Sustainable Food Production and Consumption
Literature Review

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Literature Review submitted as part requirement for the

Master of Arts in Professional Practice

(Sustainable Development Advocacy)

University of Worcester

July 2012

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1 Introduction

Food is defined as any nutritious substance that people consume to maintain life and growth (Soanes & Stevenson 2003) and is vital for the health and wellbeing of members of the UK's 25 million households (Office for National Statistics 2011). The consumption of food plays a significant role in our lives either as three meals a day, as subsistence level calories essential for survival or as the main focus for traditional celebrations and rituals.

This report reviews the literature concerning the history of food production, UK food self-sufficiency, climate change and the impact of food waste and transportation of food on the environment, together with food security and rising prices. Threats to a sustainable food system and opportunities for small scale producers to contribute to a sustainable food supply will also be examined.

2 Agricultural land

The majority of our food is sourced directly or indirectly from land plants and land is essential for converting solar radiation through plant photosynthesis into food (Bowman 1977) and should therefore be protected from environmental damage.

The land area in the UK is 24.5 million hectares and as at June 2011 there was 17.2 million hectares of land designated for agricultural use, representing 70% of the UK's land area (DEFRA 2012a). Land also plays a vital role in the balance of our ecosystem in sequestering carbon dioxide, purifying water and supporting wildlife. The Green Food Project (DEFRA 2012b) predicts that there will be increasing tensions between land interests and the UK's food system in the forthcoming decades as the pressure increases to provide the nation with food produced sustainably. Global food production accounts for 70%-80% of water consumption (Earth Security Initiative 2012) and with the uncertainties of climate change and changing weather patterns it is likely that this resource will be depleted in some parts of the world.

3 Sustainable food production

A sustainable food production system is one that limits the use of natural resources so that the rate at which the earth's capacity replaces them is not exceeded (DEFRA 2012c). However this definition does not take into account the need to nurture the environment upon which not only food production but an entire eco system depends.

The Kindling Trust (2012) defines sustainable food as being local, seasonal and produced without negatively affecting the environment because this minimises the energy and oil based products used in artificial fertilisers, storage and transportation and supports the local economy. High welfare standards for livestock, sustainable sources of fish, a fair return for farmers and workers and minimal packaging are also important elements of sustainable food production together with the health and wellbeing of the global population and an equitable food supply for all. The Future of Food and Farming Report (Foresight 2011) states that sustainable food systems should also embrace financial and human capital in connecting food production to economic growth. However, the profit related nature of linking food production to the economy is not necessarily of benefit to the environment as a high level of the profit margin is derived from food processing and transportation rather than actually growing and producing food (Tudge 2011, Pretty 1998).

A significant change in food production over the last 60 years has been a reduction in the number of food suppliers to a few major corporations (DEFRA 2005) with stakeholders such as agrochemical, animal feed, seed producers, food processing and transport companies claiming a share of the profit (Pretty 1998). It could be argued that current food production is more closely linked to maximising profit than to safeguarding the environment and human health (Tudge 2011). There is potential to produce a proportion of household food needs sustainably at a local, grass roots level outside of the profit focussed operations of major food producing conglomerates and this is discussed in section 10.

4 The development of an agrarian society

One of the main priorities for the majority of the population throughout the evolution of mankind has been the essential task of producing food (Sinclair 2010). Stone-age hunter-gatherers lived in small nomadic communities in order not to deplete their food supply beyond a sustainable level at each new location and food sourcing was largely a group activity that did not involve the hierarchy associated with land ownership (Sinclair 2010). As indicated by the green arrow in Figure 1 below (Skeptical Science 2011), the transition to an agrarian society began after the last ice age with a warmer climate. One of the challenges to food production in the next century is the forecast of an increase of about 2-3°C in the global mean surface temperature (GMST) (IPCC 2007) that may adversely affect food crop harvests.

