Queensland Organics Kerbside Collection Trials

Final Report

July 2024

Queensland Government

Prepared by: Office of Circular Economy, Department of Environment and Science

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Executive Summary

Establishing a kerbside organic waste collection service, where collection of household organic waste bins becomes part of council's core waste service, is identified in the Queensland Organics Strategy 2022-2032 (Organics Strategy) as one option available to councils to maximise the diversion of organic waste from landfill [1]. Both garden organic (GO) and food organic and garden organic (FOGO) collection services require significant investment and are subject to location-specific variables, including community attitudes and behaviours, environmental factors, collection capability, processing availability and end-market (generally compost) demand.

In 2021, the Department of Environment, Science and Innovation (the department) provided funding to Townsville City Council, Rockhampton Regional Council, and Lockyer Valley Regional Council to undertake kerbside organics collection trials (the organics trials program). The objective of the organics trials program was to assist local governments to deliver GO and/or FOGO waste collection services within their councils, and generate valuable, Queensland-focused data to inform future investment decisions.

Participating councils and the department chose to target the trials to FOGO collection as this would result in higher diversion rates than collection of GO alone. However, some councils opted to deliver FOGO services to some households and GO services to others in order to test acceptance of the two options. The trials focused on the operational delivery of kerbside organic services by councils. Full service implementation cost/benefit, compost processing technology and capacity, regulatory settings and end-markets for final compost product were beyond scope. The organics trials program provided data about:

- kerbside organics collections within three Queensland local government areas over the period August 2021 to September 2022
- 3241 households across eight suburbs, of which:
    - 2490 households received a FOGO collection service
    - 751 households received a GO collection service.

Outcomes

The organics trials program has demonstrated that, from an operational delivery perspective, the implementation of kerbside organic waste collection in Queensland communities is achievable and can result in measurable progress towards recovery targets for organic waste (Table 1). Trial councils achieved results for both GO and FOGO collections that are comparable to mature systems in other parts of Australia [3-7].

The councils which participated in the trials have provided valuable input to departmental policy and program planning and provided feedback on practical matters to be considered in regulating the processing of organic waste. The trials also generated valuable Queensland-based data and learnings that may be used by other councils to inform the development of kerbside organics collection services across the state.

Since completion of the organics trials program, the Queensland Government has announced funding of $151.1 million to support Queensland councils to introduce or expand kerbside collection of organic waste through the Growing the Recovery of Organic Waste via Food Organic Garden Organic (GROW FOGO) Fund [2]. The GROW FOGO Fund has been designed to assist service introduction and maximise the opportunity to meet the targets established by the Organics Strategy.

A number of other initiatives are in place to improve organic waste recovery, including the development of resource recovery education and behaviour change materials by the Queensland Government which are available for council use, and the establishment of trials to provide information about options for the management of organic materials generated by multi-unit dwellings and commercial premises. In addition, the department continues to work with councils and industry to ensure that composting activities in Queensland continue to supply safe and sustainable compost products, operating to best practice standards.

Table 1: Overall results (weighted average over the 3 trial areas)

Metric	Qld FOGO trial households	Qld GO trial households	Qld organics capture rate 2030[8]	NSW organics diversion performance [3-4]
Organic waste recovery rate	79%	49%	*90%*	*85% (2020)* *84% (2023)*
Contamination rate	3.8%	1.8%	*<1%*	*2.2% (2020)* *2.2% (2023)*

Key outcomes from the organics trial program:

- collection services with a weekly FOGO collection and fortnightly general waste collection recovered more organic waste than fortnightly GO services with a weekly general waste collection
- contamination rates for FOGO were above target levels, but consistent with new services in other jurisdictions, and mostly attributable to less than 10 per cent of FOGO trial program households
- contamination rates for GO were comparable to those found in mature GO collection systems in other jurisdictions
- 80 per cent of FOGO trial households found the service easy to use
- 70-80 per cent of trial households support the implementation of a community-wide FOGO service.

Key challenges for household participants:

- managing odour and vermin at both the kitchen caddy and kerbside bin
- separating FO from non-compostable packaging
- adapting to the reduction in general waste service frequency (and bin size for Rockhampton), particularly for large families or households with medical waste.

Key learnings for councils:

- delivering education and behaviour change activities effectively and efficiently requires significant resources and can be challenging to implement because of the specialised knowledge required. Different demographics and community groups require tailored messaging to change behaviours
- managing problematic contamination from a small portion of household participants requires significant resources and poses risks to the collection service and to the use of the final product
- the community sentiment for the FOGO bin was overwhelmingly positive, however the majority of trial program households indicated that they would not be willing to pay a fee for the service.

Key learnings for the Queensland Government:

- councils require support to implement such a significant change in waste management services
- council and community needs will vary across regions, so pathways for councils to transition to kerbside organics collection services should be flexible
- the trials provided councils with useful experience and data that has been utilised in business case development for full-service rollout. There are still unknowns with regards to processing technology and its regulatory framework, end markets for the produced composts, and costs to councils. Councils need to undertake detailed assessments of their local circumstances to fill these knowledge gaps.

Introduction

The Queensland Government's Waste Management and Resource Recovery Strategy (Waste Strategy) [9] and the Organics Strategy and Queensland Organics Action Plan 2022-2032 (Organics Action Plan) [8] set the agenda for a transition towards a circular economy. Within this strategic framework, the Queensland Government has identified initiatives that will contribute to improved landfill diversion and resource recovery and ultimately reduce carbon emissions from landfill.

In 2016-2017, Queensland generated an estimated 1.8 million tonnes of food waste, with one third generated by households [10]. In addition, the Organics Strategy states that, on average, household general waste bins contain approximately 50 per cent organic waste. This presents a significant opportunity for Queensland to divert organic waste from landfill, create new jobs in resource recovery, and reduce greenhouse gas emissions.

The provision of household waste collection services in Queensland is a local government responsibility, however both Queensland and the Commonwealth Government have set targets in relation to organic waste. In developing the Organics Strategy and Organics Action Plan, the Queensland Government recognized that councils would require support to deliver the household collection services required to achieve established targets.

In 2021-2022, twelve councils provided 340,100 households with a kerbside organic waste collection service and collected 111,000 tonnes of garden and food organic waste [11]. This is a 33 per cent increase per capita on the year before and is expected to continue to rise. In 2022-23, twelve councils provided kerbside organic waste collection services to 413,509 households – an increase of 21.6% from the previous year; and collected 113,933 tonnes of garden and food organic waste – an increase of 2.6% from 2021-22 [12]. At the time that the organics trial program commenced, only one Queensland council (Ipswich City Council) operated an opt-in FOGO collection service, and several councils had opt-in GO collection services.

Since completion of the organics trial program, several other Queensland councils have established organics collection services, these being a mix of GO and FOGO; and opt-in and opt-out services. The GROW FOGO Fund was launched in August 2023, and at the time of publishing, the Queensland Government has commenced approving funding to councils to expand their core household organics collection services [2].

The key objectives of the Organics Strategy are to:

1. halve the amount of food waste generated
2. divert 80 per cent of the organic material generated from landfill
3. achieve a minimum organics recycling rate of 70 per cent.

While the Organics Strategy provides statewide targets across all waste streams, the Organics Action Plan provides organics capture targets that are specific to organic waste generated and disposed by Queensland households. The organics trials program data are directly relatable to these specific 2030 targets:

- 80 per cent of households have an organics capture service (e.g. kerbside organics collection bin)
- 90 per cent of organic waste generated by households is captured correctly in the organics capture service, with separate capture rates comprised of:
    - 50 per cent capture of food organics
    - 90 per cent capture of garden organics
    - less than 1 per cent contamination rate.

