

Quantifying food losses in South Africa and the costs of household food waste

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BACKGROUND

Food waste is problematic for a number of reasons, including the loss of a potentially valuable food source or resource for use in other processes (e.g. energy generation or composting); wasted resources and emissions in the food supply chain; and the environmental impacts of disposing of organic waste to landfill. However, attempts to quantify food waste are constrained by limited data, particularly in developing countries. This research attempted to quantify food waste (including both pre-consumer food losses and post-consumer food waste) in South Africa (Oelofse and Nahman, 2012). In addition, it estimated the economic costs of household food waste (Nahman et al., 2012).

METHOD

Food losses at each stage of the food supply chain in South Africa were calculated based on two sources of information:

- The proportion of food entering each stage of the food supply chain that is lost or wasted, for various food commodity groups in sub-Saharan Africa (Gustavsson et al., 2011) (**Table 1**)
- Production figures for each corresponding commodity group in South Africa, from the Food and Agriculture Organisation of the United Nations (**Table 2**).

Table 1: Estimated/assumed waste percentage for each commodity group in each step of the food supply chain for sub-Saharan Africa (Gustavsson et al., 2011)

Commodity group	Agricultural production	Post harvest handling and storage	Processing and packaging	Distribution	Consumption
Cereals	6.0%	8.0%	3.5%	2.0%	1.0%
Roots and Tubers	14.0%	18.0%	15.0%	5.0%	2.0%
Oil seeds & Pulses	12.0%	8.0%	8.0%	2.0%	1.0%
Fruits and Vegetables	10.0%	9.0%	25.0%	17.0%	5.0%
Meat	15.0%	0.7%	5.0%	7.0%	2.0%
Fish and Seafood	5.7%	6.0%	9.0%	15.0%	2.0%
Milk	6.0%	11.0%	0.1%	10.0%	0.1%

Table 2: Food production per commodity group in South Africa (FAOSTAT, 2010; 2010a)

Commodity group	Production (1 000 tonnes)			
	2007	2008	2009	2007 – 2009 (Average)
Cereals	9 514	15 363	14 586	13 154
Roots and Tubers	2 023	2 147	1 882	2 017
Oil seeds and Pulses	261	535	563	453
Fruits and Vegetables	8 109	8 417	8 162	8 230
Meat	2 138	2 179	444	1 587
Fish and Seafood	673	No data	No data	224
Milk	3 066	3 200	3 091	3 119
Total Production	25 785	31 841	28 729	28 785

Table 3: Percentage (by mass) of food waste in the overall household waste stream in three South African cities (Nahman et al., 2012)

City	Source	Waste category	Low income (%)	Middle income (%)	High income (%)
Cape Town	Dept of Environmental Affairs and Tourism (1999)	Kitchen waste	8.16	8.97	4.76
Johannesburg	Jarrod Ball and Associates (2001)	Putrescibles	19.42	10.63	7.31
Rustenburg	Silbernagl (2001)	Putrescibles	26.67	13.33	16.67
Average			18.08	10.98	9.58

Table 4: Calculated average per annum food waste generation figures for South Africa (2007–2009) (Oelofse and Nahman, 2012)

Commodity group	Production 2007-2009 (average) (1000 tonnes)	Waste (1 000 Tonnes)						Total waste per commodity group
		Agricultural production	Post harvest handling and storage	Processing and packaging	Distribution	Pre-consumer waste	Consumption	
Cereals	13 154	789.3	989	398	220	2 396	108	2 504
Roots and Tubers	2 017	282.4	312	213	60	869	23	892
Oil seeds & Pulses	453	54.4	32	29	7	122	3	126
Fruits and Vegetables	8 230	823.0	667	1 685	859	4 034	210	4 244
Meat	1 587	238.1	9	67	89	404	24	427
Fish and Seafood	224	12.8	13	18	27	71	3	74
Milk	3 119	187.1	323	3	261	773	2	775
Total per stage of the food supply chain	28 785	2 387.0	2 344.6	2 413.4	1 523.0	8 668.2	372.7	9 040.9

Table 5: Quantities of household food waste generated annually in South Africa (per income group) (Nahman et al., 2012)

Income level	Domestic waste (tonnes/annum)	Food waste (%)	Food waste (tonnes/annum)
Low	5 600 116	18.08	1 012 688
Middle	2 929 639	10.98	321 577
High	1 093 352	9.58	104 713
Total	9 623 106		1 438 977