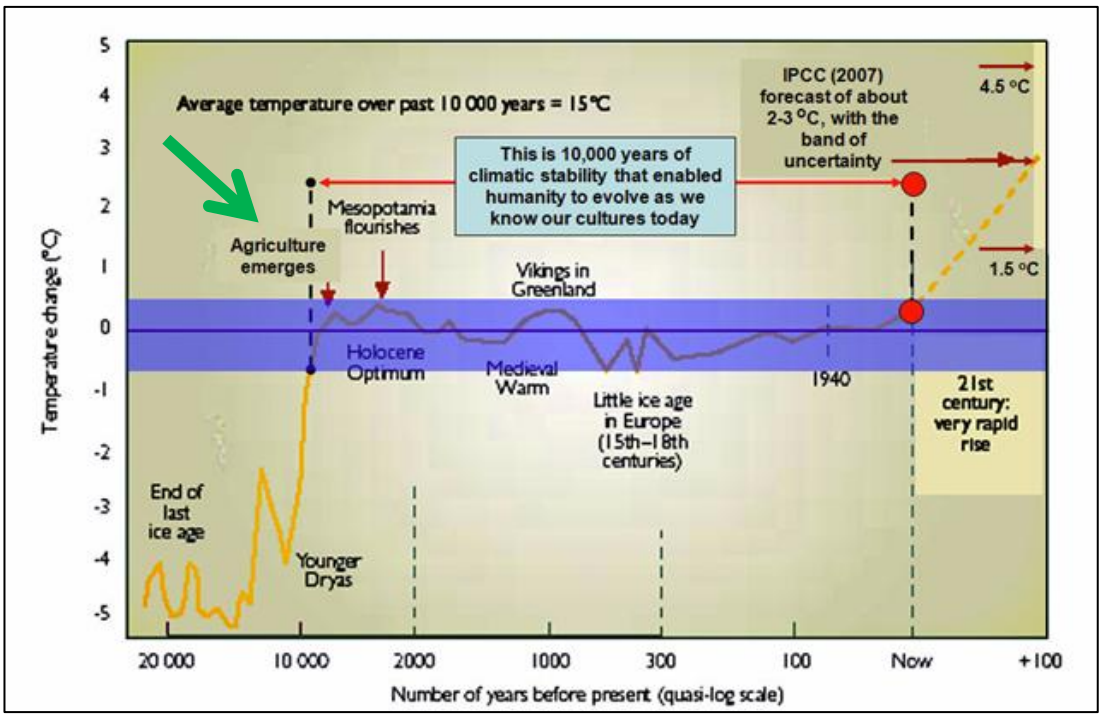

Figure 1. Development of an agrarian society (Skeptical Science 2011)

5 The development of a global food system

The process of importing and exporting food on a global scale and the development of a world food market began during the 16th century with the ability of mankind to explore and travel across continents (Campbell et al 2004).

This marked the beginning of major changes to food production and consumption in the UK that has continued over the last 500 years.

During the 1700s the majority of men, women and children from the lower societal classes were involved in the laborious and relentless work of animal husbandry, sowing, weeding, harvesting and processing food (Sinclair 2010). Although not always plentiful due to crop failures and poverty, food was seasonal, locally produced and distributed with minimal packaging (Campbell et al 2004).

The transition from local to commercial food production was accelerated in the UK between 1760 and 1850 during the Industrial Revolution with the advent of farm mechanisation and the ability to transport food further to reach consumers (Humphrys 2001). At this time, freed from their agricultural labours by mechanisation, some of the rural population migrated to towns and cities in search of work which created a demand for more food to be transported to urban areas.

In the 1840s, the protection of local food markets was lifted with the repeal of the Corn Laws (Pretty 1998) and the UK began importing food staples such as wheat from North America because it was cheaper due to large scale mono culture production. The shift away from food self-sufficiency in Britain at this time is shown in Table 1 below and illustrates the impact of a globalised food system in reducing British food self-sufficiency.

Table 1. Indicative food self-sufficiency in Britain
(based on DEFRA, Food Security and the UK 2006)

Period	Percentage for all food
Pre 1750	100%
1750-1830s	90%-100% except for poor harvests
1870s	60%
1914	40%
1930s & 1940s	30%-40%
1950s	40%-50%
1980s	60%-70%
2000s	60%

6 UK food production in the 20th century

The UK's food supply was vulnerable to negative external events in the 20th century such as the food shortages experienced during and after the Second World War (WWII) (Pretty 1998). In particular, food rationing in the 1940s and early 1950s due to U-boat blockades and the aftermath of WWII, resulted in UK household diets that were nutritionally adequate but monotonous (Zweiniger-Bargielowska 2000). People were encouraged to grow as much of their own food as possible and more than 50% of the UK's manual workers had an allotment or garden producing fresh fruit and vegetables that represented about 10% of the nation's overall food requirements (Hopkins 2008). The UK's gardens and allotments also provided 25% of the egg supply and pigs were kept in back yards by the 6,900 pig clubs in operation at the time (Gardiner 2004).

Following the food shortages during and after WWII, government agricultural policy utilised farm subsidies to encourage farmers to produce maximum harvests in order to meet the needs of post war Britain (Humphrys 2001). In the 1950s food was in good supply due to the implementation of the Agriculture Act of 1947 (DEFRA 2006) and the price of food fell. The Act guaranteed prices for farmers for main food staples and production increased due to financial incentives to maximise yields, reducing the cost of food for the consumer. There was a change in farming practices to intensification and instead of crop rotation and allowing fields to lie fallow there was an increase in the use of artificial fertilisers, pesticides and herbicides. With lower food prices, it was no longer essential for people to grow their own food as before (Humphrys 2001).

