Food waste in SA - The Magnitude, Cost and Impacts

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Competency Area: Solutions for a Green Economy
Operating Unit: Natural Resources and the Environment

SAAFoST Lecture 27 March 2014
Motivation for the research

• Food is treated as a disposable commodity
• Almost one in seven people globally are estimated to be undernourished
• Food waste has a triple negative effect:
  • It impacts on food security
  • Resources used in food production and distribution are wasted
  • Environmental impacts throughout the supply chain

It is estimated that globally between 30-50% of food produced is wasted before reaching consumers
Motivation for the research

• Availability of water is the limiting factor to agricultural production in South Africa (DAFF, 2012)
  • South Africa is a water scarce country (30th driest in the world)
  • Irrigated agriculture is the largest user of water in South Africa
  • 62% of available water is used for irrigation
  • 30% of crops is produced through irrigation
  • About 90% of fruit, vegetables and wine are produced under irrigation
  • 46% of South African agricultural production is for export markets (2009)
South African Context

- South Africa’s average rainfall of 450 mm per annum
- Global average of 860 mm per year
- 62% of water used for irrigation
- Primary agriculture contributes about 3% of GDP

Source: CSIR, 2010
South Africa’s agri-food exports (% by volume)(2009)

Source: International Trade Centre, 2010
Destinations of South African agri-foods (2009) (% by volume)

Source: International Trade Centre, 2010
### Estimated waste percentage for each commodity group in each step of the food supply chain for sub-Saharan Africa

<table>
<thead>
<tr>
<th>Commodity group</th>
<th>Agricultural production</th>
<th>Post harvest handling and storage</th>
<th>Processing and packaging</th>
<th>Distribution</th>
<th>Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals</td>
<td>6.0%</td>
<td>8.0%</td>
<td>3.5%</td>
<td>2.0%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Roots and Tubers</td>
<td>14.0%</td>
<td>18.0%</td>
<td>15.0%</td>
<td>5.0%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Oil seeds &amp; Pulses</td>
<td>12.0%</td>
<td>8.0%</td>
<td>8.0%</td>
<td>2.0%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Fruits and Vegetables</td>
<td>10.0%</td>
<td>9.0%</td>
<td>25.0%</td>
<td>17.0%</td>
<td>5.0%</td>
</tr>
<tr>
<td>Meat</td>
<td>15.0%</td>
<td>0.7%</td>
<td>5.0%</td>
<td>7.0%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Fish and Seafood</td>
<td>5.7%</td>
<td>6.0%</td>
<td>9.0%</td>
<td>15.0%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Milk</td>
<td>6.0%</td>
<td>11.0%</td>
<td>0.1%</td>
<td>10.0%</td>
<td>0.1%</td>
</tr>
</tbody>
</table>
## Calculated wastage based on SA production statistics

<table>
<thead>
<tr>
<th>Commodity group</th>
<th>Production 2007-2009 (ave) (1000 t)</th>
<th>Waste (1000 Tonnes)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Agricultural production</td>
<td>Post harvest handling and storage</td>
</tr>
<tr>
<td>Cereals</td>
<td>13154</td>
<td>789.3</td>
<td>989</td>
</tr>
<tr>
<td>Roots and Tubers</td>
<td>2017</td>
<td>282.4</td>
<td>312</td>
</tr>
<tr>
<td>Oil seeds &amp; Pulses</td>
<td>453</td>
<td>54.4</td>
<td>32</td>
</tr>
<tr>
<td>Fruits and Vegetables</td>
<td>8230</td>
<td>823.0</td>
<td>667</td>
</tr>
<tr>
<td>Meat</td>
<td>1587</td>
<td>238.1</td>
<td>9</td>
</tr>
<tr>
<td>Fish and Seafood</td>
<td>224</td>
<td>12.8</td>
<td>13</td>
</tr>
<tr>
<td>Milk</td>
<td>3119</td>
<td>187.1</td>
<td>323</td>
</tr>
<tr>
<td>Total per stage of the food supply chain</td>
<td>28785</td>
<td>2387.0</td>
<td>2344.6</td>
</tr>
</tbody>
</table>
Magnitude of food waste in SA

Food waste from local production only
= 9.04 million tonnes per annum
= 31.4% of average annual production

Food waste from local production + imports – exports
= 10.2 million tonnes per annum
Cost of food waste in SA