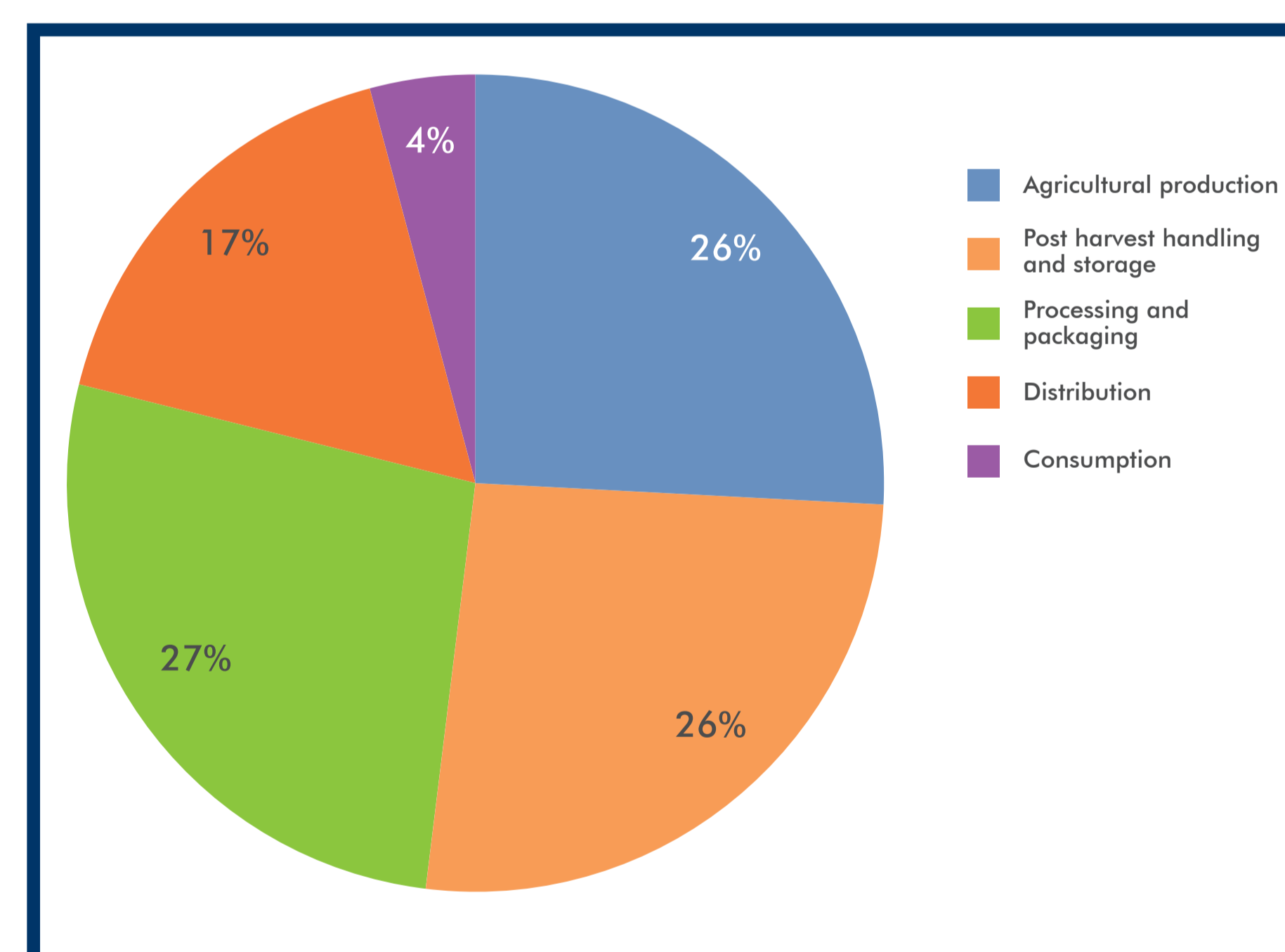


Figure 1: Percentage contribution of each step in the food supply chain to total average food waste in South Africa (Oelofse and Nahman, 2012).

Food waste at each step of the food supply chain for each commodity group in South Africa was calculated based on the percentages outlined in **Table 1**. Since production figures for the different commodities vary year-on-year, the average production figures over a three-year period (2007–2009) (last column of **Table 2**) were used (Oelofse and Nahman, 2012). The food loss percentages reported in **Table 1** (Gustavsson et al., 2011) refer to percentages (by weight) of food entering each stage. Therefore, it was assumed that the amount of food entering each stage equals the amount of food entering the previous stage, less food losses at that stage. The cost of household food waste in South Africa was then estimated. This household food waste was first quantified, based on the few available waste characterisation studies in South Africa (**Table 3**) (Nahman et al., 2012). The economic cost was then estimated; based on the monetary value (using a weighted average market price) per tonne of wasted food (edible portion only); as well as the financial and 'external' (social and environmental) costs per tonne for disposal of food waste to landfill (based on Nahman 2011). The rationale for using a weighted average market price was that, in the case of the edible portion of food waste (81% according to WRAP, 2008), this reflects the potential value of the food that is going to waste.

RESULTS AND DISCUSSION

The preliminary estimate for total food waste generated in South Africa is in the order of 9.04 million tonnes per annum (Oelofse and Nahman, 2012) (**Table 4**) (although this is likely to be an underestimate). This amounts to 31.4% of average annual agricultural production (28.79 million tonnes per annum) (**Table 2**). The percentage contribution of each step in the food supply chain to overall food waste is illustrated in **Figure 1**.

In **Table 5**, for each income group, the averages of the proportions of food waste in Cape Town, Johannesburg and Rustenburg are applied to the tonnages of household waste generated nationally per income group. The result indicates that

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in the order of 1.4 million tonnes of food is wasted by South African households (Nahman et al., 2012). On average, this equates to 14.95% of domestic waste, which is slightly lower than in other countries for which comparable estimates could be found (Nahman et al., 2012). Applying the weighted average market price per tonne of wasted food (edible portion only) across the three income groups (R15 499, R23 053 and R29 201 per tonne for low, middle and high income respectively), plus the financial and external costs of disposal to landfill (R240 per tonne and R111 per tonne respectively, according to Nahman, 2011), the total cost to society of household food waste is R21.7 billion per annum or 0.82% of South Africa's annual GDP (Nahman et al., 2012).

CONCLUSIONS

The preliminary results suggest that at least 9.04 million tonnes of food produced each year in South Africa is wasted. This is likely to be an underestimate of total food waste in South Africa, as the calculations did not account for food imports, among other factors. The associated costs to society are significant. When considering that only 4.1% of food waste in South Africa is attributed to post-consumer food waste (Oelofse and Nahman, 2012), and that the estimated cost of household food waste to society equates to 0.82% of annual South African GDP (R21.7 billion per annum) (Nahman et al., 2012), it is clear that there is a need for further research to quantify and value food waste along the food supply chain. A more accurate assessment of food waste could facilitate better waste management practices towards reduced environmental impacts and increased food security in South Africa.

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