The detrimental effect on the environment due to the increase in the use of chemicals on the land did not become apparent until 30-40 years later (Carson 1962). The work of Carson (1962) that put forward a strong case against the environmental damage caused by toxic chemicals led to a revival of interest in food produced without artificial chemicals and the beginning of the Green movement. The Green movement built on the work of the Soil Association that was founded in 1946 by a group of farmers, scientists and nutritionists who had observed the direct link between farming practices and the health of plants,

animals, humans and the environment (Soil Association 2012). Although the Food Standard's Agency review of organic food from 1958 to 2008 concluded that there was no difference in the nutritional content of organic and conventionally produced food, it should be noted that the report did not consider the effects of contaminant residues on the environment arising from intensive food production (Food Standards Agency 2009). The findings of Badgley et al. (2007) lend weight to the argument that organic methods of food production could feed a projected global population of 9-10 billion people by 2050 without increasing the land area used to produce food.

7 The current situation

Food production has undergone unprecedented changes in the last 60 years (Humphrys 2001, Charles et al. 2010). This is acknowledged in the report "The Validity of Food Miles as an Indicator of Sustainable Development" (DEFRA 2005) that highlights the most significant changes as being globalisation of the food industry, reduction of food suppliers into fewer larger corporations and a major shift to food deliveries carried out in increasingly larger vehicles via supermarket regional distribution centres, all of which contribute to food supply chain greenhouse gas (GHG) emissions. The report also identifies the change in consumer buying patterns from frequent visits to small local shops on foot to weekly supermarket shopping by car (DEFRA 2005). This change in consumer behaviour has a detrimental impact on the local economy as well as contributing to the GHGs arising from supermarket car journeys and the larger vehicles delivering food from distribution centres to out of town supermarkets.

8 Climate change and peak oil

The effects of climate change are likely to have an impact on the availability of water, flooding, soil erosion and crop failures due to extreme weather events (UKCIP 2012) that will affect food supplies. Depletion of the earth's natural resources; natural gas, coal and in particular oil, will also have an impact on the world's ability to feed itself because conventional commercial scale food production is heavily dependent on inputs such as fertiliser derived from these fossil fuel sources (Heinberg 2005).

In order to address the effects of climate change, the Kyoto Protocol set legally binding targets for Europe and 37 industrialised countries to reduce GHGs by an average of 5% over the five years from 2008-2012 using the 1990 emissions level as a base line (United Nations 2012). Governments of parties signed up to the Kyoto Protocol agreed to a second period of commitment commencing in 2013 and acknowledged that a reduction in GHGs was essential to limit the increase in global mean surface temperature (GMST) to within 2°C (United Nations 2012). The increase in GMST observed since the mid-20th century is very likely due to an increase in anthropogenic GHGs (IPCC 2007). However, Lovelock's Gaia theory argues that the earth is a self-regulating organism and asks whether as a species, mankind may eventually be doomed by the effects of anthropogenic GHGs, the earth favouring species that maintain a less threatening environmental balance (Lovelock 2000).

The Foresight Report acknowledges that the level of GHGs generated by agriculture globally is difficult to measure and changes according to where the assessment boundaries are drawn (Foresight 2011). However, agricultural GHG emissions are estimated to be between 12%-14% of all global emissions and this figure increases to approximately 30% when food processing and transportation beyond the farm are taken into account. The GHGs attributable to agriculture contribute high levels of methane (CH_4) and nitrous oxide (N_2O) that have a major effect on global warming. Agriculture is responsible for generating 47% of the CH_4 and 58% of the N_2O of the global emissions of these greenhouse gases (Foresight 2011). The most significant contribution to global agricultural GHG emissions of nitrous oxide arises from the production and application of nitrogen fertilisers (DEFRA 2011a). The second highest contribution to global agricultural GHGs is from livestock, particularly ruminants that contribute to methane and nitrous oxide levels through their digestive processes and the production of manure (Foresight 2011).

Using the 1990 carbon equivalent (CO_2 eq) for GHGs of 590 million tonnes (Mt) produced annually as a baseline (DECC 2010), the UK has set targets to reduce its overall GHG emissions by 34% by 2020 and 80% by 2050 (Foresight 2011).

