

# Toolkit

*Reducing  
the Food Waste Footprint*



# Toolkit

*Reducing  
the Food Waste Footprint*



The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations (FAO) concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The mention of specific companies or products of manufacturers, whether or not these have been patented, does not imply that these have been endorsed or recommended by FAO in preference to others of a similar nature that are not mentioned.

The views expressed in this information product are those of the author(s) and do not necessarily reflect the views or policies of FAO.

ISBN 978-92-5-107741-2 (print)  
E-ISBN 978-92-5-107743-6 (PDF)

© FAO 2013

FAO encourages the use, reproduction and dissemination of material in this information product. Except where otherwise indicated, material may be copied, downloaded and printed for private study, research and teaching purposes, or for use in non-commercial products or services, provided that appropriate acknowledgement of FAO as the source and copyright holder is given and that FAO's endorsement of users' views, products or services is not implied in any way.

All requests for translation and adaptation rights, and for resale and other commercial use rights should be made via [www.fao.org/contact-us/licence-request](http://www.fao.org/contact-us/licence-request) or addressed to [copyright@fao.org](mailto:copyright@fao.org).

FAO information products are available on the FAO website ([www.fao.org/publications](http://www.fao.org/publications)) and can be purchased through [publications-sales@fao.org](mailto:publications-sales@fao.org).

### **About this document**

This Toolkit was produced as part of the Food Wastage Footprint project of the Natural Resources Management and Environment Department, managed by Nadia El-Hage Scialabba and funded by Germany. Mathilde Iweins and Gaia Pisani undertook the best-practices research, by building on the on-line database to which many website users contributed and FAOLEX. Special thanks go to Noemi Nemes, Tristram Stuart, Clément Tostivin and Alessandra Tomassi who contributed with ideas and data, as well as to Nancy Hart and Francesca Lucci for editing and designing the Toolkit.

# Abbreviations

<b>ABP</b>	Animal By-Product
<b>AD</b>	Anaerobic Digestion
<b>AIIFP</b>	African Alliance for Improved Food Processing
<b>ARTI</b>	Appropriate Rural Technology Institute
<b>BSE</b>	Bovine Spongiform Encephalopathy
<b>BSI PAS</b>	British Standards Institution Publicly Available Specification
<b>BSW</b>	Biodegradable Solid Waste
<b>CAA</b>	Consumer Affairs Agency
<b>CDM</b>	Clean Development Mechanism
<b>DEFRA</b>	Department for Environment, Food and Rural Affairs
<b>EC</b>	European Commission
<b>EP</b>	European Parliament
<b>EPA</b>	Environmental Protection Agency
<b>ETS</b>	Emission Trading Scheme
<b>EU</b>	European Union
<b>FWF</b>	Food Wastage Footprint
<b>GAIA</b>	Global Alliance for Incinerator Alternatives
<b>GHG</b>	Greenhouse Gas
<b>GSCOP</b>	Grocery Supply Code of Practice
<b>IFAD</b>	International Fund for Agricultural Development
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>IVC</b>	In-Vessel Composting
<b>LA</b>	Local Authorities

<b>LATS</b>	Landfill Allowance Trading Scheme
<b>MSW</b>	Municipal Solid Waste
<b>NAMA</b>	Nationally Appropriate Mitigation Action
<b>NGO</b>	Non-Governmental Organization
<b>OECD</b>	Organization for Economic Cooperation and Development
<b>OFT</b>	Office of Fair Trading
<b>OIE</b>	International Office of Epizootics
<b>PAP</b>	Processed Animal Protein
<b>RFID</b>	Radio Frequency Identification System
<b>SPS</b>	Sanitary and Phytosanitary Measures
<b>TMR</b>	Total Mixed Rations
<b>TSE</b>	Transmissible Spongiform Encephalopathy
<b>UK</b>	United kingdom
<b>UN</b>	United Nations
<b>UNEP</b>	United Nations Environment Programme
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>USA</b>	United States of America
<b>SAGCOT</b>	Southern Agricultural Growth Corridor for Tanzania
<b>UTP</b>	Unfair Trading Practices
<b>WFD</b>	Waste Framework Directive
<b>WHO</b>	World Health Organization
<b>WRAP</b>	Waste and Resource Action Programme
<b>WTO</b>	World Trade Organization

