

Strategic Analysis Paper

25 November 2011

An Overview of Global Food Losses and Waste

This paper began as a series of workshop discussions hosted by Future Directions International on the subject of 'Global Food Supply and Demand to 2050.' The workshop, the fourth in the series, was attended by several eminent Australian academics and thinkers. Food losses and wastage was an area that was seen as needing more attention. Click [HERE](#) for Workshop Report Summary.*

Key points

- Almost one-third of food produced for human consumption—approximately 1.3 billion tonnes per year, which could feed the total global population of 7 billion—is either lost or wasted.
- Overall food loss primarily occurs in the production to retail phase of the food chain.
- Consumers in industrialised nations waste significantly more food than their counterparts in developing countries.
- Post-harvest losses occur mainly due to corruption and meagre infrastructure in the developing world.
- Pre-harvest losses are another major factor in the developing world, as a result of insufficient investment in biosecurity practices.
- A voluntary platform for retailers to report food waste statistics and a less over-conservative system of setting use-by dates, would aid in combating waste.
- An increasing world population, and its progressively scarce resources, make reduction in food losses and waste a key component in any strategy for a sustainable future global food supply.

Analysis

It is estimated that around 1.3 billion tonnes per year of food produced for human consumption is lost or wasted globally. This is enough to feed the present world population of around 7 billion people. Such a discrepancy presents an enormous challenge, if there is to be enough food to feed an estimated global population of 9.1 billion people by 2050. Future demographics will push higher demand for food supplies, which, in turn, intensifies the need for increasing agricultural yields that could eventually become unsustainable.

The difference between food loss and food waste is noted in *The Global Food Losses Report 2011*, commissioned by the United Nations Food and Agriculture Organization (FAO). The

former occurs as a diminishing level of edible food throughout the production, harvest, post-harvest and processing stages of the supply chain. Food waste, however, is related to retailer and consumer behaviour.

Causes

In developing countries, food losses are mainly connected to limitations in infrastructure. Examples include: investment and technical issues unfolding pre-harvest (i.e. often non-existent biosecurity in the cultivation of crops), lack of managerial competence, lack of sufficient storage or cooling facilities, inadequate packaging, uncoordinated transport networks, or simply having to cover post-harvest food stockpiles using nothing more than thin blankets. Smallholder farmers in these regions usually suffer the worst. These limitations will need to be addressed if tangible reductions in food losses are to be achieved. The losses also create a significant negative impact on the livelihoods of these farmers, as well as their low-income consumers, who have to bear the cost of increased food prices in poverty-stricken environments.

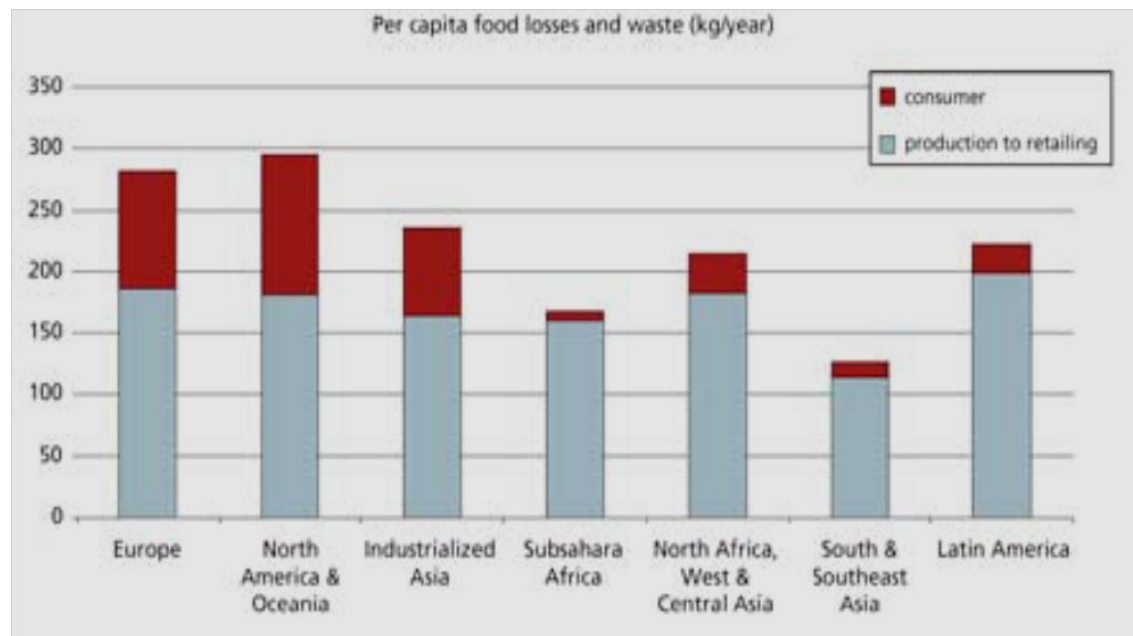
Pervasive corruption in the supply chain is another major issue for the developing world. Supply being siphoned off in places where food security is routinely compromised, is one element. The extreme cases include: Somalia, with its warlords; or nations like Cambodia, where corruption is so widespread that staffers of the local World Food Programme were implicated in rice fraud during a period of drought in 2005. Indirectly, political leadership in such regions, surviving by oppressive means, usually induce high levels of poverty, meaning that without a profitable consumer base for providers to sell to, little chance exists for commercial distribution of food to occur— even if those areas were not already perceived as dangerous. Instead, a dependence on food aid networks, in drought-and-poverty-stricken regions like the Horn of Africa, becomes a necessity.

