



Australian Government

NATIONAL FOOD WASTE STRATEGY

HALVING AUSTRALIA'S FOOD WASTE BY 2030

November 2017



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Acknowledgement of Traditional Owners and Country

The Department of the Environment and Energy acknowledges the traditional owners of country throughout Australia and their continuing connection to land, sea and community.

We pay our respects to them and their cultures and to their elders both past and present.

NATIONAL FOOD WASTE STRATEGY

HALVING AUSTRALIA'S
FOOD WASTE BY 2030

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MINISTER'S FOREWORD



Food waste is a global challenge that has environmental, economic and social impacts. It costs the Australian economy about \$20 billion a year.

To address the challenge in Australia, the Government committed in 2016 to convene a food waste summit and develop a national food waste strategy to halve our food waste by 2030.

All of Australia's environment ministers have extended their support to this commitment.

Delivery of the strategy would not have been possible without the input and expertise of a diverse range of stakeholders from across industry and business, academia, not-for-profit organisations and all levels of government. Their input has helped identify areas for improvement and future focus.

I would like to thank all those who helped to develop this important document.

The Australian Government recognises the significant amount of work already underway to manage the problem of food waste in Australia. This strategy builds on and progresses this work. Through collaboration with stakeholders, we can harness new ideas and the opportunities they present.

To support the initiatives highlighted in the strategy, the Australian Government and the states and territories will provide \$1 million funding to support an independent governance body to develop an implementation plan and establish a voluntary commitment program. The Australian Government has also committed \$370,000 through its National Environment Science Program to help establish a National Food Waste Baseline and identify the best opportunities for return on investment in food waste.

These will be delivered in the next 24 months.

Solving the problem of food waste requires a commitment from all Australians. We need to identify where improvements can be made so that we can change our behaviour, improve technology and make our food system more efficient to achieve the goal of halving our food waste by 2030.

The timing is right for new innovative technologies, practices and solutions and there is a lot of scope for different approaches to be considered to support our food waste reduction goal.

The Hon Josh Frydenberg MP
Minister for the Environment and Energy



INTRODUCTION



Sustainable Development Goal 12.3

By 2030, halve per capita food waste at the retail and consumer levels and reduce food losses along the production and supply chains, including post-harvest losses.

*United Nations
General Assembly,
2015*

The *National Food Waste Strategy* provides a framework to support collective action towards halving Australia's food waste by 2030.

The strategy contributes toward global action on reducing food waste by aligning with Sustainable Development Goal 12—ensure sustainable consumption and production patterns—in the United Nations *Transforming our world: 2030 Agenda for Sustainable Development*. It also helps give effect to Australia's obligations under the United Nations Framework Convention on Climate Change in helping reduce greenhouse gas emissions, primarily through the diversion of food waste from landfill.¹

Australia has well developed and highly sophisticated approaches to the way we produce, manufacture, distribute and sell food. These approaches make for a productive and profitable food and agribusiness industry. We also have a diverse range of hospitality and food service industries, and numerous food rescue charities and community groups that help provide those in need with a meal.

Although our food systems are highly developed and produce large volumes of nutritious food, food waste is estimated to cost the Australian economy \$20 billion each year.² This has significant impacts on the environment through the wasted use of resources such as land, water, energy and fuel to produce and distribute food. When disposed of in landfill, food waste has other environmental impacts such as the production of greenhouse gas emissions.

The volume and value of wasted food presents a number of opportunities to identify where the greatest benefits can be achieved in avoiding food waste or where it can be repurposed. This approach is consistent with the idea of a circular economy where resources are kept in use for as long as possible while also minimising negative impacts.³

In Australia, there is already a significant amount of work underway to target food waste that is making a difference locally, regionally and nationally. The strategy seeks to leverage these efforts, and identifies four priority areas where improvements can be made—policy support, business improvements, market development, and behaviour change.

The first steps on our collective journey will be supported by an initial funding commitment of over \$1.3 million over 24 months. This funding will be used to support:

- an independent organisation that will develop an implementation plan and a monitoring and evaluation framework for the strategy, and coordinate priority areas of work

- ▮ a voluntary commitment program that will initially engage businesses and industries to commit to actions that reduce food waste
- ▮ a National Food Waste Baseline so that we can monitor and track progress towards our food waste reduction goal.

Implementation of the strategy to achieve our national goal of halving food waste by 2030 requires all Australians to work together and undertake meaningful action. Governments, industry, business, academia, food rescue organisations and all of the community have a role to play.

THE FOOD WASTE CHALLENGE

The management of food waste in Australia is complex because of the large number of entities engaged in producing, moving, selling, redistributing and disposing of food. For those who repurpose food waste, there are challenges in obtaining suitable feedstock and quantities and having accessible markets for the end products. The roles of the Australian, state, territory and local governments, and their various environmental and human health policy and legislative requirements, add additional layers of complexity. Households also play a large part in the issue of food waste.

Globally, about one billion tonnes of food produced for human consumption is wasted each year. This wastage costs the global economy around US\$940 billion, consumes nearly a quarter of all the water used in agriculture, and produces eight per cent of global greenhouse gas emissions.⁴

The extent of this wasted resource has prompted a number of initiatives across the world to address food waste.

Initiatives across the globe



- 1 Food and Agriculture Organization** (FAO) of the United Nations *Save Food Initiative* helps countries in Asia, the Pacific, Middle East and others identify and develop food waste reduction strategies adjusted to the specific needs of regions, sub-regions and countries.⁵
- 2 The World Resources Institute** *Food Loss and Waste Protocol*, a global accounting and reporting standard for quantifying food waste.⁶
- 3 United Kingdom** *Waste and Resources Action Programme* (WRAP) delivers consumer campaigns, and voluntary industry commitments under their *Courtauld Commitment 2025*.⁷
- 4 United States of America** *ReFED Roadmap to Reduce U.S. Food Waste*.⁸
- 5 Canada** *National Food Waste Reduction Strategy*.⁹
- 6 Netherlands** *No Waste Network*.¹⁰
- 7 France** *Ministry of Agriculture, Agrifood and Forestry in Action* public policy includes combating food waste and legislation banning supermarkets from disposing unsold food to landfill.¹¹
- 8 Denmark** *ReFood* label is a 'green seal of approval' labelling scheme recognising food and service sector businesses committed to reducing and recycling food waste.¹²

In Australia, we have a productive and profitable food and agribusiness industry that produces enough food to feed around 60 million people.¹³ This industry contributes \$59.1 billion to the economy which is equivalent to 3.6 per cent of total gross domestic product.¹⁴ Despite this success, there is an estimated \$20 billion lost to the Australian economy each year due to food waste.¹⁵

In addition to the economic costs, over 5.3 million tonnes of food that is intended for human consumption is wasted from households and the commercial and industrial sectors each year.¹⁶ This wasted food has significant impacts on the environment through the use of resources such as land, water, energy and fuel used in producing, manufacturing, packaging, distributing and preparing food.

Once disposed of in landfill, food waste contributes to greenhouse gas emissions. **It is estimated that 7.6 million tonnes of carbon dioxide equivalent will be generated from food waste disposed of in 2014–15 over the life of its decay.** Food waste also causes issues with odour, leaching, attracting vermin, and is a potential source for disease.

There are significant social costs associated with wasted food that is fit for human consumption and could be used to relieve food insecurity. One food rescue organisation reports that over 650,000 Australians seek food relief each month.¹⁷

How much food do we waste in Australia each year?

- ▶ \$20 billion is lost to the economy through food waste.
- ▶ Up to 25 per cent of all vegetables produced don't leave the farm—31 per cent of carrots that don't leave the farm equate to a cost of \$60 million.
- ▶ The total cost of agricultural food losses to farmers is \$2.84 billion.
- ▶ Households throw away 3.1 million tonnes of edible food, that's close to 17,000 grounded 747 jumbo jets.
- ▶ Food waste costs to households vary from \$2,200 to \$3,800.
- ▶ 2.2 million tonnes of food is wasted from the commercial and industrial sectors, resulting in significant waste disposal charges and lost product costs to business.¹⁸



So much can be gained from minimising food waste in Australia, including:

- increased economic opportunities, including employment, through the creation and development of new products, services and markets
- reduced costs for businesses in saved resource inputs, reduced waste management and disposal fees, and increased profits through efficiency gains
- increasing profits by converting more ingredients that are saved into a saleable product
- reduced costs for households by lowering food bills
- reduced environmental impacts such as greenhouse gas emissions
- improved food security through the effective redistribution of surplus food.