The diversion of household organic waste from landfill is a viable strategy to significantly contribute to objectives 2 and 3 of the Organics Strategy. FOGO kerbside collection services have been broadly adopted in other jurisdictions, including New South Wales, Victoria, Western Australia and South Australia, to substantially reduce organic waste being sent to landfill. The Organics Action Plan sets actions for the Queensland Government, local governments, and industry to identify best fit-for-purpose options to improve organic waste management, implement consistent household collection options, and develop, implement and align household education and behaviour change tools to maximise the recovery of organic materials and minimise contamination across all bins [8].

This report summarises the outcomes of the organics trials program and presents the data that informs organic waste service performance. It is not state government policy.

What is involved in an organic kerbside collection service?

In general, the establishment of a household organics collection service involves the following elements:

- Households receive a new kerbside bin with a lime green lid for organic waste, resulting in each household having three bins, also including comingled recycling (yellow) and general/residual waste (red).
- Council will determine the materials that may be disposed in the organics bin based on agreed acceptable input materials (as available), community need and available collection and processing infrastructure.
- For FOGO services, councils typically provide households with a kitchen caddy, and occasionally (at council and contractor discretion) compostable caddy liners (to encourage use of the correct compostable liner). Caddies and liners provide households with a dedicated container for holding food scraps which can be disposed of into the FOGO bin.
- The organics bin is collected on a weekly or fortnightly schedule in a dedicated organic waste truck.
- The organic waste is delivered to a composting facility where it is screened for contamination, pasteurised, homogenised and composted over a period of approximately 12 weeks or more, depending on processing technology, product requirements and in accordance with regulations.
- Councils support service introduction with community education and awareness to maximise capture of organic waste in the new bin and reduce contamination.

Established services in other jurisdictions including New South Wales, South Australia, Victoria and Western Australia [3-7] show that generally the greatest rates of organic waste diversion and recovery are obtained with the following configuration, noting that this configuration attracts the highest risk for contamination:

- Lime green, 240 litre bin for organic material – collected weekly
- Red, 120/140 litre bin for general waste – collected fortnightly
- Yellow 240/360 litre bin for recycling – collected fortnightly.

It is important to note that reducing the collection frequency of the general waste bin presents a significant impact to some community members, e.g. those who generate medical waste or have young children in disposable nappies. To mitigate this impact, some councils provide options for residents to opt in to a more frequent collection service.

Service configuration is only a part of the formula for a successful organics service. For communities with changing waste services, significant awareness, education, and monitoring activities should be maintained to ensure a service has:

- community support and educational materials to promote correct recovery of organic materials
- high participation rates
- high diversion rates of organic materials per participating household
- the lowest contamination levels possible to ensure the material is acceptable to the processing facility and end users
- strong evidence-base through audit data collection and analysis [13].

Design of the organics trials program

Program objective

The objective of the organics trials program was to assist local governments to deliver organic waste service trials that generate valuable, Queensland-focused data that can be used to inform future investment decisions.

The results of the trials draw from the data points outlined below and are presented in this report as quantified metrics and qualitative findings.

Table 2: Trial data sources

Qualitative	Quantitative
Community feedback	Truck and weighbridge data
Local government feedback	Waste composition audits and bin health checks
Logistical learnings	Compost quality sampling
Resourcing learnings	Costs
Organic waste processing learnings	Community surveys

Trial design

Key aspects of the trial include:

- Three councils participated in the organics trials program: Townsville City Council, Rockhampton Regional Council and Lockyer Valley Regional Council.
- The trials were conducted in regional areas, where due to reduced urbanisation, there was more flexibility in processing options (e.g. open windrow methods and forced aeration).
- The trials were conducted between August 2021 and September 2022.
- The trial councils developed implementation plans, communication and education strategies, and monitoring and data plans to support delivery.
- Trial areas were selected by each council based on suburb characteristics and community demographics that were deemed representative of the local government area.
- Each council trialled various system configurations, detailed below.
- Each council established their own list of acceptable inputs / materials that could be disposed in the kerbside organic waste bin.
- Participation was mandatory for households within the selected suburbs. Households were provided with a lime green lidded 240L bin, kitchen caddy, and in most cases, Australian Standard approved compostable caddy liners. Participants were not charged for any equipment or the collection service.
- Organic waste collected was processed at local composting facilities.
- Waste composition audits were required to be undertaken of organic and general waste bins at the following intervals: before the trials commenced to establish a baseline, at six months (March 2022), and at twelve months (August 2022).
- Attitudinal surveys were undertaken before trials started and at the end of the trials to measure the impact on participants attitudes.
- A variety of other data was collected throughout the trials including:
    - Collection details from weighbridge and trucks movements
    - Community feedback through various mechanisms
    - Kerbside bin spot checks
    - Data from organic waste processors.
- The trials focused on typical suburban, single-unit dwellings to allow collection of comparable data and due to the additional complexities associated with collection of organic waste from multi-unit dwellings and commercial and industrial premises.

Rockhampton Regional Council trialled both FOGO and GO collections using council's waste collection fleet and reduced the size of participants' general waste bins. To test whether the use of caddy liners would improve household collection of food organics, one suburb was provided with a supply of caddy liners and the other was not. Processing was undertaken by a local provider utilising an open windrow system.

Townsville City Council trialled both FOGO and GO collections using council's waste collection fleet. FOGO and GO processing were undertaken by separate, local providers utilising an open windrow system for FOGO and Covered Inoculated Static Pile method for GO.

Lockyer Valley Regional Council conducted FOGO collection trials in two suburbs using the existing waste contractor. Council established a pilot composting facility, using forced aeration technology, at the council-owned landfill site to process the FOGO materials collected through the trial.

Table 3: Trial Configurations

Local Government	Suburb/Area	Households	General Waste Treatment	FOGO/GO Treatment
Rockhampton (763 households)	Northside (GO)	257	240L weekly	240L GO fortnightly
	Southside (FOGO)	253	140L fortnightly	240L FOGO weekly 7L caddies provided
	Gracemere (FOGO)	253		200 caddy liners provided to Gracemere; no liners provided to Southside
Townsville (1457 households)	Vincent & Heatley (GO)	494	240L weekly	240L GO fortnightly
	Burdell (FOGO)	482	240L fortnightly	240L FOGO weekly 240L vented bin trialled in Idalia
	Idalia (FOGO)	481		8L caddies provided 150 caddy liners provided
Lockyer Valley (1021 households)	Gatton (FOGO)	544	240L fortnightly	240L FOGO weekly 7L caddies provided 150 caddy liners provided

Overall trial performance results

The performance of the FOGO and GO kerbside waste collection systems trialled are presented below. They are derived primarily from the waste composition audits, and supported by truck and weighbridge data. Numbers presented are averages of the trial period.

The 2030 targets established in the Organics Strategy and Organics Action Plan are included for reference, and where relevant, the most recent performance results of NSW local government kerbside organic systems, prepared for the NSW Environment Protection Authority [4]. However, it must be noted that the trials data should not be used as a measure of progress towards the targets due to the scale and nature of the trials program.

Specifically:

- The results of the two GO trial areas across two local government areas are averaged into a single column.
- Note that comingled recycling performance has been excluded from the calculations.

- The numbers provided in this report may differ slightly to numbers published by the councils in their respective evaluation reports. This is the result of methods in aggregation and averaging for the purposes of this report.

Waste Generation

Waste generation rates (kilograms per household per week) over the trial period are summarised in Figure 1. The baseline data relate to the standard general waste collection service (red lid bin) provided before the introduction of the organics bin.

The amount of general waste generated per household during the trial period reduced from the baseline general waste measured before trials commenced. This was more noticeable in FOGO collection areas than GO collection areas. Although there is an increase in combined waste during the trial period, this is more obvious in the GO collection areas.

