

The Footprint of Scotland's Diet

*The environmental burden of
what we eat*

A report for Scotland's Global Footprint Project

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Background information

After smoking, Scottish eating habits are the second most important cause of the nation's poor health. The average Scottish diet is low in cereals, vegetables and fruit but high in confectionery, fatty meat products, sweet and salty snacks, cakes, and excessive amounts of sugary drinks and alcohol. The diets of children are especially poor and until recently so have been school meals.¹ Poor diet contributes 'to a range of serious illnesses, which include coronary heart disease, certain cancers, strokes, osteoporosis and diabetes'².

In Scotland, more than 65% of men and 59% of women are overweight. This is also the case for children, with 35% of primary school pupils and around 65% of 11 to 12 year olds being overweight³. More than 150,000 of the Scottish population have diabetes and this is likely to double over the next 10-15 years. Some half a million people are thought to have coronary heart disease⁴.

The *Hungry for Success* campaign by the Scottish Executive⁵ has been successful in starting to tackle health education and health promotion in schools. This was the first time in the UK that national nutrient-based standards for school lunches had been introduced and in the forthcoming Schools (nutrition and health promotion) (Scotland) Bill it is intended that these standards will receive legal backing.

However just as diet has health implications, food production, processing and consumption also have significant environmental impacts, and certain eating habits place unnecessary burdens onto the environment.

This study seeks to explore the environmental burden or Ecological Footprint of Scotland's diet and the implications of dietary recommendations for the environment.

¹ The Scottish Diet 1994 report, basis of current food, diet and health policy in Scotland.

² The Scottish Office Department of Health, Towards a Healthier Scotland A White Paper on Health, The Stationery Office, 1999.

³ Scottish Executive, 2006. Improving the Health & Nutrition of Scottish children report <http://www.scotland.gov.uk>

⁴ NHS Scottish Health Survey 2003; ISD Scotland Information Services (12 December 2005), NHS National Services.

⁵ <http://www.scotland.gov.uk/Publications/2003/02/16273/17567>

Method and assumptions

The Ecological Footprint is a sustainability indicator that measures the total environmental pressure of the human population in spatial terms. It estimates the land and sea area that is needed to provide all the resources for a population in a given area, and for absorbing its emissions. The Footprint is calculated as a standardized area equivalent to a world average area, expressed in global hectares (gha). It provides a snapshot of consumption for a region, organisation, or person in a given year. The Stockholm Environment Institute's (SEI) approach includes direct and indirect environmental impacts and ensures that the method is consistent with the Global Footprint Network (GFN) accounts. These Scottish food snapshots have been based on the latest available data from the National Food Survey (NFS), the largest survey of household food consumption and expenditure in the UK and worldwide⁶. NFS data have been matched with Scottish food consumption data and the final Footprints have been modelled using the REAP software tool. The most recent method has been described in several publications by SEI⁷.

The food snapshots compare the average Scottish food Footprint with Footprints from diets that are comparable to Scottish nutrient standards as set out in the Scottish Diet Action Plan (1996).⁸ The Scottish nutrient standards for school lunches refer to the dietary reference values report (1991) that forms the basis for the Scottish recommendations in *Hungry for Success*⁹.

For a meaningful comparison, food amounts were based on the Optimized Mixed Diet concept for children and adolescents developed by Kersting et al. (2005)¹⁰, and FAO/WHO Food based Dietary Guidelines. This approach provides quantitative recommendations for daily food amounts to meet nutritional standards. Since the concept is framed around 11 food categories it is flexible enough to allow for a variety of dietary choices within the nutrition recommendations. As a first approach, these have been used for comparison with the average Scottish diet and adjusted for different energy recommendations. For the ecological comparisons of diets, food Footprints were based on the upper (conservative) limits for energy intake. The recommendations were also extrapolated to vegetarian diets and to other age groups. To

⁶ <http://www.data-archive.ac.uk/findingData/snDescription.asp?sn=4512#doc>

⁷ For example: Thomas Wiedmann, Jan Minx, John Barrett, Mathis Wackernagel (2006). Allocating ecological footprints to final consumption categories with input-output analysis. *Ecological Economics* 56 (2006) 28-48. Further eblinks: <http://www.sei.se/reap>

⁸ <http://www.scotland.gov.uk/library/documents/diet-00.htm>

⁹ <http://www.scotland.gov.uk/Publications/2003/05/17090/21742>

¹⁰ Kersting, M, Alexy, U., Clausen, K. (2005). Using the concept of food based dietary guidelines to develop an optimized mixed diet (OMD) for German children and adolescents. *Journal of Paediatric Gastroenterology and Nutrition* 40:301-308.

evaluate and compare the environmental pressure of different diets and age groups in more detail, further studies are required in the future.