Finding the best solutions to address food waste requires a collective understanding of what we mean by food waste and where it occurs. Knowing what we already do well can help us learn and leverage from existing initiatives as well as innovate.



DEFINING FOOD WASTE

The definition of food waste varies globally depending on where food waste occurs in the food supply and consumption chain, how it is generated, and what it covers—for example, whether it includes or excludes inedible food waste.

Australia's National Food Waste Strategy adopts a broad and inclusive definition of food waste that covers:

“Food waste is a collective challenge in which all stakeholders must take action.”

Georges Plassat,
Carrefour

- solid or liquid food that is intended for human consumption and is generated across the entire supply and consumption chain
- food that does not reach the consumer, or reaches the consumer but is thrown away. This includes edible food, the parts of food that can be consumed but are disposed of, and inedible food, the parts of food that are not consumed because they are either unable to be consumed or are considered undesirable (such as seeds, bones, coffee grounds, skins, or peels)
- food that is imported into, and disposed of, in Australia
- food that is produced or manufactured for export but does not leave Australia.



In adopting the above definition, food waste excludes food that is produced or manufactured in Australia and is exported and becomes waste in another country.

This definition acknowledges that there are opportunities across the entire fresh and processed food systems to achieve improved environmental, economic and social outcomes.

WHERE WASTE OCCURS

The drivers of food waste are varied and complex, and occur at every point along the supply and consumption chain. Examples of how food waste can occur are outlined below.

“ My inspiration came from the pure joy of the technology in attacking waste, because I hate the thought of us throwing out beautiful fresh fruit and vegetables. ”

Michael Buckley,
Freeze Dried Industries

Primary production	- Product loss due to pests and diseases or weather - Stock or damaged or discarded during production, packing or handling - Fall in market prices making it unprofitable to harvest - Inability to meet contracted produce specifications, such as quality or size - Changes in consumer tastes and preferences
Processing and manufacturing	- Product damaged during handling - Spoilage due to contamination or inadequate temperature control - Excessive trimming of vegetables for processed foods - Changes in production due to consumer demand - Equipment failure - Spillage on conveyor belts and transfer points - Inefficient inventory management - Damage to packaging resulting in food unfit for sale
Distribution	- Spoilage due to inadequate temperature control in transport and storage - Damage due to improper handling
Retail	- Poor stock management, including over ordering, improper stock rotation, storage and handling practices - Produce no longer meets quality standards - Last minute order changes that can leave suppliers with excess product - Limited access to facilities to recycle or repurpose food waste
Hospitality and food service	Poor stock management, storage, and handling practices
Households	- Confusion over ‘use-by’ and ‘best-before’ date labelling - Over-purchasing of food that is then thrown away - Limited knowledge of how to safely repurpose or store food leftovers - Limited access to food waste collection systems

WORK UNDERWAY

Although it can be difficult to control the amount of food wasted because of the number of parties involved from farm to fork, there is already work underway that is achieving results.

This is demonstrated below, and in the examples of innovative food waste solutions later in the strategy.

Australian Government

The Australian Government is investing more than \$10 million to support research directly related to reduce food waste in conjunction with industry through AgriFutures Australia, Cooperative Research Centres, the Entrepreneurs' Programme, CSIRO and the Food and Agribusiness Growth Centre. These organisations are supporting research into the development of higher-value products from retrieved or converted food waste, and are helping to develop alternative markets and advance digital technologies.

To help reduce greenhouse gas emissions generated from food waste as part of the broader organic waste stream, the Australian Government has implemented a Source Separated Organic Waste method under its Emissions Reduction Fund to allow funding for projects that divert food waste from landfill. The Australian Government has also provided \$1.2 million to support four food rescue organisations to invest in solar, batteries and energy efficient refrigeration systems to store and transport their food.



State and territory governments

State and territory governments have primary responsibility for managing waste, including food waste. Activities being supported by one or more state and territory governments include:

- community education programs such as *Love Food, Hate Waste*
- research programs
- data collection on household food waste and conducting trials on possible management strategies
- providing funding to the manufacturing, processing and transport industries to reduce waste in their businesses
- funding businesses that purchase infrastructure to process food waste on-site
- providing financial support for local government roll-out of residential food waste diversion through green organics bins
- delivering programs with businesses that sell food to demonstrate money savings by diverting food waste at source
- support for infrastructure to process food waste into soil improvement products or for bioenergy production.



Local government

Over 500 local governments across Australia manage waste within the legislative frameworks established by the states and territories. Local governments interact directly with their communities and have a significant role in organising waste collection and processing or disposing of food waste.

Many local governments have identified a significant amount of food in their waste streams. They are taking steps to reduce food waste through a range of programs. Some of these include information sessions and demonstrations on storing food and composting at home, grants and rebates for households to purchase compost bins and worm farms, and the roll-out of kerbside organic bins to divert food waste from landfill. For restaurants and cafes, pilot programs have been supported to assess their food waste practices and collectively divert waste from landfill to shared recycling facilities.

Industry and business

Industry and business are playing their part in finding solutions by:

- ▶ value-adding food waste through composting with other organic materials, producing bioenergy, and developing innovative solutions to convert food waste to animal food
- ▶ fostering industry leadership in setting voluntary industry standards on food labelling, sustainable fishing and cold chain efficiencies
- ▶ running award schemes to promote the reduction of food waste and rewarding businesses who are making positive and sustainable changes
- ▶ marketing aesthetically imperfect produce, discounting product that is near expiry date, and optimising forecasting and planning to avoid over-ordering
- ▶ investing in infrastructure for on-site processing of food waste
- ▶ partnering with food rescue organisations to donate food that would otherwise be wasted
- ▶ setting sector-wide targets to reduce waste to landfill
- ▶ developing web-based wholesale marketplaces for surplus food and ingredients
- ▶ investigating packaging options to help reduce food waste.

“No matter what your concern is, whether it's feeding people, saving money, or saving resources, reducing food loss and waste just makes sense.”

Brian Lipinski,
WRI



Food rescue organisations

Food rescue organisations contribute to reducing wasted food that is suitable for human consumption. In rescuing food that would otherwise be thrown away, these organisations provide those in need with a meal, partly addressing food insecurity.

A range of people access food relief in Australia. The number of people receiving food relief is high. **One food relief organisation reports that each month 652,000 Australians receive food relief, with over 27 per cent of these being children.** While over 60 million meals a year are provided to over 2,600 charities nationally, more than 65,000 people are unable to receive food relief from charities or community groups.¹⁹

Food rescue organisations are proactively partnering with businesses across the supply chain to capture and redistribute surplus food that would otherwise go to landfill. The commitment by these organisations demonstrates a willingness to take action on food waste.

Academia

Research conducted through universities either on their own or in partnership with governments, business and industry helps give us a clearer understanding of the size and complexity of problems. Researchers can test solutions to provide an evidence-base for the adoption of new approaches and technologies.



MEETING THE CHALLENGE

Addressing food waste represents a significant opportunity to put in place measures to protect our environment, prevent economic losses, and help relieve food insecurity. The volume of work already underway to address food waste provides a platform to learn, leverage and build on as we work toward halving of Australia's food waste by 2030.