The tale in industrialised nations, however, is usually one of plenty. Food production often exceeds demand, due to most farmers having the capacity to produce large quantities as a precautionary measure. This protects them against natural crop losses or retailers rejecting, and not making available for sale, 'imperfect' crops based on nutritionally-irrelevant aesthetic standards, such as discolouration or out-of-the-ordinary 'odd' sizes. A significant amount of surplus crops are sold to processors or are used as animal feed, but the lack of financial profitability in these sectors compared to the retail sector, means that most of the surplus is simply wasted. The fact that retailers are not being required to report their food waste statistics only helps the continuation of this practice.

After-purchase waste, where consumers often fail to plan their purchases properly and throw out expired food, is aided by overzealous safety standards established in line with worst case scenario projections on spoiling, chiefly out of litigious fears. Broader psychology on this front involves the general encouragement of consumers to buy more than they need as a social norm. This can be seen by retailers offering package deals and oversized microwave meals, or restaurants offering buffet-style dining and over-large portions.

The FAO's study concluded that food waste is a much larger problem in the developed world and is centred on retailers and consumers throwing out large amounts of edible food as rubbish.

Regional and Global Summary of Food Losses and Waste (Figure I)



Source: *The Global Food Losses and Waste Report 2011, FAO.org.*

Global Patterns

Examining Figure (I), it can be seen that although overall food losses are largely equivalent across the full spectrum of nations, a relatively low amount of consumer waste occurs in most developing countries. Consumer waste in industrialised nations (222 million tonnes), however, is nearly equivalent to overall food production in sub-Saharan Africa (230 million tonnes). According to the FAO study, per capita waste by consumers is between 95 and 115 kilograms a year in Europe and North America, compared to a relatively minor 6 to 11 kilograms for consumers in sub-Saharan Africa and South and Southeast Asia. Moreover, total per capita food production for human consumption in industrialised nations (900 kilograms a year), is almost double that produced in poorer regions (460 kilograms a year).

As to where the food is disappearing: in developing nations, 40 per cent of losses take place during the post-harvest and processing phases, while 25 per cent of losses happen during the pre-harvest phase; in industrialised countries, more than 40 per cent of losses occur at the retail and consumer level.

Australia

Australia is no exception to the developed world's profligacy. Over three million tonnes of food are discarded annually by households, primary industry and businesses in this country; between 20 and 25 per cent of the national food supply is wasted. Not only is the scale of

the waste staggering, but so is its cost, with consumers throwing away food worth \$5.3 billion per year. A report released by the Australia Institute, identified that this waste overwhelmingly comprises fresh food, leftovers and uneaten take-away food. About half of domestic waste is made up of spoiled food, pointing to an unappreciative, complacent food culture playing a large role in this level of wastage.

North America

Food waste in the US has progressively increased from around 30 per cent of the total food supply in 1974, to nearly 40 per cent today, boosted by an increase in waste of 50 per cent per person, according to the United States Department of Agriculture. The culture of waste and excess begins at retailers, which do not have to report waste statistics and, through corporate policy, implicitly encourage their stores to crush food at compactors to ensure that excess food cannot be further distributed or reclaimed.