## Introduction

One-third of all food produced in the world is lost or wasted from farm to fork, according to estimates calculated by FAO (2011). This wastage not only has an enormous negative impact on the global economy and food availability, it also has major environmental impacts. The direct economic cost of food wastage of agricultural products (excluding fish and seafood), based on producer prices only, is about 750 billion USD, equivalent to the GDP of Switzerland.

The aim of the Toolkit is to showcase concrete examples of good practices for food loss and waste reduction, while pointing to information sources, guidelines and pledges favoring food wastage reduction. The inspirational examples featured throughout this Toolkit demonstrate that everyone, from individual households and producers, through governments, to large food industries, can make choices that will ultimately lead to sustainable consumption and production patterns, and thus, a better world for all.

**Food loss:** refers to a decrease in mass (dry matter quantity) or nutritional value (quality) of food that was originally intended for human consumption. These losses are mainly caused by inefficiencies in the food supply chains, such as poor infrastructure and logistics, lack of technology, insufficient skills, knowledge and management capacity of supply chain actors and lack of access to markets. In addition, natural disasters play a role.

**Food waste:** refers to food appropriate for human consumption being discarded, whether or not after it is kept beyond its expiry date or left to spoil. Often this is because food has spoiled but it can be for other reasons such as oversupply due to markets, or individual consumer shopping/eating habits.

**Food wastage:** refers to any food lost by deterioration or discard. Thus, the term “wastage” encompasses both food loss and food waste.

In recent years, food waste has become a widely-recognized global shame. A number of campaign groups have coalesced around the issue, pushing it further up the public agenda, while various governments have adopted policies to address the problem and companies have made pledges to reduce food wastage and, in some cases, measurable improvements have been made. However, while legislation and policies have been generated in many countries to incentivize better food waste management, such as through avoidance of landfill, this should be distinguished from pre-waste solutions aiming to actually reduce food wastage.



Although initiatives to reduce food wastage certainly deserve support, there is also chance that some may have unintended social, economic and/or environmental impacts. One aim of this Toolkit is to present different best practices and tips for reducing food wastage, looking specifically at the often overlooked cost of wastage in terms of natural resource use and, in turn, the environmental benefits of reducing that wastage.

The Toolkit classifies food waste reduction strategies according to the categories of the inverted 'food waste pyramid', which represents the most to the least environmentally friendly categories (Figure 1).