DEFRA reports that within the UK, agriculture accounts for approximately 9% of GHG emissions (DEFRA 2011a) and according to Garnett (2008), food production is estimated to produce 19% of the UK's GHGs. This estimate is confirmed in a report produced by the Food Climate Research Network (Audsley 2009) that estimates that once food leaves the farm, GHG emissions from food production in the UK rise to approximately 30% of the UK's GHGs, including food imports and direct and indirect land use change. This figure does not include GHG emissions arising from food consumption or waste but is in line with the rest of the European Union where it is estimated that 31% of GHGs are connected to the food system (Foresight 2011).

The figures in Table 2 below include the emissions arising from food distribution in the UK and these account for 25% of all UK transport emissions (DEFRA 2005). The figures do not include GHGs arising from consumer shopping trips, cooking, washing up and food refrigeration.

Table 2. Indicative food system contribution to UK GHGs
(Based on 2008 estimated 620.5 Mt CO_2 eq)

Food supply chain	Mt CO_2eq	% of UK GHGs
Food production, imports & land use change	117.9	19%
Agriculture	55.8	9%
Household food & all household packaging waste	26.0	4%
Supermarket food waste	0.3	<1%

Sources: Greenhouse Gas Emissions Projections for UK Agriculture to 2030, DEFRA 2011a
Cooking up a storm: Food, greenhouse gas emissions and our changing climate, Garnett 2008
Waste arisings in the supply of food and drink to households in the UK, WRAP 2009
Why the supermarket secrecy on food waste? Channel 4 News, 2012

Availability of water, land suitable for cultivation, land ownership and the squeezing out of local and small producers by large corporations are also potential threats to a sustainable food system (Heinberg 2005). A response to these threats could be similar to that of preparing for WWII (Hopkins 2011). This view is echoed by Heinberg (2005) who recommends that people grow as much of their own food as possible as a part of a strategy for managing the collapse of oil dependency.

It is significant that in the 1990s Cuba met the challenge of feeding the population that arose due to a sudden loss of access to Soviet oil by developing small scale organic farms and urban food growing projects (The Power of Community 2006).

9 Sustainable food consumption

Changes are needed in the methods of food production, processing, storage and transportation to meet the challenge of feeding an increasing global population that is estimated to reach 9-10 billion by 2050 in an environmentally and socially sustainable way (Charles 2010). Lang (1999) argues that change is also needed in food policy and practices in order to prioritise the protection of the environment, human health, consumers' expectations and social justice in meeting the food needs of an increasing population. Charles (2010) confirms the views of Hopkins (2011) and Heinberg (2005) and observes that changes as radical as those occurring during the Industrial, Agricultural and Green Revolutions are needed to establish a sustainable food system.

In the UK, the Government is currently pursuing a course of encouraging farmers to adopt a method of sustainable intensification to increase yields (Foresight 2011). The complexity of managing agronomic practices to reduce GHGs while simultaneously producing more food from less land is acknowledged (Charles et al 2010). One of the levers that could make an impact in reducing GHGs is the use of genetically modified seeds to self-fix nitrogen (World Economic Forum 2012). Other measures include no tillage farming, inter-planting with trees to fix nitrogen, reducing the use of artificial fertilisers, improving livestock management and transport efficiency.

Diet plays a significant role in sustainable food consumption and in particular the consumption of meat and dairy products because these make up 50% of all GHGs arising from agriculture (Garnett 2008). Weber (2008) suggests that in the US "dietary shift can be a more effective means of lowering an average household's food-related climate footprint than buying local". This is due predominantly to the high level of GHGs attributable to food processing in the

United States that contributes 83% to a households' food carbon footprint. Garnett (2008) maintains that in order to reduce food system GHGs, meat and dairy products need to be restricted, as well as other measures such as eating no more food than is required to keep us healthy, minimising the consumption of food that has little nutritional benefit and not wasting food. Changing to a diet containing less meat on a global level could have a significant impact on the availability of land use for other crops such as biomass fuels (Stehfest 2009). This would have the effect of reducing the levels of methane (CH_4) and nitrous oxide (N_2O) attributed to meat and dairy production in food system GHGs and contribute to a healthier diet (DEFRA 2010). However, the relatively inexpensive cost of meat and dairy products to consumers and increasing affluence in countries adopting a western style diet means that voluntary changes in diet are unlikely and regulatory measures and policy changes would be needed to bring about a reduction in the consumption of meat and dairy foodstuffs (Garnett 2008).

In relation to a scenario of total UK food self-sufficiency, a significant reduction in livestock production would be needed in order to maximise the availability of food calories for human consumption from crops that would have otherwise been grown for animal feed (DEFRA 2010, Garnett 2008). Thus *in extremis*, diet would by necessity consist of very little meat and dairy products and a higher level of plant based foods. The Food Standards Agency acknowledges that defining a healthy diet is complex but recommends the following proportions of food types shown in Figure 2 below (Food Standards Agency 2007).

