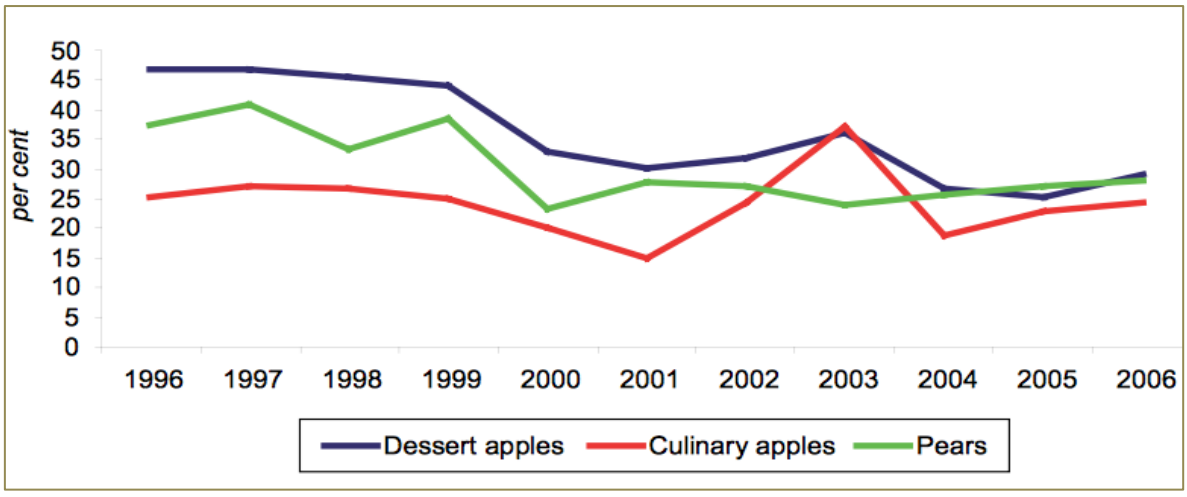
Valuing the sector more highly from diets through to waged labour might make the sector more attractive to able school leavers or career movers. Again, this is something that needs to be investigated if we are to secure a horticultural industry that can support a better and sustainable diet.

5.5 Money in the horticultural supply chain

DEFRA values total consumer expenditure on food, drink and catering services in the UK in 2014 at £198 billion(38). Of this, only £9.9 billion (5%) accrues to UK farmers and primary producers. Farmers and growers are clearly proportionately under-rewarded within the food system. Beyond this general data, specific information on how the consumer price paid for horticultural products is distributed along supply chains proves extremely elusive. This itself warrants further research and debate and, for horticulture, it raises particular questions about whether it fits that general pattern of 'squeeze' . It would be no wonder that UK horticulture has declined if returns and margins are low.

In 2008 the Competition Commission undertook a Groceries Market Investigation. Appendix 9.6 of this is potentially useful, being titled, "Fruit supply chain profitability"(53). However, the gross margin data for the individual retailers is removed from the report. Page 9 contains the following graph (Figure 5), suggesting that in the period 1996 to 2006, the producer share of the retail price of dessert apples fell from around 47% to around 30%, the share of the retail price of culinary apples started at 25%, dipped to 15% in 2001, peaked in 2001 at 40% before ending the time series at about 26%. Pears too reached a producer share of 30% in 2006 from a high of about 41% in 1997.

Figure 5: Producer Share of Retail Price(53)



This is old data and needs to be updated. This and similar data for other horticultural products should be released and would make it possible to comment on fairness to producers and packers along the supply chain. A fair and profitable return will make it more likely that production will meet a necessary expansion in UK output if UK supply is to match the demand increase that a shift to healthy diets would entail.

In the absence of supply chain price data, what alternatives exist to assess the relative financial position of horticultural enterprises? One is to consider enterprise gross margins both in comparison with other enterprises and over time. However, editors at the *John Nix Farm Pocketbook*, (54) the respected industry data annual, have commented that "the variation in performance in horticultural farms outstrips all sectors of agriculture combined, from best to worst. This makes inclusion of

horticulture (which inherently means each business will be truly unique) extremely difficult and of limited use as well"[xxii].

Personal communication with researchers who conduct the DEFRA Farm Business Survey also highlighted an issue with using gross margin data to examine horticultural enterprises: "Enterprise gross margins are particular to a crop, however we have limited data on vegetable gross margins due to sample numbers. The other problem with gross margins is that they only show half the story. Vegetables may have much higher gross margins, but they also require much higher overhead costs which are not shown in gross margins"[xxiii].