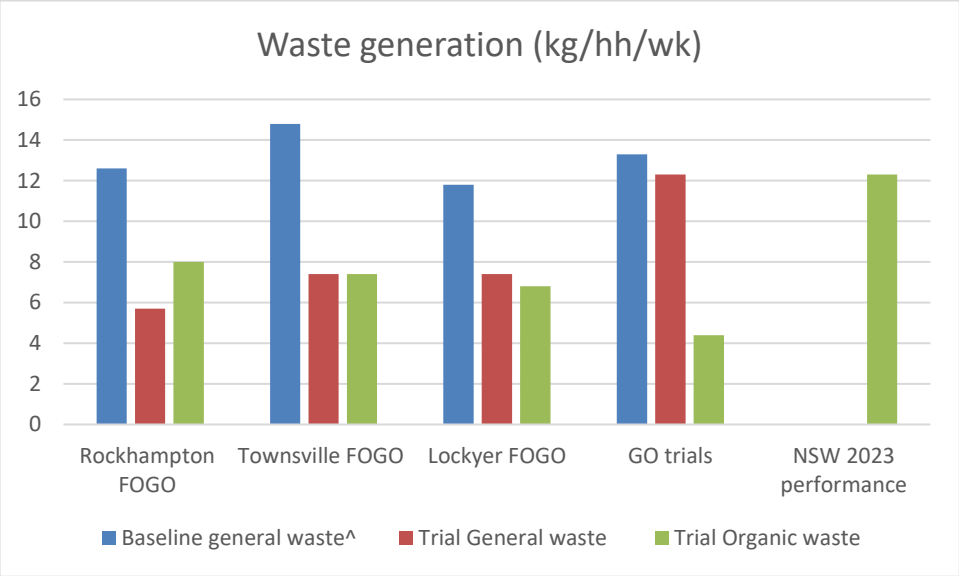

***Figure 1**: Waste generation from participating organics trials councils – baseline general waste (^measured before introduction of the organics collection service) vs trial general waste and organic waste.*

Capture rate

The capture rate is the proportion of the total organic waste disposed at the kerbside which has been correctly captured in the kerbside organics bin (as opposed to being disposed in the general waste bin). Figure 2 shows the capture rate for FOGO across participating councils and combined GO areas, represented as: (volume of organic waste disposed in the kerbside organics bin ÷ total volume of organic waste disposed at the kerbside) x 100, with New South Wales data included as a point of reference. Data has been provided below for the total organic waste capture, FOGO capture and GO capture.

Capture rate of organic materials during the trials period varies between FOGO councils between 68% and 93%. Rockhampton and Townsville FOGO trials were both comparable or exceeded the NSW 2023 FOGO capture rate of 84%. Rockhampton was the only council to achieve the Queensland 2030 household target established in the Organics Action Plan. The capture of organic materials in GO trials is lower (51%) due to food organics continuing to be disposed in the general waste bin (Figure 2).

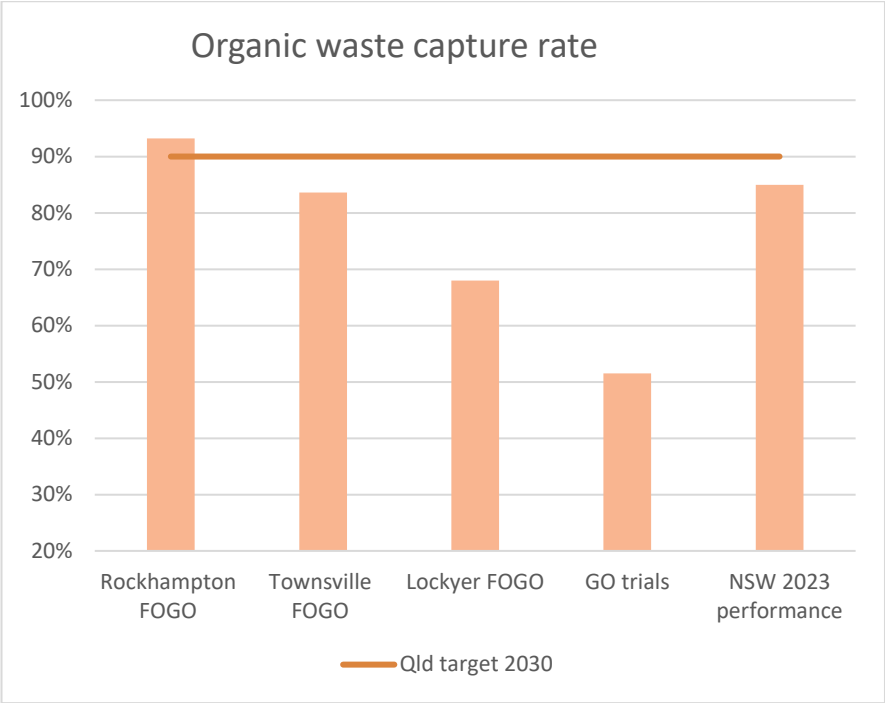

Figure 2: *Organics capture rates from participating trial councils and NSW 2023 recovery rate.*

In relation to the separate food organics and garden organics target capture rates established by the Organics Action Plan, Figure 3 shows the relative performance of the three participating FOGO trial councils against the 2030 target for food organics capture and Figure 4 shows performance for FOGO and GO trials against the 2030 target for garden organics capture.

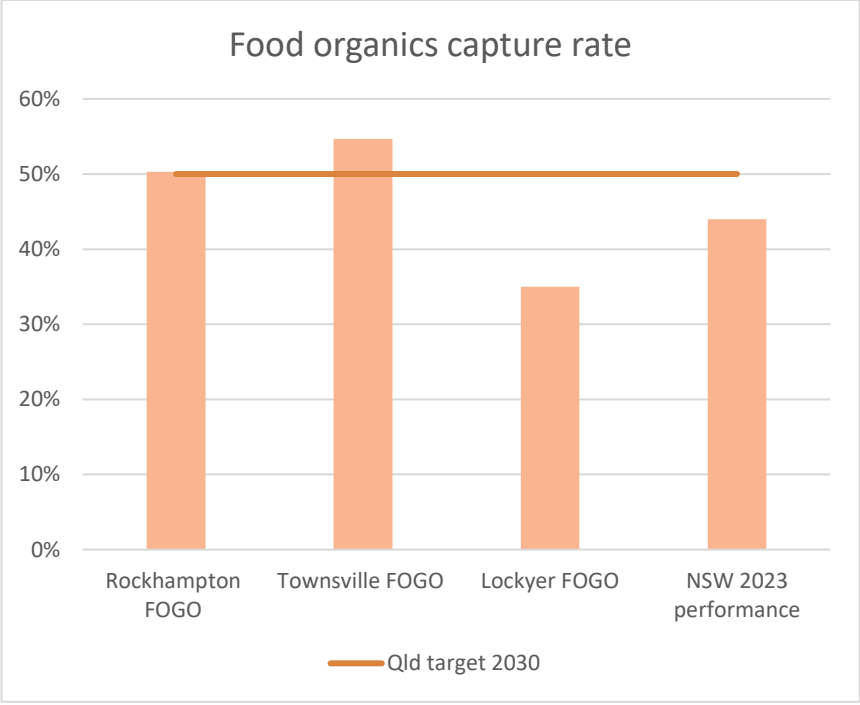

Figure 3*: Food organics capture rates from participating trial councils and NSW recovery rate.*