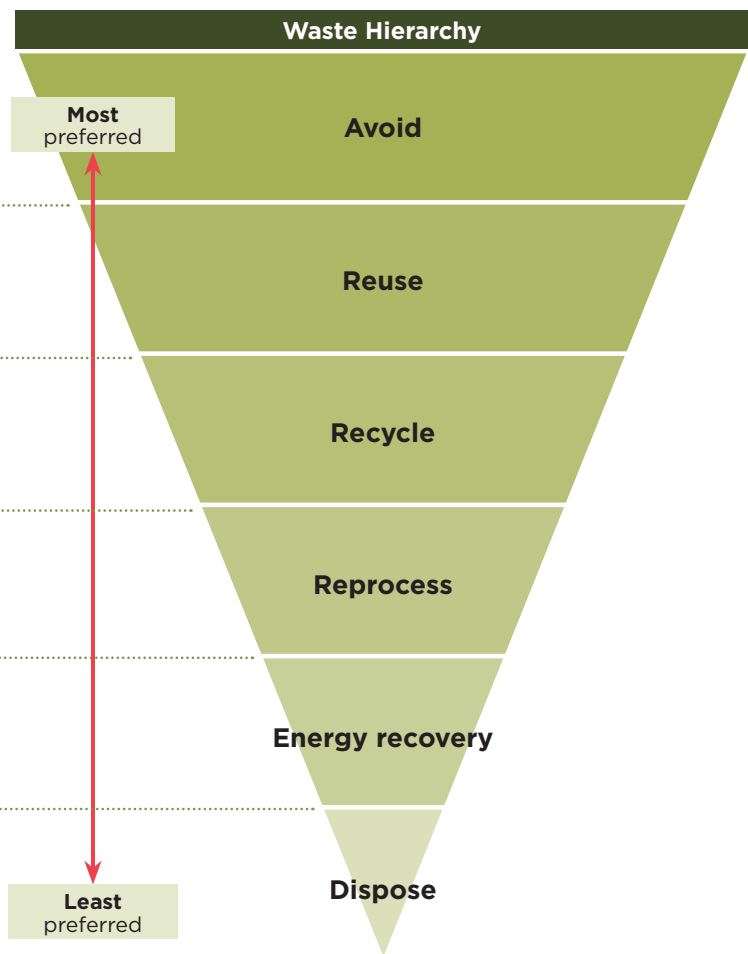
This strategy adopts a circular economy approach that takes into account the food waste hierarchy and seeks to capture food waste as a resource so it is not sent to landfill.

The waste hierarchy prioritises waste management practices in favouring food waste avoidance over resource reuse, recycling, reprocessing, and energy recovery, followed by waste disposal. The hierarchy recognises the inherent value of food waste in providing guidance on the most resource efficient and environmentally sound approaches to dealing with waste.

Waste hierarchy

Examples

- ▶ Education campaigns
 - ▶ Research and development to support more efficient production methods
 - ▶ Packaging initiatives to improve shelf life
-
- ▶ Food rescue donations
 - ▶ Repurposing aesthetically imperfect food (e.g. packaged carrot sticks)
 - ▶ Repurposing without processing for animal feed
-
- ▶ Composting (windrows and anaerobic digestion)
 - ▶ Soil conditioners
 - ▶ Worm farms
 - ▶ Biotechnology solutions for animal feed
-
- ▶ Conversion to pharmaceutical and nutraceuticals
 - ▶ Conversion to cosmetic products
-
- ▶ Incineration and anaerobic digestion for energy recovery
-
- ▶ Landfill
 - ▶ Incineration for non-energy recovery
 - ▶ Food waste going to sewer



The use of circular economy approaches and the waste hierarchy to address food waste demands a more strategic and collaborative approach. This will challenge us to find solutions across the entire food system rather than continuing to operate within single, linear supply and consumption chains.

FRAMEWORK FOR ACTION

Four priority areas have been identified to achieve our goal—policy support, business improvements, market development, and behaviour change. These, and their areas of focus, have been developed following consultation with industry, business, government, academia and the not-for-profit sectors.

Priority	Outcome	Focus
Policy support	Policies are supportive of food waste avoidance, reduction and repurposing	Establishing a National Food Waste Baseline and methodology to measure progress against our goal Identifying areas to target investment Establishing a voluntary commitment to reduce food waste Enabling legislation to better support food waste reduction and repurposing
Business improvements	Improvement and adoption of technologies, processes and actions to avoid and reduce food waste	Identifying areas for improvement Supporting technology adoption Encouraging collaboration Normalising food waste considerations into business practices
Market development	Development of markets to support the repurposing of food waste	Identifying food waste composition and nutritional value to develop new markets Encourage innovation Connecting food waste sources to users
Behaviour change	Practices and attitudes towards avoiding and reducing food waste are adopted and sustained	Changing consumer behaviour Engaging the workforce on food waste

Priority area 1—policy support

Policies that support the avoidance, reduction and the repurposing of food waste are critical to focusing efforts and achieving outcomes. Four areas of focus have been identified.

Establishing a National Food Waste Baseline and methodology to measure progress against our goal

Achieving the 50 per cent reduction in food waste is everyone's responsibility. To understand how we are progressing towards our target, a National Food Waste Baseline and an approach to monitor and evaluate our progress to 2030 will be established.

A comprehensive picture of how much food waste Australians produce, where it is produced and its fate is not fully known. In mid-2017, the Department of the Environment and Energy commissioned work to identify accessible food waste data sources for Australia. This information will help inform the development of the baseline and methodology that can be applied consistently over time to track progress towards the 50 per cent reduction target.

As part of developing the baseline and ongoing monitoring processes, consultation on the best indicators to measure Australia's performance in reducing food waste will need to be undertaken. Indicators that could be considered include the volume or tonnes of food waste entering or being diverted from landfill, being reduced by industry sectors or within parts of the supply and consumption chain, and the level of carbon emissions produced from Australian landfills.

Identifying areas to target investment

Targeting investment in activities that support financial gains from food waste reduction can achieve positive environmental outcomes including reduced energy consumption, water use, and less waste being sent to landfill. Governments, industry and organisations can all benefit from knowing where the best opportunities exist to take action.

A return on investment study conducted in the United Kingdom identified that the implementation of initiatives to reduce food waste can be highly beneficial to households, local governments and the private sector. **For example, an analysis of a range of businesses showed that for over half of them, a \$14 return was realised for every dollar invested in food waste reduction.**²⁰

To identify where opportunities exist to target actions for investment in Australia, a study will be commissioned by the Australian Government. Areas identified may include capturing fruits or vegetables that may not meet market specifications for conversion into higher value-added products, or capturing food waste from the hospitality sector for conversion into soil improvement products.

Establishing a voluntary commitment program to reduce food waste

Achieving reductions in food waste is everyone's responsibility. Establishing a program that requires signatories to voluntarily commit to a set of measurable actions that are known to achieve reductions in food waste will help achieve our target.

The commitment will include a public declaration by individual signatories on actions they will take to reduce food waste. It will also encourage the sharing of information and ideas to support actions across the entire food system.

The program will initially engage business and industry, and if successful, the program could be extended to community groups and households.



Enabling legislation to better support food waste reduction and repurposing

Australia's food and waste systems are underpinned by various national, state and territory legislative frameworks—for example, legislation to protect human health and the appropriate disposal of food waste.

Improving our understanding of where existing legislation is inhibiting the adoption of practices, or where it is required to facilitate improved outcomes for food waste, will be important. These changes could include amending or developing new legislation to provide more flexibility or incentives to redirect food waste to charities or convert it for other purposes, avoiding its disposal in landfill. It could also include legislative measures such as mandating food waste recycling where this is considered appropriate.

All governments can work together to identify and support changes to achieve national consistency.

Priority area 2—business improvements

Improving our existing processes is an important part of avoiding and reducing food waste. Improvements can support cost reductions and increased productivity in the various parts of the food system, as well as delivering positive environmental outcomes. These benefits can be realised through businesses committing to continuous improvement within their operations. Routinely reviewing and updating business processes to minimise waste, encourage innovation, adopt technologies that improve process efficiencies, and normalise industry standards and certification systems in support of food waste reductions can benefit existing systems.

“Understanding exactly the dynamics of food waste—how it flows in and out of the supply chain—will be a critical first step to identifying solutions that will work in practice.”