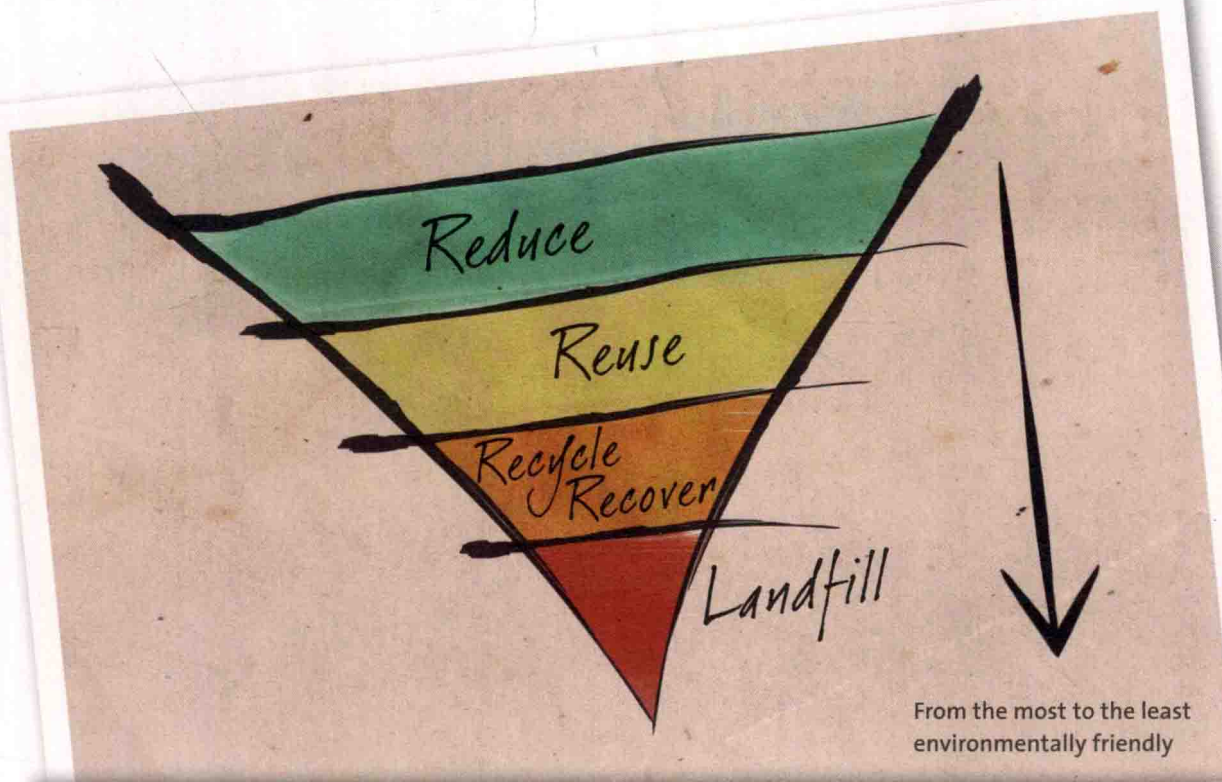


Figure 1. Food wastage pyramid on its head

**Reduce.** As the impact of food production on natural resources is enormous and increases while the food progresses on the food value chain, reducing food wastage is by far the best way of reducing the waste of natural resources. For example, if the supply-demand balance can be better adjusted on the front end, it means not using the natural resources to produce the food in the first place, thus avoiding pressure on natural resources, or using them for other purposes.

**Reuse.** In the event a food surplus is produced, the best option is to keep it in the human food chain. This may call for finding secondary markets or donating it to feed vulnerable members of society, so that it conserves its original purpose and prevents the use of additional resources to grow more food. If the food is not fit for human consumption, the next best option is to divert it for livestock feed, thus conserving resources that would otherwise be used to produce commercial feedstuff.

**Recycle/Recover.** The main recycling and recovering options are by-product recycling, anaerobic digestion, composting, incineration with energy recovery and rendering. All these options allow energy or nutrients to be recovered, thus representing a significant advantage over landfill.

**Landfill.** Landfilling organic waste causes emission of gases such as methane (a very potent greenhouse gas) and potentially pollutes soil and water, let alone odour and other societal nuisance. Landfills should be the last resort option for food waste management, especially in a context of increased land scarcity for Earth citizens.

This toolkit explains each of these categories in more detail, along with good practices around the world.