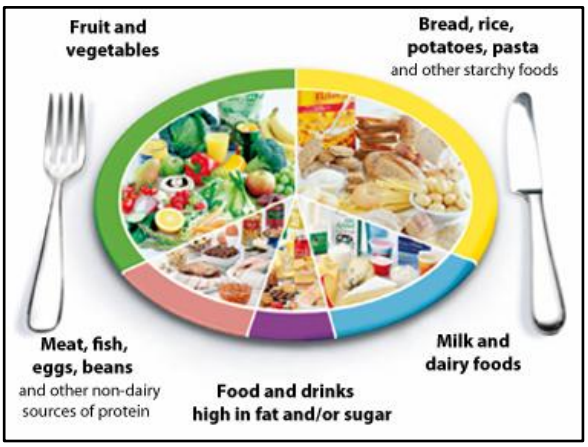

Figure 2. Food Standards Agency "Eatwell plate" (FSA 2007)

10 Small scale food production

As demonstrated during WWII, food production by keen gardeners and allotment holders can lead to an output of 10% of total food consumption (Hopkins 2008). However, there does not appear to be any Government initiative to promote food production on a domestic scale despite the potential contribution of 10% that this could make to the nation's overall food supply and GHG emissions savings targets (Hopkins 2008). Advice about growing your own fruit and vegetables is included in the Government's advisory website Environment and Greener Living (DirectGov 2012) but there are a number of high profile civil society organisations that are more pro-active in advocating home grown food such as the Royal Horticultural Society's "Grow Your Own" initiative (RHS 2012).

There is a lack of peer reviewed research available concerning the outputs of gardeners, allotment holders and smallholders and small scale food production has been outside the monitoring criteria utilised by DEFRA's annual survey of agricultural activity since 2010 (Blackburn 2011). The annual survey analyses commercial holdings with significant levels of farming activity that exceed one or more of a number of thresholds as defined by EU regulations (Blackburn 2011). For example, a holding would need to have more than five hectares of agricultural land or more than 1,000 poultry to be included in DEFRA's annual survey. The absence of accounting for the contribution that gardens and allotments can make to the overall food supply is also acknowledged by Bowman (1977) with the argument that land developed for housing can produce significant quantities of garden grown food and is therefore not totally lost to the purpose of food production. Evans (2000) argues that the global population has escalated beyond the point where it can be sustained by small scale food producers and countries self-sufficient in food. However, opinion is divided on the role of small scale food producers in contributing to a sustainable food supply as The World Economic Forum's New Vision for Agriculture (2012) identifies that "Smallholder productivity is critical to improve economic opportunity and food security".

Meat and dairy products contribute 50% of the total GHG emissions arising from food production in the UK (Garnett 2008). The capacity to produce meat and dairy food stuffs sustainably and in significant quantities is largely outside the scope of small scale producers. The impact this group can have in reducing GHGs is therefore limited to the remaining 50% of GHG emissions. Fruit and vegetable growing is an area where small scale domestic food producers can make an impact in reducing GHGs arising from production, transport and packaging. There is also potential for increasing egg and honey production on a domestic scale as these activities lend themselves to utilising relatively small land areas such as gardens.

Edward-Jones (2010) argues that for the UK to be 100% self-sufficient in fruit (currently 10%) and vegetables (currently 60%), substantial increases in production of these foods would be required. One of the barriers to doing so on a commercial scale is availability of land of the highest quality. Second grade land would therefore have to be utilised, with the end result of replacing grazing land with arable, potentially displacing dairy herds to poorer land that in turn may result in a reduction of dairy yields (Edward-Jones 2010). This highlights the opportunity for domestic and small scale producers and growers to contribute to an increase in fruit, vegetable, honey and egg self-sufficiency in the UK.

The approximate area of the 12 million gardens in the UK (Don 2008) based on an average size of 20 m^2 is a total of 2,400 hectares of land with the potential for growing food. In addition, there are 300,000 allotments in the UK (Don 2008) with an average size of 250 m^2 totalling an estimated 7,500 hectares of cultivatable land. The approximate area available for domestic scale food production in the UK is therefore at least 9,900 hectares. It is worth noting that although this represents only 0.6% of the total area utilised for commercial food production of 17.2 million hectares (DEFRA 2012a), domestic scale food production lends itself to the high value perishable crops such as herbs, salads and soft fruits that can be grown in small areas. Small land areas can be cultivated more efficiently to maximise productivity because growers are able to focus their attention on smaller areas (The Ecological Land Co-operative 2011).