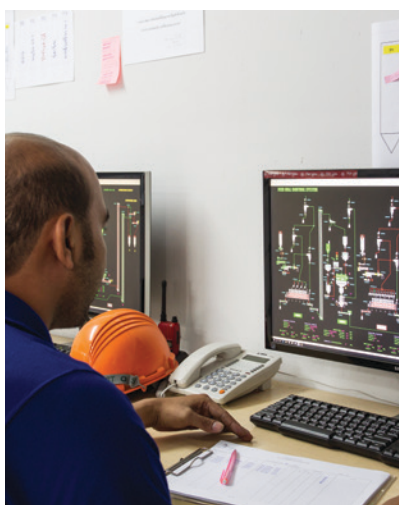
The Hon
Josh Frydenberg MP,
Minister for the
Environment and Energy

The four focus areas below identify where significant opportunities exist for business to reduce food waste in our current food system. Actions in these areas could be undertaken by individual businesses or industries, or form part of a voluntary commitment to reduce food waste.

Identifying areas for improvement

Being aware of how our systems and processes operate, and knowing how much and where food waste occurs within the food system, can help identify areas for action to avoid food waste. Assigning a monetary value to lost or wasted food can add further motivation for improvement.

Actions that can be undertaken include identifying the causes of food waste by mapping where it occurs in individual organisations and in the broader food system including harvesting, product grading, infrastructure, transportation and packaging. Identifying these areas can drive the adoption of new technologies, processes or criteria that assist in reducing avoidable food waste.



Supporting technology adoption

Technological innovations can help enhance operational efficiencies through improved assessment and monitoring equipment, and approaches to mechanisation.

A number of technologies have already been developed that could be adopted more broadly or adapted across industries, such as:

- ▶ robotics and digital technology solutions to help farmers identify crop growth needs and timing of harvest, and mechanised harvesting solutions to assist with labour availability and costs
- ▶ better market intelligence for farmers to reduce risks of over production
- ▶ the development of commercial microwave technology for pest disinfestation to reduce fruit and vegetable losses, and megasonics technology for oil refining processes to minimise seed and fruit oil losses during processing
- ▶ technologies that access real time and quality data to assist in informing decisions on where to streamline activities in the food system, including cold chain monitoring
- ▶ improvements in cold chain security through mechanised chilling and distribution processes
- ▶ data analytics technologies to track consumer purchasing behaviour
- ▶ smart meters to measure waste in commercial kitchens
- ▶ improvements in the way we package food to encourage smaller portion sizes or changes in the packaging material that can prolong shelf-life—other forms of post-harvest produce protection such as invisible and edible ‘skins’ that have been developed to keep produce fresh could be further investigated
- ▶ new labelling technologies that help consumers and businesses determine the freshness of packaged foods and whether it is safe to eat, and adopting alternative labelling solutions such as laser technologies.

“We’re redesigning our fridges and addressing fridge layout to help raise awareness of what is in inside...and we’re developing technology—such as the Family Hub fridge—to help cut food wastage.”

Jeremy Senior,
Samsung Electronics
Australia



Encouraging collaboration to identify solutions

The sharing of knowledge developed within businesses or by industries through an integrated network of producers, suppliers, manufacturers and distribution systems²¹, and collaboration to solve food waste issues, can extend positive change across entire industries.

Information sharing could be achieved through the development of a central web-based portal, or through more formal processes such as issue-focused food waste forums that bring together all stakeholders in the food system to discuss solutions to improve food waste reduction.

Other actions could include the adoption of targets within businesses or industries to help individual or collective action towards the reduction of food waste.

Normalising food waste considerations into business practices

The food industry has operational guidelines and standards systems in place for the handling, storage and transportation of goods to maintain the safety, quality and longevity of food products from the producer to the consumer.²²

“As well as helping to keep organics out of landfill we are also helping to make recycling commercial organic waste easier and more affordable for businesses.”

Pat McCafferty,
Yarra Valley Water

Existing standards could be reviewed for their appropriateness to support food waste reductions. For example, standards that currently include criteria that result in edible food being disposed of as waste. New standards could be developed that are fit-for-purpose, such as those for packaging designers and food producers that set out considerations to reduce food waste.

Certification and rating systems also have an important role in normalising practices to reduce food waste. Consideration could be given to incorporating or establishing:

- certification for staff handling food
- certification for businesses engaged with the cold food chain to encourage consistency in equipment and handling, and temperature control
- certification to identify how well waste is managed and disposed of in buildings
- a tailored rating system to show how well businesses take action on reducing waste could also be developed.

While guidelines, standards and rating systems are often sector-specific, they can have cross-sector applicability. Approaches that allow for the sharing of information could be adopted to leverage effort and support consistency in practices across the food system.

Priority area 3—market development

Accessing the right type and amount of food waste from within the various parts of the food system provides opportunities for business to value-add to this otherwise wasted resource. In capturing food that would otherwise go to waste, existing markets can be expanded and new markets created. The creation of new markets allows suppliers and users of the raw material to attract other sources of revenue and potentially create employment opportunities.

Guidelines and standards may need to be developed to provide direction on the types of products that can be developed from food waste, and the specifications to which those products must comply.

Applying circular economy approaches to achieve reduction in food waste requires a better understanding of how the connections in food systems operate and what interventions enable change. A number of businesses and organisations in Australia have recognised the value of food waste and implemented a range of solutions such as:

- ▶ converting produce that does not meet specifications, or surplus produce, into chopped and packaged vegetables for sale
- ▶ extracting nutrients from food waste to be used in higher value products such as pharmaceutical and cosmetic products
- ▶ producing organic fertilisers and soil enrichers
- ▶ diverting food waste to animal feed
- ▶ converting food waste to energy.

Three focus areas have been identified that can help expand these existing markets and foster new market growth for repurposing food waste.

“There is no trade-off between business and sustainability, it is creating real value for (the business) Unilever.”

Paul Polman,
Unilever



Identifying food waste composition and nutritional value to develop new markets

The composition and nutritional value of food waste is important to determine where value-adding can be applied. Access to information on the volume, type and nutritional composition of food waste assists in supporting investment decisions on product development. For example, food waste that can be used for animal consumption may have different characteristics to that used for composting or energy generation.



Encourage innovation

As opportunities to utilise food waste emerge, the development of new technologies will be central to ensuring that new products and solutions are fit-for-purpose and new markets can be realised. Encouraging the broader adoption of these technologies will be important to support change. Examples of where technological innovations can make a difference include:

- nutrient extraction from food waste
- improvements in refrigeration technologies and reducing food waste through improved storage and distribution
- on-site food waste processing technologies that can be incorporated into residential and commercial sites
- biotechnology solutions to convert food waste to animal feed
- intelligent decision-making tools, sensor technologies, and new processing technologies to recover and make use of edible portions of food that would be otherwise wasted.

Connecting food waste sources and users

Business and food rescue organisations have identified that costs associated with transporting food waste from its source to the buyer, or for donation, can prohibit the reuse or repurposing of food. The ability of wholesalers and retailers to donate edible food to charities is also limited by a lack of infrastructure and services outside metropolitan areas.²³

There are different challenges for rural and urban areas in the potential reuse or repurposing of surplus food or food waste because of the distance between the processing and distribution facilities and the source of food supply. Local freight and logistics solutions are needed to support the transport of edible and inedible food waste.

Investment in regional infrastructure that centralises the collection of surplus, or off-specification produce or food waste, would allow greater volumes to be collected and sold for repurposing, or donated to food rescue organisations. Alternatively, existing infrastructure that may not currently be used for this purpose could be adapted. Where possible, the location of processing plants closer to food waste sources provides opportunities for local employment growth, and generates alternative revenue streams.

Investment in the development of virtual website portals and applications provides an alternative central point to buy, sell and donate surplus food or food waste.

Some local governments offer food and organic waste collection services for households and businesses or support commercial, precinct-based food waste collection services. Broader adoption of these types of collection systems can help to capture a greater volume of organic waste for repurposing.



Priority area 4—behaviour change

Changing our attitudes and behaviours that reduce food waste should be encouraged. A key component of driving behavioural change is educating the community on the economic, social and environmental costs of producing food and the benefits that can be achieved from reducing food waste.²⁴

Behaviour change is not only needed in households, but across the entire food system, and as such is the responsibility of industry, governments and the broader community.

