



Book review: Waste, uncovering the global food scandal*

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Over 6.5 billion people inhabit Earth and roughly 1 billion regularly go hungry. The challenge to feed the world's inhabitants is jeopardizing its soil, water and climate. Could curbing food waste significantly reduce world hunger and environmental pressures? Tristram Stuart argues cogently that it could. *Waste* details the global food-waste scandal and delves into questions such as how much food is available globally? How much is needed and used and how much is wasted?

It is perhaps best to start with how much food is needed and how much is available, although Stuart does not discuss these topics directly until Chapters 11 and 12. Minimum daily energy requirements (MDER) are between 1900 and 2000 kcal per person per day, based on populations in western countries (p. 174). Supplying a population with 130% of its MDER is believed to provide an adequate buffer against food shortages and anything significantly above 130% has a good chance of ending up as waste (p. 191). Thus, around 2600 kcal per person per day is deemed adequate.

Stuart cites UN Food and Agriculture Organization data from 1990 that 4600 kcal per capita per day of edible food are actually harvested globally and food production trends suggest that this amount has increased despite a parallel increase in human population. Plenty of food is produced, but on average only 2000 kcal per capita per day are consumed (p. 190). Thus, 2600 kcal of edible food per capita per day never reach human mouths and beg for an accounting.

Understanding sources of food waste can be key in recouping it and *Waste* details how 2600 kcal is lost from "field to fork". Losses due to poor harvesting and storage techniques account for 600 kcal, with more loss occurring in underdeveloped than developed nations. Another 800 kcal is lost in distribution, retail, institutions and households, with higher levels of retail and consumer waste in developed countries. Feeding grains and pulses to livestock uses 1700 kcal, with 500 kcal recovered as meat and dairy products. Livestock converts many forages inedible by humans into meat as a source of high quality protein. Nonetheless, the 1700 kcal

comes disproportionately from relatively few countries where meat and dairy production and consumption are significant (pp. 300, 304) and in which protein consumption exceeds daily requirements.

Of course, an average consumption of 2000 kcal per capita per day masks gross differences between affluent and poor nations. The US has 3900 kcal available per capita per day (roughly 200% of MDER), where obesity and directly related diseases have become epidemic. Other affluent nation MDERs range from 150 to 190%. Incredibly, between 30% and 50% of food in Europe and America is thrown out by consumers, supermarkets and food manufacturers — enough to feed the world's hungry at least twice over (pp. 83, 186). In underdeveloped nations, lack of technology and infrastructure lead to depressed production and to postharvest losses that chronically keep MDERs below 130%. Altogether, if countries kept food supplies at 130% MDER and poor nations greatly reduced postharvest losses, then 33% of global food supplies could be saved — enough to nourish 3 billion people (p. 193).

Determining the caloric value of food waste highlights the enormity of the problem, but Stuart also shows that wasting food exacerbates world hunger and environmental degradation. Demand for food includes that which is used and that which is wasted. Thus, more waste, greater demand. Responses to greater demand are increased price or increased supply. Elevated prices benefit a minority in the food-production chain and people in developed countries can cut back on food, shift disposable income to food, or do both. However, higher prices disproportionately curtail buying power of 3 billion people who live on \$2 per day or less and so more go hungry. Putting food in waste bins is equivalent to taking it off the world market and out of the mouths of the starving (p. 82).

Wasting food leads to unnecessary food production and extends agriculture's incursion into what was previously forests, wetlands and natural grasslands. For instance, it takes 8.3 million hectares to produce meat and dairy products *wasted* in UK households and by consumers, retailers and food services in the U.S.—an amount equal to that deforested in Brazil in a year and land that could have produced grains to directly feed people (p. 96).

Greater demand for food increases the environmental footprint associated with its production, which requires more use of agrichemicals such as fertilizers and pesticides. Additionally, more

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energy is required to make agrichemicals and to run tractors and other equipment for food production. Stuart notes that nearly one tenth of the West's greenhouse gas emissions are generated in growing food that will never be eaten. Moreover, most food waste in developed countries is buried in landfills and decomposes into various components, including methane, a greenhouse gas over 20 times more potent than carbon dioxide.

