

Commissioned by:



Written and researched by:



Written and researched by Hannah Pearce, Michael Green and Emma Noble, Soil Association, with contributions from Roberta Sonnino and Kevin Morgan, Cardiff University.

Edited by Peter Melchett, Soil Association, and Joanna Collins, Sustainable Consumption Roundtable.

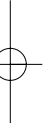
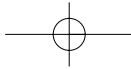
About the Sustainable Consumption Roundtable

The UK's Sustainable Consumption Roundtable is an initiative jointly hosted by the National Consumer Council and the Sustainable Development Commission. Funded by Defra and the DTI, the Roundtable brings together a small group of leading experts in consumer policy, retailing and sustainability to advise Government on how to create consumer choices that stay within environmental limits. It is due to report in early 2006, following which the Government will set out a plan for further action on sustainable consumption.

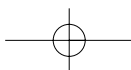


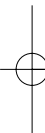
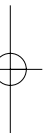
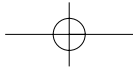
Design: Greg Stevenson
Printing: Seacourt Cleaner Communications
Cover photo: Education Contract Services

ISBN 1 899581 64 2

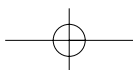


Printed by Seacourt using the environmental **Waterless Offset** process and vegetable-oil based inks on totally chlorine free paper with at least 75% post consumer waste. Seacourt Ltd holds ISO14001 and EMAS environmental accreditations, the Biodiversity Benchmark and is a carbon-neutral company powered by renewable energy.





a joint initiative from SDC and NCC



Double dividend?

Promoting good nutrition and sustainable consumption through healthy school meals

Contents

Foreword

Introduction

Key recommendations for improving sustainability of school meals

Section 1. Environmental impacts of food consumption

1.1 Overview	12
1.2 Biodiversity impacts	15
1.3 Contribution to climate change	16
1.4 On-farm water and waste impacts	16
1.5 Food transport and distribution	17
1.6 Processing, packaging and food waste	18
1.7 The unsustainable impacts of conventional meat and dairy production	18
1.8 Animal feed	19
1.9 The sustainable alternative	20
1.10 Fish - the environmental impacts of marine fishing	21
1.11 Impacts of aquaculture	23
1.12 Promoting sustainable marine fishing	24

Section 2. Nutritional advice

2.1 Introduction to the Caroline Walker Trust guidelines	26
2.2 Fruit and vegetables	26
2.3 Meat	27
2.4 Dairy products	29
2.5 Vegetarian dishes	29
2.6 Fish	30

Section 3. Improving the sustainability of school meals - implications of nutritional standards

3.1 Key sustainability implications for CWT guidelines	32
3.2 Discussion of the sustainability implications of the CWT nutritional guidelines	32
3.3 Scenarios for sustainable school meals	36

3.4 How can we deliver a best case scenario?	36
--	----

Section 4. Costs, barriers and opportunities

4.1 Overview	39
4.2 Will new Government money for ingredients go far enough?.....	39
4.3 The cost of improvements.....	42

Section 5. Increasing uptake of sustainable school meals

5.1 Improving Catering Management	43
5.2 Developing Sustainable Procurement & Supply Chains	44
5.3 Valuing and measuring the sustainable school meals effectively	46

Section 6. Case studies

6.1 School Meals in Rome - The Quality Revolution.....	47
6.2 East Ayrshire - Scotland's first Food for Life organic, local and fresh school meals service....	54
6.3 Bradford - sustainable local procurement pioneer	57
6.4 Lethbridge Primary School, Swindon - Food for Life champion	62
6.5 Columbia Primary School	63

Tables and figures

Table 1 Key impacts of modern food production/consumption on biodiversity, carbon, water and waste at each stage of the food cycle	13
Table 2 Food conversion rates for main livestock species	20
Table 3 Life cycle energy inputs for food ready to eat	21
Table 4 CWT guidelines - divergence (D) and convergence (C) with sustainability goals	33
Table 5 Best-case and worst-case sustainability scenarios for implementing CWT guidelines for school meals.....	35
Table 6 Sample of Food for Life Schools	41
Figure 1 Average distance travelled per menu item in East Ayrshire schools (miles)	56

Foreword

If everyone on the planet were to consume natural resources and generate carbon dioxide at the same rate as we do in Europe, we would need three planets to support us.

The Sustainable Consumption Roundtable – a joint initiative of the National Consumer Council and the Sustainable Development Commission – has been asked by the Government to advise on practical steps they should take to help people reduce their environmental footprint to sustainable levels. The Roundtable will report in full early in 2006.

We are perhaps more aware than ever before that what we eat plays a crucial role in influencing our health and capacity to enjoy life. We are less aware of the critical impact it can have on the well-being of the planet. Now, for the first time, a landmark study for the European Commission has highlighted that what we eat has more impact on climate change than any other aspect of daily life – responsible for 31 per cent of the global warming potential of products consumed within the EU.¹ The impact of high meat and dairy consumption was singled out as disproportionately great.

So much of what we do is a matter of habit. Our eating patterns are no different. Thanks to the spotlight shone by Jamie Oliver's Feed Me Better campaign, parents everywhere are now calling for school meals to set a better example for kids and get them used to a more nutritious diet. The Government responded by getting experts to devise new minimum nutrition standards for school meals, which have been presented to and welcomed by the Education Secretary Ruth Kelly and are now out for wider consultation². The expert panel made welcome reference to the value of seasonality and were careful to avoid specifying an unsustainable level of fish consumption. In general, however, sustainability imperatives remain peripheral to the current thrust of school meal reform.

The Sustainable Consumption Roundtable is determined that the opportunity should be taken to deliver a double dividend for upcoming generations: better nutrition from more sustainable diets. We commissioned the Soil Association and Cardiff University to assess the evidence on how the recommendations of expert nutritionists can be met in sustainable ways, while keeping costs to a minimum.

The evidence is clear that sustainable consumption and better nutrition can and should go hand in hand. Seasonal produce, better quality meat in lower quantities,

and a shift from white to oily fish are all changes that are desirable from a nutritional and sustainability perspective.

From November 2005, a new School Food Trust will give independent advice to schools and parents on improving meals beyond minimum standards. The Sustainable Consumption Roundtable calls on the Department for Education and Skills to give the Trust a clear mandate to help schools promote better nutrition and sustainable consumption at the same time. Three clear goals have emerged to shape this agenda:

Firstly, to help schools make menus more seasonal. This pays dividends for freshness as well as cutting food miles and other costs arising from food processing and delivery systems. Bradford's Education Catering Service has significantly improved the freshness and quality of its ingredients, without raising overall costs, by shifting to local, more seasonal, sourcing. Their meals remain some of the cheapest in the country. Pam Shipperbottom, caterer for Lethbridge Primary School in Swindon, is also adamant that sourcing 65 per cent of food locally has allowed her to invest more money in quality: 'Sourcing direct cuts out the wholesales with their increased transport costs, delivery charges and minimum order penalties.' There are surely few more enjoyable and effective ways of responding to climate change than by reconnecting our national diet to the flow of seasons.

Secondly, to encourage schools to serve less, but better quality, meat. The Caroline Walker Trust is an acknowledged authority on appropriate food standards for vulnerable groups. Their most recent report, prepared jointly with the National Heart Forum, makes nutritional recommendations for food in schools. They are clear that, while red meat offers the most easily absorbed source of iron available, it should be served in moderation because of the possible link between large intakes of meat and some types of cancer.³ Reducing the amount of meat in the menu also reduces climate impacts and allows more money to be spent on guaranteeing quality. In common with the Food Standards Agency, the Trust stresses the need to reduce saturated fat intake by serving better quality, less processed meat. Extensively-reared animals produce meat that is lower in saturated fat and higher in essential fatty acids than intensively-reared meat. Organic certification is currently the best guarantor of extensively-reared quality meat. Research has shown that organic chicken contains 25 per cent less fat than factory-farmed chicken.⁴ Rearing animals extensively also avoids some of the worst climate impacts of intensive meat production systems dependent on energy-intensive feed and chemical inputs.

Thirdly, to confirm the nutritional advice of serving oily fish but to keep this at sustainable levels. When it comes to fish, a sophisticated approach is needed to ensure that nutritional advice does not take us in an unsustainable direction. While the Caroline Walker Trust does support the sustainability imperative of cutting out over-exploited white fish, such as haddock – which is also of lower nutritional value - it recommends increasing oily fish to one portion weekly, to compensate for poor diets out of school. Oily fish certified sustainable by the Marine Stewardship Council – such as Alaskan salmon - can comfortably meet the quotas needed for school meals. However, the state of the world’s fisheries means that we will need to get used to eating fish in moderation rather than excess, which is closer to a serving of oily fish once every three weeks. As the authors of this report argue, ‘Facing up to that reality means that a concerted effort will be needed by nutritionists and scientists to develop alternative sources of the key nutrients (long chain omega-3 fatty acids) found in oily fish’.

Creative caterers like those profiled in this report have found clever ways to offset some of the costs associated with investing in quality for our children. Reducing the proportion of meat and costly processed foods in the menu, while sourcing seasonally and over shorter distances, can help to cover the overheads associated with the preparation of fresh meals from scratch. All the schools showcased in this report have seen take-up of school meals increase significantly, helping to bring in added income. However we do not want to get trapped into pretending that healthy, sustainable diets can always be had on the cheap. The evidence suggests that an ingredients spend of 70p per meal for each primary school child and 80p for secondary are essential to deliver the double dividend. Even a narrow focus on nutrition alone would require this spend, according to the Caroline Walker Trust.⁵ Eagle Solutions, an inner London catering firm, suggests that predominantly organic meat and one portion of organic fruit and vegetables a day can be delivered at this cost. To date the Government has only committed to raise minimum spend to 50p per head for primary and 60p for secondary.

Our notion of ‘best value’ in school meals needs to move beyond a narrow focus on upfront costs. Encouraging the development of good eating habits in young people is a classic case of investing-to-save. Diet-related diseases are already costing the NHS an estimated £4 billion a year⁶. Of course, changing ingrained habits and tastes involves more than just a focus on ingredients. What is needed is a whole school approach, where every opportunity is taken to make children knowledgeable and enthusiastic about the food that they eat, bringing the subject alive with cooking lessons and farm visits. This is what underpins the ‘quality revolution’ demonstrated

by the City of Rome, where 140,000 organic school meals are served every day, and the authorities take seriously the responsibility to instil a positive food culture in each new generation.

The ambition and imagination shown by the Government in its agenda of school meal reform will be a litmus test for its commitment to public health, education and sustainable consumption. The recommendations set out on page 9-10 of this report offer a clear set of steps for bringing sustainable consumption to the heart of school meal reform. The National Consumer Council and Sustainable Development Commission look forward to working with the Department for Education and Skills, Defra and the School Food Trust to help deliver on this broader vision. With Jamie Oliver and his food quality agenda still fresh in the public mind, the opportunity is there for the taking.

Ed Mayo, Co-Chair (& Chief Executive, National Consumer Council)

Alan Knight, Co-Chair (& Sustainable Development Commissioner)

On behalf of the Sustainable Consumption Roundtable

Introduction

'To be effective The School Meals Trust will need to drive nutritional standards for school meals and the Government's public sector sustainable food procurement initiative as one single agenda.' Roger Sheard, Business Development Manager, Education Services Catering, Bradford.

Public clamour for better school meals reached a peak in March 2005 after Jamie Oliver described in graphic detail, to a classroom of truculent London teenagers, the contents of chicken nuggets.

Responding to public demands for wholesale reform, the Government signalled a step change in school catering when it pledged in April 2005 to bring forward tougher school meals standards by the end of September 2005, to be implemented on a mandatory basis from the start of the next school year (2006-7) with support from a new 'School Food Trust'. The Secretary of State for Education, Ruth Kelly, promptly established the School Meals Review Panel to advise on new standards for school meals. This panel recommended the adoption of the Caroline Walker Trust guidelines for school meals and the adoption of nine food based standards⁷.

However, as this report and most especially the case studies in Section 6 illustrate, upgrading the food served in schools offers an opportunity to not only improve our children's diet but also provide a critical opportunity to place the procurement of school food - a fifth of the £1.8 billion total spend by the English public sector on food and catering - on a truly sustainable footing.

Over the long term the transformation of school meals will help ensure that our children mature into adults who not only appreciate the benefits of eating a balanced diet but recognise the importance and value of food produced in a sustainable way. This will help to develop an urgently needed positive food culture in England.

This report unpacks those opportunities, to examine in detail the double dividend to be reaped from the provision of healthy, nutritious school meals using meat, dairy, fish and vegetable produce from more sustainable sources.

Key recommendations for improving sustainability of school meals

Setting a new strategic direction for school meals in England

The Department for Education and Skills should:

1. Set challenging targets to improve the sustainability and nutritional value of school meals simultaneously, giving priority to the goals of:
 - Better quality meat, in moderation (ie unprocessed and extensively-reared);
 - Seasonal menus, with increasing proportions of fresh, Integrated Farm Management (IFM) and organic produce;
 - Shifting from white to oily fish, to be served at levels consistent with sustainability and nutritional requirements (ie once every three weeks).

Measure and report against these targets, making them publicly available to parents and others as a means of benchmarking school meal performance and increasing confidence in the service.

2. Give the School Food Trust a clear mandate to help schools deliver the double dividend – promoting a joined-up approach to sustainable consumption and nutrition.
3. Develop a parallel educational programme to encourage take-up of school meals and parental support for sustainable food procurement, through promotional material, farm visits, cooking classes and growing projects in schools.

The Audit Commission should:

4. Work with Defra's sustainable food procurement unit, the School Food Trust and DfES to develop a new Best Value assessment framework for school meal provision, that gives clear weighting to delivery on the targets above, in light of their environmental and health benefits.

Defra's sustainable food procurement unit should:

5. Work with the School Food Trust, the Department for Education and Skills and the Audit Commission to develop clear, authoritative guidance for local authorities on what weightings can be employed in awarding contracts for seasonal, IFM and organic produce, extensively-reared meat, and sustainably sourced fish, in light of their environmental and health benefits. This should include best practice guidance on how other school meal providers have managed to improve quality in line with 'best value'.

Sustainable Procurement Task Force:

6. Encourage the Government to prioritise a strategic set of procurement choices which will exemplify sustainable consumption in practice to citizens, and have the potential to actively influence their habits and attitudes. Getting children into sustainable eating habits at school should be a central priority, but the importance of sustainable food procurement goes beyond this, to hospitals, prisons and all public sector catering.
7. Ensure that the messages on sustainable purchasing are consistent throughout Government and reach all involved on the ground, and make a strong case for Government to provide the resources to disseminate and encourage best practice.

School meal providers should aim to:

8. Make menus seasonal, encouraging small local producers and suppliers to tender to supply fresh produce, incorporating key regional and local foods, for example Welsh lamb or local organic apples in Herefordshire.
9. Serve meat only in moderation. Ensure meat is of good quality, with an emphasis on extensively-reared and unprocessed meats. Increase both the quantity and quality of non-meat options.
10. Shift from white to oily fish, served at levels that meet nutritional needs within sustainability limits (ie once every three weeks, as recommended by the School Meals Review Panel). Source fish from a recognised and verifiable sustainable fishery, such as the Marine Stewardship Council (MSC) certified fisheries.

11. Increase the opportunities for local suppliers, and realise the sustainability dividend of fresher food delivered over shorter distances, by developing simpler and less complex supply chains for meat, salads, vegetables, eggs, milk and bread.
12. Start by serving the following, and aim to increase over time:
 - one portion of seasonal, local, organic fruit and vegetables every day, aiming to increase the proportion of local organic food over time
 - organic milk and one serving of local, organic meat a week
13. Improve education and training in nutrition, seasonality, local and organic sourcing for school cooks, menu planners and school food procurement professionals.
14. Work in partnership with producers outside the contractual process, on a voluntary basis, to inform and encourage them towards greater sustainability, and to consider the commercial opportunities and wider benefits of opening up supply chains to more local producers.
15. Local authority caterers should consider entering into long-term contracts with local suppliers to ensure consistent supply of local and, where possible, IFM or organic food.