Another possibility is to look at farm income data but again, variation between horticultural farms is so great (in terms of size and product mix) that comparisons are meaningless.

Research along selected horticultural value chains to establish costs and revenues at each point of exchange would help to identify any hotspots that might prevent further expansion of the industry to meet a potentially growing demand for homegrown fruit and vegetables.

5.6 UK Policy towards horticulture

There seems to be very little UK government policy expressly focussed on the UK horticultural sector. The Coalition Government 2010-15 did support the reduction of peat use in horticulture (55) – a good thing – and the Conservative Government elected in 2015 has initiated a 25 year strategic review (56)– again, in principle a good thing – but this is framed around a manufacturing industry focus, which sits ill with the need to address fresh produce such as horticulture. If 'Brand Britain', its other focus was to be applied to horticulture, there would surely have to be policy encouragement for a massive increase in horticultural activity in the UK.

At the European level, the main support measure is the EU Fresh Fruit and Vegetables Aid Scheme under which Producer Organisations (POs) can register and then receive financial assistance if they meet certain criteria. There are currently 34 POs in the UK, mostly located in the east of England. The scheme was designed to help farmers improve efficiency and competitiveness with funding to growers channelled through the scheme and linked to good environmental production practices(57). However, with the UK having less of a tradition of co-operation between grower organisations than exists in other EU nations, coupled with regulation problems, there has been low uptake of operational funds for fruit and vegetable POs in the UK. This is regrettable.

DEFRA's now abolished Council of Food Policy Advisors had proposed back in 2009 that DEFRA hold a roundtable to discuss how to encourage greater domestic consumption of fruit and vegetables and to consider how to increase domestic production. The result was a task force that produced a strategy in 2010 around three main areas - encouraging a competitive supply base, an efficient supply chain and increasing consumption(58). The low cost proposals that the task force identified to remove barriers to increased domestic production and consumption of fruit and vegetables focus on:

- Removing regulation
- Sustaining R&D capability
- Improving skills and attracting new entrants to the industry
- Encouraging collaboration
- Improving supply chain relationships
- Expanding market opportunities

[xxii] Personal communication with Graham Redman, Editor, John Nix Farm Management Pocketbook

[xxiii] Personal communication with Richard Crane, Head of Agriculture and Food Investigation Team, University of Reading

- Changes to existing Government behaviour change campaigns
- Encouraging industry promotions
- Aligning VAT with the 5 a Day objective
- Supporting Grow Your Own

The NFU subsequently put a 12 point strategy in place(32) to support its vision of "a thriving, productive and profitable horticulture sector that is able to meet the demands of consumers, both today and in future". The consultancy English Food and Farming Partnerships (EFFP) has also produced an eight point regional action plan for change – "to promote the competitiveness and sustainability of horticulture and potato growing in the West Midlands". And the Royal Horticultural Society in 2014 published a plan for promoting horticulture in the education and business sectors(52). This plethora suggests the need for improved co-ordination and implementation. A 'chairing' and facilitation role surely is the responsibility of Government. Why doesn't DEFRA and the Secretary of State take charge?

Published results of evaluations to assess the extent to which the patchwork of strategies for change might deliver results would be useful in guiding further research and a more coherent UK horticultural policy.

6. Questions Arising and Policy Options

This Briefing Paper set out to analyse the state of horticulture, as seen through a public interest perspective. It suggests rich opportunities for academic, civil society, industry and governmental action. The Annex at the end of this Briefing provides more data of interest.

The Briefing has highlighted a sector and situation with some worrying features – much decline, missed opportunities, low returns, poor labour status, a mismatch with health requirements, questions about land use and national food security, a trade gap, lack of leadership, and more. The Briefing has highlighted issues worthy of more detailed academic research. There is surprisingly little policy research or evidence of serious scenario planning for the UK horticultural sector. This is partly because it is weakly represented politically, perhaps, but also partly because of its disparate nature. Growing carrots is not the same task as specialising in top fruit. Glasshouse work is not the same as field-based growing. An industry reliant on migrant or casual labour is too used to keeping its policy head down, perhaps, too.

One over-riding concern highlighted by the Briefing remains: the current mismatch between public health evidence and diets. Yet this suggests a considerable potential for a rebirth of domestic horticulture. For strategic as well as public health reasons, we urge more attention on this Cinderella sector.