# Content

List of Boxes	7
Abbreviations	9
Introduction	11

## *Reduce* 14

Definition	15
Impact of food wastage on natural resources and implications for food wastage reduction	15
Main impact of food wastage on natural resources	15
The impact of food wastage on natural resources increases along the food supply chain	17
The food wastage hotspots along the supply chain vary geographically	17
The production of some products consumes more natural resources than others	17
Challenges of natural resources savings from reduction of food wastage	19
Tips for reducing food wastage	20
Raising awareness about food wastage	20
Developing communication campaigns	21
Promoting food wastage audits	22
Improving communication along the supply chain to match demand and supply of food	25
Improving organization within institutions	25
Improving communication between the different stakeholders in the supply chain	26
Developing improved food harvest, storage, processing, transportation and retailing processes	28
Improving harvest techniques and post-harvest storage	29
Improving processing techniques	31
Improving packaging	32
Improving transportation	33
Improving retailing	35
Improving quantity planning for food services	37
Improving consumption habits	39
Implementing legislation to lower food wastage	41
Implementing policy frameworks and strategies to reduce harvest and post-harvest losses	42
Implementing legislation to prevent and reduce food wastage	43
Revising regulation on 'best-before' and 'use-by' dates	47
Revising regulation on aesthetic requirements for fruit and vegetables	49
Regulating unfair practices in the retail supply chain	50

## Reuse

52

Definition

53

Impact on natural resources

53

Reuse vs Reduce

53

Reuse vs Recycle

53

Tips for reusing food wastage

55

Developing markets for products which wouldn't have stayed in the food chain otherwise

55

Gleaning unharvested produce

55

Developing markets for products rejected by retailers but still good to be consumed

57

Redistributing food to the ones in need

59

Feeding to livestock food not fit for human consumption

63

## Recycle / Recover

68

Definition

69

Impact on natural resources

69

Tips for food wastage recycling and recovering

69

Recreating food from by-products and food waste

74

Anaerobic digestion

76

Composting

78

In-vessel composting

81

Home composting

82

Incineration with energy recovery

83

Rendering

85

## Landfill (burying or dumping): last resort option

86

Impact on natural resources

87

The landfilling dilemma

89

New regulations and market-based instruments can drive changes

89

Conclusion

93

References and Further Reading

96

**Annex** *Guidelines and pledges favouring food wastage reduction* (inserted into the back cover)

# List of Boxes

<b>Box 1:</b>	Love Food Hate Waste (UK)	20
<b>Box 2:</b>	"Think Before You Waste" campaign (Abu Dhabi)	21
<b>Box 3:</b>	"Feeding the 5000" building the global movement against food waste (UK)	21
<b>Box 4:</b>	Schools competing to reduce food waste in canteens (UK)	22
<b>Box 5:</b>	Automated food waste tracking system (USA)	23
<b>Box 6:</b>	Joining forces to efficiently reduce food wastage (UK)	23
<b>Box 7:</b>	"Wise Up on Waste" Toolkit	23
<b>Box 8:</b>	Reducing post-harvest losses and improving smallholders' income from cassava (Cameroon)	24
<b>Box 9:</b>	Improving access to retail with centralized dairy collection centers (Zambia)	24
<b>Box 10:</b>	The Courtauld Commitment (UK)	26
<b>Box 11:</b>	Improving mobile phone technology to reduce food wastage along the food supply chain	26
<b>Box 12:</b>	Improved rice bag protects stored rice from moisture, pests and rats and keeps rice seeds viable (Philippines)	28
<b>Box 13:</b>	Solar drying saves children and the environment (West Africa)	29
<b>Box 14:</b>	Best harvesting practices for farmers (Sub-Saharan Africa)	29
<b>Box 15:</b>	Improvement of food storage facilities and promotion of the use of post-harvest technologies (Gambia)	30
<b>Box 16:</b>	The African Alliance for Improved Food Processing (Eastern Africa)	31
<b>Box 17:</b>	Improved food industry processing to generate less waste	31
<b>Box 18:</b>	New packaging could keep fruit and vegetables fresher for days longer (UK)	32
<b>Box 19:</b>	Integrated planning for agri-supply chain efficiency improvement (Tanzania)	33
<b>Box 20:</b>	Promoting short supply chains (EU)	33
<b>Box 21:</b>	Retailers sizing the close to expiry date opportunity	35
<b>Box 22:</b>	"Stop and Shop" saved US\$100 million by reducing the amount of food displayed (USA)	35
<b>Box 23:</b>	Freedom is about buying the amount you need at Granel (Spain)	35
<b>Box 24:</b>	Thornton's Budgens food waste avoidance measures across the board (UK)	36
<b>Box 25:</b>	Adapting portions size to consumer needs in restaurants (Portugal)	37
<b>Box 26:</b>	The Modern Pantry – You can't manage what you can't measure (UK)	37
<b>Box 27:</b>	The Cozinha Kitchen Programme (Brazil)	39
<b>Box 28:</b>	Don't bite more than you can chew (Belgium)	40
<b>Box 29:</b>	Coaching households to reduce waste (France)	40
<b>Box 30:</b>	Framework Law for Mother Earth and Holistic Development to Live Well (Bolivia)	42
<b>Box 31:</b>	The Crusade Against Hunger (Mexico)	42
<b>Box 32:</b>	Volume-based Radio Frequency Identification System (Korea)	43
<b>Box 33:</b>	Policy document on sustainable food (The Netherlands)	44
<b>Box 34:</b>	European Parliament Resolution on how to avoid food wastage	45
<b>Box 35:</b>	EU Commission Roadmap to a Resource-Efficient Europe	45
<b>Box 36:</b>	Guidance to clarify the 'one-third' rule and the meaning of 'use-by' and 'best-before' dates (Japan)	47
<b>Box 37:</b>	Reducing expiration date confusion (UK)	47
<b>Box 38:</b>	EU Regulation on marketing standards for fruit and vegetables	48
<b>Box 39:</b>	Zero Waste dinner at UNEP Headquarters (Kenya)	49