Food in Scotland

According to the Scottish diet report (1994)¹¹, Scottish eating habits are inadequate, for example, for being too low in fruit, vegetables, and cereals, too high in cakes, pastries, meat and total fat. A healthy diet provides all the nutrients that are essential for avoiding disease and for achieving general wellbeing (Table 1). A healthy food selection consists mainly of fruit and vegetables, wholegrain products, potatoes, legumes, milk and dairy products, nuts and seeds. If all this is eaten, the consumption of meat, fish and eggs is limited (Hoffmann, 2004)¹².

Recommended food group proportions independent of age (in %)	%	Example: Daily amounts 13 -14 yr olds (g)
Beverages and plant foods		
Beverages	40	1250
Vegetables	10	280
Fruit	10	280
Bread/Cereals	9	275
Potatoes/Pasta	7	225
.....subtotal	76	
Animal foods		
Milk/Milk products	18	438
Meat/Sausages	2	70
Eggs	<1	20
Fish	<1	30
.....subtotal	20	
High-Fat, High-sugar foods		
Tolerated food groups (sweets, sugar...)	3	85
Oils/ Fats	1	38
.....subtotal	4	

Table 1. Healthy food selection based on Kersting et al. (2005). Note that this includes beverages. Example shows average values for male and female 13-14 year olds.

¹¹ The Scottish Office (1994). Scotland's Health. A challenge to us all. The Scottish Diet, report of a working party to the chief medical officer for Scotland.

¹² Hoffman, I. (2004). Sustainable nutrition: feasibility and consequences – an overview. Auszug 9. Karlsruher Ernährungstage, BfEL.

Ecological Footprint of the Scottish average diet compared to a healthy diet

Just including food consumed within the home the food Footprint of the average Scot is 0.75 global hectares (gha) per person. Different kinds of foods also have different Footprints. Most of the impacts in the diet of the average Scot come from eating meat (Figure 1).