Environmental effects are also felt in the oceans. An increasing proportion of fish harvests consists of undesirable, yet perfectly edible species that are discarded to satisfy increased demand for preferred species of dwindling supply. European studies show that the majority of fish caught are thrown back and 70 to 80 % of these will perish in the process (pp. 124-125).

The book is chock full of suggested solutions. Chapters 13 through 17 discuss the general theme of "reduce, reuse and recycle", addressing specific solutions such as using food waste for biogas production. Japan, Taiwan and South Korea are hailed as models for curbing food waste. South Korea, for example, recycles 98% of food waste mainly through composting and as feed for livestock. Chapter 18 outlines an "Action Plan to Utrophia," a place of good (i.e. moral and socially conscious) food consumption. This includes local, individual acts such as eating less, limiting purchases of unnecessary food, using what is purchased, and practicing freeganism (p. 5, consumption of free discarded food). Stuart advocates eating less meat and dairy products, but he also asserts that animals are underutilized as food because of cultural undesirability of offal and certain types of fish. However, he underplays the fact that much offal, though not always consumed directly, is put into myriad meat products such as frankfurters, sausages and lunchmeats.

Some solutions are controversial, such as cutting agricultural subsidies on one hand and calling for more government regulation of food waste on the other. Sometimes, there are competing interests of public health versus food-waste reduction. For example, Stuart devotes considerable text (pp. 60-67, 288) to debating standards of best-before, sell-by and use-by dates that produce vast quantities of food waste versus protecting public health from risks associated with outdated food. He also argues for feeding more food waste to livestock, showing how this diverts food from pointlessly ending up in landfills and consequently shifts grains for human consumption that were otherwise bound for livestock. *Waste* also touches on the food-versus-fuel debate, arguing that increased demand for crop-based biofuels has raised food prices and decreased land available for food production.

Claims about food waste are only as good as the statistics behind them and coming up with solid statistics on food waste was itself a major challenge. Nevertheless, Stuart provides plenty of statistics on food waste by documenting some of the few published studies on it, piecing together and extrapolating from crude unanalyzed figures, interviewing people in food-supply and reclamation chains and even collecting some of his own raw data from various sources (including rubbish bins). Because few comprehensive studies on food waste are available, Stuart has extrapolated some figures and pieced together statistics from disparate sources. Approximations and estimates are often applied to data. The logic behind his calculations seems generally sound, though sometimes protracted.

Statistics are presented throughout the text and in an appendix containing graphs and tables (pp. 300-314). There are also notes

(pp. 315-382), an extensive bibliography (pp. 383-431) and 16 pages of superb color photos to illustrate sources of food waste and how solutions are being applied. However, individual graphs and tables and pages on which they appear (pp. 300-308) are not numbered. Explanatory notes follow (pp. 309-312), but it was difficult to associate graphs and tables with specific text where they are discussed.

Some statistics are derived from retailers, environmental organizations and other interest groups or based on results not subjected to scrutiny of scientific peer review (p. 187). Stuart has generally been cautious in relying on such data and occasionally points out how such figures may have been either inflated or understated by groups to suit their particular interests (e.g., pp. 111, 212-213). At times, sources differ substantially in estimates of food waste (e.g. municipal food-waste estimates by USDA Economic Research Service vs. U.S. Environmental Protection Agency, p. 189). Sometimes, the only statistics available are from 10 to 30 years ago and Stuart generally concedes such shortcomings (e.g., pp. 185, 190).

The book repeatedly acknowledges need for more systematic quantification of food waste (pp. 43, 111, 189, 212-213, etc.) and urges supermarkets, suppliers, governments, watchdog groups and researchers to develop better systems for accurately recording food waste. *Waste* will inform scientists of the scale of food waste and its impact globally. Scientists will also identify ample research opportunities to accurately document food waste and to devise strategies for curbing it.