“Impact only occurs if people act.”

Liz Goodwin,
WRI

Changing consumer behaviours

Individuals' choices impact on the amount of waste generated and how it is managed. Food that is not consumed, either in the home or when eating out, results in personal financial loss and contributes to greenhouse gas emissions once it enters landfill.

Existing programs to reduce household waste, such as the United Kingdom's *Love Food, Hate Waste* campaign, have been adopted in some states in Australia. Programs of this type can result in significant changes in behaviour by raising awareness of how much food is wasted, how it impacts on household budgets, and what people can do about it.²⁵

Some retailers have also adopted approaches to repurpose food that would be otherwise thrown away, while giving consumers more choice when purchasing fresh fruit and vegetables. These approaches include offering lower prices for aesthetically imperfect fruit and vegetables and raising awareness of the value of this type of produce. Retailers are also modifying food packaging to reduce wastage and educating consumers on proper food storage.

The introduction by some local governments of kerbside organics collection bins that take food waste is helping to raise awareness of this waste stream, places the responsibility on households to sort their domestic waste, and enables increased diversion of valuable organics from landfill.



Further changes in consumer behaviour can be supported by:

- ▶ adopting nationally consistent approaches to raising consumer awareness and education about household food waste. These approaches could include the adoption of a national campaign that addresses issues such as food handling to optimise storage life, food planning to only purchase food that is likely to be eaten, explaining the differences between 'use-by' and 'best before' dates, and uses for left-over food
- ▶ increased adoption of home composting and worm farms
- ▶ creating a culture of taking left-over food home when eating out
- ▶ increasing awareness of aesthetically imperfect food choices.

Engaging the workforce on minimising food waste

Education programs can provide food service businesses with the skills and knowledge to avoid food waste.

Many businesses already work in partnership with governments, industry and food rescue organisations to reduce food waste.

The actions taken, and their impact on reducing food waste, can vary significantly from business to business.²⁶

In the retail sector, a number of training activities are already in place that support food waste minimisation. These include better inventory management and overstocking of shelves, the importance of stock rotation, understanding date labelling and labelling for storage instructions, quality standards, and better management of surplus-to-demand produce, to name a few.²⁷

Other businesses in the food service sector have built waste auditing into their staff training programs to increase awareness of what is disposed, and the costs incurred to the business from this waste.

Rewards programs that publicly recognise industry practices and innovations to reduce food waste can also encourage change.

Further and wider adoption of these practices can help instil a culture of innovation to find solutions to reduce food waste within business practices. They can also change the perception that food waste is acceptable and normal.²⁸



THE WAY FORWARD

A halving of Australia's food waste by 2030 will require collective effort that is supported by good governance and a clear plan of action.

EVERYONE HAS A ROLE TO PLAY

“While the magnitude of the food loss and waste challenge can seem daunting...progress can be made if you have the right levels of engagement and commitment, and an understanding of the size of the problem and where to focus.”

Liz Goodwin,
WRI

To achieve success in the four areas of policy support, business improvements, market development, and behaviour change, all Australians will need to contribute to and adopt an integrated approach where we:

- ▶ *collaborate* to achieve common or coinciding goals
- ▶ *innovate* to find new solutions and change the way we do things
- ▶ *share* knowledge and data so we are better informed to make decisions.

Governments can assist by facilitating communication and collaboration between those involved in the food system. They can increase community awareness of food waste, share data and knowledge, encourage innovation and continuous improvement, and incentivise action. They can also assess regulations to ensure they support food waste reduction and are not inadvertently causing impediments to dealing with food waste. The Australian Government can support actions in areas where national consistency and harmonisation of approaches is needed.

Industry is best placed to find solutions for businesses, including identifying opportunities for efficiency improvements and new areas with market potential, especially where the financial case for reducing food waste is clear.

The research community has an essential role to play in finding solutions, improving our understanding of where and how much food is wasted from farm all the way through to the consumer, and supporting the development of technologies and approaches that could be adopted to reduce or repurpose food waste.

Food rescue organisations play an important role in helping to alleviate personal food insecurity. The community, including not-for-profit organisations, can help by engaging with education and awareness campaigns, and committing to actions that support reductions in food waste by local governments, business and households. Creating awareness and changing behaviour in homes can have a significant impact on reducing food waste.

STRONG GOVERNANCE IS KEY

Delivery of the strategy requires a central point for the coordination and facilitation of activities. This role is to be undertaken by an organisation independent of government that will work across the sectors, and along the entire food supply and consumption chain.

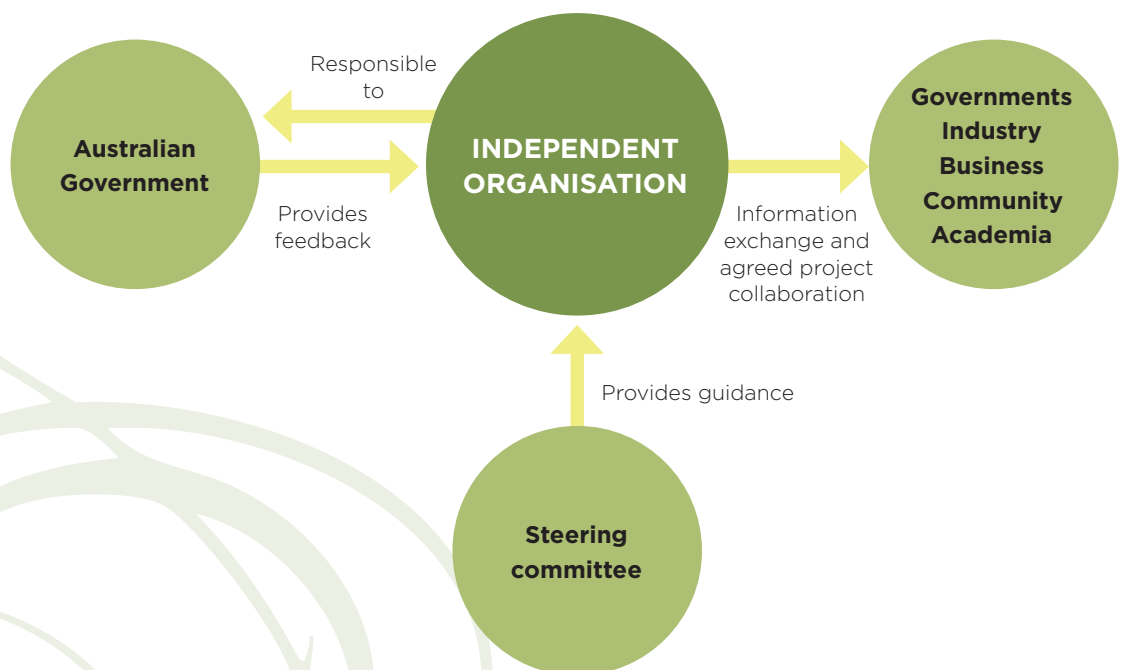
The Australian Government will commission the organisation which will be responsible for:

- ▶ coordinating work to deliver the priorities in the strategy
- ▶ obtaining and managing funding to support activities
- ▶ monitoring and evaluating progress against the strategy
- ▶ annual public reporting on the progress being made against the strategy.

A steering committee will be established by the organisation to provide it with guidance and advice on the work to be progressed to support the strategy's implementation. Members of the steering committee will operate in accordance with Terms of Reference developed in consultation with the Australian Government.

Its primary role will be to provide guidance to the organisation on the work to be undertaken to support the delivery of the strategy. It will also ensure that adequate consultation is undertaken with relevant industry sectors, academia, governments and the not-for-profit sector in developing and delivering this work. The steering committee will include representation that aligns with the priorities of the strategy.

Governance arrangements to implement the strategy



THE FIRST STEPS

The organisation will start work on implementing the strategy in early 2018. Over a 24 month period, it will be responsible for delivering:

- an implementation plan for the strategy that outlines actions and performance indicators against the priority areas
- a monitoring and evaluation framework
- a voluntary commitment program for business and industry to reduce food waste
- short-term projects to reduce food waste.