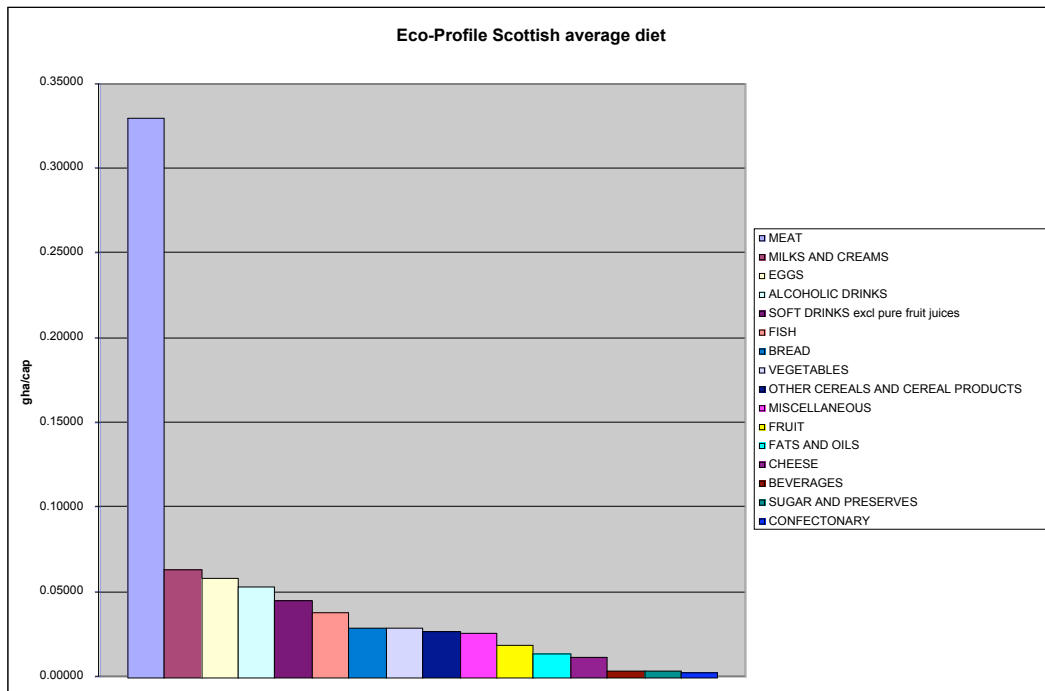


Figure 1. Eco-Profile for average Scottish diet

The high Footprint of meat is due to the large area of land needed to graze animals, for growing fodder, and the energy used in production, processing and distribution.

Calculations show that a diet based on the Scottish healthy eating recommendations has a lower Footprint than the current average. Eating mainly fruit, vegetables and wholegrain foods, and moderate amounts of meat, dairy and eggs is not only good for us but also better for the environment (Figure 2).

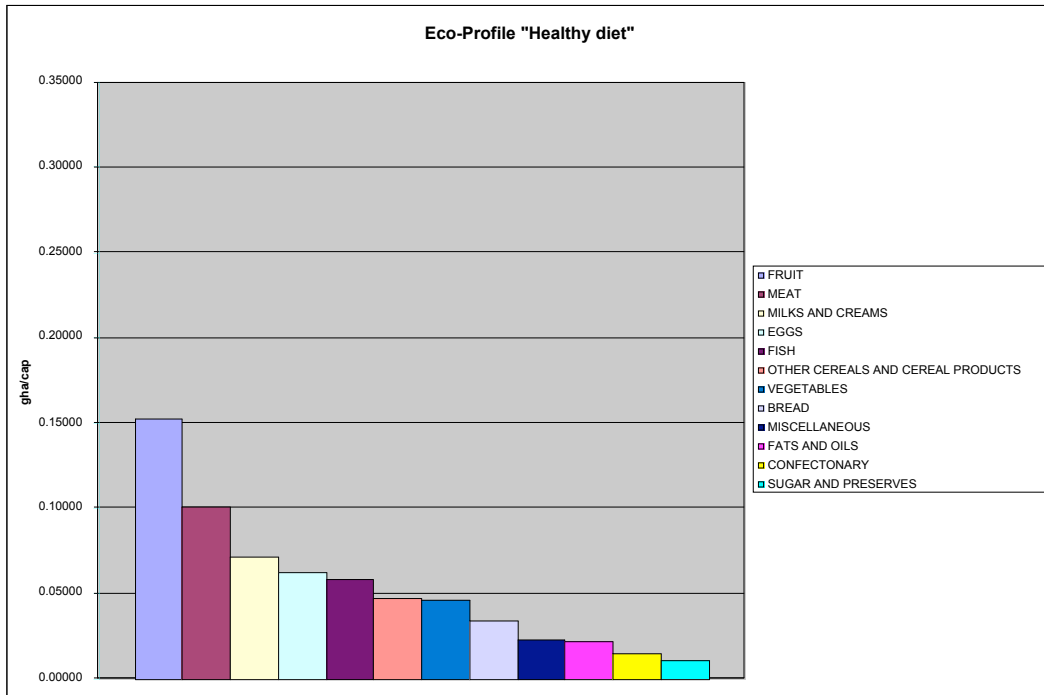


Figure 2. Eco-profile of a healthy diet according to nutrition guidelines

A comparison with the current average Scottish diet shows that a healthier diet can reduce the Scottish food Footprint by between 15 and 25% (Figure 3).