Europe

Food wastage problems are similarly widespread through Europe. Throughout the continent, it is estimated by the FAO that 50 per cent of the food produced is wasted – with a best case scenario of 20 per cent in certain regions. Moreover, a report in 2010 by the European Commission found that approximately 90 million tonnes is wasted across the EU each year. The United Kingdom government brought forward a food strategy in 2009 to curtail wastage. The plan managed reductions in the order of 270,000 tonnes by March 2010, but the issue remains an entrenched one in spite of these efforts.

There is some progress being made: Norway and The Netherlands have followed the UK's lead, with the latter committing to a 25 per cent reduction in food waste by 2015; and, in October 2010, the agriculture committee of the European Parliament approved a declaration against food waste which asked for a 50 per cent reduction in food waste. Waste prevention targets, however, are yet to make their way into EU legislation. European legislation will be needed, alongside action by national and local governments, if this problem is to be tackled effectively.

Asia

India is a good example of the infrastructure-oriented struggle with food loss in developing nations. Even a fast-industrialising nation like India can face severe problems in this area. The nation loses 40 per cent of its food in transit due to a lack of cold storage, faulty electricity and poor roads – in all, more fruit and vegetables than the UK consumes and more grain than Australia produces. This is exacerbated by policy-level inadequacy, even corruption, at certain junctures. For example, employees of the Food Corporation of India (FCI) claimed, in 2011, that top-down management failures were responsible for problematic storage and huge losses in food grain supplies.¹ On a wider scale, this type of mismanagement has led to less food being produced per person today than in the 1970s. The percentage of GDP being spent on agriculture today is down to 0.6 per cent, from 1.4

¹ 'FCI employees point fingers at management for food loss', *Business Standard*, 30 July 2011.

per cent in the 1980s. China, by contrast, spends 5 per cent of its GDP on agricultural development and produced double India's output of rice in 2008.

Further afield, Asian countries with a lower socio-economic index, such as North Korea and Indonesia, can potentially lose up to 50 per cent of rice annually post-harvest, according to the FAO. Post-harvest storage and transport inadequacies mean that up to 37 per cent of rice can be lost on average throughout Asia. Moreover, rats alone are responsible for 5 to 10 per cent of pre-harvest annual rice losses in the region, enough to feed the entire 240 million population of Indonesia for a year.²

However, recent measures by the governments of growing Asian countries to industrialise food production, won't be the silver bullet they might wish for. There is as much waste in cosmopolitan South American or East Asian cities as in the West. A complementary anti-waste philosophy must be introduced alongside the industrialisation of supply and transport infrastructure to combat long-term wastage, as Asia modernises into tomorrow's potential economic force.

Africa

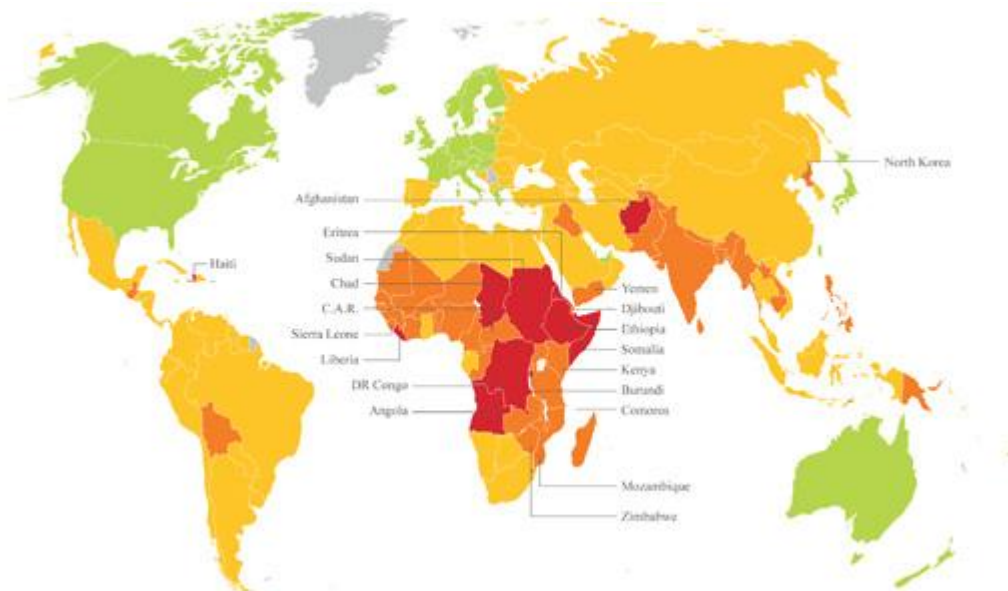
Investment in post-harvest technologies and security would significantly reduce food losses in sub-Saharan Africa. An estimated \$US4 billion (\$4.06 billion) worth of grain is lost each year, a full 10 to 20 per cent of total shipments, which could feed up to 48 million people in the region.