To begin mapping some of what that might be, Figure 6 summarises the points raised and some of the questions posed in this Briefing. It starts by accepting the government's recommendation that consumption should amount to 5 portions of fruit and vegetables per day, although ideally this ought to be higher. The 2016 Eatwell Guide talks of 'at least 5-a-day'. Two extreme responses to this recommendation are possible, with a spectrum of differing responses in between.

At one extreme, Figure 6 recognises that one option is for no response to the recommendation; if this is pursued (the default option), there would be very little change in quantities of fruit and vegetables consumed. This could be considered as approximating to the current situation with perhaps small temporary increases in consumption immediately following public health campaigns.

Such a lack of response would lead to the following questions:

1. Why is there so little response to governmental advice to change diets? Clearer understanding of consumer behaviour is needed: do consumers realise how far they are from the 5-a-day target? Is portion size clear enough? Are the health benefits of eating 5-a-day adequately explained?

2. What can be done to encourage a response to advice?

Lack of response to governmental advice has an impact on morbidity and mortality. This has both direct and indirect costs to society. This again leads to questions:

3. What are the direct costs to the NHS of a population avoiding dietary guidance on fruit and vegetable intake?

4. What are the indirect costs to society caused by loss of productivity as a result of a population avoiding dietary advice with respect to fruit and vegetable intake?

At the other extreme in Figure 6, the potential response is that we see a **population-wide response to the recommendation** to eat 5 portions of fruit and vegetables per day. This is certainly not happening as yet, but where is the *ex ante* social, environmental and economic impact assessment of such a response? We are led therefore to pose the following question:

5. What would be the environmental, economic and social impacts of a significant increase in the demand for fruit and vegetables in the UK?

Three strategies for coping with an increased demand might be activated: (a) to increase UK production of fruit and vegetables, (b) to increase imports of fruit and vegetables and (c) to reduce exports. Most likely would be a mix of all three strategies to cope with a surge in domestic demand. Each strategy raises questions:

Strategy (a): Increase UK production

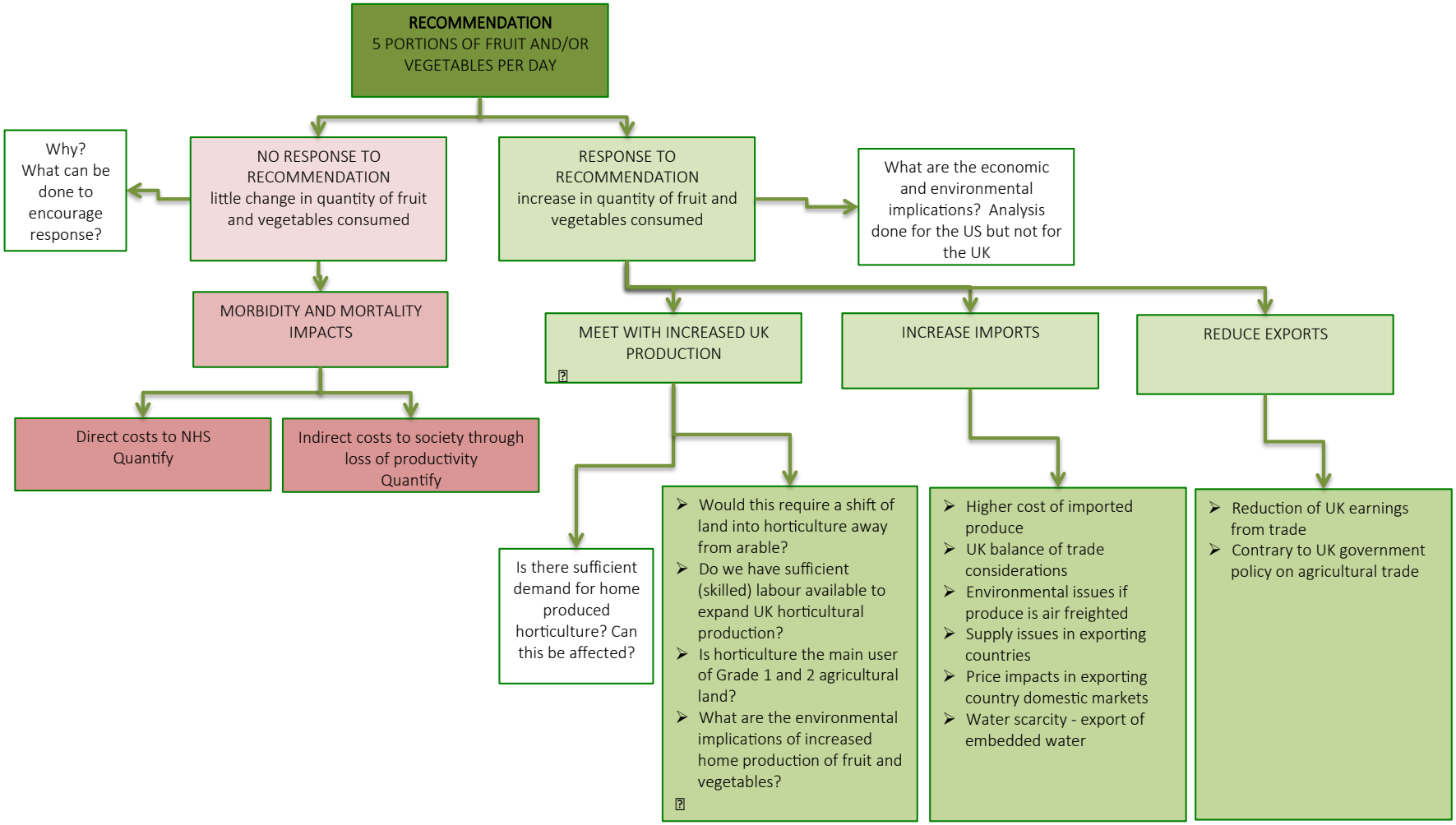
6. Before looking at this strategy, we would need to assess whether there is demand for more home produced fruit and vegetables. The trend seems to be increased demand for horticultural produce from overseas. Can anything be done to arrest this?