An initial investment of \$1 million from the Australian, state and territory governments will be provided to the organisation to deliver this work. An additional \$370,000 in funding from the Australian Government's National Environment Science Program will support two research projects.

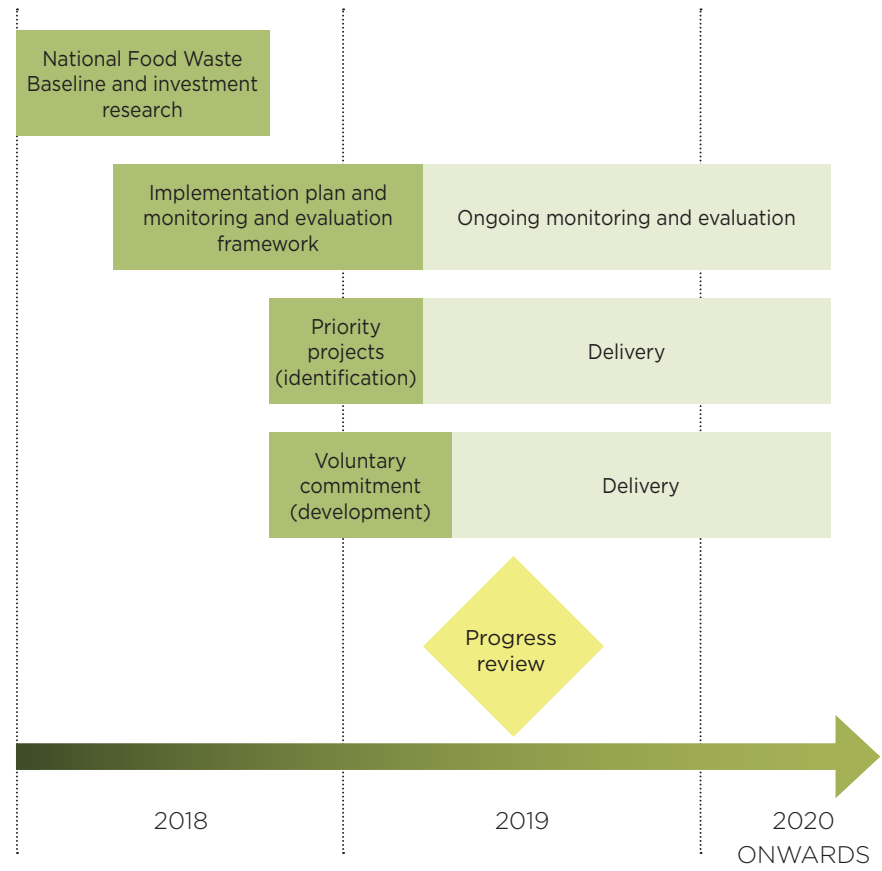
The research projects will start in early 2018 and inform the development of a National Food Waste Baseline and identify where investment in reducing food waste should be targeted. This research, along with consultation with a range of stakeholders, will help develop an implementation plan for the strategy to 2030, and a monitoring and evaluation framework.

The implementation plan will identify a range of projects that are designed to reduce waste over the short, medium and long term. Developing a baseline and a monitoring and evaluation framework to measure performance will be important to track progress in achieving the 2030 goal.

The organisation will be responsible for establishing a voluntary commitment program to reduce food waste by the end of 2019. The program will initially engage business and industry to commit to actions that reduce food waste. The design of the program will be developed in consultation with all stakeholders to ensure that it has relevance and that identified actions are achievable. If successful, consideration will be given to extending the program to community groups and households.

During 2019, the Australian Government will undertake an assessment of the work being progressed against the strategy and identify an approach for ongoing support for the strategy's implementation.

First steps towards a 50 per cent reduction in food waste by 2030.



EXAMPLES OF INNOVATIVE AUSTRALIAN FOOD WASTE SOLUTIONS

The following pages provide a snapshot of some key food waste initiatives already underway across Australia.

CSIRO

Avoiding food loss from farmer to retailer—The Eliminate Food Loss research testbed within the CSIRO Active Integrated Matter, Future Science Platform aims to develop new strategies to avoid food loss from farm to retail. It does this by recovering and value adding the edible portion of the lost food to produce food ingredients and products that will enhance the sustainability of the food supply chain. The focus is on the development of intelligent decision making tools, new sensors and new processing technologies for stabilisation of food loss materials and conversion. As part of an industry-led drive to reduce waste, Horticulture Innovation Australia and the CSIRO are working with growers and stakeholders along the horticulture value chain to turn imperfect-looking vegetables into nutrient-rich snacks and supplements.

research.csiro.au/aim/home/aims-research-test-beds/eliminate-food-loss

CSIRO

Tools to help business identify the most cost-effective food transport options—CSIRO and the Australian Government are reducing costs for Australia's agriculture industry by optimising vehicle movements between businesses in the supply chain. Using the largest dataset ever assembled for agricultural transport in Australia, the Transport Network Strategic Investment Tool (TraNSIT) tracks the movement of every industry road or rail trip in Australia, from farm through to processor, storage facility or manufacturer, through to retailers and export ports. TraNSIT has exciting potential to support the full food supply and consumption chain to improve its efficiency and reduce costs.

csiro.au/en/Research/LWF/Areas/Landscape-management/Livestock-logistics/TRANSIT

CSIRO

From coffee grounds to kitty litter, the online marketplace connecting waste producers with innovative buyers—CSIRO, in collaboration with Kingston City Council, have developed a digital tool helping to connect businesses that produce waste with those that are able to make better use of it. The Advisory System for Processing, Innovation and Resource Exchange (ASPIRE) has helped Australian-owned manufacturer of commercial grinders Aximill connect with fast food restaurant McDonalds to use coffee grounds in the development of a compostable kitty litter. ASPIRE has reduced McDonalds' operating costs through saved landfill disposal fees, and helped Aximill to establish a new collaborative business partnership and increased awareness of the resource potential of waste.

aspire.csiro.au/sites/default/files/aximill_usgboral_metro.pdf

Food Agility CRC

On-farm digital technology to improve producer yield—Australian start-up company and lead partner in the Food Agility Cooperative Research Centre, The Yield, has commercialised a digital tool to help growers increase their harvest, reduce waste, and mitigate the risks of bad weather. 'Sensing+ for Agriculture' provides an accurate picture of on-farm growing conditions like relative humidity, rainfall, air temperature, leaf wetness and soil moisture, empowering growers to make informed decisions about their crops.

theyield.com/products/sensing-plus-for-agriculture

Foodbank

Paddock to plate collaboration—Foodbank, Australia's largest food relief organisation, targets the entire supply chain, from farmers to retailers, tackling food insecurity and food waste. In the last year, Foodbank rescued approximately 30 million kilograms of food and groceries, distributed through 2,600 charities and 1,750 schools. Foodbank's latest collaboration will see a FareShare kitchen in Brisbane, with one million meals expected for charities across Queensland in its first year.

foodbank.org.au

Harris Farm Markets

Educating customers on imperfect produce—Family owned business Harris Farm Markets sells imperfect produce to their customers. IMPERFECT PICKS is their seasonal range of fruit and vegetables that might not look perfect from the outside, but are as perfect as ever on the inside. IMPERFECT PICKS helps reduce the astonishing statistic that 25% of farmers' crops currently never leave the farm gate simply because they are a bit ugly, and do not meet the visual specifications of some consumers and supermarkets (Horticulture Australia). Every time customers buy an IMPERFECT PICK they help Harris Farm Markets take more of the farmer's crops, helping reduce food wastage, and most importantly saving up to 50%.

harrisfarm.com.au/blogs/campaigns/116554629-imperfect-picks

Natural Evolution Foods

Green banana innovation—Queensland producers Natural Evolution Foods are transforming misshapen, oversized, spotted, unsaleable bananas into gluten-free banana flour and resistant starch dietary fibre. This innovation provides a profitable potential for the 500 tonnes of bananas dumped every week in Australia because they are the wrong size or shape for supermarkets. They have also used their bananas to produce an anti-bacterial, anti-fungal and anti-inflammatory ointment.

