Zero Waste SA / OzHarvest

Environmental assessment of food rescue

Environmental benefits of rescuing un-sold food in Adelaide SA

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1 Executive summary

OzHarvest rescues surplus prepared meals and meal ingredients from many different organisations, and provides this food to agencies catering to the homeless and hungry in Sydney, Canberra, and beginning soon—Adelaide.

In Sydney during 2009–10, OzHarvest rescued approximately 550 tonnes of food, mainly ready-to-eat meals—this was nearly 2 million meals. OzHarvest is targeting building to a similar (per capita) level of food rescue in Adelaide, over the next 3–5 years. This would be an estimated 150 tonnes of food rescued per year in Adelaide—approximately ½ million meals.

The waste reduction associated with this large scale food rescue has a significant benefit for the environment. Food rescue programs have existed for some time now and are acknowledged for their social and welfare benefits. The environmental benefits of food rescue programs are also an important benefit of these types of programs.

The objective of this study was to build upon earlier food rescue related LCA work undertaken by Hyder Consulting, to estimate the approximate environmental benefits of OzHarvest's anticipated food rescue program in Adelaide.

In summary, the findings are:

- The estimated benefits of OzHarvest's food rescue anticipated activities is the avoided emissions of 310 tonnes of greenhouse gases (tonnes $CO_{2\text{-}eq}$) or the annual equivalent of permanently removing 90 cars from the road. It also achieves a water saving equivalent to the annual water consumption of 120 Adelaide households, and a saving in landfill disposal equivalent to the annual generation of 300 households.
- On average, every kilogram of food that OzHarvest rescues will avoid 2 kg of greenhouse (kg $CO_{2\text{-}eq}$) emissions, and avoid the consumption of 143 litres of water.

2 Introduction

OzHarvest was established in 2004, out of concern about the amount of food waste within the hospitality and catering industries, and to do something about food insecurity for financially struggling families and individuals. Today, OzHarvest delivers 100 000 meals per month across Sydney and Canberra, and operates a fleet of six vans.

In Adelaide OzHarvest will initially operate one diesel van, which will run deliveries Monday to Friday, all year around, to approximately 6–8 local charities.

The purpose of this report is to:

- describe the review of available food Life Cycle Assessment (LCA) data used to determine the environmental benefits of providing a meal using rescued food versus the provision of the meal through typical channels, based upon OzHarvest's proposed activities.
- quantify the environmental gains achieved by OzHarvest's forecast level of food rescue in Adelaide.

OzHarvest collects surplus ready-to-eat meals and food ingredients from organisations such as:

- caterers
- function centres
- tourist operators
- hotels
- food wholesalers
- retailers
- restaurants
- delis.

Food is collected by OzHarvest and distributed at no cost to the food donor or the recipient charity. OzHarvest connects food donors with charities, but does not directly prepare meals with donated ingredients.

The waste reduction associated OzHarvest's large scale food rescue has a significant benefit for the environment. OzHarvest straddles issues of both hunger awareness and environmental sustainability, and will contribute to reducing the estimated 240 000 tonnes of food thrown out in South Australia annually.

The environmental benefits of OzHarvest's activities primarily arise through the avoided consumption of food elsewhere, by rescued meal recipients, should they have not received the rescued meal. This means that the charity or meal recipient would have to source food from elsewhere, requiring that additional production of food. So, assuming the rescued food meal recipient did not go hungry, then for every meal OzHarvest provides, it avoids the environmental impacts of producing a second meal.

In real life, a significant proportion of recipients do go hungry if they are not provided a meal by OzHarvest. For the purposes of this study, it is assumed that two thirds of meal recipients would typically go completely hungry if not provided with a meal rescued by OzHarvest. This information is incorporated into the analysis of the environmental benefits of OzHarvest's activities, so as to not overstate the environmental benefits of OzHarvest's food rescue program.

Within the actual modelling and reporting it is assumed that the consumer would have eaten a meal (unless they went hungry) that has an equivalent environmental impact to the OzHarvest provided meal, should they have not received the OzHarvest meal.

It is also assumed that if OzHarvest did not intervene to rescue the surplus food, it would be disposed to landfill.

The environmental benefits of recovered food were determined across the following four indicators:

- **greenhouse gas benefits** (units – kg $CO_{2\text{-}eq}$ and equivalent refrigerators switched off for one year)
- **energy savings** (units – kWh and number of refrigerators annual energy consumption)
- **water savings** (units – kilolitres and number of households annual water consumption)
- **landfill savings** (units – cubic metres and number of households annual landfill generation)

3 Project method

3.1 LCA background

Life Cycle Assessment (LCA) is a technique for assessing the environmental impacts associated with a product over its life cycle. LCA approaches are increasingly being used to assess the environmental performance of products and systems. This approach models the environmental impacts from each stage of a product's lifecycle across raw materials acquisition, manufacture, product use and end-of-life.

3.2 Goal and scope definition

The goal of this study is to determine the environmental benefit of providing a meal using rescued food versus the provision of the meal through typical channels.

Each meal modelled has its ingredient inputs limited to those that will dominate the life cycle impacts. For example, the main ingredients for a typical sandwich or roll are approximated as; bread, meat, vegetables/salads and dairy (cheese). These ingredients are modelled in the lifecycle, with any other minor ingredients assumed to have the same average impact as the main ingredients.

It is important to note that it is assumed that for two thirds of meals provided, no meal would otherwise have been consumed by the meal recipient. For this proportion of meals the environmental impact of OzHarvest's activity is not off-set by an avoided food production credit, i.e. OzHarvest's food rescue activity has a net impact upon the environment in these cases.