7. How would land use patterns change? Is it economically sensible and agriculturally feasible to bring land from arable into horticultural production? Is the balance between land use for animal feed and land use for horticulture correct or is adjustment necessary?

8. Do we have sufficient skilled UK and migrant labour to meet an expanded demand for horticultural produce? What needs to happen to make horticulture a more appealing sector for training and employment? Do we know enough about the pay and working conditions on horticultural farms in the UK?

9. Is horticulture happening on the best agricultural land or should we be looking at the way land is used by Grade of land? Currently there are no readily available data for England that show land use by Grade of land. Is there 'good' land that could and should be used more for horticulture? Could other land be used?

Figure 6: Policy Options for Horticulture: A Decision Tree



10. What are the environmental implications of increased production of fruit and vegetables?

11. Finally, the ever elusive question is raised: where does the money go? Are returns shared fairly along fruit and vegetable supply chains or are some not adequately rewarded for their time and investment in the industry? Who is making the money from fruit and vegetables at present? Are there new opportunities for challenger enterprises? Box schemes, for example, have been excellent at giving growers greater and well-deserved returns.

Strategy (b): Increase imports

12. How does imported produce compare with UK produce on price? What are the reasons for importing significant quantities of crops that can be produced in the UK and can anything be done to address this?

13. What are the Balance of Trade implications of increasing imports to the UK?

14. What are the costs to the environment if additional imports are air freighted to the UK?

15. What are the impacts on the supplying countries of expanding exports to the UK? This may have price impacts on the crops in domestic markets as well as supply impacts. There is also an additional raft of issues when the environmental consequences of exporting embedded water through horticultural crops is taken into consideration.

Strategy (c): Reduce exports

16. This strategy would be in contrast to the current UK government's plan for agriculture that seeks exports increased. It would also have implications for the Balance of Trade. Would this be a feasible alternative for meeting an increased domestic demand for fruit and vegetables or given UK exports are small, would this have little effect?

7. Implications for Academics and Civil Society

When the Food Research Collaboration was set up in 2014, academics and civil society organisations asked for it to help explore cross-cutting issues such as how to link health, environment and economy better in the food system, and how to understand where the power lies, or what determines the flow of money in the supply chain. This Briefing Paper has suggested fertile terrain for such policy discussions lies in horticulture. The mismatch of supply and demand is serious. This is an issue in which academics and civil society organisations interested in the food sector should surely become more involved. Land areas for horticulture are reducing while public health advice recommends the opposite path in terms of demand. National policy is weak. There is room for serious regional engagement, as horticultural activity varies across the country. CSOs have a big opportunity to work together. Everywhere the issue warrants more attention. There is room to consider a civil society pro-horticultural alliance, bringing together environmentalists, anti-meat campaigners, campaigners for workers' rights, public health and trade activists and land use reformers. Academics could have a really useful role here, helping address questions such as are posed in the previous section. More attention is needed to sketch what a good horticultural sector could look like, taking into account known implications for the environment, the economy, and society both here and in supplying countries. This paper is only a start to the process: much needs to be done.