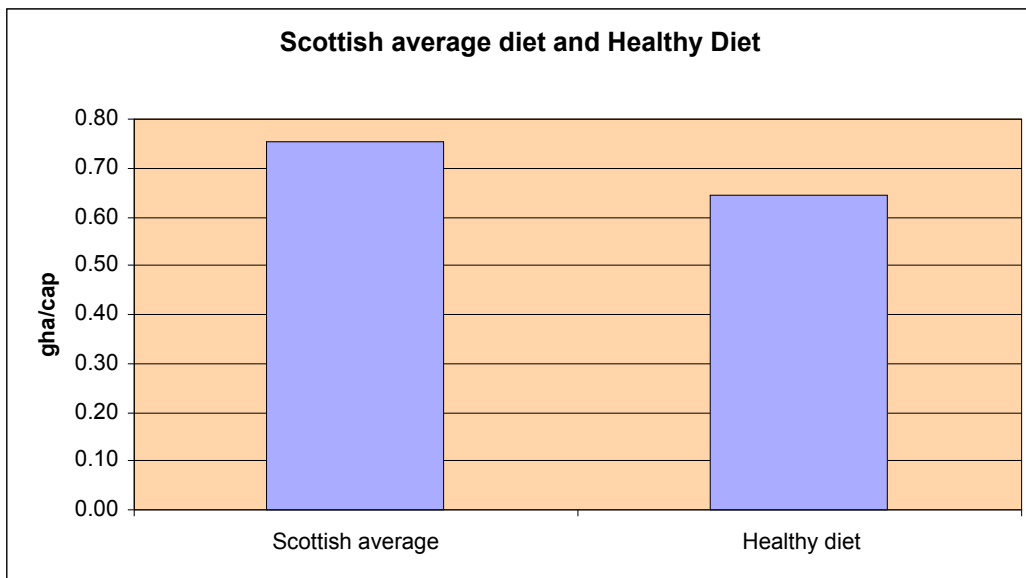


Figure 3. Scottish average diet compared to healthy diet

Footprints of some typical school meal menu choices

The study also measured the Ecological Footprint of two typical meal menu choices as served in North Lanarkshire schools. The menu choice before the introduction of *Hungry for Success* was a cheese pizza accompanied by potato chips, peas, soft drink, desert of apple crumble and skimmed milk. The *Hungry for Success* menu choice consisted of chicken-vegetable curry accompanied by rice, boiled potatoes, and fruit yoghurt for desert.

These snapshots are just two examples of possible, different food choices (and do not provide a nutritional evaluation) but show that a significant Footprint reduction can be achieved by a “healthier” choice:

- The Footprint of the *Hungry for Success* menu is 42% lower than before and has 83% less added fats compared to the previous menu;
- Eggs, milk, cheese and fats had the highest Footprints in the *Pre-Hungry for Success* lunch;
- The *Hungry for Success* menu contained only half the amount of animal products compared to the *Pre – Hungry for Success* menu. This resonates with recommendations to eat meat in moderation¹³;
- Although dairy products and meat also had the highest Footprints in the *Hungry for Success* menu, their footprints were 50% lower than previously;
- Even without meat, a lunch can have a high Footprint if ingredients are not chosen wisely (for example, too much fat, eggs and dairy products can result in a relatively high Footprint); and
- This suggests that a wide uptake of *Hungry for Success* menus could provide substantial benefits not just for health but also the environment. However, more detailed, wider and long-term studies are needed to verify this.