naturevolutionfoods.com.au/story/

Nolan Meats

New technologies automating meatworks—Nolan Meats operates the Southern Hemisphere's largest fully-automated meat chilling and distribution system at its processing facility near Gympie in southern Queensland. The company's \$20 million investment in the latest-generation automated freezing, storage, retrieval and palletising technologies has improved its cold chain security by minimising handling and by optimising trimming, inventory management, and cold storage to keep products as fresh as possible and ready for distribution to domestic and international markets.

nolan.com.au/our-story/our-story.aspx

OzHarvest

Rescued food supermarket—Food rescue organisation OzHarvest has opened Australia's first rescued food supermarket offering customers donated or surplus food on a 'take what you need, give if you can' basis. The initiative aims to eliminate hunger by connecting people in need with surplus food donated by commercial food outlets while reducing food waste to landfill.

ozharvest.org/what-we-do/market/

Peats Soil & Garden Supplies

BiobiN® turning food waste into compost—South Australian company Peats Soil has developed the BiobiN®, a scalable, on-site organic waste management system that processes food waste into compost. Peats Soil currently collects food waste from hotels, restaurants, supermarkets, schools and offices, as well as food processors and manufacturers around Australia. BiobiN®'s process the waste into an organic material that provides a valuable source of nutrients, carbon and organic matter that can be added to compost, soil conditioners and biofuels.

peatsoil.com.au/about-peats/

RMIT

Technology to measure and reduce food waste—RMIT University (Industrial Design) working with the Plenty Food Group, a Melbourne based industry network for food manufacturing companies, has developed DIRECT, the Dynamic Industry Resource Efficiency Calculation Tool. DIRECT calculates the true cost of waste. It helps measure and reduce waste generated by businesses through tracking production input and output costs such as energy and water consumption, and manufacturing waste streams such as packaging and general waste, to optimise resource efficiency.

directool.com.au

Tarac Technologies

Wine and seafood industries combine with technology to find an alternate use for wine waste—Barossa Valley company Tarac

Technologies is working with the South Australian Research and Development Institute to trial grape marc, the seeds and skins leftover from wine production, as food for farmed abalone.

Research is being undertaken to measure the impact of this feed on abalone growth rates, its fortification to heat stress, and its cost effectiveness. If successful, the company will investigate domestic and international markets for abalone feed and other suitable fish varieties. Tarac Technologies also use grape marc as an input into other value added products such as stock feed, grape seed extract and soil improvers.

tarac.com.au/products/agriculture/brentons-agri-blog/grape-marc-proves-a-superfood-for-abalone/

The Australian Institute of Packaging

Recognition for packing and processing innovation—The Australian Institute of Packaging’s packaging and processing innovation and design awards provide recognition to businesses that aim to save food waste through packaging design. These awards are designed to encourage innovation in both the food manufacturing and the packaging industries to identify ways to reduce food waste in retail, food service and in the home through improved shelf-life, quality and convenience.

aipack.com.au/education/pida

Yarra Valley Water

Waste-to-energy powering sewage treatment—Yarra Valley Water operates a waste-to-energy co-digestion facility, ReWaste, powered by feedstock from local commercial organic waste producers such as markets and food manufacturers. The organic waste is converted into methane or biogas and used to power Yarra Valley Water and a nearby sewage treatment plant. Any surplus energy generated is then sold to the electricity grid. ReWaste has the annual capacity to process and divert up to 33,000 tonnes of organic waste from landfill and is a cost-effective and renewable energy alternative to more traditional power sources.

yvw.com.au/about-us/major-projects/waste-energy-facility

Yume

A wholesale marketplace for surplus food—Yume has developed an online platform to facilitate the sale and donation of surplus food between buyers and sellers, which may have otherwise been wasted. The platform allows sellers to list surplus products for sale, at no cost, to enable buyers to purchase these goods at discounted prices.

yumefood.com.au/

ACKNOWLEDGEMENTS

The *National Food Waste Strategy* has been developed in close consultation with industry, business, academia, all governments and the not-for-profit sector.

Formal consultation on the strategy commenced in April 2017 with the Roundtable on Food Waste convened by the Minister for the Environment and Energy, the Hon Josh Frydenberg MP, and hosted by The Pratt Foundation.

Following the roundtable, the Department of the Environment and Energy established four advisory bodies to provide advice on where the greatest opportunities to reduce food waste occurred, data sources that could assist in the formation of a National Food Waste Baseline, and possible governance arrangements for the delivery of the strategy.

State and territory governments have contributed by identifying opportunities for data sharing, collaboration on existing food waste reduction programs, and consideration of the appropriateness of food waste regulation.

The Australian Government would like to acknowledge everyone who contributed to the development of the strategy through the formal consultation process or other contact with the Department.

ACT Government—ACT NOWaste

AgriFutures Australia

ALDI

Australian Bureau of Statistics

Australian Food and Grocery Council

Australian Government—Department of Agriculture and Water Resources

Australian Government—Department of Defence

Australian Government—Department of Employment

Australian Government—Department of Foreign Affairs and Trade

Australian Government—Department of Health

Australian Government—Department of Immigration and Border Protection

Australian Government—Department of Industry, Innovation and Science
Australian Government—Department of Infrastructure and Regional Development
Australian Government—Department of the Prime Minister and Cabinet
Australian Hotels Association
Australian Institute of Packaging
Australian Local Government Association
Australian Organics Recycling Association
Australian Pork Limited
Australian Retailers Association
Banksia Foundation
Brambles Ltd
Central Queensland University
Centre for Organic Research and Education
Clean Energy Finance Corporation
Closed Loop Environmental Solutions Pty Ltd
Coles
CSIRO
Costa Group
Curtin University
Empauer Pty Ltd
FareShare
Food Innovation Australia Limited
Foodbank Australia Ltd
Global Crop Diversity Trust
Goodman Fielder Pty Limited
Government of South Australia—Green Industries SA
Government of South Australia—Primary Industries and Regions South Australia
Victorian Government—Sustainability Victoria
Government of Western Australia—Department of Water and Environmental Regulation
Grain Growers Limited
Karma3
Lendlease
Monash University
National Farmers' Federation
Nestlé Oceania
OzHarvest
Queensland Farmers' Federation
Queensland Government—Department of Environment and Heritage Protection

Queensland University of Technology
Refrigerants Australia
Restaurant & Catering Industry Association
RMIT University
SecondBite
Swisse Wellness Pty Ltd
Tasmanian Government—Department of Primary Industries, Parks,
Water and Environment
New South Wales Government—the NSW Environment Protection
Authority
Northern Territory Government—Department of Environment and
Natural Resources
The Australian Wine Research Institute
The National Waste and Recycling Industry Council
The Pratt Foundation
Unilever Food Solutions Australasia
University of Canberra
University of Melbourne
University of Technology Sydney
Veolia Australia and New Zealand
Visy Industries
Waste Resources and Action Programme, United Kingdom
Winemakers' Federation of Australia
Woolworths Food Group
WWF Australia
Yume Food