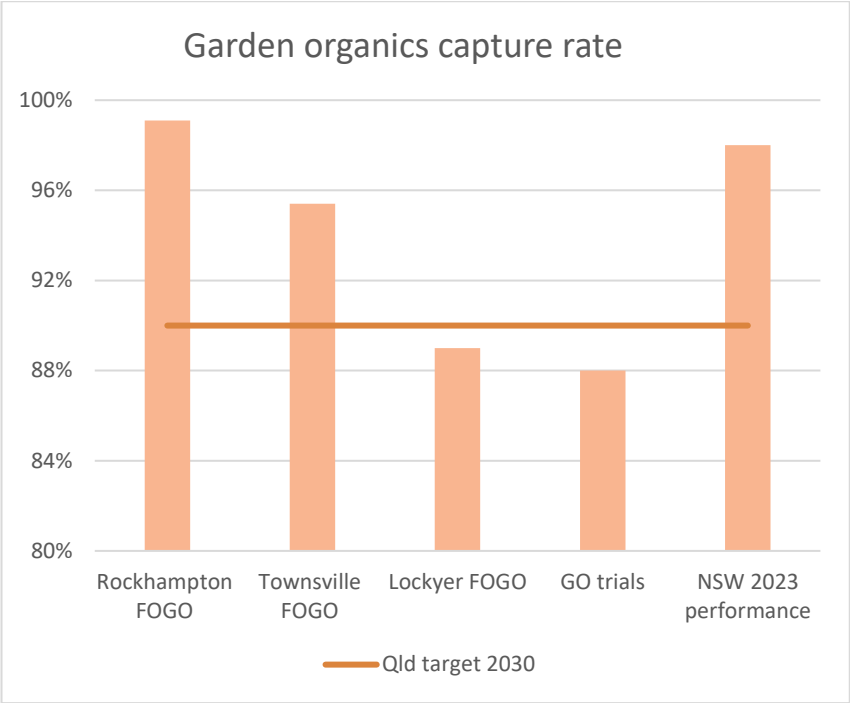

***Figure 4**: Garden organics capture rates from participating trial councils and NSW recovery rate.*

Contamination of kerbside organics bins

The organics contamination rate is the proportion of material identified as a contaminant in the kerbside organics bin, with data derived through kerbside waste audits. A contaminant is defined as any material found in a bin that is not correctly disposed in that bin. In context of the organics trials program, contaminants varied across trial participants as each participating council set its own acceptable inputs.

Contamination, represented as: (volume of contaminants in the organics bin ÷ total volume of the organics bin) x 100, varied across participating councils, suburbs and services (GO/FOGO) but ranged between 0.2% and 11.4%, as shown in Figure 5. The Organics Action Plan sets a 2030 target of less than 1% contamination. While this was not achieved consistently across trials, some trials (particularly Townsville) were within reach of the target and several improvements could be made to likely reduce contamination across all trials.

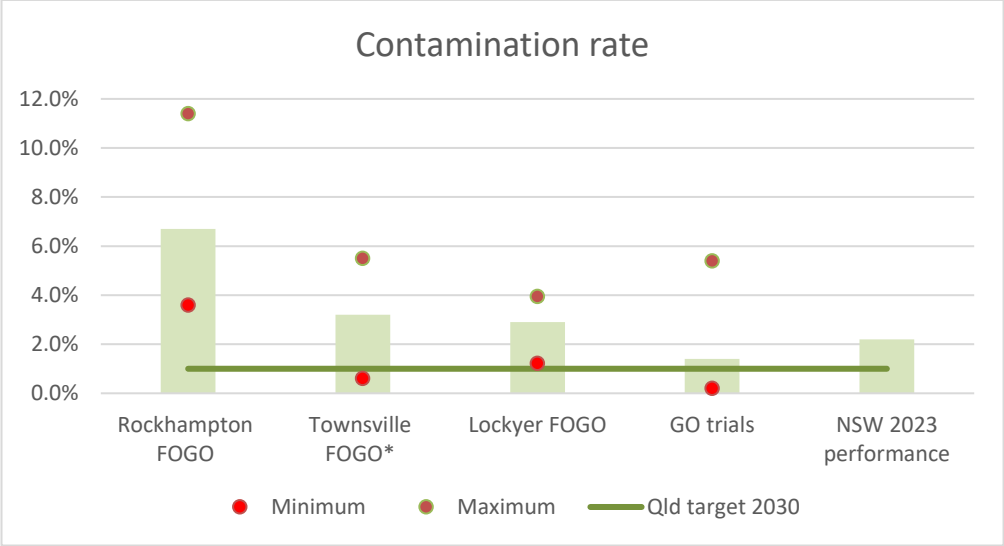

***Figure 5:** Contamination rates from participating trial councils and NSW performance*

Presentation rate

The presentation rate is the proportion of bins presented on the kerb for collection on a given day, providing an indication about household use of the new service, represented as: (total number of bins presented in a trial area ÷ total number of bins in the trial area) x 100.

In general, presentation rates across GO and FOGO collections and participating councils (between 51% and 65%) are lower than presentation rates of kerbside general waste bins (between 87% and 99%), and lower than reporting in New South Wales in 2020 (77%).

***Table 4**: presentation rates from participating trial councils and NSW*

Metric	Rockhampton FOGO	Townsville FOGO	Lockyer FOGO	GO Trials	NSW EPA 2020 performance
Presentation rate – weekly general waste baseline	89%	99%	87%	-	-
Presentation rate – fortnightly general waste	91%	93%	93%	90%	-
Presentation rate – weekly organics	60%	65%	51%	57%	77%

Findings

Findings are discussed below and, where possible, compared to examples from other jurisdictions. Findings are grouped into the following subsections:

- Community reception
- Education and community awareness
- Contamination
- Total waste generation
- Household infrastructure
- General waste service changes
- Compositional auditing
- Allowable inputs
- Processing and compost quality
- Lockyer Valley Regional Council's composting pilot
- Costs

Community reception

Anecdotally, overall community sentiment towards organics collection services was overwhelmingly positive with council staff reporting positive and constructive interactions regularly throughout the trial period. Surveys of trial participants were undertaken before and after the trials (Appendix**Error! Reference source not found.**), and included questions to determine service change acceptance. Councils provided surveys to trial households in paper copy and digitally but response rates were generally less than 20 per cent.

- For trial areas with a FOGO service:
    - 80 per cent of respondents found the service easy to use
    - 70-80 percent of respondents supported the implementation of an ongoing FOGO service
    - 25-30 per cent of respondents indicated that they would be willing to pay for the organics collection service, while 50 per cent were unwilling to pay any more than for their current waste service.
- Survey responses from GO trial areas were generally very positive, noting that these participants experienced the least amount of change to other elements of their waste collection service (e.g. size of general waste bin or frequency of general waste collection).
- Commentary was captured as part of the surveys. The majority of negative commentary was related to the reduction of the general waste bin collection to fortnightly in one council area. Other issues across all areas included vermin and odour at both caddy and bin.
- Lockyer Valley found that 27% of households used their FOGO service more than 75% of the time, and that 85% of households used the service at least once during the trial.
- Rockhampton undertook targeted behaviour change messaging, based on NSW's Scrap Together campaign, in the second half of the trial and measured impact through the surveys. Surveys identified key barriers to participation as vermin/smells and inconvenience of managing food packaging. The survey results show an observable improvement in perceived barriers to using the service after the communication exercise, which is consistent with other studies [14].
- Rockhampton's voluntary end-of-trial survey asked participants if they would continue with the FOGO service; 13 per cent of respondents indicated they would opt-out. All trial participants were given the choice to continue with the service post-trial and 33 per cent opted out; indicating a level of survey bias.
- While surveys can be informative, the Rockhampton example demonstrates that caution should be exercised when extrapolating results, particularly when response rates are relatively low. Large surveys of households with organic waste collection schemes in the UK show that perceived participation in survey responses was 20 per cent higher than actual measured participation [15].
- Businesses that provide garden waste collection services in Rockhampton and Townsville raised concerns with councils regarding the impact of the council collection service on their businesses. This impact has not been quantified. Trial councils engaged with these stakeholders and kept them informed of trial progress and have committed to further engagement as they consider broader implementation plans.
- Some multi-unit dwellings were captured by the trials, and anecdotally had low participation. Nevertheless, Lockyer Valley had success in engaging champions of some unit blocks, who were able to support residents to engage in the trial and manage the bins within the confines of storage areas.

