Macroeconomic valuation: Food waste in the FEW nexus of the UK

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Economic effects of food waste reduction: Macro-level

Production ➔ Supply ➔ Purchase ➔ Flows to Households ➔ Generate Income

Sources: Pictures are copied from the internet for illustration.
Economic effects of food waste reduction: Macro-level

Production → Supply → Food

Generate

Food → Purchase → Income

Flows to Households

Sources: Pictures are copied from the internet for illustration.
## Input and output across production sectors

<table>
<thead>
<tr>
<th>Region i</th>
<th>Agriculture</th>
<th>Forestry</th>
<th>Fisheries</th>
<th>Electricity</th>
<th>…</th>
<th>Services</th>
<th>Consum</th>
<th>Invest</th>
<th>Total demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor</td>
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<tr>
<td>Capital</td>
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<tr>
<td>Natural res.</td>
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<tr>
<td>Total output</td>
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<td></td>
</tr>
</tbody>
</table>

**Returns/income to productive resources**

**Income = Expenditure**

**Final demand for consumption and investments**
Key sectors in UK IOT2015

• **Food products**
  – 01 Products of agriculture, hunting and related services
  – 03 Fish and other fishing products; aquaculture products; support services to fishing
  – 09 Mining support services
  – 10.1 Preserved meat and meat products
  – 10.2-3 Processed and preserved fish, crustaceans, molluscs, fruit and vegetables
  – 10.4 Vegetable and animal oils and fats
  – 10.5 Dairy products
  – 10.6 Grain mill products, starches and starch products
  – 10.7 Bakery and farinaceous products
  – 10.8 Other food products
  – 10.9 Prepared animal feeds
  – 11.01-6 and 12 Alcoholic beverages & Tobacco products
  – 11.07 Soft drinks
  – 56 Food and beverage serving services
Key sectors in UK IOT2015

• Energy products

  – 05 Coal and lignite
  – 06&07 Extraction Of Crude Petroleum And Natural Gas & Mining Of Metal Ores
  – 19 Coke and refined petroleum products
  – 35.1 Electricity, transmission and distribution
  – 35.2-3 Gas; distribution of gaseous fuels through mains; steam and air conditioning supply
Key sectors in UK IOT2015

• Water products
  – 36 Natural water; water treatment and supply services
  – 37 Sewerage services; sewage sludge

• Waste
  – 38 Waste collection, treatment and disposal services; materials recovery services
  – 39 Remediation services and other waste management services
  – 38g Waste collection, treatment and disposal services; materials recovery services non-market
In 2012, the wasted food (or editable part of food waste) costs £12.5 bn, accounting for 14% of total spending on food and drinks by households of £92 bn according to the Family Food datasets (WRAP, 2013, p. 60).

The wasted food costs were adjusted upward as £14 bn for 2012 according to WRAP (2018), meaning the share in total spending becomes 15.2%.

The WRAP has set a target to reduce wasted food by 20% in 2025 compared to the 2015 level (WRAP, 2019). If we assume the households follow the reduction target, then the reduced share in total spending of households would be 15.2%*20%= 3.04%, all of which are assumed for domestic produced food.
• Total expenditure of households on food amounts to £33.4 bn (IOT2015, ONS2018): products of agriculture (01), fish (03), and produced food (10) and drinks (11) by households.

• The 3.04% reduction of food expenditure is equivalent to £1001 million, which is the maximum savings of income.

• This income savings correspond to domestic income (value added or sectoral GDP) of £756 million and imported goods of £245 million (based on IOT2015)

• If the reduced income from production activities is considered, then the income savings could be as low as £245 million, which can be for other consumptions

• How to spend the saved income? Scenarios!!

A rough calculation: The example of UK households

9 %

Wasted food
(15%~£5bn)

Target 2025
to reduce by
20%

£1bn

Total food spending
(100%~£33.4bn)

Domestic income: £755 MM
Imports: £245 MM
A rough calculation: The example of UK households

- If food services are included, then
- Total expenditure of households on food amounts to £111.3 bn (IOT2015, ONS2018).
- The 3.04% reduction of food expenditure is equivalent to £3340 million, which is the maximum savings of income.
- This income savings correspond to domestic income (value added or sectoral GDP) of £2722 million and imported goods of £618 million (based on IOT2015)
- If the reduced income from production activities is considered, then the income savings could be as low as £618 million, which can be for other consumptions
- How to spend the saved income? Scenarios!!
If food services are included, then the main reduction is from food sectors. Values from energy and water sectors are relatively small. Imports: about 18% as total, but for energy (38%) and water (5%).

<table>
<thead>
<tr>
<th>Domestic Income</th>
<th>imports</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>food</td>
<td>1874.3</td>
<td>423.9</td>
</tr>
<tr>
<td>energy</td>
<td>60.7</td>
<td>37.7</td>
</tr>
<tr>
<td>water</td>
<td>5.5</td>
<td>0.3</td>
</tr>
<tr>
<td>waste</td>
<td>3.8</td>
<td>0.7</td>
</tr>
<tr>
<td>others</td>
<td>777.9</td>
<td>154.9</td>
</tr>
<tr>
<td>Total</td>
<td>2722.2</td>
<td>617.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Domestic Income</th>
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<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>food</td>
<td>82</td>
<td>18</td>
</tr>
<tr>
<td>energy</td>
<td>62</td>
<td>38</td>
</tr>
<tr>
<td>water</td>
<td>95</td>
<td>5</td>
</tr>
<tr>
<td>waste</td>
<td>85</td>
<td>15</td>
</tr>
<tr>
<td>others</td>
<td>83</td>
<td>17</td>
</tr>
<tr>
<td>Total</td>
<td>82</td>
<td>18</td>
</tr>
</tbody>
</table>
Further extensions
• Distinguish private and public consumers and investors

• Cost to implement the reduction of wasted foods
• Cost of restructure of labour force and capital to maintain income

• Social and environmental values
  – Carbon emissions
  – Savings of water, energy, and land use for production
  – Savings of food waste disposal and treatment (Phosphorus?)
  – Any others?

• What can the Bristol ULL contribute to the analysis?
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