Box 40: The Grocery Code Adjudicator Bill (UK)	50
Box 41: The useful business of gleaning and preserving (USA)	56
Box 42: A farmers' market clients testimony (Australia)	58
Box 43: Eco-Cycle's zero waste farmers' market (USA)	58
Box 44: A Taste of Freedom's Fruit Screams (UK)	58
Box 45: The Bill Emerson Good Samaritan Food Donation Act 1996 (USA)	60
Box 46: Rules governing the distribution of foodstuff for social solidarity purposes (Italy)	60
Box 47: Mayor obliges supermarkets to donate their food surplus (Belgium)	60
Box 48: Annakshetra Foundation redistributing surplus food among the needy (India)	61
Box 49: Giving vulnerable Londoners a "fair share" (UK)	62
Box 50: Last Minute Market (Italy)	62
Box 51: Gleaning and improving nutrition for food banks (USA)	62
Box 52: Feeding animals with leftovers (USA)	64
Box 53: Reducing waste and recycling leftovers for animal feed (Japan)	65
Box 54: EU legislation on the use of animal by-products to feed livestock	66
Box 55: Swine Health Protection Act 1980 (USA)	66
Box 56: Ecological Solid Waste Management Act 2000 (Philippines)	70
Box 57: Promoting best treatment options for food waste diverted from landfills (EU)	71
Box 58: The Waste Management (Food Waste) Regulations 2009 (Ireland)	72
Box 59: The Mandatory Commercial Recycling Law and the Organics Recycling Package (California, USA)	72
Box 60: Mitigation strategies for the reduction of GHG emissions from food waste recycling (Malaysia)	73
Box 61: Growing mushrooms out of coffee grounds (USA)	74
Box 62: A whole new food range from by-products (USA)	75
Box 63: Bags developed from fruit waste (Malaysia)	75
Box 64: The British Standards Institution Publicly Available Specification (UK)	76
Box 65: Waste turned into biogas for household (India and Tanzania)	77
Box 66: Creating electricity and fertilizers from organic municipal waste (Thailand)	77
Box 67: Food waste gets you warm (Japan)	78
Box 68: National Organic Waste Composting Strategy 2013 (South Africa)	79
Box 69: The Food Recovery and Reuse Plan (Taiwan)	80
Box 70: Closing the loop by returning fine dining to the earth (USA)	80
Box 71: Support of public authorities to composting (USA)	82
Box 72: Terra à Terra home composting project (Portugal)	83
Box 73: Waste Regulations 2012 No. 148 (Scotland)	84
Box 74: Converting spent grain into renewable energy (UK)	85
Box 75: Reconversion of the Rio's Bay dumping site (Brazil)	91
Box 76: The Landfill Allowance Trading Scheme and the Landfill Tax (UK)	92
Box 77: The Draft Waste Classification and Management Regulations (South Africa)	92