Education and community awareness

Participation in organic waste kerbside collections is driven by individual behaviours and attitudes [14, 16]. Improving participation rates improves organic waste diversion and system performance, and the right communications can influence community behaviours [15]. Long lead times are generally recommended to increase awareness before rollout [17], with initial communications ideally commencing 12 months or more before service launch date. Effective behaviour change techniques for improvement in household waste management are continually advancing. Work by the NSW Environmental Protection Agency [16], Behaviour Works Australia, and Fight Food Waste Cooperative Research Centre is contributing to waste behaviour change resources in the Australian context.

The organics trials program demonstrated that State government supported behaviour change resources should be made available to local governments as soon as reasonably practicable to enable consistent, well-planned, and timely communications for FOGO implementation. Since completion of the organics trials program, the department has developed a range of education and behaviour changes toolkits that can be accessed by councils to deliver targeted, consistent behaviour change interventions within their local areas.

During the trials, councils developed comprehensive communication and education strategies with their communications teams which are outlined below:

- Common communications across the trials included:
    - Invitational letter advising of trial participation.
    - 'Start-up' pack delivered with kitchen caddies that included caddy liners and collateral such as calendars.
    - Website landing page that hosted resources and provided a platform for trial updates and surveys.
    - In-person community events.
    - Social media and other media advertising, including television with local news.
    - Customer service centre support for enquiries.
    - Flyers, corflute signage and bin tags.
- Because of the scale of the trials and time constraints, initial communications to trial participants were made 8 weeks before trial launch dates. Due to the complex nature of changing household waste behaviours, and based on best practice behaviour change, it is recognised that a longer initial communications period would have been beneficial.
- Councils sourced example collateral from other jurisdictions and tailored materials to their specific needs.
- Trial councils advised that education and communication activities consumed more staff resources than initially estimated, and that this aspect of the trials was most challenging.
- Communications had to be tailored for serial contaminators and required council staff to explore behaviour change science and resources, requiring skills and knowledge that may have been outside their expertise.
- Marketing collateral required multiple reviews and iterations, with challenges experienced by councils in adapting messaging and materials to respond to emerging issues.
- Council staff took every opportunity to engage in-person with trial households including during council and community events, through community enquiries, while undertaking bin-tagging, chance encounters with staff or collection truck drivers, and trial area walk-arounds.
- Households with tenants were more difficult to engage throughout the trial process, and changing tenants meant new individuals to the trials part way through.
- Rockhampton identified that a key challenge for communications was the lack of suitable contact database for households, meaning cheap and effective means of communication (such as text and email) could not be utilised to great extent.
- Lockyer Valley had success in engaging with a local park care group and schools to introduce the concept of FOGO and promote the use of final compost product, helping to create a tangible connection between waste and the community's environment.

See **Appendix 2** for an example communication and engagement plan overview provided by Townsville City Council.

Contamination

Contamination of kerbside organic bins is, in part, contributable to the difficult nature of influencing complex household behaviours. Average contamination rates in mature systems from research conducted in other Australian jurisdictions including New South Wales, Western Australia, Victoria and South Australia [3-7] are typically 2-3 per cent, but can be highly variable between samples (0.04 - 17 per cent) [16]. While service contamination is caused by a small percentage of users, they can have a disproportionate impact on the costs of processing the waste, with contamination removal requiring significant capital and labour. Councils may be able to achieve reductions in contamination through education strategies with specific, targeted interventions supported by broad community messaging [3].

Contamination results from the organics trials program include:

- The trial councils were able to achieve reasonable contamination rates and experienced variability as observed in other jurisdictions, with Rockhampton experiencing notably higher instances, possibly linked to the reduction in the size of the general waste bin along with the reduced frequency of collection. The higher observed Rockhampton contamination rate reflects the general trend observed in other jurisdictions of

higher contamination rates resulting from a weekly FOGO collection service combined with a reduced fortnightly residual waste collection; combined with a reduction in the size of the general waste bin [3].

- Rockhampton's assessment of factors contributing to the high contamination identified that 5 per cent of households seriously/catastrophically contaminated, and that these were in areas with higher proportions of rental properties; large, young families; and/or lower socio-economic demographic areas. Lockyer Valley also identified that these cohorts are more likely to contaminate.
- Contamination levels exceeded the 1 per cent target of the Organics Action Plan. Despite this, the trial processors were able to process the organic waste into compost product utilising manual picking and product screening.
- Contamination in GO trial areas was extremely low, and in Townsville contamination was lower than mature GO systems in other Australian jurisdictions. The lower contamination level for GO services is likely due to:
    - The minimal change required to the householder's behaviour.
    - Less complication in only diverting organics from the garden.
    - No changes to the residual waste bin collections.
- Due to the low GO contamination, the processing costs for GO would be considerably less than the FOGO stream.
- Townsville's bin tagging program, undertaken during the first 12 months of the trial, reduced the overall number of organics bins with contamination between first and second tags. A four-tag health check was undertaken in the post-trial period and found that improvements diminished with subsequent tagging.
- In all trial areas, there was a small percentage (estimated less than five per cent) of participants who were unwilling to engage with council on their waste management behaviour and were responsible for instances of serious contamination in organic waste bins. Bin tagging and education did not result in behaviour change for these participants and none of the participating councils had local laws in place to manage repeat offenders.
- The trials demonstrated that it would be beneficial for councils to investigate local law compliance models for managing households that wilfully contaminate kerbside bins.
- Council's waste truck drivers became key in managing contaminated loads through identification using collection software. This has also been identified as a success factor in other states [13].

Similar to other Australian jurisdictions, contamination rates from the trials were likely due to:

- The reduction of the collection frequency of the residual waste bin from weekly to fortnightly:
    - Particularly for large families
    - Families with young children, nappies disposal etc.
- The reduction of the size of the residual waste bin.
- The potentially lengthy list of allowable and non-allowable food wastes.
- The inclusion of food in non-compostable containers and packaging in the FOGO bins.
- Non-organics contamination included in the caddy liners. Some of this contamination was not included in the initial de-contamination of the kerbside collected material but later found after the composting process.
- The large volume of plastic bags.
- Nappies in the FOGO bins.
- The significant household behaviour change required by the householders to divert food wastes.
- Contamination by residents of social housing, culturally and linguistically diverse communities, transient communities, residents of MUDS (multi-unit dwellings) etc.

Total waste generation

Overall, trial councils captured on average 5-15 per cent more waste, above the baseline, with the addition of FOGO services, peaking at a 40 per cent increase in wet periods. GO systems generated on average 10-30 per cent more waste above baseline volumes. Kerbside organics collection services are expected to increase the capture of GO materials that would have been managed by alternative means (e.g. self-haul or self-composted) in the absence of the collection service.

While self-haul garden waste is expected to decrease with the introduction of organics services, data to support this hypothesis is limited. Results from the trials indicate that garden waste previously delivered to commercial processors or council transfer stations by householders was disposed in organics bins during the trials.

Variables such as season/weather events and macro-economic trends influence waste generation rates, however were outside the scope of this analysis. During the trials period, Lockyer Valley received 1430mm of rain, Townsville 1228mm, and Rockhampton 713mm. Seasonality impacts organics generation, primarily attributable to garden waste, with 83 per cent of material collected between October 2021 and May 2022 in Townsville, for example (Figure 6).