It is estimated that 36% of people with gardens grow edible plants (Ipsos MORI 2004). However the potential for increasing food production by promoting domestic scale food growing appears to be largely overlooked by the UK Government. Given that, *in extremis*, food grown on allotments and in gardens represented 10% of the UK's food in WWII (Hopkins 2008), this is a missed opportunity. It could be that Government policies favour a global food system due to the influence of global food corporations and the drive for economic growth through international trade over a high degree of UK food self-sufficiency and domestic scale food production (Foresight 2011).

Domestic scale sustainable food production has a vital role to play in contributing not only to a resilient food supply within local communities but also social cohesion (Hopkins 2008). The food that we eat defines who we are in terms of our values and culture. There is an important link between growing and eating food (Don 2008, Tudge 2011) that enables people to be responsible for an element of their food supply which can be empowering and provide a sense of achievement. The *modus operandi* of small scale food producers lends itself to the characteristics of a local food system as outlined in Table 3 below that illustrates some of the tensions between global and local food systems.

Table 3. Characteristics of global *v.* local food systems (based on Lang, 1999)

Global		Local
Many food miles		Few food miles
Import & export model of food security		Food from own resources
Rural depopulation		Vibrant rural population
Agrochemicals		Organic/self-sustainable food production
Biotechnology		Indigenous knowledge
Processed (stored) food		Fresh (perishable) food
Food from factories		Food from the land
Hypermarkets	*v.*	Farmers' markets
Standardization		'Difference' and diversity
People to food		Food to people
Created wants (advertising)		Real wants (learning through culture)
Burgerization		Local food specialities
Fast food		Slow food
Global decisions		Local decisions
Top down controls		Bottom up controls
Dependency culture		Self-reliance
Social polarization and exclusion		Social inclusion
Consumers		Citizens

11 Household food waste

As can be seen in Figure 3 below, households produced 8.3 Mt of food and drink waste in 2008, accounting for almost 260% more waste than food manufacturing (DEFRA 2012d). This figure excludes packaging estimated to be 3.6 Mt for both food and non-food household packaging waste. It is estimated that in 2008 the impact of waste arising from household food and drink together with all household packaging waste contributed the carbon equivalent of 26 Mt of GHGs to UK emissions (DEFRA 2012d). This represents approximately 4% of the UK's total estimated GHG emissions carbon equivalent of 620.5 Mt in 2008. It should be noted that since 2008, the UK's GHGs overall have been steadily decreasing and that the provisional figure for 2011 is 549.3 Mt CO_2 eq (DECC 2012).

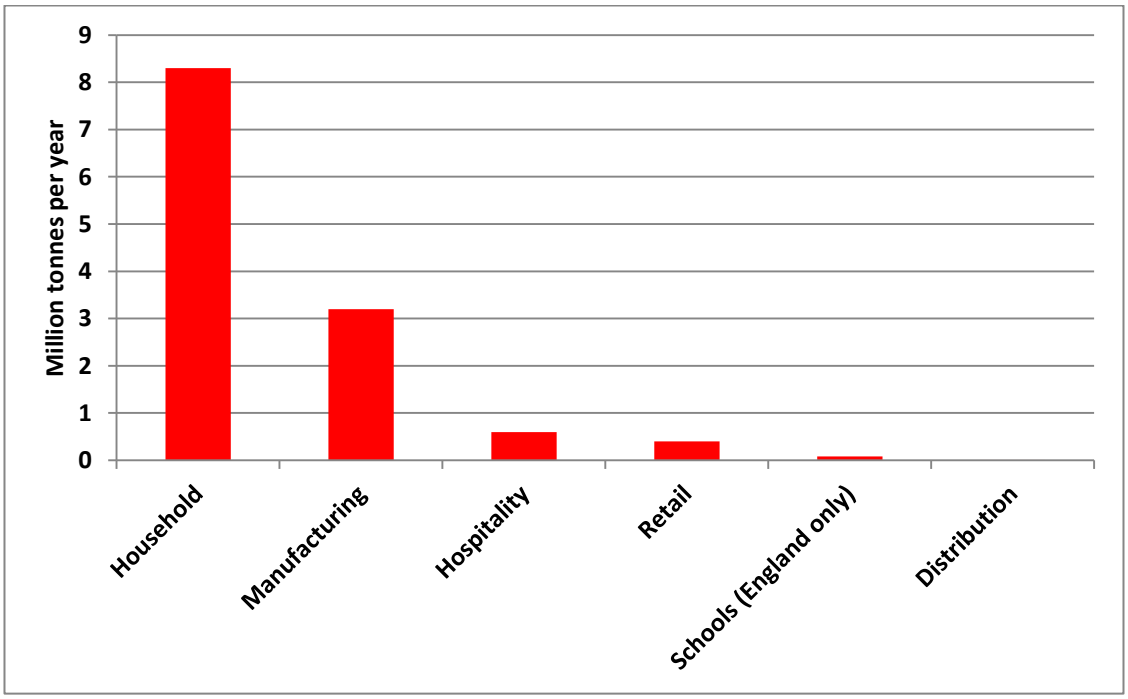

Figure 3. UK food and drink waste (excluding packaging)
(based on UK food and drink waste through the food chain (DEFRA 2012d)