Annex: Supplementary tables giving more detail

A1: Area of fruit planted in the UK, by type(31) (hectares)

	1985/86	1990/91	1995/96	2000/01	2005/06	2010/11	2014/15 [24]
Total dessert apples	12,771	11,787	8,8449	7,662	5,505	5,077	5,295
Total culinary apples	7,066	7,005	5,594	5,352	3,810	3,604	3,331
Total pears	3,427	3,251	2,941	2,355	1,636	1,580	1,448
Cider apples and perry pears	3,417	3,336	3,453	5,209	6,551	6,940	7,430
Total plums	2,406	1,927	1,588	1,213	940	870	752
Cherries	938	771	604	458	400	500	688
Others and mixed	365	223	241	176	286	363	434
TOTAL ORCHARD FRUIT	30,389	28,300	23,271	22,425	19,128	18,934	19,378
TOTAL SOFT FRUIT	14,291	12,882	10,446	7,998	8,768	9,683	9,440
Glasshouse fruit	24	23	35	79	127	185	225
TOTAL FRUIT	**44,703**	**41,204**	**33,751**	**30,502**	**28,023**	**28,801**	**29,044**

A2: Production of fruit in the UK, by type(31)('000 tonnes)

	1990	1995	2000	2005	2010	2014
Total dessert apples	179.0	138.5	101.3	118.0	124.9	147.9
Total culinary apples	159.9	135.0	107.5	99.7	110.1	94.5
Total pears	34.1	29.7	26.6	23.4	31.4	25.9
Total plums	7.2	14.4	5.3	13.5	13.2	11.7
Cherries	1.5	3.5	0.4	1.1	1.4	4
Others and mixed		3.2	2.4	3.3	5.2	7.2
TOTAL ORCHARD FRUIT	381.7	324.1	243.3	259.0	286	291.1
TOTAL SOFT FRUIT	102.4	79.2	65.6	105.5	138.3	142.9
TOTAL FRUIT	**484.1**	**403.3**	**309.0**	**364.4**	**424.5**	**434.0**

A3: Area of vegetables planted in the UK, by type(31)(hectares)

	1985/86	1990/91	1995/96	2000/01	2005/06	2010/11	2014/15
Roots and onions[25]	34,150	37,045	33,298	27,281	27,879	29,592	30,031
Brassicas[26]	53,241	48,040	44,284	32,532	31,387	26,317	26,736
Legumes[27]	72,109	78,422	65,099	60,250	45,485	59,774	56,674
Others[28]	21,684	22,734	19,106	16,635	15,725	17,881	17,933
TOTAL FIELD VEGETABLES	**181,184**	**186,241**	**161,788**	**136,697**	**120,476**	**133,565**	**131,374**

[24] All 2014/15 and 2014 data is provisional
[25] Beetroot, carrots, parsnips, turnips and swedes, onions
[26] Brussels sprouts, cabbage, cauliflower, broccoli
[27] Beans – broad, runner and dwarf, peas
[28] Asparagus, celery, leeks, lettuce, rhubarb, watercress, others

A4: Production of vegetables in the UK, by type(31)('000 tonnes)

	1985	1990	1995	2000	2005	2010	2014
Roots and onions	973	986	1,023	1,422	1,374	1,408	1,445
Brassicas	1,012	828	711	539	532	479	447
Legumes	306	341	298	276	304	239	238
Others	398	466	430	356	378	388	377
TOTAL FIELD VEGETABLES	**2,689**	**2,621**	**2,461**	**2,594**	**2,488**	**2,513**	**2,509**

A5: Supplies of apples, pears, plums, strawberries and raspberries in the UK(31)('000 tonnes)

	1990	1995	2000	2005	2010	2014
Apples						
Production	338.9	273.4	208.7	217.7	235.0	242.3
Total supply	785.6	689.9	665.6	724.8	675.4	670.0
Self sufficiency %	43.1	39.6	31.4	30.0	34.8	36.2
Pears						
Production	34.1	29.7	26.6	23.4	31.4	25.9
Total supply	129.7	129.6	148.6	172.5	159.7	191.5
Self sufficiency %	26.3	22.9	17.9	13.5	19.7	13.5
Plums						
Production	7.2	14.4	5.3	13.5	13.2	11.7
Total supply	34.3	44.4	84.5	83.9	66.4	71.0
Self sufficiency %	21.0	32.3	6.2	16.1	19.9	16.4
Strawberries						
Production	50.8	41.6	37.3	68.6	95.7	104.4
Total supply	69.7	67.9	66.5	115.5	133.4	152.4
Self sufficiency %	72.9	61.3	56.1	59.3	71.8	68.5
Raspberries						
Production	28.4	12.2	9.8	12.2	15.9	17.8
Total supply	28.3	11.9	11.7	17.8	23.3	28.5
Self sufficiency %	100.5	102.8	83.4	68.1	68.4	62.5