¹³ For example: British Dietetic Association, <http://www.bda.uk.com>

Pre- H4S lunch example

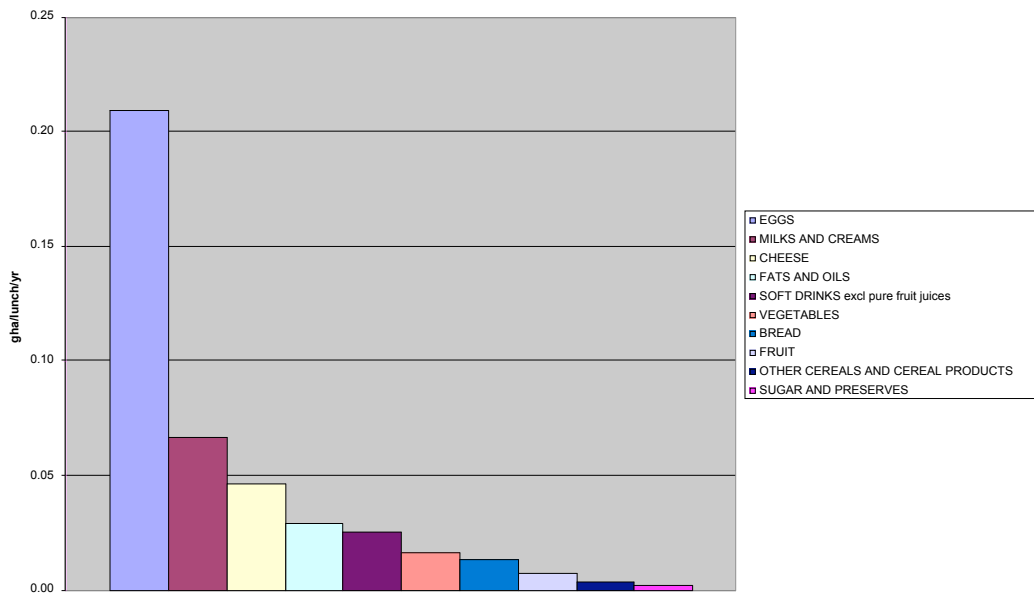


Figure 4. Footprint example of North Lanarkshire, random menu selection (cheese pizza, chips and desert) before H4S

Post- H4S lunch example

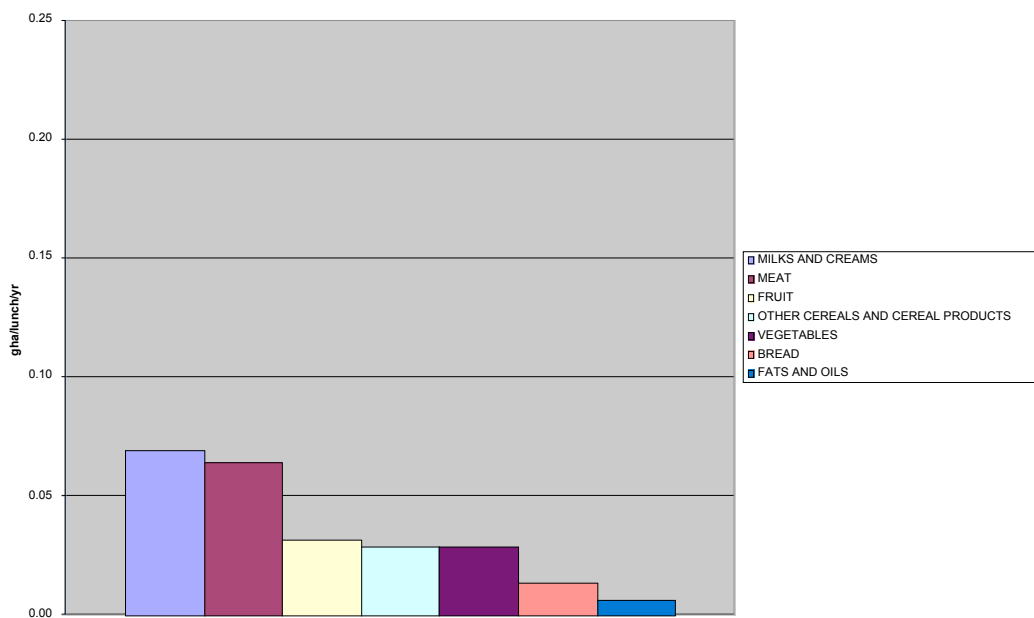


Figure 5. Footprint example of North Lanarkshire, random menu selection (chicken-vegetable curry and desert) after H4S

A vegetarian diet compared to the recommended healthy diet

A vegetarian diet that is varied and rich in wholegrain products, vegetables, pulses and fruit, and that includes moderate amounts of dairy products and eggs, can meet the requirements of a wholesome diet. In addition, the low amounts of animal fats and cholesterol are beneficial in preventing obesity and coronary heart disease (DGE, 2004¹⁴; Elmadfa and Leitzmann, 1990)¹⁵. A vegetarian diet that includes moderate amounts of milk and eggs can reduce the Footprint by 23% compared with a diet that follows current healthy eating recommendations (Figure 6).