Pre-harvest issues should not be overlooked, though. Witchweed has already invaded 20 to 40 million hectares of arable land in sub-Saharan Africa, reducing crop yields by more than 20 per cent. Up to 30 per cent of pre-harvest losses of key crops such as maize, in countries like Kenya, are down to simple rat infestations. And between 10 and 20 per cent of post-harvest losses for a large proportion of crops in Africa (from oats to wheat to rice) is due, in part, to pests and pathogens.

A wholesale approach is required, which addresses infrastructure crises and investment gaps to fully realize agricultural productivity in the region. It is no coincidence that the worst areas of global food losses, other than wastage, coincide with the areas bearing the highest indexes of global food insecurity – markedly, the environment of sub-Saharan Africa.

² Meerburg BG, Singleton GR and Leirs H, 'The year of the rat ends— time to fight hunger!', *Pest Management Science*, 10 February 2009, vol. 65, pp. 351–352.

Global Index of Food Insecurity (Figure II)



Legend: Green/Low Risk to Yellow/Medium Risk to Orange/High Risk to Red/Very High Risk.

Source: Maplecroft, Maplecroft.org.

Agricultural technologies are another important factor at the pre-harvest stage. The adoption of technologies that have proven successful in Asia is a promising avenue. Small-scale rice-drying technology and the use of pedal threshers and rice mills have already proven to be workable in certain pockets of Africa. Governments can aid this process directly, through public infrastructure investment in key areas like roadworks, electricity and water, or indirectly by reducing costs and obstacles to private and foreign investment this can be achieved by incentives like tax breaks, deregulation or subsidies, and by supporting effective agricultural research.

Biosecurity

Despite presumptions that could be easily formed to the contrary, pre-harvest or post-harvest food losses are not exclusively developing world problems. Almost 20 per cent of Australian wheat is lost to pathogens pre-harvest; weed invasion alone costs domestic agriculture \$3.9 billion per year.

Meanwhile, in the US, invading pest species cause losses adding up to almost \$US120 billion (\$122.4 billion) per year. Biosecurity is a truly global platform because no-one is unaffected. To cite a few examples: the fungal pathogen black sigatoka has the potential to decimate world banana yields by up to 50 per cent³; generic weeds have the potential to reduce

³ Cook D, 'Without biosecurity, higher crop yields mean better-fed rodents', *The Conversation*, 12 April 2011.

global wheat yields by almost 30 per cent⁴; and the rice blast fungus kills off enough rice to feed 60 million people per year⁵.

Historically, though, the development of agricultural technology has been focussed on increasing yield growth through breeding, cloning techniques and genetic modification. Over the past 50 years, this has resulted in an increase in the overall quantity of cereal crops produced, but the rate of improvement in yield growth has been in decline for the last 25 years. Wheat yield growth, in particular, has only been at one per cent per annum since 1970 in the developed world.

In light of this, controlling pathogens could lead to previously unforeseen rewards. CSIRO Research Economist David Cook estimates that slowing the spread of the Ug99 fungus in the world's top 15 wheat producing nations would generate annual benefits of over \$4.5 billion or, put another way, an annual increase of 46.8 million tonnes in the global wheat harvest.⁶ This is the equivalent of a seven per cent increase in average yield growth, or the equivalent of gains made in over a decade's worth of crop breeding and engineering.

As Dr Paul De Barro, senior principal research scientist of CSIRO Ecosystem Sciences, noted in FDI's Global Food Demand and Supply to 2050 Workshop ([Workshop Report](#)):

“Even if you got a 10 per cent increase in yield, that can be discounted by pre-harvest losses of 30-40 per cent. By the time it gets to the consumer you have lost a further proportion that could amount to another 20-40 per cent of the potential yield gains ... It is not just about growing more, it is about keeping more of what we grow and getting it to the people that eat it. If you total that up you probably don't need that much more water or land. It is just making better use of what you have got.”