# Toolkit

*Reducing  
the Food Waste Footprint*





[www.fao.org/nr/sustainability](http://www.fao.org/nr/sustainability)

ISBN 978-92-5-107741-2



9 789251 077412

I3342E/1/06.13

The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations (FAO) concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The mention of specific companies or products of manufacturers, whether or not these have been patented, does not imply that these have been endorsed or recommended by FAO in preference to others of a similar nature that are not mentioned.

The views expressed in this information product are those of the author(s) and do not necessarily reflect the views or policies of FAO.

ISBN 978-92-5-107741-2 (print)  
E-ISBN 978-92-5-107743-6 (PDF)

© FAO 2013

FAO encourages the use, reproduction and dissemination of material in this information product. Except where otherwise indicated, material may be copied, downloaded and printed for private study, research and teaching purposes, or for use in non-commercial products or services, provided that appropriate acknowledgement of FAO as the source and copyright holder is given and that FAO's endorsement of users' views, products or services is not implied in any way.

All requests for translation and adaptation rights, and for resale and other commercial use rights should be made via [www.fao.org/contact-us/licence-request](http://www.fao.org/contact-us/licence-request) or addressed to [copyright@fao.org](mailto:copyright@fao.org).

FAO information products are available on the FAO website ([www.fao.org/publications](http://www.fao.org/publications)) and can be purchased through [publications-sales@fao.org](mailto:publications-sales@fao.org).

### **About this document**

This Toolkit was produced as part of the Food Wastage Footprint project of the Natural Resources Management and Environment Department, managed by Nadia El-Hage Scialabba and funded by Germany. Mathilde Iweins and Gaia Pisani undertook the best-practices research, by building on the on-line database to which many website users contributed and FAOLEX. Special thanks go to Noemi Nemes, Tristram Stuart, Clément Tostivin and Alessandra Tomassi who contributed with ideas and data, as well as to Nancy Hart and Francesca Lucci for editing and designing the Toolkit.

# Toolkit

*Reducing  
the Food Waste Footprint*

# Content

List of Boxes	7
Abbreviations	9
Introduction	11

## *Reduce* 14

Definition	15
Impact of food wastage on natural resources and implications for food wastage reduction	15
Main impact of food wastage on natural resources	15
The impact of food wastage on natural resources increases along the food supply chain	17
The food wastage hotspots along the supply chain vary geographically	17
The production of some products consumes more natural resources than others	17
Challenges of natural resources savings from reduction of food wastage	19
Tips for reducing food wastage	20
Raising awareness about food wastage	20
Developing communication campaigns	21
Promoting food wastage audits	22
Improving communication along the supply chain to match demand and supply of food	25
Improving organization within institutions	25
Improving communication between the different stakeholders in the supply chain	26
Developing improved food harvest, storage, processing, transportation and retailing processes	28
Improving harvest techniques and post-harvest storage	29
Improving processing techniques	31
Improving packaging	32
Improving transportation	33
Improving retailing	35
Improving quantity planning for food services	37
Improving consumption habits	39
Implementing legislation to lower food wastage	41
Implementing policy frameworks and strategies to reduce harvest and post-harvest losses	42
Implementing legislation to prevent and reduce food wastage	43
Revising regulation on 'best-before' and 'use-by' dates	47
Revising regulation on aesthetic requirements for fruit and vegetables	49
Regulating unfair practices in the retail supply chain	50