The volume of general waste generated ranged from 11–15 kg/household/week before the trials, containing on average 1.6 kg/household/week of food waste, and 2.2 kg/household/week of garden waste (as per baseline audits conducted in August/September 2021, a period of low rainfall). Waste audits conducted 12 months after the trials commenced showed that the total volume of food waste disposed across all bins remained consistent, however an average of nearly 50 per cent was captured by the FOGO service.

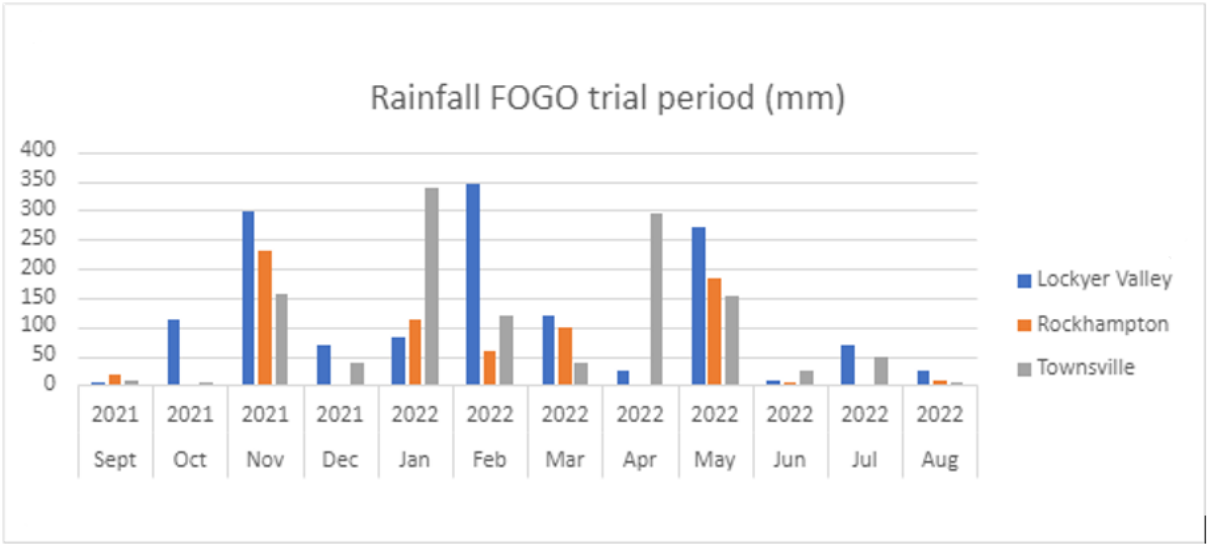

***Figure 6**: Rainfall per trial council area during the FOGO trials (Bureau of Meteorology, accessed April 2023)*

Household infrastructure

Established systems show that the provision of caddies and compostable caddy liners to households improves participation in food separation, overall satisfaction, and recovery. They are essential elements to overcoming some of the key barriers experienced by households. Established systems show:

- caddies provide the initial infrastructure change in the kitchen [18], and
- compostable liners (approved standard) maintain participation and higher food recovery, especially if supplied by councils [15, 19, 20].

The organics trials program outcomes included:

- All trial councils provided caddies to FOGO trial participants, and all but one trial area (Southside, Rockhampton) received a supply of compostable caddy liners (AS5810-2010/AS4736-2006).
- Southside, Rockhampton, which did not receive a supply of compostable caddy liners, recovered 21 per cent less food waste at the 12-month audit. This is consistent with findings from New South Waste where councils that never supplied compostable liners had the lowest average FOGO diversion rates [3].
- In Townsville, caddy liner use increased between the first and second audits, from 1.2 liners per week per household to 2.1 liners per week, with the average weight of contents increasing by 43 per cent.

- In the same audit, 18 per cent of bags in FOGO bins were non-compostable plastic. These bags often contained food suggesting that some trial participants were utilising incorrect caddy liners despite being provided with compostable liners and education materials.
- Trial councils noted retailers stocking a large variety of liners and that it was difficult, even for council staff, to determine which ones met Australian standards. There is a clear need to ensure consumer-available caddy liners are compliant with Australian standards for compatibility with FOGO composting systems.
- Trial participants noted that some liners would tear once full, which may have been a behavioural barrier to their use.
- Kerbside bins should comply with the Australian Standard for waste and recycling colour coding (AS4123.7-2006). Trial councils undertook bin lid harmonisation of general waste bins prior to commencing trials to ensure educational materials were clear and to minimise the chance that participants were confused by general waste bins with dark green lids.
- Organics processing requires moisture content to compost successfully, and losing moisture at the kerbside bin may result in increased water costs for the processor, especially during dry periods. Organic bin designs can include vents to increase water evaporation and ultimately reduce weights at the weighbridge (however may also increase vermin risk). Townsville supplied one trial area with vented bins, however were not able to determine any quantifiable benefit.

General waste service changes

Research from New South Wales, Western Australia and the United Kingdom demonstrates optimal diversion rates are achieved when general waste services are reduced in volume (reduction in bin size) and collection frequency (weekly to fortnightly) [3, 5, 21].

However, general waste service changes can have a significant impact on community attitudes and behaviours [17, 22]. Recent surveys by the NSW EPA of households without an existing organics collection service, found that 47 per cent of respondents were less interested in an organics service once they were advised that general waste bins may be collected fortnightly. Community backlash to reduced general waste services is also evident in other case studies around the country [13, 17]. There is also a cost consideration in replacing current general waste bins with a smaller bin. Councils may choose to address the negative impacts of some of these changes through behaviour change messaging or providing households with different bin service options.

Noting that all trial councils reduced general waste collection services to fortnightly when kerbside organics collection commenced, the following outcomes were obtained:

- Trial results show that higher percentages were achieved in relation to all metrics (overall organics recovery rate, food organics recovery rate, garden organics recovery rate, and diversion rate) when the 240L general waste bin was replaced with a 140L general waste bin (Figure 7).
- The provision of awareness materials to trial households regarding the changes to the waste collection service commenced only 8 weeks before the trial commenced. Ideally this initial communication period should be longer, with best practice suggesting a period of at least 6 months prior to service commencement.
- The majority of trial participants were accepting of the service changes associated with the trials program, however all councils received feedback on the challenges presented to specific householders including large families and families with more than one child in nappies, or households generating large volumes of sanitary/medical waste.
- There can be a strong correlation between reduction in general waste services and increasing contamination in organic and recycling waste streams and this was demonstrated in the Rockhampton trial – where a general waste bin was full, overflow was often put in the organics bin.
- To mitigate these risks, councils established processes for participants to apply for additional services which were considered on a case by case basis. In most instances, a conversation with the household about how they were managing their waste was sufficient to improve waste management efforts and relieved concerns. This process, however, may be resource intensive at scale.
- Where there was a clear need, trial councils opted to provide additional general waste disposal capacity (i.e. a larger bin) to support households. Rockhampton was able to offer a bin upsize to 240L (provided to 22 per cent of participants), while Townsville and Lockyer offered an additional general waste bin that remained at fortnightly collection frequency.

- During the trials there were very limited instances where the upgraded general waste service did not resolve issues with dissatisfaction or gross contamination.