REFERENCES

1. United Nations General Assembly (2015) *Transforming our world: the 2030 Agenda for Sustainable Development*. Resolution adopted by the General Assembly on 25 September 2015. Seventieth session, Agenda items 15 and 116. Resolution 70/1. http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E. Accessed 16 September 2017.
2. SARDI (2015) *Primary Production Food Losses: Turning losses into profit*. South Australian Research and Development Institute, Primary Industries and Regions South Australia.
3. WRAP UK (2017) *WRAP and the circular economy*. The Waste and Resources Action Programme. <http://www.wrap.org.uk/about-us/about/wrap-and-circular-economy> Accessed 29 September 2017; Ellen Macarthur Foundation (2017) *What is a circular economy?* Ellen Macarthur Foundation. <https://www.ellenmacarthurfoundation.org/circular-economy>. Accessed 29 September 2017.
4. Champions 12.3 (2017) *SDG Target 12.3 on Food Loss and Waste: 2017 progress report*. <https://champs123blog.files.wordpress.com/2017/09/champions-123-sdg-target-123-2017-progress-report.pdf>. Accessed 12 October 2017.
5. Food and Agriculture Organisation (2017) *Save Food: Global initiative on food loss and waste reduction*. <http://www.fao.org/save-food/en/>. Accessed 19 September 2017; PMSEIC (2010) *Australia and Food Security in a Changing World*. The Prime Minister's Science, Engineering and Innovation Council. http://www.chiefscientist.gov.au/wp-content/uploads/FoodSecurity_web.pdf. Accessed 18 September 2017.
6. World Resources Institute (2017) *Food Loss and Waste Protocol*. World Resources Institute. <http://www.wri.org/our-work/project/food-loss-waste-protocol>. Accessed 20 September 2017.
7. Parry, A., LeRoux, S., Quested, T. and Parfitt, J. (2015). *UK food waste – historical changes and how amounts might be influenced in the future*. Waste and Resources Action Programme, London.
8. ReFED (2016) *A roadmap to reduce U.S. food waste by 20 percent*. ReFED. www.refed.com. Accessed 13 September 2017.
9. National Zero Waste Council (2017) *National Food Waste Reduction Strategy*. National Zero Waste Council. <http://www.nzwc.ca/focus/food/national-food-waste-strategy/Documents/NFWRS-Strategy.pdf>. Accessed 13 September 2017.
10. Ministry of Economic Affairs (2017) *No Waste Network*. <http://www.nowastenetwerk.nl/en/>. Accessed 19 September 2017.

11. Ministry of Agriculture, Agrifood and Forestry (2016) *The Ministry of Agriculture, Agrifood and Forestry in Action*. http://agriculture.gouv.fr/sites/minagri/files/plaqmingb72_0.pdf. Accessed 23 September 2017.
12. ReFood Label (2017) *ReFood Label*. <http://refoodlabel.dk/> (English translation, <https://translate.google.com.au/translate?hl=en&sl=da&u=http://refoodlabel.dk/&prev=search>). Accessed 24 September 2017.
13. PMSEIC (2010) *Australia and Food Security in a Changing World*. The Prime Minister's Science, Engineering and Innovation Council. http://www.chiefscientist.gov.au/wp-content/uploads/FoodSecurity_web.pdf. Accessed 18 September 2017.
14. Food Innovation Australia Limited (2017) *Sector Competitiveness Plan: Food and Agribusiness Growth Centre, April 2017*. Food Innovation Australia Limited. https://fial.com.au/Attachment?Action=Download&Attachment_id=37. Accessed 16 September 2017; PMSEIC (2010) *Australia and Food Security in a Changing World*. The Prime Minister's Science, Engineering and Innovation Council. http://www.chiefscientist.gov.au/wp-content/uploads/FoodSecurity_web.pdf. Accessed 18 September 2017.
15. SARDI (2015) *Primary Production Food Losses: Turning losses into profit*. South Australian Research and Development Institute, Primary Industries and Regions South Australia.
16. Blue Environment (2016) *Australian National Waste Report 2016*. Prepared for the Department of the Environment and Energy. <http://www.environment.gov.au/system/files/resources/d075c9bc-45b3-4ac0-a8f2-6494c7d1fa0d/files/national-waste-report-2016.pdf>
17. Foodbank (2017) *Foodbank Hunger Report 2017*. Foodbank Australia. <https://www.foodbank.org.au/wp-content/uploads/2017/10/Foodbank-Hunger-Report-2017.pdf>. Accessed 16 October 2017.

18. SARDI (2015) *Primary Production Food Losses: Turning losses into profit*. South Australian Research and Development Institute, Primary Industries and Regions South Australia; PMSEIC (2010) *Australian and Food Security in a Changing World*. The Prime Minister's Science, Engineering and Innovation Council, Canberra, Australia; NSW EPA (2016) *Love Food, Hate Waste – NSW food waste tracking survey 2015-16*. Environment Protection Authority. <http://www.lovefoodhatewaste.nsw.gov.au/Portals/0/docs/Report%20-%20Tracking%20Survey%202015-2016.pdf>. Accessed 21 September 2017; Victorian Government (2017) *Do I really waste food?* Love Food Hate Waste Victoria. <http://www.lovefoodhatewaste.vic.gov.au/about-your-food/do-i-really-waste-food>. Accessed 29 September 2017. Blue Environment (2016) *Australian National Waste Report 2016*. Prepared for the Department of the Environment and Energy. <http://www.environment.gov.au/system/files/resources/d075c9bc-45b3-4ac0-a8f2-6494c7d1fa0d/files/national-waste-report-2016.pdf>
19. Foodbank (2017) *Foodbank Hunger Report 2017*. Foodbank Australia. <https://www.foodbank.org.au/wp-content/uploads/2017/10/Foodbank-Hunger-Report-2017.pdf>. Accessed 16 October 2017.
20. Champions 12.3 (2017) *The business case for reducing food loss and waste*. https://champs123blog.files.wordpress.com/2017/03/report_-business-case-for-reducing-food-loss-and-waste.pdf. Accessed 12 October 2017.
21. Reardon, T., Timmer, C.P., and Berdegue, J.A. (2007) *Supermarket expansion in Latin America and Asia, implications for food marketing systems new directions in global food markets*, Chapter 4, Economic Research Service, United States Department of Agriculture, Washington D.C. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2935112/>. Accessed 23 September 2017.
22. Australian Food and Grocery Council (2017) *Australian Cold Chain Guidelines 2017 – For handling, storage and transport of refrigerated fresh, chilled and frozen foods for sale in retail and food service outlets or export customers*. <https://www.afgc.org.au/wp-content/uploads/Australian-Cold-Chain-Guidelines-2017.pdf>. Accessed 19 September 2017.
23. Lewis, H., Downes, J., Verghese, K., and Young, G. (2017) *Food waste opportunities within the food wholesale and retail sectors*. Prepared for the NSW Environment Protection Authority by the Institute for Sustainable Futures at the University of Technology Sydney. https://opus.lib.uts.edu.au/bitstream/10453/115674/1/Lewisetal2017EPA_Food_waste%20report_2017-08-23.pdf. Accessed 19 September 2017.
24. PMSEIC (2010) *Australia and Food Security in a Changing World*. The Prime Minister's Science, Engineering and Innovation Council. http://www.chiefscientist.gov.au/wp-content/uploads/FoodSecurity_web.pdf. Accessed 18 September 2017.

25. WRAP UK (2017) *Love Food, Hate Waste*. Waste and Resource Action Programme, United Kingdom. <http://www.wrap.org.uk/content/love-food-hate-waste>. Accessed 23 September 2017; NSW Environment Protection Authority (2017) *Love Food, Hate Waste*. NSW Environment Protection Authority. <http://www.lovefoodhatewaste.nsw.gov.au/>. Accessed 23 September 2017; Victorian State Government (2017) *Love Food, Hate Waste*. Victorian Government. <http://www.lovefoodhatewaste.vic.gov.au/>. Accessed 23 September 2017.
26. Lewis, H., Downes, J., Verghese, K., and Young, G. (2017) *Food waste opportunities within the food wholesale and retail sectors*. Prepared for the NSW Environment Protection Authority by the Institute for Sustainable Futures at the University of Technology Sydney. https://opus.lib.uts.edu.au/bitstream/10453/115674/1/Lewisetal2017EPA_Food_waste%20report_2017-08-23.pdf. Accessed 19 September 2017.
27. Lewis, H., Downes, J., Verghese, K., and Young, G. (2017) *Food waste opportunities within the food wholesale and retail sectors*. Prepared for the NSW Environment Protection Authority by the Institute for Sustainable Futures at the University of Technology Sydney. https://opus.lib.uts.edu.au/bitstream/10453/115674/1/Lewisetal2017EPA_Food_waste%20report_2017-08-23.pdf. Accessed 19 September 2017.
28. Verghese, K., Lewis H., Lockrey, S., and Williams, H. (2013) *Final report: The role of packaging in minimising food waste in the supply chain for the future*. <http://mams.rmit.edu.au/ie9rn2ifqca.pdf>. Accessed 23 September 2017.

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