3.3 Food LCA data analysis and calculator development

Pre-existing and extensive LCA studies on food have been completed and are available in compiled forms through the following LCA databases:

- LCA food DK database (primarily data for Denmark and Western European conditions).
- Centre for Design at RMIT and Life Cycle Strategies Pty Ltd (2010) *Australasian LCI database version 2010.7, data released in SimaPro LCA Software*. Melbourne, Life Cycle Strategies, July 2010.
- Swiss Centre for Life Cycle Inventories (2010) *ecoinvent 2.2 LCI database*, Switzerland.

The food LCA data in the above databases was generally available up to the point of wholesale distribution. However, the environmental impact of the rescued food across the entire food lifecycle covers the following general areas:

- farm production impacts
- food processing (and transport to food processing) impacts
- wholesale distribution – transport and storage
- retail transport and storage
- OzHarvest transport impacts
- consumption impacts.

To enable an approximation of the full lifecycle impacts of food supply, a literature review was undertaken to identify the respective impacts of each stage of the lifecycle, for each food ingredient, for each impact category.

The life cycle data for each of the food ingredients was collated up to the wholesale (or in some cases the farm gate) point of the food lifecycle. The impacts of food supply up to the point of consumption were then approximated from the review of the impacts of the full lifecycles. This allowed the full life cycle impacts to be approximated for the four impact categories (global warming potential, embodied energy, embodied water and landfill impacts).

Other key aspects of the life cycle approximation were:

- The calculated landfill GHG impact was 0.33 kg $CO_{2\text{-eq}}$ per kg of food landfilled, which assumes a typical methane recovery rate at landfills servicing Adelaide of 60%.
- It was assumed that environmental impacts of delivering a meal to the point of consumption is the same as the sum of the impacts of delivering the individual ingredients to the point of consumption (including food processing and cooking), i.e. meat or vegetables are processed and cooked with similar impacts regardless of if they are consumed as a single ingredient, or combined with other ingredients.
- Due to the lack of Australian specific water consumption data across the full lifecycle of most food ingredients, the following general water split across the different stages of the life cycles of food was adopted: on farm (75%), processing/packaging (10%), wholesale distribution (2.5%) retail distribution (2.5%) and consumption (10%). This split is a synthesis of information found in MBS (2006), Heller (2000) and Larsen (2008), and provides a general approximation to the actual life cycle water impacts. Water consumption to the farm gate or wholesale level was drawn from the LCA food DK database.

Key conversion factors used in the calculator are presented in Table 3-1.

Table 3-1 Key conversion factors

Factor	Conversion value
Refrigerator $CO_{2\text{-eq}}$ emissions	0.32 tonnes $CO_{2\text{-eq}}$/fridge.year
Car $CO_{2\text{-eq}}$ emissions	3.44 tonnes $CO_{2\text{-eq}}$/car.year
Household domestic water consumption	183 kilolitres/household.year
Household garbage yield	500 kg/household.year

4 Results

The estimated avoided environmental impacts of OzHarvest's food rescue activity, at a recovery level of 150 tonnes/year, are summarised in Table 4-2 below.

Table 4-2 Total *avoided* environmental impacts due to OzHarvest's estimated activity in Adelaide SA

Impact category	Value	Unit
Greenhouse gas emissions	306 500	kg $CO_{2\text{-eq}}$
	960	refrigerators switched off for one year
Energy use impact	590 000	MJ
	330	equivalent refrigerators energy consumption per year
Water use impact	21 500	kilolitres
	120	annual households water consumption
Landfill impact	150	m^3/year
	300	annual households landfill yield
Total weight of recovered food	150 000	kilograms

On average, every kilogram of food that OzHarvest recovers will avoid 2 kg of greenhouse gas (kg $CO_{2\text{-eq}}$) emissions, and avoid the consumption of 143 litres of water.

The data in Table 4-2 is based upon the estimated food rescue breakdowns, by weight, meal type and ingredients, provided in Table 4-3.

Table 4-3 OzHarvest estimated food rescue, by meal type and modelled ingredients

Primary ingredient or meal	Weight of recovered food (kg)	Ingredient 1		Ingredient 2		Ingredient 3		Ingredient 4	
		Ingredient name	% by weight of meal	Ingredient name	% by weight of meal	Ingredient name	% by weight of meal	Ingredient name	% by weight of meal
Sandwiches and rolls	7 500	Bakery - roll	30%	Meat - ham	30%	Vegetable - mixed	20%	Dairy - cheese	20%
Meats – poultry, pork, lamb, beef, ham	12 000	Meat - beef (round)	25%	Meat - chicken	25%	Meat - pork mince	25%	Meat - ham	25%
Desserts and pastries	19 500	Bakery - pastry	50%	Dairy - cream	20%	Dairy - butter	10%	Other - sugar	20%
Assorted vegetables, salads, fruit	63 000	Vegetable - potato	25%	Vegetable - onion	25%	Fruit - apples	25%	Fruit - bananas	25%
Cooked meals	16 500	Vegetable - mixed	50%	Meat - chicken	20%	Meat - beef (round)	20%	Bakery - bread	10%
Bread	15 000	Bakery - bread	100%	-	-	-	-	-	-
Dairy	15 000	Dairy - milk	30%	Dairy - butter	20%	Dairy - cheese	30%	Dairy - cream	20%
Dry stock (e.g. cereals, sugar, etc.)	1 500	Other - sugar	50%	Cereal - flour	50%	-	-	-	-
Total	**150 000**								

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