A6: Supplies of cabbages, cauliflowers, carrots, mushrooms, lettuce and tomatoes in the UK(31) ('000 tonnes)

	1990	1995	2000	2005	2010	2014
Cabbages						
Production	392.6	341.5	254.3	265.7	247.6	232.0
Total supply	420.1	349.7	269.6	283.7	258.2	249.0
Self sufficiency %	93.5	97.7	94.3	93.7	95.9	93.1
Cauliflowers						
Production	306.1	242.8	156.1	133.2	109.4	94.1
Total supply	336.0	310.0	244.0	253.5	216.9	239.0
Self sufficiency %	91.1	78.3	64.0	52.5	50.4	39.4
Carrots						
Production	485.7	512.4	725.8	710.0	768.0	786.3
Total supply	511.3	525.8	754.9	757.5	783.4	775.3
Self sufficiency %	95.0	97.4	96.2	93.7	98.0	101.4
Mushrooms						
Production	110.9	101.5	89.9	69.6	72.3	79.0
Total supply	144.6	146.9	158.1	203.5	169.9	205.2
Self sufficiency %	76.7	69.1	56.8	34.2	42.6	38.5
Lettuce						
Production	247.1	222.1	154.6	140.9	133.9	135.5
Total supply	273.1	343.1	315.4	322.9	283.0	316.5
Self sufficiency %	90.5	64.8	49.0	43.6	47.3	42.8
Tomatoes						
Production	134.2	112.8	113.0	78.7	89.4	98.5
Total supply	350.1	374.5	395.6	495.4	471.3	508.3
Self sufficiency %	38.3	30.1	28.6	15.9	19.0	19.4

A7: Value of fruit and vegetables in the UK 1995-2014(31)(£ million)

	1995	2000	2005	2010	2014
VEGETABLES					
Production	1,061	887	916	1,273	1,233
Total supply	1,830	1,827	2,410	3,098	3,170
Self sufficiency %	58%	49%	38%	41%	39%
FRUIT					
Production	269	230	386	575	616
Total supply	1,560	1,1596	2,254	3,006	3,451
Self sufficiency %	17%	14%	17%	19%	18%

A7: Net imports (imports less exports and re-exports) of fruit into the UK ('000 tonnes)(31)

	1990	1995	2000	2005	2010	2014	% change 1990-2014
Oranges	374	321	304	308	240	252	-33
Peaches and nectarines	91	66	101	96	62	86	-5
Apples	447	416	457	507	440	428	-4
Pears	96	100	122	149	128	166	73
Lemons and limes	56	56	56	89	100	117	109
Melons	112	169	153	192	197	236	111
Grapes	118	117	155	230	239	252	114
Plums	27	30	79	70	53	59	119
Dates and figs	10	12	11	16	14	22	120
Small citrus fruit	132	133	172	248	234	291	120
Bananas	469	637	760	853	986	1,127	140
Strawberries	19	26	29	47	38	48	153
Cherries	7	13	15	20	16	19	171
Avocados	14	13	23	57	34	52	271
Other exotic fruit (e.g. mango, pawpaw, kiwi)	25	37	56	93	84	104	316
Pineapples	21	21	29	72	136	140	567
TOTAL	**2,124**	**2,327**	**2,675**	**3,179**	**3,099**	**3,507**	**65**

A8: Net imports (imports less exports and re-exports) of vegetables into the UK ('000 tonnes)(31)

	1990	1995	2000	2005	2010	2014	% change 1990-2014
Tomatoes, fresh or chilled	229	272	294	423	382	410	79
Onions	175	243	166	312	356	400	129
Cucumbers	51	41	66	129	150	151	196
Mushrooms	34	45	68	134	98	126	271
Cauliflowers and broccoli	37	69	89	120	108	145	292
Sweet peppers	27	45	80	137	122	181	570
Lettuce	26	121	161	182	149	181	596
TOTAL	**726**	**1,050**	**1,175**	**1,872**	**1,788**	**2,061**	**184**

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