Schools should aim to:

14. Develop a positive food culture in their schools by:
 - adopting a school food policy which prioritises the double dividend of better nutrition and sustainable consumption;
 - fostering a whole school approach to educate children about healthy and sustainable food choices through farm visits, growing and cooking projects;
 - working closely with catering staff and school meal providers to support efforts to reform school meals;
 - reporting openly against school meal targets.

NB: It should be noted that public sector buyers cannot specify local produce in contracts as this contravenes EU law. However, requirements such as delivery frequencies, freshness, seasonality and methods of production are permitted, all of which can encourage local suppliers and producers to tender for contracts.

Section 1. Environmental impacts of food consumption

1.1 Overview

According to one leading commentator, sustainable food production can be defined as:

*... farming that makes the best use of nature's goods and services while not damaging the environment. Sustainable farming does this by integrating natural processes, such as nutrient cycling, nitrogen fixation, soil regeneration and natural pest control, within food production processes. It also minimises the use of non-renewable inputs that damage the environment or harm the health of farmers and consumers.*⁸

This chapter reviews the evidence surrounding the sustainability of agricultural impacts in reference to the three food groups under consideration (meat and dairy, fruit and vegetables, and fish).

The Sustainable Consumption Roundtable focused this research on the impact of food consumption on carbon emissions, a major contributor to climate change. In addition to carbon dioxide (CO₂) and methane (CH₄), this report looks at the impacts of agriculture on nitrous oxide (N₂O) emissions. Agriculture is the main anthropogenic source of N₂O and CH₄ which are more powerful climate change gases than carbon dioxide; the global warming potential over 100 years of one kg of CH₄ or N₂O is 23 or 296 times the greater than 1 kg CO₂.⁹

Each stage of modern food production and distribution has a wide range of environmental impacts on *biodiversity, carbon, water and waste*.

For the purpose of the summary analysis presented in

Table 1 these are divided into the following life-cycle stages:

- pre-farm impacts of inputs used to produce food
- on-farm impacts of food production
- post-farm impacts of food transport, distribution and processing.

Table 1 Key impacts of modern food production/consumption on biodiversity, carbon, water and waste at each stage of the food cycle

Process	Environmental impact
a. Pre-farm	
Manufacture of agricultural machinery and farm equipment	Mining of non-renewable raw materials (e.g. ore to make steel) - biodiversity, pollution and waste impacts. Fossil fuels; CO ₂ and N ₂ O emissions.
Seed	Growing, storing and transporting seed has same impacts as other crops. Seed must also be cleaned, treated with pesticides to protect in storage and against diseases (if non-organic), packed and transported.
Fertiliser production	Mining of non-renewable raw materials - biodiversity, pollution and waste impacts. CO ₂ & N ₂ O emissions from manufacturing. CH ₄ emissions from extraction of natural gas used to produce fertilisers (unquantified).
Fertiliser and seed transport	Fossil fuels; CO ₂ and N ₂ O emissions.
Lime production/extraction (used to counteract soil acidification caused by fertilisers)	Fossil fuels; CO ₂ and N ₂ O emissions. Process emissions CO ₂ .
Concentrated animal feed production and transport (including imported maize, soya and other grains e.g. barley, wheat)	All of the above impacts. CO ₂ and N ₂ O emissions. Reduced biodiversity.
Pesticide production and transport	Fossil fuels; CO ₂ emissions; waste and toxic emissions from chemical plants.

b. On-farm	
Agrochemical use, intensification of production, monocultures etc	Reduced biodiversity for farmland and aquatic life.
Fertiliser application	N ₂ O emissions. Reduced CH ₄ oxidation (unquantified). CO ₂ emissions.
Soil management; ploughing grass leys, soil disturbance, farmyard manure/slurry applications	Depleted soil carbon. CO ₂ and N ₂ O emissions.
Increased ground and surface water usage through irrigation, particularly of glasshouse and some field crops	Damage to soils (salinity changes), over-abstraction of surface and groundwater. Consequent loss of fertility and biodiversity.
Agrochemical and fertiliser/slurry use	Freshwater and groundwater pollution from fertiliser and pesticides with consequent loss of fertility and biodiversity.
Livestock	CH ₄ emissions from ruminants and their wastes. Overgrazing, particularly by sheep with consequent loss biodiversity.
Machinery, fuel and soil management	Fossil fuels; CO ₂ and N ₂ O emissions. Soil carbon loss.
c. Post-farm	
Food transport - international and within UK	Fossil fuels/ CO ₂ and N ₂ O emissions.
Processing, packaging and food waste	Energy use (CO ₂ and N ₂ O emissions) in manufacture/extraction of food additives, food processing, packaging manufacture. Environmental cost of rejected food (mainly on cosmetic grounds). Food waste. Packaging waste.

Note: CO₂ carbon dioxide; N₂O nitrous oxide; CH₄ methane.

1.2 Biodiversity impacts

The intensification and expansion of modern agriculture has been described as one of the greatest current threats to global biodiversity.¹⁰ A wealth of evidence suggests that technological advances over the last 50 years leading to the intensification and specialisation of farming methods has been the principal cause of the widespread declines in European (and other) farmland bird populations, substantial reductions in both abundance and diversity of many plant and invertebrate taxa¹¹ and the gradual but relentless erosion of the traditional relationship between agriculture and nature conservation.¹²

A system of farming known as Integrated Farm (or Pest) Management (IFM) aims to curb the environmental impacts of conventional farming by reducing, but not eliminating, the use of agrochemicals, and through encouraging a number of other beneficial practices (such as the provision of non-farmed headlands). A recent English Nature/ADAS report that reviewed eleven European studies that compared the biodiversity under IFM and conventional management and concluded that IFM was better for biodiversity than conventional farming in mixed or arable systems.¹³ While there are no legally defined standards for IFM or IPM systems, schemes such as LEAF (Linking Environment and Farming) clearly contribute to enhanced biodiversity compared to other non-organic farming systems.

It is important to note that the biodiversity impacts of farming are not restricted to arable cropping systems: 'Biodiversity losses have been attributed to conventional grassland management, particularly silage making and the use of high levels of fertiliser.'¹⁴

A number of scientific studies¹⁵ have demonstrated that mixed and grassland (dairy, beef, sheep or other livestock) organic farms support a greater density and diversity of farmland wildlife (across most taxa) than non-organic (including LEAF) farms and can contribute to the restoration of biodiversity in agricultural landscapes. For this reason English Nature has stated that it would like to see more farmers taking up this option to farm in an environmentally sensitive way using what it terms a 'well-defined modern system of agriculture that is broadly beneficial to the environment and to wildlife'.¹⁶

1.3 Contribution to climate change

Carbon dioxide emissions arise from all manner of energy use and some soil management practices. Methane is produced through anaerobic (without oxygen) decomposition of waste in landfills, animal digestion, decomposition of animal wastes, production and distribution of natural gas and oil, coal production, and incomplete fossil-fuel combustion.¹⁷ Nitrous oxide is a greenhouse gas emitted through soil cultivation practices, especially the use of artificial and organic fertilisers.¹⁸

Direct energy inputs on the farm include the fuel oils, electricity and gas consumed by machinery. Organically grown crops require around 50% less energy input per unit area than do conventional crops, largely because of lower, or zero, fertiliser and pesticide energy inputs.¹⁹ Organically reared ruminants (beef, sheep) must also have a diet where at least 60% is forage, with no more than 40% derived from cereals, soya or maize which must also mainly be organically grown. However, lower yields from organic crop and vegetable systems reduce the advantage to organic when energy input is calculated on a unit output basis.

Routine deep ploughing leads to an increased use of fuel and greater loss of soil carbon where no organic matter is added to the soil. Shallower ploughing depths (common in organic systems) and non-organic reduced tillage systems can reduce the need for machinery and fuel, and reduce losses of soil carbon. However, reduced tillage systems rely on the use of pesticides, and tend not to be sustainable for more than a few years due to build-up of persistent weeds.

In 2004 the Scottish Executive estimated that fertiliser application accounted for 57% of total nitrous oxide (N₂O) emissions in Scotland. Total direct emissions of N₂O in Scottish agriculture were 16,760 tonnes per year contributing, in terms of Global Warming Potential, between 6.5 and 7% of Scotland's total greenhouse gas emissions.²⁰

1.4 On-farm water and waste impacts

Water pollution is caused by agrochemical use, soil erosion and nutrient enrichment from fertiliser and pesticide/herbicide run off (or direct from sheep dip) as well as by leachate from slurry and soil sediment.

A recent review of the evidence estimated that negative externalities of UK agriculture on water pollution cost £347.5m in 2000. This accounted for pesticides in

water (£143.2m), nitrate, phosphate, soil and *Cryptosporidium* in water (£112.1m), eutrophication of surface water (£79.1m) and monitoring of water systems and advice (£13.1m). If the whole of UK agriculture switched to organic farming, it is estimated that these costs would fall to £86.6m.²¹

In 2003, around 31,000 tonnes of pesticide active ingredients were applied to UK farmland²² from among the 350 pesticides to which the non-organic farming sector has access. In comparison, no more than 124 tonnes of four pesticides were applied to Soil Association organic land in the UK in 2003²³. Unlike many used in conventional systems, these four pesticides (sulphur, soft soap, derris and copper) do not leave systemic residues in food and should not pose significant risks to health or the environment²⁴.

1.5 Food transport and distribution

The transport of food, on a global and national scale - often coined in the debate as 'food miles' - produces carbon and N₂O emissions that contribute directly to climate change. A diet composed of locally and regionally produced foods will minimise these climate impacts, although overall sustainability will depend on the production method involved²⁵.

In one of the most recent studies on this subject, published by the Department of Food and Rural Affairs (Defra) in June 2005²⁶, it is estimated that food production, retailing and transport represent 8% of the UK's final energy consumption, and that food transport accounts for 47% of this. Significantly, this analysis explicitly excludes energy use related to packaging and the preparation of food by caterers or at home. Separate estimates suggest that if these categories were included, food preparation and transport would represent 29% of the UK total²⁷.

Negative impacts associated with food transport, including increased congestion, road building, pollution and greenhouse gas emissions, were estimated to give rise to social costs of more than £9 billion per year.

Another study has estimated that in 2000, domestic food freight accounted for 28% of goods transported on UK roads, imposing external environmental, social and health costs of an estimated £2,348 million per year²⁸.

Sea transport is relatively energy efficient, generating only 12% of CO₂ emissions from 65% of tonne kilometres. By contrast, air transport generates 11% of CO₂-

equivalent emissions from less than 1% of tonne kilometres (40% of that on vegetable imports from Africa, 21% on fruit and 7% on fish imports) ²⁹.

1.6 Processing, packaging and food waste

Energy use, pollution and wastes arising in food processing and packaging (plus manufacturing of food additives) represent significant additional post-farm impacts. An extensive source of data is the Environmental Impact of Products (EIPRO) study, an EU wide life cycle analysis of food products discussed in section 1.7.

Another impact arises from the routine rejection of fresh produce from marketing systems (mainly by supermarkets on cosmetic or size grounds). This deserves better research since recent experience amongst schools that are pioneering improvements suggests that such 'rejected' produce may provide an important and cost effective source of fresh supplies for school kitchens.

It is beyond the scope of this study to examine in detail the environmental costs of the catering sector's food and packaging waste disposal, although once again, recent experience amongst pioneering schools suggests that direct purchase from farmers can substantially reduce overheads associated with packaging waste disposal, delivery transport costs and kitchen waste.

1.7 The unsustainable impacts of conventional meat and dairy production

Many studies show that meat and dairy products, when produced using modern intensive methods, have the highest environmental impacts of all food groups. These impacts reflect the resources (fertiliser, pesticides and energy) required to produce and transport animal feed in the first place, the low efficiency with which animals convert that feed to milk or meat, the high water needs of cattle, slaughterhouses and processing factories, ³⁰ and the waste produced by farm animals. There are also lesser impacts associated with overgrazing when this occurs, which reduces soil carbon and biodiversity.

It has been suggested by one study that globally, animal manure is responsible for 10 per cent of all greenhouse gases, including approximately 15-20% of methane emissions ³¹. Government data records that 43% of the UK's methane emissions were from cattle and sheep in 2002 ³² with around 80% of these emissions directly from the animals and 20% from animal waste. However, this official figure excludes

an important agricultural source of atmospheric methane levels: the effect of fertilisers.

A landmark EU-funded study published in 2005, Environmental Impact of Products (EIPRO), concluded that food and beverages account for 31% of global warming potential (GWP) generated in all product categories. Going further, the study found that meat and meat products (including meat, poultry, sausages or similar) ‘can be singled out for their high environmental importance within this area of consumption’. The estimated contribution of these products alone to GWP ranged from about 4-12% of ‘all products’ or 19-38% of the ‘food and beverage’ category. Within this figure this study also revealed the startling statistic that meat packing plants alone contribute 5.9% of GWP across all products³³. The impacts of meat and meat products are not confined to global warming, making a strong appearance across the many other ‘impact’ categories, such as eutrophication (14-23% of the impact potential of all products). Dairy products proved little better – generating over 5% of total GWP in aggregate across all products, and making a strong eutrophication impact (10% of all products)³⁴.

1.8 Animal feed

Animal feed is a significant issue because modern livestock breeds - reared for higher yields - need to eat more high-protein feed ‘concentrates’. Livestock, such as sheep and some beef cattle, which are reared more extensively and fed mainly on grass have a much lower environmental impact than those reared in intensive systems, due to their much reduced consumption of grain-based animal feed concentrates.

A report published in 2004 by Compassion in World Farming stated that ‘the key determinant of sustainability is the overall efficiency with which we use our natural capital (soil, water, energy and so on) to produce the food that we need... and...the more meat we eat, the less efficient that ratio becomes’³⁵.

Conversion ratios are often a contested topic, but the figures outlined in Table 2, based upon a survey of several studies, offer a useful indication; to produce 1kg of poultry meat it requires around 3kg of feed, over 4kg of feed for pork and 10kg for beef. In addition, it takes an estimated two calories of fossil fuel to produce one calorie of protein from soyabeans compared to 54 calories of fuel to make only one calorie of protein from intensive beef³⁶. Rearing animals extensively can avoid some of the worst climate impacts of intensive meat production systems dependent on energy-intensive feed and chemical inputs. One study found that organic dairy

production requires 74% less energy inputs per unit output compared to conventional systems ³⁷.

Table 2 Food conversion rates for main livestock species ³⁸

Species	Kilos feed per kg liveweight gain	Kilo feed per kilo product
Aquaculture	1.2-1.6	1.5-2.0
Poultry meat	1.8-2.4	2.1-3.0
Pork	3.2-4.0	4.0-5.5
Beef	7	10

A Defra-funded life-cycle assessment (LCA) model examines the environmental impact of various food commodities in the UK. Provisional findings indicate that for pig production, energy use would fall by about 50% if all production converted to organic, although to produce as much pork, land take would increase significantly. The main use of energy in pig farming is in the production of concentrate feed, and the energy embedded in organic pig concentrates is a fraction of that needed to produce non-organic concentrate ³⁹.

1.9 The sustainable alternative

The only realistic way to improve the sustainability of protein served in schools is to raise the proportion of grains and vegetables in the diets. Organic milk should be served wherever possible and meat should be served less often while ensuring it comes from a production system that uses a minimum of concentrate feed, avoids overgrazing and uses minimal amounts of fertilisers on pasture or pesticides for parasite control.

The logic for this sophisticated and informed approach is underscored by results from a Swedish life-cycle analysis of the food chain completed in 2003. The system boundaries in that study stretched from farm inputs, drying of crops, processing, storage and transportation to the retailer and on through storage, preparation and cooking in the home. The results show that in order to lower the energy inputs and greenhouse gas emissions coming from household food consumption, less meat and cheese, more *in-season* vegetables and locally produced and fresh foods are required ⁴⁰.

It should be noted that in that study tomatoes reared in Swedish greenhouses were found to be almost as resource intensive as local beef, while sausages from chicken meat also had energy inputs equal to frozen broccoli from overseas (see Table 3).

One further conclusion of this work is that any guidance to schools aimed at encouraging the consumption of less and more sustainable animal products must also identify energy efficient alternatives to such products.

Table 3 Life cycle energy inputs for food ready to eat ⁴¹

Category	Food type, origin and preparation	MJ life cycle inputs per kg
Lamb	Fresh, Sweden, cooked	43
Chicken	Fresh, Sweden, cooked	35
Chicken sausage	Fresh, Sweden, cooked	20
Pork	Fresh, Sweden, cooked	40
Beef	Fresh, Sweden, cooked	70
Tomatoes	Fresh, greenhouse, Sweden	66
Tomatoes	Fresh, Southern Europe	5.4
Broccoli	Frozen, overseas, cooked	20

1.10 Fish - the environmental impacts of marine fishing

‘The oceans are denuded of life, marine ecosystems across great swathes of the planet are on the point of devastation ⁴².’ The damage caused to marine biodiversity as a result of overfishing is virtually insurmountable and there is currently no way to reverse these impacts while maintaining - let alone increasing - fish consumption.

At the root of this problem are modern industrial fishing methods – large trawlers, huge cheap nets and sophisticated fish-finding technology – which are having devastating impacts on the marine environment (habitats, plants, non-target fish,

birds and marine mammals)⁴³ that are wholly separate from those associated with the land-based food groups discussed in the previous sections.

World fish stocks are in serious trouble. In its latest estimates, the Food and Agriculture Organisation (FAO) suggests that 75% of the world's fish stocks are fully exploited, over-exploited or depleted⁴⁴. In addition, the FAO estimates that about one-quarter of the stocks monitored were under-exploited (3%) or moderately exploited (21%) and could perhaps produce more in 2003. Around half of all stocks (52%) were fully exploited and therefore producing catches that were close to their maximum sustainable limits. Around one-quarter were overexploited (16%), depleted (7%) or recovering from depletion (1%) and needed rebuilding. A year later and these figures have already risen to 17% overexploited and 8% depleted⁴⁵.

The UK has already eaten its way to the heart of this problem. In 2004, the Government estimated that half of the fish landed by the UK fleet under the current quota-management system came from sources that are unsustainable or borderline⁴⁶. Cod is still the most popular type of fish consumed in the UK, accounting for 21% of the market, followed by haddock (10%), salmon (8%) and shrimps and prawns (16%)⁴⁷. Cod stocks have undergone severe declines during the last few decades and the species is now threatened with commercial extinction in UK waters⁴⁸.

Nets dragged across the sea floor can flatten reefs and aquatic plants that anchor entire local ecosystems and it is unclear whether trawled areas ever recover from such damage. Bottom trawling can also plough furrows up to 6m wide and 0.15m deep, for many kilometres across the seabed. Some areas are trawled this way five times a year. Declining fish stocks, catch quotas and hi-tech fishing have also led to a rapid increase in the proportion of non-target species or 'discards' and the amount of 'by-catch' (birds, sea mammals and other species caught in nets and trawls)⁴⁹.

Over-fishing with modern trawlers has already led to the collapse of the Grand Banks cod fishery off Newfoundland, Canada in 1992. There is no certainty that cod stocks will ever recover in the area and it could well be many decades before they do⁵⁰. Globally, over 90% of larger predatory fish may have been lost since the pre-industrial era⁵¹. The Marine Species Population Index, which calculates the average changes in populations of 217 species of marine wildlife, also shows a decline of about 35 per cent since 1970⁵².

1.11 Impacts of aquaculture

Much of the growth in fish production in recent years is accounted by aquaculture, or fish farming, which comprises 30% of total global fisheries and continues to grow more rapidly than all other animal food-producing sectors ⁵³.

Whilst some freshwater fish farms do exist, the majority of UK aquaculture is based in the sea and largely produces salmon. The current methods of fish farming has a number of unsustainable environmental impacts: wild caught fish used for fish meal, escapees, disease, parasites (particularly sea lice) and, to a lesser extent, pollution.

Fishmeal fed to farmed fish is mainly made from fish oils and small wild 'forage' fish harvested from the oceans for this purpose. Fishmeal producers argue that these small bony pelagic fish are not be eaten by people, ⁵⁴ but this overlooks how these losses affect the wider ecosystem, including many sea birds and sea mammals along with many of the predatory species of fish that people do eat. In summary, their removal exacerbates problems already discussed in the previous section ⁵⁵.

Like animal feed, fishmeal conversion rates are not high (between 3 and 5 kg of wild fish are needed for each kilogram of farmed fish produced) so the quantity of fishmeal used in aquaculture far exceeds the volume of fish produced for human consumption. In addition to the biodiversity impact of such practices, processing one tonne of fish into fishmeal and fish oil consumes around 625kWh of energy ⁵⁶. Set in context, these figures mean that Scotland's farmed salmon harvest of 130,000 tonnes in 2001 used feed which required around 250 GWh of energy and an estimated 400,000 of wild fish to produce ⁵⁷.

Fish farms also suffer from problems with disease, parasites like sea lice, ⁵⁸ and from escaped fish cross-breeding with wild stocks. The exact impact of escapees on wild populations remains uncertain ⁵⁹. Whilst these problems can be - and have to an extent been - reduced, they can never be eliminated.

Organic aquaculture is relatively new, and the industry is working to assess whether these problems can be managed in ways that meet organic principles and the aspirations of organic consumers. Under Soil Association interim standards for organic salmon, stocking levels are half those in conventional salmon farming to keep stress levels to a minimum and to lower the risk of disease. Organically farmed fish are also fed with the by-products (trimmings) of fish caught for human consumption, not industrial fishmeal, and with less fish oil than conventionally

farmed salmon. Attempts are also being made to increase the proportion of vegetable matter in fishmeal.

1.12 Promoting sustainable marine fishing

Though far from a complete solution, there are a number of potential options for reducing the environmental impact of current fish consumption.

The Marine Stewardship Council (MSC) has developed an environmental standard for sustainable and well-managed fisheries and a product label used to reward environmentally responsible fishery management and practices⁶⁰. This marine eco-labelling system is built around *Principles and Criteria for Sustainable Fishing* and a third party, independent and voluntary certification programme. For the time being, it offers the best prospect for delivering real and measurable improvements in marine conservation through better management and fourteen fisheries have now been certified. These include Alaskan salmon, New Zealand hoki, South African hake and the world's largest whitefish fishery, the Bering Sea and Aleutian Islands Alaskan pollock fishery. Four UK fisheries have also been certified: the Thames Blackwater herring, the Burry Inlet cockles fishery, the Loch Torridon nephrops fishery and the South West mackerel handline fishery⁶¹.

The MSC scheme is not without its critics. Some within the industry say that certification takes too long and costs too much. Some environmental organisations believe that the 'bar' is being set too low for certification and that some of the fisheries certified to date – the Bering Sea and Aleutian Islands Alaska pollock fishery and the South Georgia Patagonia toothfish fisheries – should not have been certified⁶².

The UK Marine Conservation Society's list of fish to avoid include Atlantic cod, halibut or wild-caught salmon, grey mullet, haddock, monkfish, plaice, seabass, shark and snapper⁶³. Those it recommends as coming from well managed sustainable stocks are Pacific salmon (from Alaska, line caught, MSC certified), Alaska or walleye Pollock, Dover sole (from Eastern Channel), Herring (from North Sea, Eastern Channel, Skagerrak, Kattegat and MSC certified from Thames Blackwater), Hoki (MSC certified), Mackerel (line caught from Cornwall), Pacific cod (line caught), Pacific halibut (line caught), Red mullet (not from Mediterranean), Alaskan Salmon (farmed organic or Freedom Food certified) and Whiting (from English Channel).

A recent report by Sustain recommends that, if consumers do eat fish, they should ensure it has the MSC-label, and when buying farmed fish, choose organic.⁶⁴

Organically farmed fish was identified as being better environmentally than non-organic farmed equivalents. However, this report emphasised that farmed fish remain part of the problem, in so far as fish meal fed to farmed fish is still partly obtained from wild-caught stocks (which can contribute to their decline) and effluent from fish farming can alter the local water quality and may increase disease.

A more sustainable fish production system of freshwater aquaculture is now on the horizon which may provide opportunities to rear trout or carp in the UK to organic standards. However, this is unlikely to yield the volumes of fish relevant to school meal procurement in the short-term. It is anticipated that this system will have reduced impacts in terms of its energy requirements, impact on surface water and reliance on marine harvested fishmeal, although these impacts have yet to be evaluated.

Section 2. Nutritional advice

2.1 Introduction to the Caroline Walker Trust guidelines

The Caroline Walker Trust (CWT) recently updated and revised its guidelines for improving school meals. Their June 2005 report, Eating Well At School, provides nutrient-based standards and practical food-based guidelines to enable the provision of wholesome, healthy, tasty school meals containing as little, fat, sugar and salt along with as few additives as possible, adequate vitamins and sufficient key nutrients such as iron, zinc or essential fatty acids.⁶⁵

According to the CWT, ‘the need for nutritious school meals to improve the health and well-being of the current generation of school-aged children remains essential. School lunch remains the main meal of the day for many children and offers an opportunity both to provide good food for young people and to encourage the development of good eating habits⁶⁶.’

The obesity epidemic in the western world and the poor quality of many peoples’ diets in the UK has been well recorded. For example, in 2003 a study by Mike Rayner of Oxford University estimated that diet related diseases, such as obesity, cancer, heart disease and diabetes, in the UK were already costing the NHS an estimated £4 billion per annum, twice as much as road and rail accidents.⁶⁷

The World Health Organisation (WHO)⁶⁸ has called clearly for a ‘shift away from human consumption of meats, vegetable oils, eggs and dairy products towards consumption of more cereal-based products, pulses, fruits and vegetables,’⁶⁹ based on the evidence of the long-term health impacts of diet. Much of the same evidence also highlights the nutritional importance of using many different kinds of fruit and vegetables⁷⁰ to deliver a full mix of beneficial vitamins, minerals and metabolically active compounds, and red meat rich in iron to address chronically low iron status amongst infants, toddlers and adolescents.⁷¹

2.2 Fruit and vegetables

Responding to the evidence outlined above, The Food Standards Agency (FSA) recommends that a variety of fruit and vegetables should make up one-third of our daily food intake - at least five (80g) portions each day - because they are high in fibre and contain a range of vitamins and minerals important to human health.⁷² In October 2004, Britain’s Largest Ever Health Survey, conducted by Optimum Nutrition UK endorsed the benefits of this ‘5 a day’ advice but also found that the

healthiest people amongst the 37,000 surveyed consumed eight or more servings of fruit and vegetables a day and drank a great deal of water.

Echoing this advice, the CWT guidelines recommend that ‘Children and young people should be encouraged to have at least one portion of fruit and one portion of vegetables as part of their school lunch.’ This advice also reflects the findings reported in the National Diet and Nutrition Survey that show older children and those from poorer households eating very little food of this type and all children on average eating less than half the recommended five portions a day.⁷³

According to the FSA, preparation and freshness are important factors in enhancing the nutritional properties of fruit and vegetables. To maximise the vitamins or minerals in fruit and vegetables they should be fresh, cooked with as little water as possible, not overcooked, and covered once cut⁷⁴. School meals play a vital role in the health of young people and standards must reflect the need to use fresh produce as well as frozen, canned, juiced or dried fruit or vegetables in the practical delivery of ‘5 a day’.

Going further, the CWT recommends that, in addition to two portions of fruit and vegetables a day at lunch, school meals standards must also require that ‘Children who attend both breakfast club and after-school club and have school lunch should have had the opportunity to have at least 4 different portions of fruit and vegetables in the school environment.’

The CWT does not classify potatoes as vegetables. It further stipulates that ‘fried or processed potato products should not be offered on the school lunch menu more than once a week’. The CWT do suggest that potatoes, that are not fried, can play a greater role in school meals since they contains additional nutrients compared to pasta and white rice⁷⁵.

2.3 Meat

Meat is a good source of iron, zinc, B vitamins (particularly B12) and protein, although nutritional properties vary across different animals (making it important to vary the type of meat served). Meat is also a major source of saturated fat, associated with increased blood cholesterol and risk of coronary heart disease⁷⁶. Therefore the FSA recommends that the saturated fat intake can be reduced by either cutting down on meat consumption, or choosing lean cuts, trimming off visible fat, grilling rather than frying and avoiding chicken skin, sausages and burgers.⁷⁷

Surveys show that young people - especially girls aged 6-18 – often have average iron and zinc intakes well below recommended levels.⁷⁸ Good sources of iron include liver, meat, beans, nuts, dried fruit, whole grains, fortified breakfast cereals, soybean flour and most dark green leafy vegetables such as watercress, curly kale and spinach.⁷⁹ Iron in red meat is more easily absorbed by the body than that from vegetable sources but the possible link between large intakes of meat and some types of cancer leads the CWT to recommend a wide variety of different foods with red meat offered only in moderation. In addition, the CWT recommends that processed meats should be kept to a minimum.⁸⁰

There are additional nutritional reasons to limit meat consumption. Most children and young people in the UK eat more protein than they need, with children aged 4-10 years receiving approximately twice the reference nutrient intake (RNI) of protein. Very high protein intakes offer no benefit and it has been suggested that it is prudent to avoid protein intakes greater than twice the RNI⁸¹ due to possible links to poor bone health or potential kidney problems.⁸²

The CWT guidelines contain no specific recommendations concerning types of fresh meat or poultry. Yet, their recommendation to serve less saturated fat would be supported by the provision of ‘better quality’ beef reared extensively on a grass-fed diet.

Organic standards require that cattle be fed on predominantly forage-based diets. Research suggests that a diet high in forage rather than grain reduces the saturated fatty acid concentrations and enhances the content of omega-3 polyunsaturated fatty acids in beef.^{83 84} Meat and dairy cows fed proportionately more grass, hay or silage have also been found to show better ratios of omega-6 to omega-3 essential fatty acids⁸⁵ and higher levels of the naturally occurring fat-conjugated linoleic acid,⁸⁶ known to help prevent cancer, reduce heart disease and help weight control. Research has also shown that organic chickens contain 25% less fat than non-organic chickens.⁸⁷

The Food Standards Agency is currently consulting on proposed nutritional standards for processed food in school meals, known as *UK target nutrient specifications for manufactured products used in school meals*.⁸⁸ Target specifications are proposed for total fat, saturated fat, total sugar and salt. (In addition, target minimum values for protein have also been set for certain products to help ensure an adequate protein intake when pupils select vegetarian options.⁸⁹) For example, sausages should contain no more than 10g per 100g of total fat, with no more than 2g of saturated fat.

2.4 Dairy products

Milk and dairy products such as cheese and yoghurt are great sources of protein and vitamins A, B₁₂, and D. They are also an important source of readily absorbable calcium, which helps to keep our bones strong.⁹⁰ Yet intakes are very low amongst a significant proportion of teenagers (12% of 11-14 year-olds boys and 25% of girls in same age group). Milk consumption also declines markedly with age from 25% of calcium intake for children aged 4-6, to 8% of intake for 15-18 year-olds.⁹¹ To address this widespread problem the CWT guidelines recommend that consumption of semi-skimmed or skimmed milk should be encouraged as a drink between meals and that schools should be encouraged to look at innovative ways to offer milk to children and young people in their care. Going further still, the CWT suggests that free school milk should be considered as an option by local authorities. However, some nutritionists argue that there is evidence to suggest that milk consumption should be reduced on health grounds and that the Recommended Daily Allowance of Calcium has been set too high.⁹²

2.5 Vegetarian dishes

CWT says little in specific terms about the provision of vegetable-based protein dishes although they do recommend schools should always provide nutritious non-meat alternatives. In practice, vegetarian food in schools is widely over-reliant on dairy ingredients.

The nutritional issues around consuming large amounts of meat, and the environmental impacts associated with meat production, are well understood, and highlight the need to develop more imaginative tasty, nutritious and appealing vegetarian options which deliver all the nutrients required. Such dishes could be used to reduce overall meat consumption.

To support this there may be cause to review the guidance to school caterers on nuts, which often prevents the use of nuts in school kitchens. According to a Committee of Toxicity report on peanut allergy (1998) the prevalence of food allergy for children in the UK is between 2-8%.⁹³ (In addition some food allergies such as milk and egg allergies are resolved (outgrown) by the time the child reaches 5/6 and this appears to be due to maturation of the gut.⁹⁴

It is also clear that on nutritional and sustainability grounds, although not considered in this study, the increased use of pulses and mixed grains should be encouraged.

2.6 Fish

Fish is widely regarded as a 'healthy' food and the FSA recommends that people should eat more fish.⁹⁵ Fish and shellfish are rich in protein and vitamins (A, D and B complex), provide valuable minerals such as iodine, calcium, iron, zinc and selenium and are low in cholesterol. White fish such as cod, haddock, plaice and whiting are very low in fat and contain limited quantities of omega-3, but oily fish such as salmon, trout, mackerel, sardines, herring, kipper and fresh tuna (but not canned tuna since the oil is removed during processing) are on average six times richer in long-chain n-3 polyunsaturated fatty acids associated with numerous health benefits.⁹⁶

The FSA believes that, at least on health grounds, most people are not eating enough fish. Therefore they advise people to increase their intake of fish to at least two portions a week, including one of oily fish.⁹⁷ According to the Royal Commission on Environmental Pollution's estimates, total fish consumption averaged across the adult population is around 1.55 portions a week, of which only a third of a portion is oily.

In schools the most popular fish by far are white fish such as haddock and pollock, served by some schools in fillet form but more commonly in some kind of processed finger or shape made from flaked fish flesh.

Alongside the health benefits of eating seafood, there are serious concerns over persistent environmental pollutants in marine fish, especially oily fish, such as dioxins, dioxin-like polychlorinated biphenyls (PCBs) and methyl-mercury that accumulate in fatty tissues.⁹⁸ As the Food Standards Agency says, 'although they have no immediate effect on health, [they] can be harmful if they build up in our bodies over time'.⁹⁹ A scientific advisory report to the Government recommended that eating oily fish can deliver clear health benefits without undue risk if consumption is limited to a guideline range of 1-2 portions for girls and 1-4 portions for boys a week.¹⁰⁰ Some scientists contest that assessment. One study published in *Science* in 2004 concluded that 'only a half to one meal of eight ounces of farmed salmon should be eaten per month or the risk of cancer would rise by at least one case in 100,000'.¹⁰¹

According to the FSA, 'oily fish is the best source of omega-3 fatty acids. These fatty acids have been shown to help protect against coronary heart

disease. Some omega-3 fatty acids are found in certain vegetable oils, such as linseed, flaxseed, walnut and rapeseed, but these aren't the same type of fatty acids as those

found in fish. Recent evidence suggests that the type of fatty acids found in vegetable sources may not have the same benefits as those in fish.’¹⁰²

Most importantly, the CWT guidelines recommend that oily fish should be served in school lunches once a week to help increase the amount of omega-3 fatty acids in the diet in line with government guidance.¹⁰³ The School Meals Review Panel suggests that one portion every three weeks would allow school lunches to supply, rather than over-supply, the necessary amounts of omega-3 fatty acids.¹⁰⁴

Section 3. Improving the sustainability of school meals – implications of nutritional standards

The task of this section is to consider the sustainability implications of nutrient-based standards for school meals. Section 4 assesses of the cost implications, the barriers to change and the opportunities likely to arise from implementing new nutritional standards in a more sustainable manner.

3.1 Key sustainability implications for CWT guidelines

Taking as the starting point the nutritional framework developed by CWT to meet health objectives (detailed in Section 2) and the basis of the school meal standards recommended by the School Meals Review Panel.¹⁰⁵

Table 4 presents a summary of evidence concerning how implementation of standards based on this framework could:

- **Support** sustainability goals
- **Conflict with** sustainability goals.

3.2 Discussion of the sustainability implications of the CWT nutritional guidelines

Nutritional advice to increase fruit and vegetable consumption, alongside a reduction in meat, will help to reduce the environmental impact of school meals. Especially if that produce is purchased locally to where it is consumed and before it has generated the substantial health and environmental externalities that arise from transport and processing. Going further, the increased use of Integrated Farm Management and organically grown produce would further improve sustainability in the school food chain by minimising our reliance on inputs such as artificial fertilisers and pesticides that are non-renewable and polluting. Organic production systems are more extensive (they use more land for the equivalent volume of output) but they generally use around 50% less energy input per unit crop area,¹⁰⁶ thus benefiting climate change as well as significantly enhancing farmland biodiversity.

That said, it is difficult to rank the impacts of particular foods definitively because energy inputs clearly vary ‘due to a multitude of factors related to animal or vegetable origin, degree of processing, choice of processing and preparation technology and transportation distance’¹⁰⁷ and there is a lack of comprehensive accurate data comparing systematically the whole range of impacts associated with each type of meat, fruit or vegetables.

One Swedish study comparing the energy inputs showed that fresh carrots produced locally in Sweden require roughly a quarter the amount of inputs (2.7 MJ) compared to canned ones from central Europe (11 MJ).¹⁰⁸ Even locally canned Swedish carrots were getting on for double (4.0 MJ) the fresh variety (2.7 MJ) in terms of their energy requirements. In addition, vegetables grown in local greenhouses (for example, tomatoes and some salads) were found to be much more energy demanding than vegetables grown in the field (for example, root vegetables, green vegetables and field salads), and in some cases more energy-demanding than some types of meat (chicken and pork).

Table 4 CWT guidelines - how they may support (S) or conflict with (C) sustainability goals

Nutritional advice	Implication
Increase fruit and vegetable consumption	S: Increased <i>proportions</i> of fruit and vegetables in school meals will cut down levels of processed meat, which has a higher relative environment impact. If organic, this dividend is greater.
Red meat consumption 'in moderation', keeping processed meat to a minimum	S: Less processed meat will curb the energy impacts of food processing. C: Intensively produced 'conventional' meat has a significantly higher environmental impact than other food types.
Encouraging milk consumption	S: Fresh milk has short supply chains. C: Milk production is energy-intensive, particularly if from conventional (non-organic) systems. ¹⁰⁹
Encouraging oily fish consumption	S: Increased demand for fisheries certified by the Marine Stewardship Council will help speed up the wider implementation of this management framework. C: Increasing fish consumption is unsustainable, unless sourced from well-managed fisheries. In general, <i>and despite the known nutritional advantages</i> , fish consumption needs to go <i>down</i> rather than up.
Discouraging white fish	S: Sends strong message about unsustainability of current marine fishing practices.
No guidance on locality, seasonality, production standards (MSC, organic)	C: Evidence shows the nutritional benefits of diversity, ¹¹⁰ which seasonality supports, and a cost-effective sustainable approach demands imaginative, seasonal menus with increased use of regional specialities, local and organic supplies. C: Over reliance on dairy food in vegetarian cookery suggests caterers need more information on ways to use soya, a wide range of pulses and whole grain combinations (with vegetables in some cases) to provide more imaginative and acceptable meat-free meals.

In line with the conclusions from several other research projects, a 2005 UK study also demonstrated that non-organic beef has the highest level of energy inputs of all foods and that one kilogram of conventional beef creates 65p of external environmental costs, compared to 44p for lamb/mutton, 13p for pork, 6p for poultry, 1.44p for fruit and 0.61p for vegetables. These figures do not take account of impacts on farmland biodiversity, waste or animal welfare. Looking at the same question slightly differently, another study estimated that in conventional intensive production systems it takes no less than 7kg of animal feed to produce 1 kg of intensively reared beef, compared to 4kg for 1 Kg of pork and 2kg for the same amount of chicken.¹¹¹

These figures illustrate in graphic terms why the CWT recommendations to serve *meat in moderation* and *less processed meat* will help to deliver more sustainable school meals. Fresh and frozen meat is inherently more sustainable than processed meat (see Section 3). Moreover, any form of extensively reared meat, especially predominantly grass-fed beef and lamb, is likely to offer a more sustainable choice with lower environmental impacts, and extensive rearing is guaranteed by organic standards.

While most non-organic beef cattle do spend some of their life outside eating grass, they will always be finished indoors, primarily on a diet of grains and protein crops. The equivalent organic animals must be fed a diet of only grass and conserved grass (silage or hay) for most of their lives, and may be fed a limited amount of grain-based feed that must also have been grown organically (eliminating the high environmental impacts associated with the routine usage of artificial fertilisers in non-organic crops used for animal feed).

Provisional research findings suggest that energy use in pig production would fall by about 50% if all production converted to organic, although more land would be needed to produce the same volume of output.¹¹² Like intensive pork, intensive chicken production also supports little or no farmland biodiversity, since they are mostly housed indoors, causes significant pollution risks, and consumes large amounts of concentrated feed produced from crops with significant environmental impacts. In a similar vein, sheep reared extensively outside, and with fewer inputs like animal feed, represent a far more sustainable supply.

Serving *more fish* in line with CWT targets poses the greatest challenge in sustainability terms. The state of the world's fisheries is bleak. Marine ecosystems face virtually insurmountable damage as a direct consequence of relentless over-fishing. Given the state of global fish stocks it is untenable – whatever the nutritional benefits - that

nutritionists should make recommendations to eat more fish whilst ignoring the environmental imperative to conserve fish stocks. As Tim Lang, Professor of Food Policy at City University, recently suggested in the Times newspaper ‘It’s absurd to say that we should all eat more fish, in the circumstances’.¹¹³

There is *no* clear-cut solution to ‘sustainable’ fish harvesting, whether from wild marine stocks or from fish farms. Almost all the world’s main fish stocks are already so heavily exploited that catches must be drastically reduced. Facing up to that reality will – sooner rather than later – require a concerted effort on the part of nutritionists and scientists to identify and develop alternative sources of the key nutrients (long chain omega-3 essential fatty acids) currently derived from fish that can be delivered to children in a different manner.

It is clear that reforming the sustainability of school meals alongside improving their nutritional quality represents a challenge to the industry which it will take many years to realise. Evidence gathered from latest best practice (see case studies, Section 6) shows consistently that a sustainable approach demands imaginative and innovative action, including the use of seasonal menus with increased use of regional, local and organic supplies.

Table 5 Best-case and worst-case sustainability scenarios for implementing CWT guidelines for school meals

Best-case		
Fruit and vegetables	Meat and dairy	Fish
Seasonal	Eat less, better quality meat, very little processed meat.	Only MSC certified fish.
Local and fresh	Local and fresh	Fish only served occasionally.
Organic	Organic	Oily fish once every three weeks.
Education for school children origins of fruit and vegetables, and seasonality.	Education about farming and meat production.	No overexploited white fish e.g. cod, haddock (unless MSC certified). Education for school children on sustainable fishing practices

Worst-case		
Fruit and vegetables	Meat and dairy	Fish
Cheapest option, imported. Mainly processed Little fresh. Heavy reliance on canned.	Cheapest option, imported meat and some dairy products (cheese).	Fish from exploited stocks, not MSC certified or organically farmed.
Standard menus throughout the year (unseasonal).	Processed, but with higher meat % than at present (as required by CWT standards).	Mainly white fish, cod, haddock.
Non-organic	Non-organic	Oily fish once a week (not MSC certified).
No requirements for origin/locality.	No requirements for origin/locality.	Mainly processed, for example, breaded fish shapes.

3.3 Scenarios for sustainable school meals

Scenarios have been developed through desk based research on environmental impacts, and through interviews with key stakeholders to assess their implications and practicality.

Table 5 presents best and worse case scenarios – in sustainability terms – for the implementation of new school meal standards.

3.4 How can we deliver a best case scenario?

To be effective The School Food Trust will need to drive nutritional standards for school meals and the Public Sector Sustainable Procurement Initiative as one single agenda Roger Sheard, Education Service Catering, Bradford.

Since March 2003 the Soil Association and its partners have worked with more than 300 schools and catering contractors to promote greater use of fresh food that is sourced directly from local producers, including many that are using some organic food. The Soil Association's Food for Life targets include 75% unprocessed, 50% locally sourced and 30% organic food each week, by weight of ingredients, for all

primary school meals. ¹¹⁴ Evidence gathered from this experience shows very clearly that standardised menus or rigid rules to restrict the use of particular foodstuffs will prevent catering and procurement managers develop more sustainable menus cost effectively. What is required is a joined up approach between cooks, catering managers, procurement professionals and producers to develop the relationships and the supply chains necessary to delivery sustainable school food.

To deliver a best case scenario, school cooks need the training, the confidence and equipment to handle fresh produce and meat and to prepare tasty meals from scratch. They also need flexible, seasonal menus, and menus which make much greater use of less resource intensive and healthier non-meat alternatives such as soya, legumes and mixed grains.

In more sustainable menus a clear preference will be given to organic milk and dairy products. The benefits of organic milk have been demonstrated in other areas of public procurement. Acorn Dairy is contracted to supply Darlington Memorial Hospital with approximately 98,000 litres of organic milk a year. The milk only has to travel 2.6 miles, so transport costs and carbon emissions are reduced. It is estimated that switching to a larger supplier further away would increase annual lorry kilometres by approximately 17,000 and increase transport carbon dioxide by 3.8 tonnes p.a. Though more expensive than conventional milk, the quality Acorn milk competes strongly on value for money. ¹¹⁵

Under a best case scenario red meat will be mainly or entirely grass fed and served in smaller quantities. Beef fed on grass and conserved grass (silage or hay) system will have a reduced environmental impact and is likely to have lower saturated fatty acid concentrations and higher levels of omega-3 polyunsaturated essential fatty acids. ¹¹⁶ Of the various food assurance schemes that exist in the UK organically reared is the only label which prohibits nitrogen fertilisers in crop production and significantly restricts the use of non-grass feed for cattle (and sheep). Beef is an important source of iron but some schools and parents remain reluctant to serve it due to concerns over the traceability of beef following the BSE crisis. Local organic meat that is produced to high, transparent farming standards is likely to prove more acceptable to parents.

On sustainability grounds, fish will be only served occasionally and will always come from a source certified by the Marine Stewardship Council such as Alaskan Pollock, New Zealand Hoki and South African Hake. Overexploited white fish such as cod or

haddock will no longer be served, unless a future MSC source is secured. To balance sustainability issues with minimum nutritional requirements oily fish should be served once every three weeks and should also be MSC certified such as Alaskan Salmon, Southwest handline-caught Mackerel and Thames Herring (all currently available). There are a number of other fisheries currently being certified.

Organic farmed salmon has some reduced environmental impacts compared to non-organic farmed salmon. However, the unresolved issues of escapes, the fishmeal required for feed for farmed salmon and the impact on wild salmon, as well as the cost, make this a less than ideal choice for a sustainable school menu. In local circumstances, such as coastal or island communities, some school meal providers may find alternative, local, sustainable solutions to MSC labelled fish.

Anyone working in school food procurement – from a single school to a large local authority – is likely to struggle to source enough local and organic produce to meet their needs unless they take a phased approach.

Section 4. Costs, barriers and opportunities

4.1 Overview

This section offers some more detailed analysis of the cost implications, and the barriers and opportunities likely to arise from implementing new nutritional standards in a more sustainable manner. It presents evidence from Food for Life schools and other best practice that the Government's latest figures for food costs will not deliver the best case sustainability scenario, but that the CWT recommended figures could do so if spent wisely on predominantly local, organic and fresh foods.

4.2 Will new Government money for ingredients go far enough?

In its guidance the Caroline Walker Trust states that:

It is unlikely that providers can meet the nutrient-based standards if they spend less than 70p on ingredients per pupil in primary schools, and 80p per pupil in secondary schools (2005 prices).¹¹⁷

In 2005 the Soil Association completed a survey of how much English local authorities spend on ingredients for primary school meals. The average spend was just 45p for a two course hot meal. However, it is often difficult to verify quoted food costs.

The Soil Association has collated figures on ingredient spend by primary schools working towards the Food for Life targets (to deliver more sustainable, nutritionally balanced menus which are 75% unprocessed, 50% locally sourced and 30% organic by weight of ingredients). Typical spend of these schools on ingredients is around 70p per child per meal, see

Table 6.

Table 6 Sample of Food for Life Schools

School	Spend on Ingredients (p)	Cost of Meal (£)	Uptake (%)
All Saints Primary School, Ilkely	70	1.60	79
Lethbridge Primary School, Wiltshire	80	2.00	60?
Mornington Primary School, Notts	85	1.59	65
Southdown Infants School, Bath	75	1.50	80
St Peters School, Notts	70	1.75	83
East Ayrshire (11 schools in FFL pilot)	75	1.48	68
Thomas Fairchild Community School, Hackney	67	1.60	90 tbc

Bradford school meals service, serving over 50,000 meals a day has developed seasonal menus, reduced processed foods and increased local sourcing for a cost of 60p per child per meal in primary schools at a cover price of only £1.20 (the second cheapest in the country). For reasons of cost it has only introduced organic carrots to its menu.

Eagle Solutions, which operates a catering management service in inner London and has some schools working towards FFL targets suggest that predominately organic meat and one portion of organic fruit and vegetables per day can be achieved for a primary school menu ingredient spend of 70p.

A recent study commissioned for Bath and North East Somerset Council ¹¹⁸ also concluded that compliance with Food for Life targets would cost 13p per meal increase in spend on ingredients and 10p per meal in additional labour costs (preparation, training, additional equipment). Critically the Council calculate that these increased costs can be offset by greater menu simplicity, reduced usage of costly processed food and increased uptake of school meals. This notion is confirmed by uptake figures in existing Food for Life schools. In 2003 the average uptake for primary school meals in England was 43% (LACA survey school Meals 2004 England and Wales). In Food for Life schools, where meals have already improved significantly, uptake figures can be as high as 90%.

It seems likely therefore that the Government's figure for food costs of 50p for primary school children will not deliver sustainable school meals, but that the CWT recommended figures of 70p for primary schools and 80p for secondary schools could.

4.3 The cost of improvements

Fresh, local and organic produce is often more expensive than non-organic or imported produce. In addition, in most schools there will be cost implications for training (catering and procurement staff) and longer preparation times along with better kitchen facilities, equipment and storage.

Fresh organic meat is more expensive than conventional fresh or processed meats, but by serving meat in moderation (recommended by CWT on nutritional grounds) and by using cheaper cuts from organic animals, there is more scope to meet sustainability objectives in a cost effective way, (see Rome case study in Section 6). Experience in at least one large UK local authority serving over 50,000 meals a day (see Bradford case study in Section 6) has also shown that fresh conventionally produced meat sourced from shorter, more local supply chains can even save money.

Other strategies to help keep per meal costs down include simplified and more seasonal menus, changing to local suppliers, buying 'outsize' fruits or vegetables that do not meet supermarket cosmetic standards, buying good quality products when in glut, making long-term commitments direct with producers, and increasing the uptake of school meals.

Fish is regarded by school meal operators as a high price menu item. The MSC report that, for now, fisherman are not seeing a price premium for certified products which offers some hope that as demand increases the market and the choices available to schools will increase. There may be future cost implications from the audit trail required to enable caterers and schools to use the MSC symbol.

Section 5. Increasing uptake of sustainable school meals

All the case studies in this report illustrate that it is far easier to win acceptance from the children if menu development work and nutritional changes are supported by curriculum activity and by activities that will engage parents. All of this needs to be delivered within a whole school approach that includes activities such as farm visits, cooking and growing projects.

As catering specialist Kemi Atijosan of Eagle Solutions says:

You can make any changes to school meals that you want but the only way to get children to eat it is through the whole school approach. If there is no education for children or their parents, then forget it.

Catering managers also need to be seen as a core part of the school staff team where they enjoy the support and encouragement of their colleagues and the respect of the children. In the words of school food heroine Jeanette Orrey:

catering staff have to be valued for the work that they do, meetings between catering staff and teaching staff are vital to the vibrancy of the school meals service and the school as a whole.

In many of the pioneering schools pursuing Food for Life targets this is now commonly achieved by ensuring kitchen staff feel valued by the school. This includes enabling catering staff to attend training events with teaching staff, work with children in the class room to develop menus and on healthy eating projects and being included in staff social events.

5.1 Improving Catering Management

A move away from processed foods in school kitchens will be difficult in schools that lack adequate kitchen infrastructure (storage, ample refrigeration, equipment and preparation space), have staff that lack prime cooking skills or have reduced working hours among catering staff. While it certainly takes longer to prepare food from scratch, additional labour costs may be offset by increased take- up of school meals. Increased numbers of children staying for a school meal helps cover overheads associated with fresh food preparation allowing more money to be spent on good quality ingredients.

5.2 Developing Sustainable Procurement & Supply Chains

The barriers associated with increasing the proportion of seasonal, local and organic fresh produce and meat in schools have been well documented by the work of Defra's Food Procurement Initiative.

Demand side:

- Standardised, rather than seasonal, menus;
- Narrow and inaccurate interpretation of EU procurement rules;
- Lack of desire to use fresh meat and unprocessed foods;
- Preference given to large central suppliers that can conduct audit trails, as well as single delivery and invoicing, at a low cost;
- Lack of local suppliers tendering for contracts;
- Low prices quoted for fresh produce;
- Necessity of a local agency to audit the local food sector and facilitate links between local producers and buyers;
- Lack of understanding of assurance schemes.

Supply side:

- Lack of supply in some regions, particularly of home-grown fruit;
- Low volumes of delivery drop to multiple sites;
- Major lack of distribution and processing infrastructure;
- Need to provide necessary audit trails and assurance;
- Lack of capacity in producers to develop and invest in new markets.

To deliver the best-case scenario public sector caterers and procurers need to work with local and organic producers and processors to build long-term partnerships and contracts so that producers can make the necessary investments and to develop simpler and less complex supply chains.

The Government must continue to provide a clear policy framework on sustainable purchasing. Currently many procurement professionals claim that policy messages from the Treasury, and EU procurement law, which prevents the specification of local in public contracts, inhibit sustainable procurement. The Government has made it perfectly clear that this is not the case. As part of their commitment to healthy school meals, Government policy is to encourage schools 'to look to local farmers and suppliers for their produce, where possible', linked to enabling children 'to learn about: the practical side of farming; the countryside; and our wildlife'.¹¹⁹ While public authorities cannot demand food from local sources because this would contravene European law, they can specify seasonal, fresh and organic food, and they can encourage local producers and suppliers to tender for contracts either individually or collectively.

It is Government policy that raising production standards and reducing environmental impacts of food does not conflict with value for money requirements, and that catering costs should be balanced with the quality of outputs. Public bodies are therefore able to ensure that food served is consistent with sustainable development objectives. To support this Defra has produced a catering tool kit to support this process.¹²⁰

School caterers and catering organisations will need to work in close partnership with producers outside the contractual process, on a voluntary basis, to inform and encourage them towards greater sustainability. This will also help support or enable the development of simple and less complex supply chains and distribution networks. To accelerate and consolidate change, it is also essential to ensure school meal providers enter into long-term agreements or contracts with local suppliers to ensure consistent supply of local and organic food and enable producers/ processors to make the investments necessary

The main exception to this will be fruit, many school caterers will struggle to secure anything resembling a local source, never mind one that is also organic, due to the very limited availability of indigenous supplies. Nevertheless, even in this difficult area, some progress has been made, for example in South Gloucestershire, where local, organic apples are being grown for the school meals service, and in Bradford, where 50% of pears are now being sourced from Gloucester (they were all coming from Belgium).

5.3 Valuing and measuring the sustainable school meals effectively

Defra's Food Procurement Initiative recommends that public procurers look for opportunities to localise supply chains and raise production standards, whilst operating within EU law. Local authorities can favour and specify for measures of sustainability within (school meals) procurement under the 'Best Value' Framework. Yet in measuring the performance of a school meals provider there is nothing to prevent the pursuit of cost reductions ahead of sustainability considerations. In particular, some school meal providers suggest that the Audit Commission's current measures of 'Best Value' may work against sustainable procurement.

To ensure that this is not the case, the Audit Commission must develop a transparent costing framework for school meals sufficient to ensure that any public or private organisation contracted to provide school meals is always able to work towards achieving the Government's sustainable procurement objectives.

Section 6. Case studies

6.1 School Meals in Rome - The Quality Revolution

By Roberta Sonnino & Kevin Morgan, School of City and Regional Planning, Cardiff University

In the year 2000, a programme was begun to improve school meals across the city of Rome. Initially, organic fruit, vegetables, eggs, tinned tomatoes and cereals were introduced, followed by organic mozzarella cheese and yoghurt in 2003. By 2005, almost all of the food served in schools was organic, except bananas and chocolate, which are Fairtrade, and meat, which is sourced from mainly extensively-reared national breeds. The scheme covers the whole of Rome where 140,000 organic school meals are served every day, including special recipes for 4,000 children with dietary restrictions due to health and religion. Seasonality is incorporated into summer and winter menus, as well as weekly dishes, and fried, frozen and GM food are banned.

Crucially, changes to school meals have also been part of a wider revolution, in which the Government is investing 166m euros from 2004-2007 on ingredients and layout. The notion of 'best-value' has also been calculated in a totally different manner from that used in the UK, adopting a wider notion of 'educational value' that is not just focused on cost, but also concerned with nutrition and culture.

Every day during term time some 140,000 school meals are served in the city of Rome. The school meal uses almost all organic ingredients, including seasonal fruit and vegetables, and traditional local recipes. Many children in Rome stay for a school lunch and the meal is seen as a central part of their education about Italian food culture and healthy eating. Children between the ages of 2 and 14 sit down at round tables, with table cloths, crockery and silver wear, where they are served a three course meal.

A typical day's food in November 2005 in a primary school:

Mid Morning Break	Organic bread roll (with olives/nuts/grapes or sesame) or Fairtrade banana
Lunch	First course: Traditional organic lentil soup and pasta
	Main: Roman-style saltimbocca; boiled chards with organic extra virgin olive oil and lemon juice; organic bread
	Dessert: Seasonal organic fruit (oranges, bananas, tangerines, apples, pears, kiwis, grape, grapefruit)

To meet the stated objectives of 'quality, safety and food education' a number of changes have been made through the programme.

To maintain quality and a high standard of nutrition:

- Food served in the schools comprises only organic and foods certified as PDO (Protected Designation of Origin), PGI (Protected Geographical Indication) and/or Fairtrade.
- No GM foods are allowed in the schools.
- Fried and frozen foods (with the exceptions of peas, green beans and spinach) are not allowed.
- Children are no longer allowed to bring their own snacks from home, as these are served at school during the morning break.
- Catering companies are provided with data tables specifying the exact weight of all cooked food.
- Special menus designed to guarantee a healthy diet for roughly 4,000 children who have dietary restrictions for health or religious/cultural reasons.

To build on Italian 'food culture':

- 'To stimulate children's curiosity and appetite', at least three different types of fruit must be served in schools every week.
- Meals must be served to children directly at the table to make sure that they are consumed hot.¹²¹

Meals have been designed by 70 nutritionists who have toured the city schools in recent years to identify traditional recipes, which, as they explained, ‘strengthen children’s relationship with their territory,’ and are also healthy and attuned to children’s taste. In all cases, the menus change every week, and no dish is served to children more than once a month.¹²² The results of the nutritionists’ work have been published in a recipe book that provides suggestions on how to prepare traditional recipes in the healthiest possible way. Conceived also as a guide for contracting companies, which must comply with the guidelines concerning ingredients and food preparation, this recipe book can be requested by parents.

According to the Councillor of Education, ‘contracting firms must guarantee and be responsible for quality and safety at all stages of the food chain: farming and breeding practices, transport, conservation and preparation of the food.’¹²³

Integrating Sustainability

Moderate use of certified meat

The amount of meat served in the Roman schools has decreased by 18% since 2000 as a result of safety concerns related to the BSE epidemic. This persuaded the City to replace some of the meat served in the schools with regional cheeses and with dishes based on pasta and legumes.

All the meat now served comes from animals certified as PDO or PDI (one of the five protected breeds in Italy or, as in the case of lamb, from Wales). Most of these animals are extensively reared but are not certified organic (due to what Rome’s authorities perceive as scarce availability of good quality organic meat in Italy)

To further help control costs, they source good quality meats (which are both nutritious and have a reduced environmental impact), but only two cuts are used in the schools: shoulder and the inner part of the hindquarters, which are the cheaper and less popular cuts of good quality carcasses. This enables producers to sell the more expensive cuts to more lucrative and more widely available markets.

PGI and PDO meat is also used to ‘promote the market for national products’, as stated by the City administration. Interestingly, this requirement has allowed PGI Welsh lamb into the Roman schools, where it is supplied weekly.

Seasonality

Seasonality is an essential aspect of the service, with a summer and a winter menu. The City has produced a list of seasonal fruit and vegetables that schools are allowed to serve each month.

Use of organic food

The City's use of organic food has two motivations. Firstly, to reduce children's exposure to chemicals, a priority for Italian nutritionists and paediatricians; and secondly, the use of fresh and local organic produce supports the administration's commitment to seasonality.¹²⁴

Managing costs

The City has invested 166 million euros in the centralised school meal service for the period between September 2004 and June 2007, in the form of meal subsidies. Roman families only pay 2 euros per meal (the remaining 4.23 euros are paid by the City). There are further subsidies for families on low incomes. The cost of each meal has increased by 54 euro cents (roughly 37 pence) between 2002 and 2004 (going from 3.69 euros/meal, the equivalent of £2.50, to 4.23 euros or £2.86 per meal), due to an increase in the prices of fruit and vegetables.

The introduction of organic ingredients has caused a 15-18% increase in the costs of each meal, but, as the Administration explained, this is a price worth paying to remove chemical residues and safeguard child health and nutrition.¹²⁵

Working with local producers

Before implementing the reform, the City's Administration carefully assessed the market availability of the products that they had decided to offer to children. As they explained, after a number of meetings with producers and representatives from certifying bodies, they evaluated 'the costs and effects that a massive and sudden increase in the demand' would have produced on the market. Such evaluation led the Administration to identify a list of organic products that they could realistically introduce in the schools without negatively impacting the market. As a result there has been a gradual introduction of organic foods in the schools, 'so as to allow producers, transporters and storing structures to acquire the capacity needed to manage the significant amount of products necessary to supply the Roman schools'.

The same type of assessment was done for Fairtrade products, which were evaluated on the basis of ‘their presence on the market, their taste and their nutritional content’. Such analysis led the City to choose Fairtrade bananas and chocolate and to discard cereals and legumes. When asked about the introduction of Fairtrade products, the Administration emphasised that these have been chosen ‘primarily for their social and cultural meaning’.

No further investment in local infrastructures and distribution has been necessary. The preliminary assessments concerning the availability of ‘quality’ food products enabled the City to ‘adjust’ to the local system.

Education programmes

*School meals in Italy are embedded in a culture that emphasises their educational value and their links to locality and territoriality.*¹²⁶

As a fundamental part of an education programme called ‘Cultura che Nutre’ (Culture that Feeds), Italian teachers back up the effort made in the school kitchen by linking it to material in the class room which covers a number of key areas: food, nutrition and life style (including cooking), Italian farming practices and food quality and, finally, the Italian diet and food culture.

According to one of the co-ordinators of the Cultura che Nutre programme, in the last three years there has been a significant decline in children’s desire to organise birthday parties at McDonald’s, whereas home parties and home-made cakes have become increasingly popular.

More recently, in May 2005, another educational programme has been introduced. Sponsored by the Ministry for Agricultural and Forestry Policies, such programme, called ‘Dal Campo al Piatto’ (‘From the Field to the Plate’), aims at both monitoring and explaining to children the various stages of the food chain.¹²⁷

With regard to the impact of the school meal service on children’s food habits, the chief of staff explained that schools are required to post their daily menu so that parents know exactly what kind of food their children were served at school during the day and can adjust the dinner menu accordingly. The fact that the schools distribute a mid-morning snack to the children has also had a positive impact on their food habits, as it prevents them from feeling too hungry before lunch while also providing a correct caloric intake. When asked about whether this is having any

influence on the eating habits of families, the City administration stated: 'It is still too early to know, but this is certainly our wish'.

Why can't UK cities be like Rome?

The school meal system in Italy is deeply embedded in a national culture which treats food as 'pleasure'. In this sense Italy is often juxtaposed to the UK, where the national culture treats food as 'fuel'. Though useful as shorthand guides to the past, these national stereotypes conceal two major problems: they belittle the Italian achievement and they underestimate the capacity for change in the UK.

As the case of Rome clearly shows, public authorities in Italy devote considerable time and resources to actively promoting a quality food culture that represents their interpretation of the ideals of sustainable development. In fact, such culture emphasises simultaneously the values of seasonality and territoriality and the socio-cultural meanings attached to food (as, for example, in the case of Fairtrade products). It is important to emphasise, however, that such values and meanings are not a passively inherited legacy. In Italy, as elsewhere, these values must be created anew in each new generation. In this respect, school-based food education programmes, such as *Cultura che Nutre*, play a major role.¹²⁸

Similarly, the 'food as fuel' stereotype fails to do justice to the remarkable changes that have occurred in certain localities in the UK. Innovations such as those introduced, for example, in Carmarthenshire (Wales), Aberdeenshire (Scotland) and South Gloucestershire (England), combined with the blossoming of school-based food initiatives like the 'Cook it!' pilot project and programmes such as the Cooking Bus, 'Dish it up!', 'Five-a-day the Bash Street Way', 'Eat Smart, Play Smart', 'Fruit Tuck Shops' and vending healthy drinks in schools, prove that British people do care about the taste and quality of their food and are prepared to do something about it too.¹²⁹

The British examples of good practice may be islands of excellence in a sea of mediocrity, but they prove that food cultures are not set in aspic, and therefore there is no iron law that prevents aspects of the Roman model being transferred to the UK. For this to happen, however, it is necessary to foster more systemic change. As happened in Rome, this ought to be based on the following major steps:

- the creation of a new national regulatory environment that, as happens in Italy with Law 488/1999, fosters, rather than frustrates, the development of sustainable forms of public food procurement;
- a much higher resource investment to bridge the unacceptable gap between the sum of 4.23 euros (roughly £2.85) invested by the City of Rome for each school meal and the average of 45p spent per school meal in the UK;
- a systematic implementation of school-based food initiatives and programmes, such as *Cultura che Nutre*, that teach children the value of sustainability in the food chain, ensuring that the message of the classroom is echoed in the canteen;
- a consistent effort to monitor and control the school meal system on the ground, as it happens in Rome, and to identify and disseminate examples of good practice.

But the major lesson from Rome is the need for more concerted and resolute action to mobilise political support for a different metric of development. Our notion of ‘best value’, for example, ought to be interpreted not merely in terms of the narrow economic characteristics of the school meal system, but also, as happens in Italy, in terms of its hygienic, nutritional and sensory (taste) qualities. In short, school meals, as all public meals, should be part of a wider strategy for sustainability, integrating production, consumption, health and education. Quoting one more time the City of Rome Administration, in the context of food, this is the real essence of the concept of ‘qualità’.

Acknowledgements to Rome Case Study

This case study has benefited enormously from the generous and invaluable help and support provided by the City of Rome. Special thanks go to: the Assessore for Educational and School Policies, Maria Coscia; the Coordinator of the school meal project, Dr. Silvana Sari; to her head of staff, Dr. Luisa Massimiani; and to the press officer of the Directorate for Educational and School Policies, Dr. Sara Cusatelli Lener. The authors would also like to acknowledge the contributions of Dr. Alessandra Migliozi and Dr. Antonella Giuliano (ISMEA).

6.2 East Ayrshire - Scotland's first Food for Life organic, local and fresh school meals service

Under a pilot started in August 2004 (serving one school) and expanded in May 2005 (to serve 11 schools) East Ayrshire Onsite Services has shown how partnership working with dietitians, local producers and procurement teams offers the best way for schools and their caterers to develop more sustainable supply chains. Whilst complying with all 24 targets set out by the Scottish Executive in Hungry for Success (against which to measure improved nutritional and educational characteristics of school meal provision), this local authority caterer has shown how sustainability goals can be addressed through the routine use of high quality fresh, local and local organic foods that are delivered, cooked and served within a day.

In August 2004 East Ayrshire set off a quiet revolution in Scottish school meal procurement when it established a pilot project at Hurlford primary school near Kilmarnock to provide organic, local, and fresh food in line with the Soil Association's Food for Life targets. Going further than almost any other local authority in the UK to date, project manager Robin Gourlay opted to test an approach where 75% of food consumed each week should be made from unprocessed ingredients of which 50% is locally sourced and 30% organic. In doing so he committed the council's procurement team to establishing a web of relationships with local producers sufficient to keep the pilot kitchen in ready supplies of fresh, local and organic ingredients.

The Soil Association's Food for Life targets for school meals ask that:

- School lunches should aim to provide food that meets the nutrition targets established by the Caroline Walker Trust (and cited only as guideline values in government guidance on school catering).
- At least 75% of all foods consumed (over a week) be made from unprocessed ingredients
- At least 50% of meal ingredients be sourced from the local region
- At least 30% of food served should be from certified organic sources
- Better classroom education on food, cooking and farming , ensuring that all children visit a farm at least once during their time at school.

Supported by Pam Rodway, co-ordinator of Food for Life for Soil Association Scotland, local food and nutrition specialist Wendy Barrie led a process to develop new menus that could make the most of local and seasonal fresh produce and avoid processed foods high in fat, sugar or salt. As part of this Gourlay and his colleagues were also put in contact with a number of different local (organic and non-organic) producers willing to supply the pilot school.

As a result, by the end of the pilot (July 2005) the school kitchen at Hurlford Primary school had significantly exceeded the Food for Life targets. Over 50% of the food served is organic including; fruit, vegetables, milk, flour, pulses and brown rice), 70% local including; bread, farmhouse cheese, free range red meat, chicken and eggs. More than 90% of all food on the menu was made from scratch using entirely unprocessed raw ingredients.

Despite a very modest price rise (approximately 20% more in ingredient spend), school meal uptake levels rose by around 10% (to 68%) by June 2005, bucking a national trend where school meal uptake across Scotland fell over the same period by an average of 2%. Confounding expectations, there was no increase in labour overheads.

Building on this success, from May 2005 the pilot expanded to take in a diverse group of ten more schools from across the local authority. This is the next step in a process which Gourlay and his colleagues hope can continue until the same high quality, fresh, local food is served to all children attending schools in East Ayrshire.

Changing to the Soil Association's Food for Life menu had a huge effect on 'food miles' – reducing them by 70%. Switching to more local suppliers reduced the average distance travelled per menu item from 330 miles in the standard menu to 99 miles in the Food for Life menu (Figure 1). In the 11 schools using the menu, 12 out of 15 products are being sourced within 40 miles, compared to only 3 products on the standard menu.

While food for the single pilot school was not sourced competitively, food going in to the 11 schools under the expanded pilot is now being purchased under a series of competitive contracts structured to permit participation by smaller local businesses. To develop these arrangements the authority held several open meetings with local producers where local producers discussed barriers and opportunities to supply schools.

Figure 1 Average distance travelled per menu item in East Ayrshire schools (miles)

[insert pic here]

Source: East Ayrshire Council, 2005. Figures include 14 menu items which can be produced locally, excluding oranges.

Responding to this feedback, one large procurement contract serviced previously by the West of Scotland Local Authorities' buying consortium was divided into eight separate lots covering Fresh Red Meat, Dry, Bottled & Tinned Food Stuffs, Fresh Fruit & Vegetables, Fresh Cows' Milk, Fresh Cheese, fresh Hens Eggs. Fresh Fish and Fresh Poultry.

Using the full scope of EU regulations, East Ayrshire Onsite Services did not award contracts solely on basis of cost. Instead they deemed that product price would account for only 50% of a decision where the most economically advantageous tender should also address Ability to Supply to Deadlines (15%), Quality & Range of Foods (15%), Food Handling Arrangements & Facilities (10%) and Use of Resources (10%).

Gourlay argues that the result of this process is a set of local supply chains that are considerably more transparent and accountable than those his team previously relied on. 'Rather than paying for food miles or the profit margins of conglomerates we have been able to spend more in the local economy. In the process we have also won the additional freedom to stipulate what amounts to far less processed and much fresher food,' he says. Looking to the future, it is hoped these innovative purchasing arrangements developed with local producers will help to create an essential new infrastructure of sustainable supplies that can eventually meet the needs of all East Ayrshire schools while also securing access to this important market for diverse local food producers.

These efforts have not gone unnoticed. In February this year the Scottish Parliament commended East Ayrshire Onsite Services for the imagination it has shown. In the

early summer Scottish food and health ‘tsar’ Gillian Kynoch paid her own visit to take a closer look at what was taking place in the 11 pilot schools, only to conclude that the East Ayrshire model should be regarded as something close to a ‘gold standard’ for other Scottish local authorities to emulate. Soon after this the Scottish Executive’s Department of Environmental and Rural Affairs (SEERAD) agreed to commission an independent evaluation of the 11-school pilot phase with a view to producing an ‘evidence-based best practice model’ for others to follow. Significantly, this research will not just consider cost criteria but will also include survey work to examine and quantify the less tangible benefits to children and parents that arise from healthier school meals.

6.3 Bradford - sustainable local procurement pioneer

Bradford school meals remain some of the nations cheapest (£1.20 per day). Yet most of the food ingredients used by Education Catering Service (ECS) are now sourced locally, including fruit, vegetables, multigrain breads, free range eggs, fresh meat and fresh poultry. As Roger Sheard, business development manager at ECS explains:

It took us a full two years to track out all of our sourcing arrangements but as a result we’ve been able to significantly improve meal ingredient quality at no extra cost through the use of simpler menus, less processed food, better product specification, more seasonality, fresher local butchery, less packaging and simpler delivery arrangements.

Like countless other children in the UK, those having school lunch in Bradford used to eat meat that came from places like New Zealand or Argentina, was butchered and frozen in South Yorkshire, shipped on to Birmingham for additional processing and ‘spiral freezing’ and then shipped back to Bradford for distribution and consumption. Then, in April 2000, Bradford City Metropolitan District Council opted to delegate all school meals budgets back to their schools leaving each school free to decide what kind of service they wanted.

With one of the highest take-up rates in the country for school meals - 56% - Roger Sheard, business development manager with overall responsibility for procurement, sales, marketing, organisational development and business planning at Bradford’s Education Catering Service (ECS), realised that the organisation would need to differentiate itself from the likes of competitors such as Scolarest if it was to persuade children and parents in 200 schools to continue purchasing 50,000 school meals a day. He also knew that an increasing number of parents wanted to know where the food was coming from:

Any caterer who purchases fresh food should be able to trace back through a quality HACCP analysis (Hazard Analysis of Critical Control Points) in line with best practice in food hygiene, but if the shorter a supply chain the simpler it is to audit thoroughly. In addition, as a specialist educational contract caterer we saw it as part of our corporate social responsibility to place a strong emphasis on supporting the education and health of the children we served. So we revised our core values and took on the commitment to source as much as possible of our ingredient list from local suppliers.

From a turnover of £18 million (which covers cleaning contracts across the borough as well kitchen management and food provision) ECS knew it was spending around £4.7 million per annum on food ingredients but before it started to source all its needs locally it wanted to complete a comprehensive supply chain mapping exercise.

To begin with we did not really know how many suppliers we had, admits Sheard, and some of them did not even have a computer, so it took a lot of work on all sides to assemble the information we needed about where our food ingredients were coming from. In the event it took a full two years to track out all of our sourcing arrangements whilst also running the business.

In the process Sheard discovered that ECS could make significant improvements in what it was providing without incurring extra overall cost. 'It was clear, very early in our research, that where we could cut extended supply chains we could redirect or 'repatriate' budget into local food spending that has previously been lost to intermediaries and wholesalers. What's more we soon realised that this also created the opportunity to improve our product specifications and to take advantage of things like seasonality and fresh local butchery. Sheard added:

Local sourcing also made it easier to reduce the amount of processed food on the menu, allowed us to move more rapidly to a simpler and more standardised healthy menu, made it possible to cut down on how much packaging we had to deal with and allowed us to simplify delivery arrangements in ways that would provide smaller deliveries better suited to primary schools.

Having mapped what was available, ECS teamed up with Yorkshire Forward in 2002 to form a strategic partnership with funding from Defra's public sector food procurement initiative. A steering group that included a nutritionist, local farmers and NFU reps, a local charity called the Grassroots Food Network, and an independent food specialist, developed a set of new contract specifications that aimed to promote local sourcing and customer health, while reflecting the issues faced by small and large suppliers and procurers.

In summer 2003, ECS then set itself a series of time-limited improvement targets and began working, contract by contract, to put new arrangements in place, starting first with vegetables, potatoes and salads. Before publishing the tender, ECS held meetings with producers and distributors, where they sought to communicate how and why local sourcing would feature high in selection criteria. As part of each tender ECS also invited all suppliers to support their bids with information about their practical plans for supporting educational development of pupils around the food and farming curriculum. According to Roger Sheard, ‘this process did not raise the total number of bids by much but it did greatly improve the quality of what those bidding were offering as part of their attempt to secure their business for the future.’

By the autumn of 2003 ECS had managed to establish a local supply chain for all of its potatoes, fresh vegetables and salads when in season. ‘For these food groups, local sourcing didn’t save us a significant amount of money, but we saw a real improvement in quality and freshness. We also managed to ensure that all the carrots we use in schools are now organic – including those served as snacks to infant children under the government’s free fruit and vegetable scheme.’

Fruit has proved a greater challenge, even when as Sheard admits, he and his colleagues widened their definition of ‘local’ to cover the whole of the UK. Unable to escape a heavy reliance on imported fruit, they did at least switch to fairly traded bananas.

By Easter 2004 all meat and poultry was being sourced locally whilst also applying high welfare standards, in line with those already applied over more than two decades to source Halal meat for Muslim children’s meals.

For many school caterers the problems associated with local meat sourcing often seem the most challenging and intractable, especially on grounds of cost, so it is rarely the first food group to be sourced locally. In Bradford, ECS found that it could raise quality and save money through sourcing these foods locally with their existing Halal meat supplier.

Halal means lawful according to Islam and applies to all foods, requiring stringent inspection and audit trails for the entire supply chain from farm to plate. Given those demands, there has always been a preference for shorter supply chains since the audit demand are then kept to a minimum, especially for foodstuffs that are perishable. ECS’s halal meat supplier is based in South Yorkshire. It has always sourced halal meat down a short, independently audited and assured local supply chain that runs

from local farmers within a 30 mile radius via a single slaughterhouse and butcher located less than 10 miles from the ECS distribution facility.

ECS fully expected local meat from these sources to cost a lot more than supplies of the cheap ‘free flow frozen’ alternative. ECS discovered however that whilst generating a robust and documented audit trail from farm to plate, the local meats were not only fresher and tastier but would cost some 18% less on average (across eight different meats), delivering a saving of around £30,000 within the first year alone. ‘We were more than pleasantly surprised and it was with great satisfaction that we could reinvest that saving to improve the specification and nutritional quality of our processed meat items such as sausages and burgers,’ says Sheard.

No figures are yet available to identify how many local jobs arose as a result of these changes. One study has investigated the environmental benefits of local sourcing by Bradford Education Contract Services.¹³⁰ In one scenario, a weekly delivery of frozen lamb from Northumberland to a depot in Bradford, was replaced with a twice-weekly delivery of locally produced vacuum-packed product. The reduction in travel distances, use of smaller vehicles and need for temperature control would reduce vehicle operating costs by 82% (£6,100) and transport carbon dioxide emissions by 89% (12 tonnes) per year.

The £30,000 saved through local sourcing was reinvested back into processed meat specifications to ensure that, in line with Caroline Walker Trust guidelines, there is *no* mechanically recovered meat or highly processed shaped ‘meat items’ on the menus in Bradford. ECS has also found that the use of better quality meats has reduced wastage in the dining hall where small mouths, parents and teachers all show noticeable appreciation for the better taste and texture of what they are now offered.

In the spring of 2004 ECS also held another ‘buyer’ event for local producers and suppliers in reference to various supply contracts coming up for renewal over the next 18 months. This event drew a significantly bigger response from a collection of predominantly new faces and led eventually to new arrangements for the delivery of low salt multigrain or wholemeal breads and free range eggs from local supplier. In addition, several local dairy suppliers were also identified who are keen to bid for the milk contract when that is rewarded in 2006.

Contrary to all expectations, prices have not risen and Bradford school meals remain second cheapest in the country at a cost of £1.20 per head per day with, on average, ingredients costing around 60 pence for a primary school meal. Improving quality and

knowing where more of the food comes from has attracted more customers, raising uptake by 2% to 58% by June 2005, well above the national average. What is more, the supply chain changes detailed above, and the resulting improvement to ingredient quality, have been delivered to all schools with *no new resources* and before the arrival of new government money (from September 2005) to raise ingredient spending in school catering. Once ECS receives that additional money, Roger Sheard is confident that further gains in nutritional quality will be made and that ultimately more children will take up school meals. 'Parents will get the message that our menu offer is even better and that the quality of ingredients has improved even further,' he said.

Meanwhile, Bradford schools attest that sustainably sourced lunches are fresher lunches, more nutritious, and help deliver measurable health benefits. Likewise, as part of a whole school approach to health and wellbeing, it is far easier to build interesting curriculum links when classroom discussion about issues such as farming and production, seasonality, food preparation, animal welfare and wider environmental impacts arising from the food chain (such as packaging wastes and road congestion) comes to life every day in the dining hall.

In its latest innovation, from the start of the 2005-6 school year, all of Bradford primary school menus have also complied with the revised quantified nutritional guidelines for school meals that were issued by the Caroline Walker Trust in June 2005. These standards are the basis for the new nutritional standards for school meals, proposed by the School Meals Review Panel.

The special ingredient in Bradford's success that remains impossible to quantify is the leadership and vision provided by Roger Sheard, a former restaurant and hotel chef with a passion for good food, gardening and the countryside. His belief is that every child deserves healthy food at the heart of their lives. However, that vision may be under threat and the improvements delivered to date may yet be dismantled pending the outcome of local political decisions set to be taken later this year. Under plans to liquidate a range of assets owned currently by the local authority, Bradford Metropolitan District Council decided in 2004 to transfer a range of its business functions (of which ECS is one) into alternative ownership. The outcome of that process remains uncertain.

6.4 Lethbridge Primary School, Swindon - Food for Life champion

In December 2003, when uptake levels fell to less than 50 out of 480 children on the school roll, Lethbridge Primary was left by the local authority (after just one term's notice) without a lunch service. Two parents offered to establish a stand-alone service similar to that run by the award winning school cook (and now the Soil Association School Meals Policy Advisor) Jeanette Orrey at a village primary in rural Nottinghamshire. They wanted to replace heavily processed frozen 'animal shapes' of largely unknown provenance with home-cooked food made from scratch every day using quality fresh, local organic ingredients such as meatballs in tomato sauce, salmon fishcakes, jacket potatoes and salads.

Pam Shipperbottom and Laura Illsley formed their own company, Let's Do Lunch, and to set about delivering tasty nutritious meals based on Food For Life targets, using at least 75% unprocessed, 50% local and 30% organic ingredients.

Pam and Laura duly took their food hygiene exams, upgraded their kitchen equipment with the help of a local kitchen maintenance company run by a parent, developed a new set of menus and took over the employment of the school's kitchen staff. They also sought out and built relationships with a range of local suppliers, many of them local organic farms and businesses. Let's Do Lunch then began serving high quality home cooked food in Sept 2004 at the price of £2 per child, £3 for teachers.

Let's Do Lunch spend 80p per meal on ingredients of which an estimated 90% are unprocessed and around 80% are organic (including meat, vegetables, dairy, flour, sugar, mayonnaise, bread, oats, pasta, pulses, rice, honey, dried fruit and non-hydrogenated margarine). In addition some 65% of the food is also locally sourced, including ice cream. Shipperbottom is adamant that local sourcing has saved rather than cost her money. 'Sourcing direct cuts out the wholesales with their increased transport costs, delivery charges and minimum order penalties. We have also been able to find like-minded people with whom it has been possible to negotiate better prices. We support local businesses and they support us.'

That said, Shipperbottom is pleased to be exceeding the Food for Life targets but is blunt about the fact that the original goal - to be entirely organic - is something she and Illsley have learned they can't deliver for the price they can charge. Staff levels have not risen on a per capita or school meal basis. Under the old contractor two staff worked a total of 8-9 hours a day to regenerate highly processed meals for 40.

Lets Do Lunch employs four staff a total of twenty hours a day who deliver 200-250 tasty meals a day, all of them cooked from scratch. Flexibility also allows children to opt in or out of cooked lunch on a daily basis so numbers can be higher, depending on the popularity of particular meals and the weather.

As part of its new sourcing arrangements the school has established strong relationships with several local organic farms where pupils can now visit to learn more about food and farming. In addition, the Lethbridge school kitchen also runs a weekly organic box scheme for vegetables, meat and bread, and uses the profits to subsidise the cost of some of the vegetables used in school meals.

By popular demand Let's Do Lunch is expanding rapidly. From September 2005 it began serving two further primary schools, is due to start serving two more in early November (after half term) and has a further two primaries signed up to take its services from January 2006. By this point the company could well be providing meals for as many as 1300 children a day.

Scaling up has brought new challenges. A desire to make all dairy ingredients organic including the milk has met with some resistance, due to concerns about rising costs. A background of rising oil prices has generated non-negotiable price increases on many grocery staples, provoking a search for new suppliers and adjustments to this term's menus based on prices agreed at the end of the summer term.

In the mean time Swindon Borough council was obliged to close down its entire school meals provider at the end of the 2005 school year after too many local schools rejected its services and opted-out to take control of their own delegated budget. Closure of the borough-wide service has, in effect, left many schools starting the school year with just sandwich provision. Some have hastily joined a consortium which serves meals pre-cooked in Nottingham shipped to Swindon for regeneration in a large central production kitchen and shipped in to the schools, at a cost of £1.65 per head per day.

6.5 Columbia Primary School

Columbia Primary School, near the Sunday flower market of the same name in the inner London Borough of Tower Hamlets, started looking for ways to improve the food served to its children in 2002. 'We did not set out to do anything special. We

just decided to find the money out of our delegated budget to add to the government scheme to provide free fruit to all of the children every day and a parent who happens to be a dietician suggested we ask our catering contractor to improve the quantity and quality of salad on offer at lunch,' says headteacher Penny Bentley. 'Then we backed up those changes with special assemblies, lesson time devoted to healthy eating and a member of the teaching staff on duty every day at the salad bar to help serve. As Penny says, 'We will never require a child to eat salad or fruit but, in much the same way that any good parents does, we do exert a modicum of pressured encouragement when children refuse.'

Almost 70% of the pupils have a school meal and, of these, almost all pick up at least one portion of salad when they pass the salad bar placed strategically at the end of the serving counter.

'After those changes' adds Bentley, 'we were on a roll. It made sense to make other changes too. These days the breakfast club no longer serves cereals with added sugar and at lunch time processed 'food' like potato smiles, turkey dinosaurs, fish fingers along with white bread have all have disappeared - without complaint - from the menu.'

Unlike many schools that want to be pro-active about better food, Columbia has not had to set up its own stand-alone service and the ease with which it has made changes partly reflects the orientation and aspirations of its contractor, Education Contract Services in Tower Hamlets. As Della Murray, Business Development Manager says, her organisation knows that 'increasing exposure, improving access and providing encouragement are the key principles that help raise children's fruit and vegetable consumption'. What's more, with more than 20 out of 106 schools in Tower Hamlets having *no kitchen at all*, increasing the raw and fresh produce element in the diet has provided a relatively easy means to deliver rapid improvements in the nutrition and quality of the food they offer.

As a borough-controlled service, ECS is one of only 12 in-house providers left in inner London. With very few schools deserting the area-wide service, ECS still provides meals to 93% of all local educational sites within the Borough including all schools save 5 of the secondaries. In another small but significant difference, only 3 of the 9 secondaries that ECS still serves has a cash cafeteria. The rest have single plate meals for a fixed price (£1.75) and a healthy 'milk bar' option where sandwiches, flavoured milk, juice or water, home baked cakes (on some days) and fresh fruit are on offer conspicuously without the addition of some unhealthy crisps or fizzy pop.

As part of a wider improvement programme ECS has already reduced the proportion of processed food on its latest menus to around 5%. It has also pushed suppliers to provide a number of 'healthier' products such as reduced-salt and sugar baked beans and spaghetti, reduced-salt bread products and 33% reduced-fat chips for the one day a week when chips are offered.

Alongside this, ECS offers school heads considerable flexibility about the type of menu they can choose. 'We still offer a choice,' says Bentley, 'and we haven't moved to a single plate meal because flight trays suit a lot of the food which our children (of whom many are Bengali) will by tradition eat with their hands. With over 70% Muslim children we also have a fully Halal provision and with the support of the kitchen staff we have moved to completely fresh vegetables - with the exception of frozen peas and sweetcorn.'

Since September 2004, ECS has been running a pilot project at Columbia school to make all the fruit and salads organic. 'This has delivered very noticeable improvements in quality and taste,' says kitchen manager Afusat Ibrahim. 'We know that partly because the children say so, but also because at least 60% choose salad by preference. Overall, our children not only eat more salad now than cooked vegetables, but they also consume a great deal more organic salad than they ever did of the conventional variety.'

Continuing their commitment to food education Columbia school now holds a healthy eating week every year, when the entire curriculum in every classroom is turned over to subjects such as cookery, where good food comes from and how to eat well. Year four pupils also go on farm visits to Ashlyns Organic farm in nearby Ongar. In addition, parent and dietician Marjon Willers has also set up an organic vegetable stall in the school playground once a week that now sells over 40 fixed priced bags of seasonal organic vegetables at an affordable price to parents.

Bentley says that it is difficult to measure how far healthy food contributes to educational achievement, but recent research shows that children on a healthy diet are calmer and better able to concentrate. 'And in any case, setting up healthy eating habits in children is worth doing for its own sake'.

References

- ¹ Tukker A, Huppel G, Guinee J, Heijungs R, de Koning A, van Oers L, Suh S, Geerken T, Van Holderbeke M, Jansen B and Nielsen P (2005) *Environmental impact of products (EIPRO): Analysis of the life cycle environmental impacts related to the total final consumption of the EU25*, European Science and Technology Observatory and Institute for Prospective Technological studies, full draft report, April 2005; p92
- ² Turning the Tables: Transforming School Food - Recommendations for the Development and Implementation of Revised School Lunch Standards. <http://www.dfes.gov.uk/consultations/>.
- ³ Crawley H (2005) *Eating well at school. Nutritional and practical guidelines*. Caroline Walker Trust and National Heart Forum; p35
- ⁴ Wang YQ, Thomas B, Ghebremeskel K and Crawford MA (2005) *Changes in Protein and Fat Balance of Some Primary Foods: Implications for Obesity?* Institute of Brain Chemistry and Human Nutrition (IBCHN), London Metropolitan University
- ⁵ Crawley H (2005) *Eating well at school. Nutritional and practical guidelines*. Caroline Walker Trust and National Heart Forum; p46
- ⁶ Rayner M, 'The burden of food-related ill-health in the UK', unpublished paper, 2002 (www.sustainweb.org). To be published shortly by Journal of Epidemiology and Community Health)
- ⁷ Turning the Tables: Transforming School Food - Recommendations for the Development and Implementation of Revised School Lunch Standards. <http://www.dfes.gov.uk/consultations/>.
- ⁸ Pretty J (2002) *Agri-culture*, cited in Gold M (2004) *The global benefits of eating less meat*. Compassion in World Farming Trust
- ⁹ IPCC (2001) *Climate change 2002: The Scientific Basis*. IPCC, page 388
- ¹⁰ Hole, Perkins, Wilson, Alexander, Grice and Evans (2005) 'Does organic farming benefit biodiversity?', *Biological Conservation*, 122, 113-130
- ¹¹ Hole, Perkins, Wilson, Alexander, Grice and Evans (2005) 'Does organic farming benefit biodiversity?', *Biological Conservation*, 122, 113-130
- ¹² English Nature (2001) *Environmentally sustainable agriculture and nature conservation*. Position Statement, 1 June 2001. www.english-nature.org.uk/news/statement.asp?ID=11
- ¹³ Berry, Ogilvy and Garnder (2005) *Integrated farming and biodiversity*. ADAS/English Nature
- ¹⁴ Berry, Ogilvy and Garnder (2005) *Integrated farming and biodiversity*. ADAS/English Nature
- ¹⁵ Azeez, G (2000) *The biodiversity benefits of organic farming*. Soil Association; Bengtsson J, Ahnstrom J, Weibull AC (2005) 'The effects of organic agriculture on biodiversity and abundance: a meta-analysis', *Journal of Applied Ecology*, 42, 2, 261-269; Hole, Perkins, Wilson, Alexander, Grice and Evans (2005) 'Does organic farming benefits biodiversity', *Biological Conservation*, 122,

- 113-130; R.J. Fuller, L.R. Norton, R.E. Feber, P.J. Johnson, D.E. Chamberlain, A.C. Joys, F. Mathews, R.C. Stuart, M.C. Townsend, W.J. Manley, M.S. Wolfe, D.W. Macdonald and L.G. Firbank (2005) 'Benefits of organic farming to biodiversity vary among taxa.' *Biology Letters*
- ¹⁶ English Nature (2003) *Organic farming*. Position Statement, 18 December 2003. www.english-nature.org.uk/news/statement.asp?ID=25
- ¹⁷ IPCC (2001) *Climate Change 2001: Synthesis Report. Annex B Glossary of Terms*. Intergovernmental Panel on Climate Change; p379
- ¹⁸ IPCC (2001) *Climate Change 2001: Synthesis Report. Annex B Glossary of Terms*. Intergovernmental Panel on Climate Change; p380
- ¹⁹ MAFF (2000) *Energy use in organic farming systems*. Ministry of agriculture, fisheries and food
- ²⁰ Scottish Executive (2004) *Scottish Agriculture and Global Change - Nitrous Oxide Emissions from Fertiliser Use*. Environment Group Research Report 2004/09. Scottish Executive; p5
- ²¹ Pretty J N, Ball A S, Lang T, Morison J I L (2005) 'Farm costs and food miles: An assessment of the full cost of the UK weekly food basket.' *Food Policy*, 30, 1, 1-20
- ²² *Pesticide Usage Statistics*, Central Science Laboratory, 2005. <http://pusstats.csl.gov.uk>
- ²³ Soil Association (2005) *Pesticide use on organic farms in the UK*. Soil Association
- ²⁴ Soil Association (2005) *Pesticide use on organic farms in the UK*. Soil Association
- ²⁵ Duchin F (2005) 'Sustainable Consumption of food. A framework for analyzing scenarios about changes in diets.' *Journal of Industrial Ecology*, 9, 1/2, 99-113; p105
- ²⁶ Smith A et al (2005) *The validity of food miles as an indicator of sustainable development: final report*. Prepared by AEA Technology for the Department for Environment, Food and Rural Affairs, July 2005; p95
- ²⁷ Smith A et al (2005) *The validity of food miles as an indicator of sustainable development: final report*. Prepared by AEA Technology for the Department for Environment, Food and Rural Affairs, July 2005; p33
- ²⁸ Pretty J N, Ball A S, Lang T, Morison J I L (2005) 'Farm costs and food miles: An assessment of the full cost of the UK weekly food basket.' *Food Policy*, 30, 1, 1-20
- ²⁹ Smith A et al (2005) *The validity of food miles as an indicator of sustainable development: final report*. Prepared by AEA Technology for the Department for Environment, Food and Rural Affairs, July 2005; p32
- ³⁰ WHO (2003) Diet, nutrition and the prevention of chronic diseases: report of a joint WHO/FAO expert consultation. WHO technical report series, 916; p140
- ³¹ Gold M (2004) *The global benefits of eating less meat*. Compassion in World Farming Trust; p38
- ³² Environment Agency (2005) *State of the Environment 2005*. Environment Agency
- ³³ Tukker A, Huppes G, Guinee J, Heijungs R, de Koning A, van Oers L, Suh S, Geerken T, Van Holderbeke M, Jansen B and Nielsen P (2005) *Environmental impact of products (EIPRO): Analysis of the life cycle environmental impacts related to the total final consumption of the EU25*, European Science and Technology Observatory and Institute for Prospective Technological studies, full draft report, April 2005; p92
- ³⁴ Tukker A, Huppes G, Guinee J, Heijungs R, de Koning A, van Oers L, Suh S, Geerken T, Van Holderbeke M, Jansen B and Nielsen P (2005) *Environmental impact of products (EIPRO): Analysis of the life cycle environmental impacts related to the total final consumption of the EU25*, European Science and Technology Observatory and Institute for Prospective Technological studies, full draft report, April 2005; p105
- ³⁵ Foreword by Porritt J to Gold M (2004) *The global benefits of eating less meat*. Compassion in World Farming Trust

- ³⁶ Gold M (2004) *The global benefits of eating less meat*. Compassion in World Farming Trust; p38
- ³⁷ Based on Tables 16 and 17 in MAFF (2000) *Energy use in organic farming systems*. Ministry of agriculture, fisheries and food; p12
- ³⁸ CAST (Council for Agricultural Science and Technology), 1999. *Contribution of Animal Agriculture to Meeting Global Human Food Demand*. Cited in Gold (2004) CIWF report; p23
- ³⁹ *Examining the environmental burden and resources use in the production of agricultural and horticultural commodities*. Commissioned by Defra. Provisional findings from PowerPoint presentations, Silsoe Research Institute, www.sri.bbsrc.ac.uk
- ⁴⁰ Carlsson-Kanyama A, Pipping Ekstro M, Shanahan H (2003) 'Food and life cycle energy inputs: consequences of diet and ways to increase efficiency', *Ecological Economics*, 44, 2-3, 293-307
- ⁴¹ Carlsson-Kanyama A, Pipping Ekstro M, Shanahan H (2003) 'Food and life cycle energy inputs: consequences of diet and ways to increase efficiency', *Ecological Economics*, 44, 2-3, 293-307
- ⁴² Porrit J (2005) *Fishing for good*. Forum for the future
- ⁴³ Royal Commission on Environmental Pollution (2004) *Turning the Tide. Addressing the Impact of Fisheries on the Marine Environment*. Summary of the Royal Commission on Environmental Pollution's report; p6
- ⁴⁴ FAO (2004) *State of the World Fisheries and Aquaculture 2004*. Food and Agriculture Organization of the United Nations; p32
- ⁴⁵ Personal communication, FAO press office, 14.9.05
- ⁴⁶ PM Strategy Unit cited in Royal Commission on Environmental Pollution (2004) *Turning the Tide. Addressing the Impact of Fisheries on the Marine Environment*. Summary of the Royal Commission on Environmental Pollution's report
- ⁴⁷ Foster C (2005) *Fish Consumption and Production: The Sustainability Challenge*. National Consumer Council
- ⁴⁸ <http://www.wwf.org.uk/researcher/issues/livingseas/0000000020.asp>
- ⁴⁹ Royal Commission on Environmental Pollution (2004) *Turning the Tide. Addressing the Impact of Fisheries on the Marine Environment*. Summary of the Royal Commission on Environmental Pollution's report; p5
- ⁵⁰ Royal Commission on Environmental Pollution (2004) *Turning the Tide. Addressing the Impact of Fisheries on the Marine Environment*. Summary of the Royal Commission on Environmental Pollution's report
- ⁵¹ Royal Commission on Environmental Pollution (2004) *Turning the Tide. Addressing the Impact of Fisheries on the Marine Environment*. Summary of the Royal Commission on Environmental Pollution's report; p4
- ⁵² <http://www.wwf.org.uk/researcher/issues/livingseas/0000000020.asp>
- ⁵³ FAO (2005) *State of the World Fisheries and Aquaculture*; p14
- ⁵⁴ Fishmeal Information Network (2004) *Fishmeal from sustainable stocks*. Factsheet
- ⁵⁵ Royal Commission on Environmental Pollution (2004) *Turning the Tide. Addressing the Impact of Fisheries on the Marine Environment*; p125
- ⁵⁶ Foster C (2005) *Fish Consumption and Production: The Sustainability Challenge*. National Consumer Council; p12
- ⁵⁷ Foster C (2005) *Fish Consumption and Production: The Sustainability Challenge*. National Consumer Council; p12
- ⁵⁸ Royal Commission on Environmental Pollution (2004) *Turning the Tide. Addressing the Impact of Fisheries on the Marine Environment*; p141

- ⁵⁹ McGinnity P, Prodohol P, Ferguson A, Hynes R, O Maoileidigh N, Baker N, Cotter D, O'Hea B, Cooke D, Rogan D, Taggart J and Cross T (2003) 'Fitness reduction and potential extinction of wild populations of Atlantic salmon, *Salmo salar*, as a result of interactions with escaped farm salmon', *Proc. R. Soc. Lond*, 270, 2443-2450
- ⁶⁰ http://www.msc.org/html/content_462.htm
- ⁶¹ Howes R (2005) *Reversing the decline in global fish stocks: Eco-labelling and the Marine Stewardship Council*. www.sustdev.org
- ⁶² Howes R (2005) *Reversing the decline in global fish stocks: Eco-labelling and the Marine Stewardship Council*. www.sustdev.org
- ⁶³ Marine Conservation Society (2004) *Pocket good fish guide*. MSC. Also www.fishonline.org
- ⁶⁴ Wielgosz B (2005) *Like shooting fish is a barrel. The collapse of worlds fisheries in the 21st century and what we can do about it*. Sustain, the alliance for better food and farming
- ⁶⁵ Crawley H (2005) *Eating well at school. Nutritional and practical guidelines*. Caroline Walker Trust and National Heart Forum
- ⁶⁶ Crawley H (2005) *Eating well at school. Nutritional and practical guidelines*. Caroline Walker Trust and National Heart Forum; p46
- ⁶⁷ Rayner M, 'The burden of food-related ill-health in the UK', unpublished paper, 2002 (www.sustainweb.org). To be published shortly by Journal of Epidemiology and Community Health)
- ⁶⁸ WHO (2003) *Diet, nutrition and the prevention of chronic diseases: report of a joint WHO/FAO expert consultation*. WHO technical report series, 916; p13
- ⁶⁹ Irz X, Shankar B and Srinivasan C S (2003) *Dietary Recommendations in the Report of a Joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases (WHO Technical Report Series 916, 2003): Potential Impact on Consumption, Production and Trade of Selected Food Products*.
- ⁷⁰ Health Education Authority (1999) *Nutritional aspects of the development of cancer. A briefing paper prepared for the Health Education Authority*. Health Education Authority; p49
- ⁷¹ National Diet & Nutrition Survey - Young people aged 4-18 (Gregory J, Lowe S, Bates CJ, Prentice A, Jackson, L, Smithers G, Wenlock E & Farron M, The Stationery Office, 2000)
- ⁷² <http://www.eatwell.gov.uk/healthydiet/nutritionessentials/fruitandveg>
- ⁷³ Crawley H (2005) *Eating well at school. Nutritional and practical guidelines*. Caroline Walker Trust & National Heart Forum; p34
- ⁷⁴ <http://www.eatwell.gov.uk/healthydiet/nutritionessentials/fruitandveg>
- ⁷⁵ Crawley H (2005) *Eating well at school. Nutritional and practical guidelines*. Caroline Walker Trust and National Heart Forum; p58
- ⁷⁶ British Nutrition Foundation (1997) *Diet and Heart Disease: A round table of factors. 2nd edition*. Ed. Ashwell, M - cited on http://www.meatmatters.com/sections/health/meat_and_fat.php
- ⁷⁷ <http://www.eatwell.gov.uk/healthydiet/nutritionessentials/meat>
- ⁷⁸ National Diet and Nutrition Survey cited in Crawley H (2005) *Nutrient-based standards for school food. A summary of the standards and recommendations of the Caroline Walker Trust and the National Heart Forum*. Caroline Walker Trust; p31
- ⁷⁹ <http://www.eatwell.gov.uk/healthydiet/nutritionessentials/vitaminsandminerals/iron>
- ⁸⁰ Crawley H (2005) *Eating well at school. Nutritional and practical guidelines*. Caroline Walker Trust and National Heart Forum; p35

- ⁸¹ Crawley H (2005) *Eating well at school. Nutritional and practical guidelines*. Caroline Walker Trust and National Heart Forum; p26
- ⁸² Personal communication, Helen Crawley, CWT.
- ⁸³ Warren, H., Scollan, N.D., Hallett, K., Enser, M., Richardson, I, Nute, G and Wood, J.D (2002) 'The effects of breed and diet on the lipid composition and meat quality of bovine muscle.' *Proceedings of the 48th International Congress of Meat Science and Technology*, Rome
- ⁸⁴ R & H Hall (1999) 'The quality of meat from beef cattle: is it influenced by diet?', *R&H Hall Technical bulletin* issue No. 4 ~ 1999. http://www.rhhall.ie/print/issue4_1999.html
- ⁸⁵ Source: Enser et al 1996, cited in a presentation from Meat & Livestock Commission.
- ⁸⁶ Heaton S (2002) *Organic Farming, Food Quality and Human Health*. Soil Association, 2002
- ⁸⁷ Wang YQ, Thomas B, Ghebremeskel K and Crawford MA (2005) *Changes in Protein and Fat Balance of Some Primary Foods: Implications for Obesity?* Institute of Brain Chemistry and Human Nutrition (IBCHN), London Metropolitan University
- ⁸⁸ FSA (2005) *UK target nutrient specifications for manufactured products used in school meals*. 26 July 2005. www.food.gov.uk
- ⁸⁹ FSA (2005) *UK target nutrient specifications for manufactured products used in school meals*. 26 July 2005. www.food.gov.uk
- ⁹⁰ <http://www.eatwell.gov.uk/healthydiet/nutritionessentials/milkanddairy>
- ⁹¹ Crawley H (2005) *Eating well at school. Nutritional and practical guidelines*. Caroline Walker Trust and National Heart Forum; p32
- ⁹² Dr Mike Rayner *pers comm* September 2005
- ⁹³ Chief Medical Officer (1988) *health advice for Peanut Allergy* http://archive.food.gov.uk/dept_health/archive/cot/peanut.htm
- ⁹⁴ Helen Crawley, *pers comm*, October 2005.
- ⁹⁵ <http://www.eatwell.gov.uk/healthydiet/nutritionessentials/fishandshellfish>
- ⁹⁶ Royal Commission on Environmental Pollution (2004) *Turning the Tide. Addressing the Impact of Fisheries on the Marine Environment*; p42
- ⁹⁷ <http://www.eatwell.gov.uk/healthydiet/nutritionessentials/fishandshellfish>
- ⁹⁸ Royal Commission on Environmental Pollution (2004) *Turning the Tide. Addressing the Impact of Fisheries on the Marine Environment*; p45
- ⁹⁹ <http://www.eatwell.gov.uk/healthydiet/nutritionessentials/fishandshellfish>
- ¹⁰⁰ Scientific Advisory Committee on Nutrition and Committee on Toxicity (2004) *Advice on fish consumption: benefits and risks*. The Stationery Office; 1.32
- ¹⁰¹ Cited in *The Guardian*, ' Cancer warning over Scottish farmed salmon.' Brown P and Scott K, 9 January 2004
- ¹⁰² www.eatwell.gov.uk/healthydiet/nutritionessentials/fatssugarssalt/fats
- ¹⁰³ Crawley H (2005) *Eating well at school. Nutritional and practical guidelines*. Caroline Walker Trust and National Heart Forum; p23
- ¹⁰⁴ Turning the Tables: Transforming School Food - Recommendations for the Development and Implementation of Revised School Lunch Standards. <http://www.dfes.gov.uk/consultations/>.
- ¹⁰⁵ Turning the Tables: Transforming School Food - Recommendations for the Development and Implementation of Revised School Lunch Standards. <http://www.dfes.gov.uk/consultations/>.
- ¹⁰⁶ MAFF (2000) *Energy use in organic farming systems*. Ministry of agriculture, fisheries and food
- ¹⁰⁷ Carlsson-Kanyama A, Pipping Ekstro M, Shanahan H (2003) 'Food and life cycle energy inputs: consequences of diet and ways to increase efficiency', *Ecological Economics*; 1-15

- ¹⁰⁸ Carlsson-Kanyama A, Pipping Ekstro M, Shanahan H (2003) 'Food and life cycle energy inputs: consequences of diet and ways to increase efficiency', *Ecological Economics*, 44, 2-3, 293-307
- ¹⁰⁹ Based on Table 16 and 17, MAFF (2000) *Energy use in organic farming systems*. Ministry of agriculture, fisheries and food; p12
- ¹¹⁰ Health Education Authority (1999) *Nutritional aspects of the development of cancer. A briefing paper prepared for the Health Education Authority*. Health Education Authority; p49
- ¹¹¹ Pretty J N, Ball A S, Lang T, Morison J I L (2005) 'Farm costs and food miles: An assessment of the full cost of the UK weekly food basket.' *Food Policy*, 30, 1, 1-20
- ¹¹² http://www.sri.bbsrc.ac.uk/science/bmag/LCA_Workshop_12_July_05.htm
- ¹¹³ Times Online, 'It's time to slug it out'. 23 July 2005
- ¹¹⁴ Soil Association (2003) *Food for Life*. Healthy, local, organic school meals. Soil Association
- ¹¹⁵ ADAS (2005) *Food and Drink in Yorkshire and the Humber: Regional Supply Chains Mapping Study - Draft Final Report. Annex 3: Case Studies*. Prepared by ADAS for Yorkshire Forward
- ¹¹⁶ Warren, H., Scollan, N.D., Hallett, K., Enser, M., Richardson, I, Nute, G and Wood, J.D (2002) 'The effects of breed and diet on the lipid composition and meat quality of bovine muscle.' *Proceedings of the 48th International Congress of Meat Science and Technology*, Rome; R & H Hall (1999) 'The quality of meat from beef cattle: is it influenced by diet?', *R&H Hall Technical bulletin* issue No. 4 ~ 1999. http://www.rhall.ie/print/issue4_1999.html
- ¹¹⁷ Crawley H (2005) *Eating well at school. Nutritional and practical guidelines*. Caroline Walker Trust and National Heart Forum; p46
- ¹¹⁸ Bath and North East Somerset Council, personal communication August 2005.
- ¹¹⁹ The Labour Party (2005) *Rural communities - forward not back*. The Labour Party <http://www.defra.gov.uk/farm/sustain/procurement/sellingpublic.htm>
- ¹²⁰ <http://www.defra.gov.uk/farm/sustain/procurement/sellingpublic.htm>
- ¹²¹ GreenPlanet.net (2004) Roma, Nuovo Appalto per le Bio-Mense. Corriere della Sera, 9 April.
- ¹²² Municipio II di Roma (2005) Se mangi a Scuola. www.municipioroma2.it/municipioperte_index_3col.php
- ¹²³ Department for Education and School Policy, City of Rome, personal communication 2005
- ¹²⁴ Department for Education and School Policy, City of Rome, personal communication 2005
- ¹²⁵ Department for Education and School Policy, City of Rome, personal communication 2005
- ¹²⁶ Migliozzi, A. (2005) Inglese a Tavola nelle Mense per 'Copiare' i Menu Romani. Il Messaggero, 20 Agosto 2005
- ¹²⁷ ANSA (2005) E' Boom per Mense Bio nelle Scuole. Press Release, 15 July
- ¹²⁸ Morgan, K. And Sonnino, R. (2005) Catering for Sustainability: The Creative procurement of School Meals in Italy and the UK. The Regeneration Institute, Cardiff University
- ¹²⁹ Food Standards Agency (2005) School-based Food Initiatives. www.food.gov.uk
- ¹³⁰ ADAS (2005) *Food and Drink in Yorkshire and the Humber: Regional Supply Chains Mapping Study - Draft Final Report. Annex 3: Case Studies*. Prepared by ADAS for Yorkshire Forward