Biosecurity does not have to mean the application of high-tech science, either. Simple improvements can be compatible with, and even the cornerstone of, this strategy. Rodent- and insect-proofed facilities, established hygiene protocols, and maintaining the integrity of transport infrastructure, can all play important roles in preventing food loss, especially in the developing world, where the investment for such practices can be insufficient or non-existent.

Conclusion

A solution to First World food waste problems will have to involve changes in consumer behaviour and massive shifts in procedure by primary industry (such as food processors, etc.) and retailers. Since it can be observed that starvation could be solved, in a perfect world, simply through the re-structuring of equitable food distribution, these are not the idle concerns they can sometimes appear to be, amidst the wasteful food culture of developed nations. The provision of a voluntary registration platform, overseen by the FAO and international equivalents of the Australian Chamber of Commerce and Industry, for retailers, hospitality outlets and other stores to report food waste statistics, would be a step in the right direction to reversing this kind of culture. Tort reform might also be necessary, to ease

⁴ Oerke EC, 'Crop Losses to Pests', *Journal of Agricultural Science*, 2006, vol. 144, pp. 31-43.

⁵ Ibid.

⁶ Cook D, 'Without biosecurity'.

litigious fears and convince providers that some regression of their over-conservative setting of use-by dates is possible. Every available path must be pursued to stem the tide of waste, but it almost appears that the psychological tendency to waste resources would be harder to fix than the food loss difficulties of developing countries. The practical problems, such as finding ways of improving storage and transport, pre-harvest infrastructure and domestic management, have concrete solutions, after all.

Beyond that, the level of lost yields due to pre-harvest or post-harvest issues – almost amounting to half of all food production in certain cases– makes the harnessing of biosecurity practices crucial in the fight to contain food losses, especially in the developing world. The potential for a biosecurity paradigm shift is impressive, but translating the full practical import of this potential to policymakers and the aid community has proven difficult. Next to the scientific marvels of genetic modification or plant breeding design, the evolution of trading practices and application of storage or transport technologies, can seem less significant. However, to meet the challenge of constructing a sustainable food supply future, it must be ingrained into policymakers that, alongside addressing issues of waste, maintaining the health and security of the food supply chain is an important tool in this campaign.

This challenge is not merely significant, meeting it is essential.

By Tim Thomas

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***Workshop Attendees**

All roundtables

- Major General John Hartley AO (Retd), CEO and Institute Director, Future Directions International, Roundtable Chairman.
- Alyson Clarke, FDI Executive Officer.
- Gary Kleyn, Manager, FDI Global Food and Water Crises Research Programme.

Sydney

- Dr Paul De Barro, Senior Principal Research Scientist, CSIRO Ecosystem Sciences.
- Prof Bill Bellotti, Vincent Fairfax Chair in Sustainable Agriculture and Rural Development, School of Natural Sciences, University of Western Sydney.
- Dr Monika Barthwal-Datta, Food Security Programme Leader, Centre for International Security Studies, University of Sydney.
- Colin Richardson, Adjunct Professor, Centre for International Security Studies, University of Sydney.
- Ben Shepherd, PhD Candidate in the Food Security Programme, University of Sydney Centre for International Security Studies.

Melbourne

- Robin Batterham, Kernot Professor of Engineering, School of Engineering, Melbourne University, former Australian Chief Scientist.
- Patrick Francis, editor of the Australian Farm Journal, which is part of Rural Press Limited.
- Jennifer Hawkins, Nuffield Scholar.
- CMDR Warren Kemp RFD RANR, President, Royal United Services Institute of Victoria.
- Andrew Lang, farmer near Lismore and also manages 130ha of farm forestry woodlots on the family's 2200ha wool, wood and cropping property. Chairman of SMARTtimbers Cooperative, one of Australia's leading farm forestry organisations. Board member of the World Bioenergy Association, representing the Australasia-Oceania region.
- Sue Marriott, Director, Secretariat for International Landcare Inc.

Canberra

- Neil Andrews, Principal Economist, ABARES.
- Dr Matt Barton, Strategic Horizon, Defence Intelligence Organisation.
- Dr Denis Blight, Executive Director, Crawford Fund.
- Julian Cribb, Science Alert, author of "The Coming Famine".
- Don McDonagh, Outcomes Australia.
- Dr Simon Hearn, Principal Advisor, Australian Centre for International Agricultural Research.
- Simon Winter, Senior Research Manager, Global Challenges Program, Rural Industries Research and Development Corporation (RIRDC).

Any opinions or views expressed in this paper are those of the individual author, unless stated to be those of Future Directions International.

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