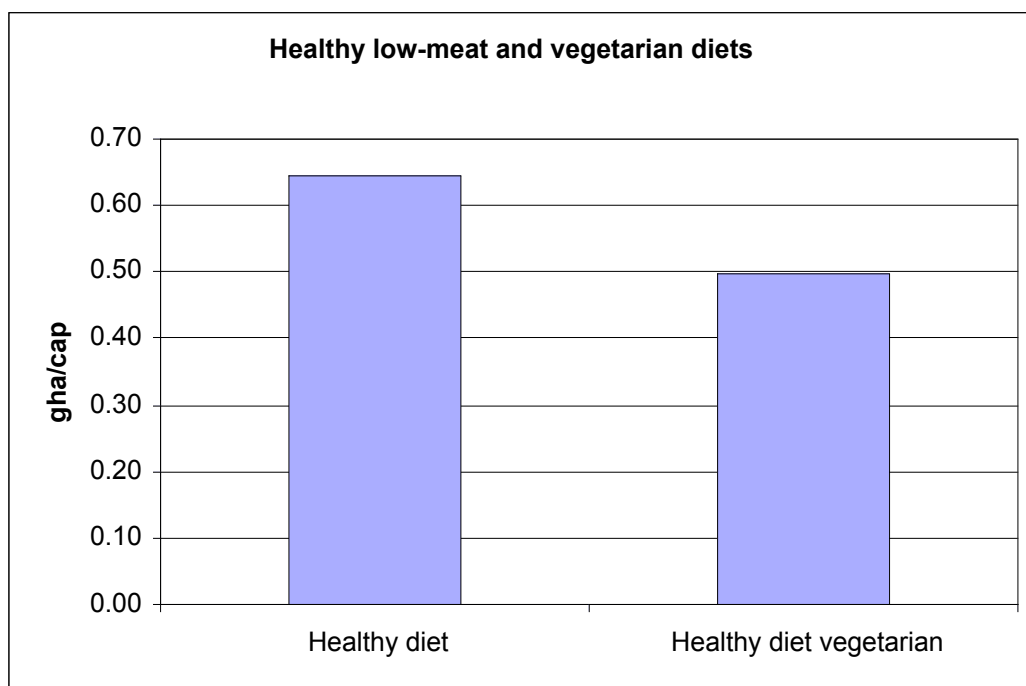


Figure 6.

Diet with and without meat

¹⁴ <http://www.dge.de/modules.php?name=News&file=print&sid=24>

¹⁵ Elmadfa, I.; Leitzmann, C. (1990). Human Nutrition. Eugen Ulmer Stuttgart.

British and imported food

Currently around 26% of the food we eat in Scotland is imported. Buying British food instead of imported food can reduce the Footprint of food by 54% compared to a diet based entirely on imports (Figure 7).

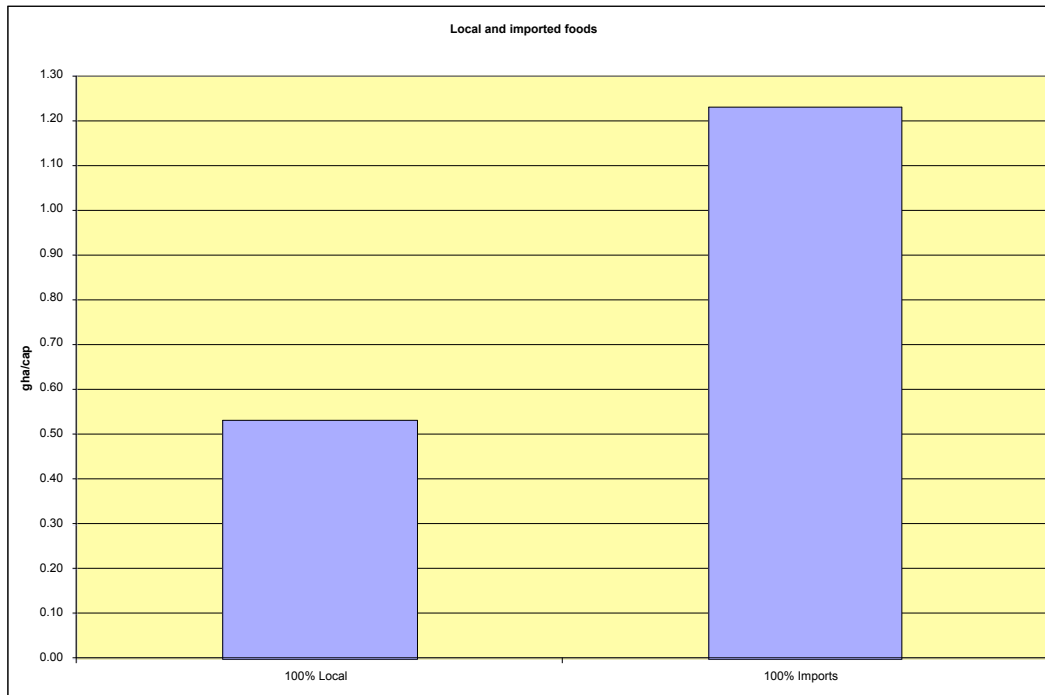


Figure 7. Local and imported food

“Food miles” are a significant source of CO₂ emissions. They gave rise to around 20 million tonnes of CO₂ emissions in 2002, of which 10 million tonnes were emitted in the UK and the remainder overseas. They account for 1.8% of the total annual UK CO₂ emissions. The majority of the environmental costs of transporting food come from domestic road transport split almost equally between road haulage of food by manufacturers and retailers and car transport by consumers travelling to and from shops. Only 0.1% of UK food miles are currently due to air freight (although this is the fastest growing sector)¹⁶

Compared to the current Scottish average, eating a recommended healthy diet based only on UK produce can reduce the Footprint of our diet by 29%.

¹⁶ Food Industry Sustainability Strategy DEFRA 2006

Organic and conventional food

First results for the UK show that eating organic can reduce the average food Footprint by a further 2% (Figure 8). Due to data availability, not all direct and indirect resource flows in organic production systems could be included¹⁷. However, results from a recent study for Australia showed that the total energy intensity in conventional farming systems is 56% higher than in organic farming¹⁸.

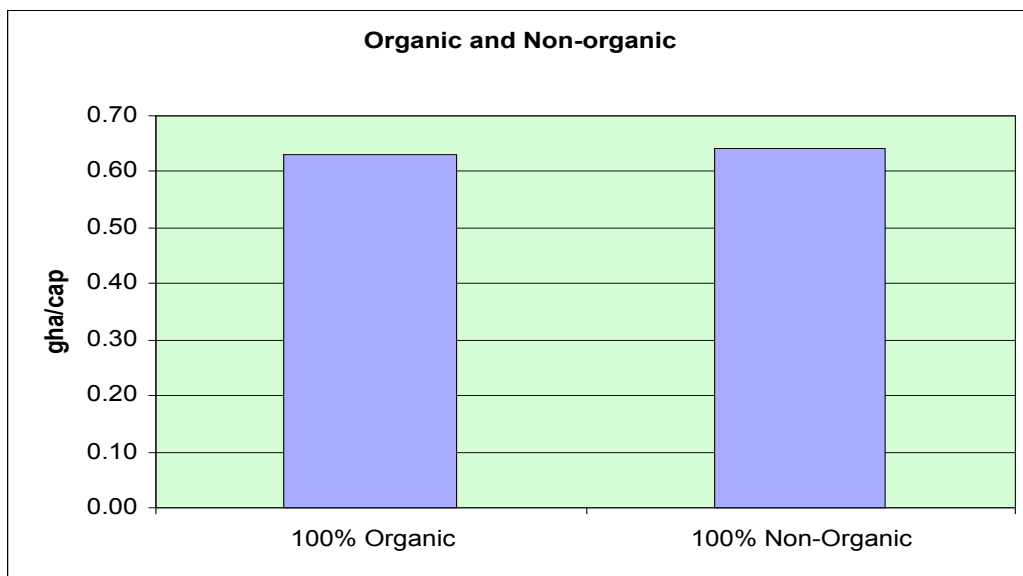


Figure 8. Comparison organic and non-organic food

¹⁷ More research is needed to disaggregate organic from conventional farming to fully understand the implications of both farming systems in the UK. SEI is currently seeking funding to undertake such research.

¹⁸ Wood, R., Lenzen, M., Dey, C., Lundie, S. (2006). A comparative study of some environmental impacts of conventional and organic farming in Australia. *Agricultural Systems* 89 (2006) 324-348.

The best diet?

The ideal diet - one that meets nutritional requirements and also has the lowest Footprint possible – is one that is healthy, vegetarian, local and organic. In comparison to the eating habits of the average Scot, such a diet meets the environmental, economic, and societal sustainability criteria and can reduce the Food Footprint by almost 40% (Figure 9).

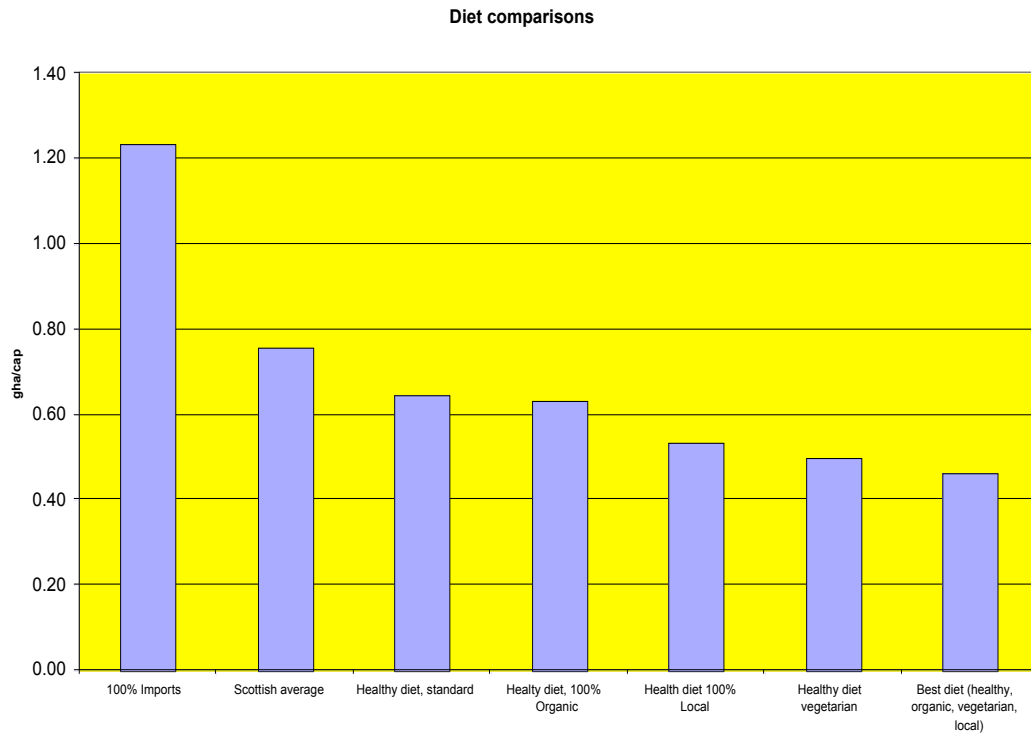


Figure 9. Footprint comparison of different diets

Summary and conclusions

Excess food consumption and an imbalanced choice of foods not only have severe consequences for our personal health, they also place an unnecessary burden on society, on agricultural demand, and on the environment. The food snapshots in this study show that a healthy diet based on nutrition recommendations can reduce the environmental pressure significantly - between 15 and 25% compared to the average Scottish diet - and that the Ecological Footprint can be reduced further by choosing a vegetarian option and by buying local and organic food. It also showed that a diet that does not contain meat but high amounts of dairy and egg can have a higher Footprint than a healthy option that includes animal products in moderation. A “Best Diet” that serves both health and the environment is one that combines all four criteria (healthy, vegetarian, local, organic) and can reduce the Scottish food Footprint by around 40% (Table 2).

Diet	Footprint (gha/cap)	Net change
100% Imports	1.23	63%
Current Scottish average	0.75	Baseline
Healthy diet, standard	0.64	-15%
Healthy diet, 100% Organic	0.63	-16%
Health diet 100% Local	0.53	-29%
Healthy diet vegetarian	0.50	-34%
Best diet (healthy, organic, vegetarian, local)	0.46	-39%

Table 2. Summary: Ranking of different diet options by Footprint

These results underline that an integrated policy approach is needed to address the problems in food production and consumption from a health, environmental and socio-economic perspective.