It is significant that 64% of the 8.3 Mt of household food and drink waste shown in Figure 3 above is considered to be avoidable. Of the 5.3 Mt of avoidable food and drink waste produced in the UK in 2008, 42% was due to too much food being cooked, prepared or served and 55% was not used within the best before date (WRAP 2011). Table 4 below shows the proportions of avoidable food and drink waste by food groups and these indicate that consumers buy more food

than is needed and that there may be a lack of meal planning for food shopping and uncertainties regarding food storage methods (WRAP 2011). In addition, there may be confusion between 'use by' and 'best before' date food labelling resulting in food being thrown away before necessary and resistance to or a lack of skill in making meals from ingredients already in the food cupboard. Portion control is also an important factor as 42% of avoidable food waste is due to too much food being cooked (WRAP 2009).

Table 4. Avoidable food and drink waste by food group
(based on Household food and drink waste in the UK, WRAP 2009)

Food group	Percentage avoidable
Ready meals	96%
Dairy and eggs	91%
Bakery, cakes & desserts	88%
Drinks	67%
Meat and fish	48%
Fresh fruit	46%
Fresh vegetables & salads	45%
All other	67%

At an estimated 300,000 tonnes, supermarket food waste is 3.6% of that disposed of by households (8.3 Mt) but it is not possible to compare the levels of food waste by individual supermarkets because some UK supermarkets consider information concerning their food waste to be commercially sensitive and will not release figures. However, Sainsbury's provided information on its 44,000 tonnes of food waste generated in 2011 and confirmed that none was sent to landfill but either used as animal food, for composting/anaerobic digestion or sent to charities for distribution to those in need (Channel 4 News 2012). Supermarket food waste estimates exclude the food wasted by farmers producing fruit and vegetables that do not meet the cosmetic standards of supermarkets or producing sufficient quantities to meet a supermarket order that is subsequently downsized.

12 Food security

The concerns over food security in the UK appear to be linked to several factors (DEFRA 2006):

- The decline of food self-sufficiency (currently on the upturn)
- The effects of climate change
- Interruptions to fuel supplies
- International political tensions

Despite calls on the UK Government by the National Farmers Union (Davies 2011) to reduce UK food imports, the Foresight Report (2011: p.13) "rejects food self-sufficiency as a viable option for nations to contribute to global food security" and concludes that food security is best served by "liberalised global trade markets" Foresight Report (2011: p.19). Figure 4 below indicates the fluctuating levels of food self-sufficiency in the UK over the last fifty years and highlights the peak that occurred in 1984 when the UK produced 95% of the supply of indigenous food types. Provisional figures for 2011 show that since 2008 there has been an upturn in the UK's food production to supply ratios for both indigenous and all food types (DEFRA 2012e) to 78% and 61% respectively.