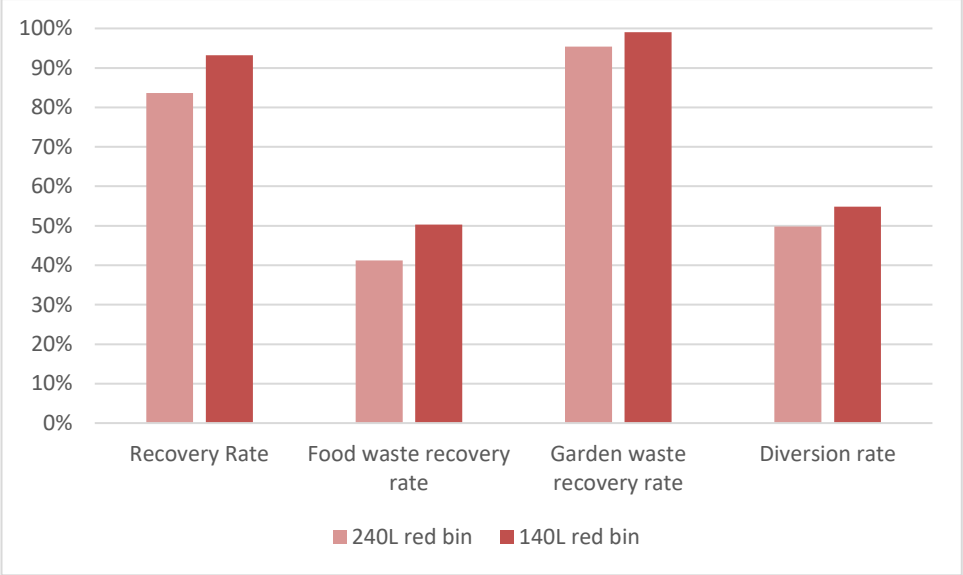

Figure 7: *Comparison of recovery and diversion rates for 240L/140L general waste bins sizes*

Compositional auditing

The auditing of kerbside waste bins is common practice in local governments. Undertaken at regular intervals, the data provides a snapshot of kerbside bin composition and is used to inform collection system management, including community education efforts. At the time of the trials, Queensland did not have a standard or prescribed methodology for the auditing of kerbside waste services. Audits are costly and increase in cost as sample sizes increase or categorisation increases in resolution. Trial councils were provided with additional grant funding to increase sample sizes beyond what is typically undertaken in audits. Outcomes of compositional auditing of the organics trial program included:

- New organics collection systems in Queensland should, where opportunity allows, measure the percentage of households using organic bins for food waste (i.e. the participation rate for food waste). This will align with NSW evaluations and inform behaviour change interventions.
- Prior to service delivery commencing, performance measures should be established and clearly defined with a prescribed calculation method. Examples include participation rate, organics recovery rate (separated by GO and FOGO as relevant), and diversion rate. Failing to define measures and calculation methods up front resulted in these terms being used interchangeably or metrics being calculated using different methods throughout the trials.
- For the purposes of setting a consistent methodology for the organics trials, trial councils were required to follow Victoria's Guidelines for auditing kerbside waste [23] and sample a minimum of 150 households per service, per audit (**Error! Reference source not found.**).
- All councils utilised their own third-party auditors which resulted in inconsistencies in methodology and reporting across the trials (similar issues have recently been identified by the NSW EPA [3]), including;
    - The treatment of bagged/containerised wastes and how they are reported
    - Method of achieving the sample size, including treatment of non-presenting households and sub-sampling
    - Waste categorisation into inconsistent categories
    - Methods of calculating metrics, including clear definitions.
- Audit data quality and comparability would be improved by the development of a standardised audit methodology.

Allowable inputs

At the commencement of the organics trials program, trial councils worked with local waste processors to determine allowable inputs materials based on available processing technology. Allowable inputs differed across participant councils but included combinations of food waste, garden waste, compostable packaging, cardboard/paper, animal waste and dust.

Feedback from the organics trials program indicated that councils believe it would be useful if a standard list of acceptable input materials to an organics collection system was provided to manage emerging contaminant risks and to allow for clear and consistent statewide communications of what is accepted in the organics collection bin.

With risks associated with contamination emerging more broadly, following completion of the trials program, councils recommended limiting allowable inputs to food waste, garden waste, and Australian Standard compliant compostable liners only, noting that this presents challenges in the ability for householders to easily identify liners that are certified compostable.

Since completion of the trials, an agreed list of materials that can be accepted by councils in kerbside organics collection services has been developed by the department's Organics Working Group which includes Queensland councils as members.

Processing and compost quality

Rockhampton and Townsville contracted established, licenced, organic waste processors to undertake the composting of the trial waste, while Lockyer Valley constructed a pilot-scale facility. Collection trucks delivered the waste to these facilities, where contamination was hand-picked before trommel screening. Following pre-processing decontamination, the organic material was composted in windrows for up to three months.

Townsville and Lockyer Valley's trial organic waste was processed separately in dedicated trial windrows, while Rockhampton's processor blended trial organic waste into waste materials from other sources. Trial councils were required to ensure compost was quality tested against *AS4454 - composts, soil conditioners and mulches* and sampled for chemical analysis.

- Broadly, compost produced using the material collected through trials was found to be compliant with AS4454. However, preliminary chemical analysis of compost by the trial councils did identify higher than acceptable levels of PFAS in some samples.
- Compost produced was also found to contain microplastics and glass, due to the contamination of inputs by packaging materials.
- Details of volumes of organic waste collected and processed, and end markets are shown in Table 5.

Table 5: *Total organic waste collected, compost produced and end-market details for organic material collected from each participating council*

Council	Total waste collected (tonnes)	Total compost produced (tonnes)	Market for final product
Lockyer Valley	385	61	The collected FOGO was processed and used as soil conditioner on Council parks and gardens, noting that a small amount of collected material is yet to be processed. If the FOGO kerbside collection program was expanded, council suggested that all processed material could be used in parks and gardens.
Rockhampton	273	141	The FOGO material collected from the trial was included and diluted by the commercial organics. The finished products have been sold.
Townsville	463	360	The finished compost was used by Council on their parks and gardens.

Lockyer Valley Regional Council's composting pilot

The department provided Lockyer Valley with $105,000 of funding to construct and pilot a small-scale composting facility using aerated floor, static pile technology known as HEAPS (High Efficiency Aerated Pile System). Broad community rollout of kerbside organics collection in Lockyer Valley is unlikely to create organic waste volumes significant enough to invest in commercial scale processing infrastructure, and existing infrastructure in South-East Queensland is greater than 50km away.

HEAPS solar system and control setup

HEAPS setup showing pipes and fan

HEAPS pile with Day 1 FOGO collection in place

In summary:

- The system was established at the Gatton landfill resource recovery area within a solar powered, engineered design.
- Collection vehicles deposited organic material at the facility where it was hand-picked for contamination, then loaded onto the aeration pipes to be composted over at least 12 weeks.
- Final product was used on council parks and gardens.

Feedback from trial processors

- Processors used in the trial were willing to receive all food organics excluding packaging and contamination.
- Processors were concerned about levels of contamination (particularly in FOGO materials) and suggested that communication and education of household participants is paramount to success of organics collection programs.

- Processors used in the trial identified that the most common contaminants (and the most difficult to separate) are plastic bags and film, glass and aluminium. These contaminants were often present due to food waste being disposed in packaging.
- Processors were supportive of the use of compostable caddy liners that meet the Australian Standard, but did raise concerns about:
    - the potential for other non-organic contaminates to be less visible if included within the liner
    - the increased chance of non-conforming bags to be used as a substitute for compostable liners.
- There was general consensus from processors that there would be markets for use of product if trial councils expanded to city-wide collection services, however the contamination issues would need to be addressed.
- It was suggested to review the Queensland Government Department of Transport and Main Roads' specifications for use of the material in roadside mulching to determine whether this provides an additional end-use for compost.