Total cost throughout the value chain = R 61.5 billion
Equivalent to 2.1% of South Africa’s GDP

- Costs are purely based on market prices
- Disposal costs are not included in this total
Cost of food waste in each stage of the value chain for each commodity in SA
Relative contribution of each commodity group to total food waste generated in SA

- Fruits and Vegetables: 44%
- Meat: 7%
- Milk: 8%
- Cereals: 26%
- Roots and Tubers: 9%
- Fish: 2%
- Oil seeds & Pulses: 4%

% of Waste

- Fruits and Vegetables: 36%
- Meat: 28%
- Milk: 13%
- Cereals: 7%
- Fish and Seafood: 6%
- Roots and Tubers: 5%
- Oil seeds & Pulses: 5%

% of Cost
Relative contribution of each stage in value chain to total food waste generated in SA

% of Waste

- Agricultural production: 26%
- Post harvest handling & storage: 24%
- Distribution & packaging: 20%
- Processing: 25%
- Consumption: 5%

% of Cost

- Agricultural production: 20%
- Post harvest handling & storage: 13%
- Processing & packaging: 25%
- Distribution: 32%
- Consumption: 10%
Calculating water loss per commodity group

<table>
<thead>
<tr>
<th>Commodity group</th>
<th>Agricultural production (1000 t)*</th>
<th>Total food waste (1000 t)*</th>
<th>Water use (m³/t)*</th>
<th>Water loss (million m³)</th>
<th>Contribution to water loss (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals</td>
<td>13140</td>
<td>2605</td>
<td>1600</td>
<td>4168</td>
<td>32.0</td>
</tr>
<tr>
<td>Roots and Tubers</td>
<td>2015</td>
<td>955</td>
<td>400</td>
<td>382</td>
<td>3.0</td>
</tr>
<tr>
<td>Oil seeds &amp; Pulses</td>
<td>1198</td>
<td>346</td>
<td>3024</td>
<td>1046</td>
<td>8.0</td>
</tr>
<tr>
<td>Fruits and Vegetables</td>
<td>8463</td>
<td>4491</td>
<td>685</td>
<td>3076</td>
<td>24.0</td>
</tr>
<tr>
<td>Meat</td>
<td>2549</td>
<td>753</td>
<td>4427</td>
<td>3334</td>
<td>26.0</td>
</tr>
<tr>
<td>Fish and Seafood</td>
<td>673</td>
<td>225</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Milk</td>
<td>3102</td>
<td>831</td>
<td>1020</td>
<td>848</td>
<td>7.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>31140</strong></td>
<td><strong>10205</strong></td>
<td><strong>1288</strong></td>
<td><strong>12854</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

* Nahman and de Lange, 2013  
+ Mekonnen and Hoekstra, 2013
Water use during production vs water loss resulting from food waste

% Contribution to water use per commodity

% Contribution to water loss per commodity food waste

- Cereals
- Roots and Tubers
- Oil seeds & Pulses
- Fruits and Vegetables
- Meat
- Fish and Seafood
- Milk

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Percentage contribution per commodity group in South Africa

Relative contribution per commodity type

- **Waste**
- **Cost**
- **Water use**

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<th>Cost</th>
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<td>6</td>
<td>8</td>
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<td>42</td>
<td>24</td>
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Water loss due to food waste compared to the water footprint of crop production in South Africa

![Bar chart showing the comparison between agricultural production and food waste in terms of water footprint (use) in South Africa. The chart uses different colors to represent grey, blue, and green water footprints.](chart.png)
Conclusions

- The water footprint of a commodity is determined by local factors at point of production.
- The water loss as a result of food waste is determined by local factors at point of consumption/wastage.
- The total water loss as a result of food waste in South Africa is equivalent to nearly 22% of the total water footprint.
- The cost impacts of fruit and vegetables are the highest (42%) followed by meat (32%).
- Water loss as a result of wasting cereals is the highest (32%) followed by meat (26%).
- Water use with respect to agricultural production and associated food waste appears to be highly inefficient – possible area of intervention.
Responding to the problem

- Massive reductions in food wasted across the food supply chain is needed
- Interventions should focus on:
  1. Processing and packaging of fruit and vegetables
  2. Distribution of fruit and vegetables
  3. Production and distribution of meat
- Alternative waste treatment technologies must be considered
  - Energy production
  - Composting
  - Source of valuable functional compounds such as antioxidants
Thank You

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