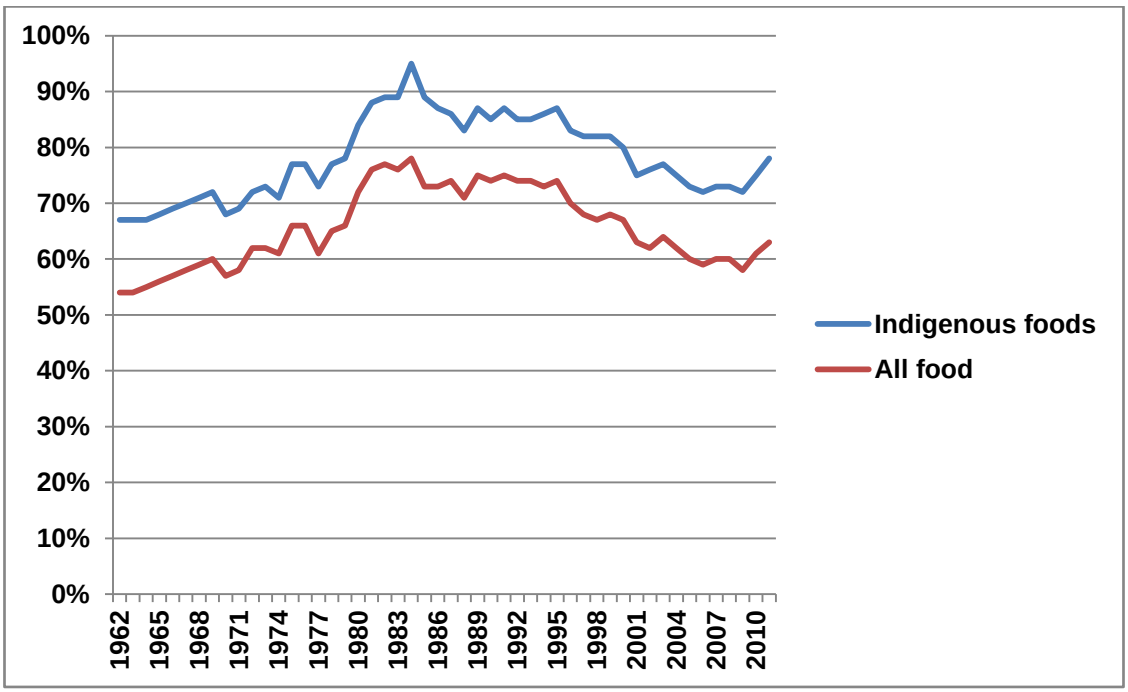

Figure 4. UK food production to supply ratio
(based on DEFRA, UK food production to supply ratio (2012e)

A globalised food system can be of benefit to food security in the UK because external events affecting food supplies in one region can be offset by producers from a different region (Foresight 2011). However, if over reliant on food imports, the UK could be vulnerable to challenges to the continuity of supply of food imports due to political unrest, poor harvests resulting from the effects of climate change and high energy/fuel prices. Rising energy prices lead to increased fertiliser costs and higher consumer prices for both imports and food produced in the UK. Rising food prices reduce the level of consumer confidence in a secure food supply. The food riots that broke out in the Middle East were in response to escalating food prices in 2008 and 2011 and demonstrate that one of the potential impacts of a lack of global food security is civil unrest (BBC 2011).

In order to conserve their own food stocks, some countries are choosing to ban exports and Egypt's ban on rice exports to maintain food security resulted in smugglers in the Middle East exporting rice illegally in shipping containers under beans and salt (Reuters 2012).

13 Food prices

The percentage of household income used to buy food in 1963 has fallen from 22% (DEFRA 2006) to the current level of 11% of income in 2010 (Tudge 2011 DEFRA 2012f).

Between 2006 and 2011 the increase in the minimum wage was 12.1% in the UK but food prices have increased by 30.5% over this time scale (Oxfam 2012a) indicating that continuing increases in the cost of food are unsustainable financially for the consumer. As food price increases exceed those of increases in wages and if a lack of food security becomes apparent, domestic households who do not grow any of their own food may become motivated to do so. For those already producing some of their own food it may become a necessity rather than a lifestyle choice.

The food price increase of 30.5% over the five years up to 2011 is significant because it is predicted that globally food prices will rise by between 20%-30% over the next decade (OECD 2011) and due to the current global economic crisis it is unlikely that wages will rise accordingly. It could be argued that consumers will respond to higher food prices by choosing to buy less or lower quality foods (DEFRA 2012a) particularly in view of the aggressive marketing of food corporations encouraging consumer spending on cut price food products.

The proportion of income spent on food in the UK (11%) is low when compared with third world countries where the percentage can be as much as 75% (Oxfam 2012b). One of the eight Millennium Development Goals (United Nations Development Programme 2012) seeks to eradicate extreme poverty and hunger. Despite the economic crisis that increased the number of people in extreme poverty by 64 million worldwide in 2010, it is anticipated that the goal of reducing by 50% the number of people living on less than a $1 a day between 1990 and 2015 will be met.

14 Conclusion

The findings of this report confirm that a global food production and distribution system is inevitable until such time as external forces lead to crop failures or affect the ability of countries to trade with each other. Meanwhile in the UK there is garden land available and the potential for small and domestic scale producers to grow more food, in particular high value, perishable produce such as vegetables, salads, herbs and soft fruit, as well as producing eggs and honey. This is an opportunity for sustainable small scale producers, including gardeners to build a more resilient local food supply chain.

In terms of sustainable consumption, it is clear that individuals can make a major contribution in a number of ways by buying more local, sustainably produced and less processed food, reducing food waste and the amount of meat and dairy products in their diets and by growing more food for their own consumption. These actions could contribute to a reduction in the GHGs attributable to food production and consumption in the UK.

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