Conclusion

The organics trials program has generated valuable Queensland-based data and learnings that may be used to inform the further development of kerbside organics collection service offerings across Queensland. Local governments have demonstrated that the implementation of kerbside organic waste collection systems in Queensland communities is possible and results in measurable progress towards recovery and diversion targets for organic waste. Trial participants were able to achieve results comparable to mature systems in other parts of Australia, taking into account the short-term nature of the trials. Local governments have stressed the importance of coordination and funding support from the state government for organics collection services to be successfully delivered across the state. This includes coordination of measures aimed to reduce contamination in organics bins and final outputs of processed material.

Limitations

While the organics trials were designed and implemented to best capture representative data there are relevant limitations that should be considered:

- The performance of waste collection services, particularly organic waste collection services, is subject to a large number of complex variables.
- Randomised sampling methods were unable to be utilised due to logistical limitations.
- Pre-service implementation of communications and engagement was limited due to trial timeframe constraints, and did not conform with best practice.
- No attempts have been made to adjust results based on regional differences, such as climate and demographics.
- The trials were undertaken during a time impacted by the COVID-19 pandemic, which may have impacted household behaviours and waste generation.
- This report does not consider or assess the effectiveness of organic waste collection services against other types of systems, such as food-only collections, that have been successful in the UK [15].
- This report does not consider the full scope of introducing an organics collection service, instead focusing on the operational delivery aspects that the trials were established to test. Whilst the operational introduction of kerbside organics collection services in Queensland is feasible, there are other matters that councils must consider in determining feasibility, including full service implementation costs and benefits, composting processing technology and capacity, regulatory settings and end markets for final compost product.

The information referenced in this report should be treated as indicative only. Where possible, results have been compared to outcomes from operating organics services in other jurisdictions.

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Appendix 1 – Trial auditing requirements

Method	Frequency	Minimum sample size	Metrics	Information Requirements	Standard/Min expectations
Baseline residual waste bin composition audit of the trial households	Prior to FOGO bin rollout	150 households	Weight (kg) per waste category Waste categories – to the resolution of the green categories in Attachment 1 – Audit Waste Classifications	Detailed methodology – protocols and interpretation, assumptions. Raw data in csv Data collection sheets	*Guidelines for Auditing Kerbside Waste in Victoria* - https://www.sustainability.vic.gov.au/-/media/SV/Publications/Government/Victorian-waste-data-portal/Victorian-statewide-bin-audits/Guidelines-for-Auditing-Kerbside-Waste-in-Victoria.pdf
FOGO/GO and Residual Waste Bin Composition Audits	Month 6 Month 12 Small adjustments to timing should be made to ensure audits are conducted during a representative time of the year (i.e. avoid Christmas)	150 households	Weight (kg) per waste category Waste categories – to the resolution of the green categories in Attachment 1 – Audit Waste Classifications	Detailed methodology – protocols and interpretation, assumptions. Raw data in csv Data collection sheets	Aggregated collection methodology The guidelines require randomised selection of households. However, acknowledging the logistical and communications difficulty in achieving this, councils were able to select sample areas (e.g. suburbs) that represent a diverse representation of the LGA. Councils were requested to include justification of trial area/s, including demographic information.
Kerbside volume and density assessments of FOGO/GO and Residual bins	Twice during the trial period	150 households	Average volume of total waste per bin per sample group (L) Average weight of total waste per bin per sample group (kg)	Detailed methodology – protocols and interpretation, assumptions. Raw data in csv Data collection sheets	Kerbside measurement from the top of the bin to the waste level within the bin to estimate volume. Kerbside bin weight measured using scales (tared to average bin weight.)
Total tonnage over trial	Collected over the life of the trial	All households subject to the trial	Total organics collected during the trial (kg) Total contaminants in the trial bins (kg) Total residual waste collected from households participating in the trial (kg) Total number of bins lifted during the trial Presentation/Set-out rates (% households)	Detailed methodology – protocols and interpretation, assumptions Raw data in csv – weighbridge	**Presentation/Set out rate** is the number of households putting out organics bins for collection within the trial area divided by the number of households in the trial area that has been supplied an organics bin on a given day (i.e. a day snapshot of the proportion of those supplied with a organics bin that actually use it). Source: https://www.environment.gov.au/system/files/resources/8b73aa44-aebc-4d68-b8c9-c848358958c6/files/collection-manual.pdf.

Appendix 2 – Example communications and engagement plan overview (Townsville City Council)

- August 2021
    - Invitational letter mail out
    - Corflutes put up in trial areas – trial awareness and barbeque event promotion
    - In-person - Community barbeque in each trial area
- September 2021
    - Information pack mail out with schedule, calendar, and A-Z guide of what goes in the bin
    - Bins, caddies and caddy liners delivered to participants
- October 2021
    - In-person – trial area walk-around day before first collection
    - Council public website tile
    - Social media & radio advertising
    - Participant Survey live on council website
    - 6th October – First collection
- November 2021
    - Social media & radio advertising
- December 2021
    - Pre-Christmas newsletter to trial participants about good food waste behaviour over festive season
    - Local newspaper article for 100 tonne diverted milestone
    - First bin tagging program
    - Ongoing targeted social media advertising with trial performance updates
- March 2022
    - Sponsored council Facebook posts to notify trial participants of upcoming bin composition audit.
    - Mid-trial participant Survey live on council website
    - Letter mail out to households with low participation rates seeking feedback on key barriers
- May 2022
    - 'Giveaway Day' – voluntary event for trial participants to collect free compost product made from trial GO waste.
    - Project team presented to local Rotary Club
- July 2022
    - Second bin tagging program
- September 2022
    - End-trial attitudinal survey mailed out to all participants and made available on council online survey platform.

Appendix 3 – Attitudinal survey questions

Topic	Question	Answer Format	Pre-Trial	Post-Trial
General attitude towards waste and recycling	Thinking about your household waste, how important would you say separating your green waste is from your garbage to you personally? Is it…?	☐ Very important ☐ Important ☐ Not very important ☐ Not at all ☐ Don't know	✓	✓
	How well do you feel that you understand the environmental benefits of recycling food and garden waste?	☐ Very well ☐ Fairly well ☐ Not very well ☐ Not at all	✓	✓
Current behaviours with food and garden waste	What do you currently do with food waste at home?	☐ Put it in the general waste bin ☐ Put it in a green bin/garden bag ☐ Use a compost bin ☐ Use a worm farm ☐ Other *multiple answers available	✓	✓
	What do you currently do with garden waste at home?	☐ Put it in the general waste bin ☐ Put it in a green bin/garden bag ☐ Use a compost bin ☐ Use a worm farm ☐ Other *multiple answers available	✓	✓
	Did the[insert service name] service make you more aware of what you are throwing away?	☐ Strongly agree ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree	✗	✓
Perceived benefits of a FOGO/GO service	Do you think adding a bin to collect food and garden waste is good for the environment?	☐ Yes ☐ No ☐ Unsure	✓	✓
	Are you likely to use, or continue to use, a food and garden waste collection bin if council provides it?	☐ Strongly agree ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree	✓	✓
Communications and engagement around waste and recycling	Are you aware of the recent [insert service name] service in [local government area]	☐ Very aware ☐ Somewhat aware ☐ Unsure ☐ No	✗	✓
	Are you aware of [XX communications campaign]?	☐ Very engaged ☐ Somewhat engaged ☐ Little engagement ☐ Unaware	✗	✓
	How helpful did you find [compliance effort e.g. contamination stickers]?	☐ Very helpful ☐ Helpful ☐ Somewhat helpful ☐ Not helpful ☐ Unaware	✗	✓
Awareness and understanding of FOGO/GO service	Have you used the food/garden waste recycling service? (If never used skip to perceived barrier question)	☐ Yes - used it regularly ