Contribution of school meals to climate change and water use in England

Valeria De Laurentiis, Dexter Hunt and Christopher Rogers

University of Birmingham

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Introduction

- Potential of dietary change to reduce the environmental impact of food consumption

- Identification of sustainable diets (low impact, healthy and culturally acceptable) – e.g. Mediterranean Diet, New Nordic Diet, Low Lands Diet

Ruini et al. (2014)
Introduction

How to promote a cultural shift to sustainable diets?

- Taxation
- Information tools and campaigns
- Dietary guidelines
- Leverage of public procurement
Objectives

• Assess the environmental impact of school meals in England

• Identify potential strategies to reduce GHG emissions and water use via menu change
Primary school food survey (PSFS)

- Survey carried out by the School Food Trust in 2009, across 136 schools in England
- 1556 unique dishes and were recorded (weight, name, nutritional info)
- For 5 days, all food items chosen by 10 pupils per school were recorded with leftover weights

110 ingredients
Collection of secondary data from LCA and WF studies of values of carbon and water footprint for a list of 110 food items.

Water Footprint: values taken from work published by the Water Footprint Network.

Carbon Footprint: almost 800 values across 323 sources.

- **Selection criteria:** GWP$_{100}$, mass FU, system boundaries clearly defined.
- **Homogenization:** FU=1 kg of product, system boundaries form cradle to gate.
- **Statistical analysis:** for each food item - average, min and max value of CF.
Ingredients sourced from the UK, whenever possible

- Refrigerated truck 250 km

If not, main supplier to the UK was chosen as country of origin (e.g. oranges from Spain)

- Combination of cargo ship and refrigerated truck (calculating an average transport route and distance from the country of origin to the UK)

Emission coefficients taken from DECC (2015)

\[ CF = CF_{production} + CF_{transport} \]
Primary school food survey: 1556 unique food codes (dishes)

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>%</th>
<th>Cooked weight (g)</th>
<th>Raw weight (g)</th>
<th>CF [gCO2/kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pasta</td>
<td>40%</td>
<td>120</td>
<td>50</td>
<td>453</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>30%</td>
<td>90</td>
<td>72</td>
<td>386</td>
</tr>
<tr>
<td>Beef</td>
<td>20%</td>
<td>60</td>
<td>85</td>
<td>26693</td>
</tr>
<tr>
<td>Onions</td>
<td>10%</td>
<td>30</td>
<td>37</td>
<td>211</td>
</tr>
</tbody>
</table>

\[
\sum_{n=1}^{N} RW_n \times w \times CF_n = CF_{food\ code}
\]

w = 1.1 (waste coefficient)
Primary school food survey: 1556 unique food codes (dishes)

Spag. Bolognese
Av. weight: 300 g

CF = 2680 gCO$_2$e
WF = 810 L
Primary school food survey: 6690 school meals (different combinations of food codes)

- CF = 2680 gCO$_{2e}$
  - WF = 810 L
- CF = 81 gCO$_{2e}$
  - WF = 42 L
- CF = 95 gCO$_{2e}$
  - WF = 91 L
- CF = 142 gCO$_{2e}$
  - WF = 117 L

Total CF and WF of each school meal
Average CF and WF of a school meal

1.02 kgCO$_{2e}$ and 0.55 m$^3$

Total CF and WF of primary school meals in England in one year

319 million kgCO$_{2e}$ and 172 million m$^3$
Average CF and WF of a school meal

1.02 kgCO$_2$e and 0.55 m$^3$

Total CF and WF of primary school meals in England in one year

319 million kgCO$_2$e and 172 million m$^3$

Twice the annual emissions from Oxford’s cars!
Results

Distribution of weight

Contribution to CF

Contribution to WF

- Meat items
- Fish items
- Vegetarian items
- Vegan items
Results

Distribution of weight

- Poultry dishes: 30%
- Pork dishes: 22%
- Lamb dishes: 13%
- Beef dishes: 35%

Contribution to CF

- Poultry dishes: 13%
- Pork dishes: 14%
- Lamb dishes: 22%
- Beef dishes: 52%
Results of the PSFS:

- **Savoury Vegetarian Items**: 28%
- **Non-Chocolate Desserts**: 60%
- **Chocolate Desserts**: 12%

Contribution to WF:

- **Savoury Vegetarian Items**: 16%
- **Non-Chocolate Desserts**: 33%
- **Chocolate Desserts**: 52%
PSFS recorded weight and content of plate leftovers for each school meal on average. 20% of the CF and WF are associated with food which is not eaten.
Lessons learned

• Hotspots:
  – Meat dishes (51% of total CF, 36% of total WF) – in particular red meat (38% of total CF)
  – Chocolate desserts (23% total WF)

• Reduction measures:
  – Introduce more vegetarian main dishes
  – Partially replace meat with other sources of protein in a recipe
  – Decrease red meat dishes in favour of white meat
  – Serve less chocolate desserts and more fruit salads
  – Introduce strategies to reduce plate waste
Conclusions

• Menu changes in primary schools can have an impact on the GHG emissions and water use caused by UK consumption

• Changes need to take into account nutrition and affordability

• Hotspot screening analyses are useful to identify priority actions

• Same method can be applied to other sectors (hospitals, university canteens, prisons...)

University of Birmingham
Thank you for your attention!

VXD317@bham.ac.uk

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References


- School Food Trust, Primary School Food Survey, 2009 [computer file]. Colchester, UK.

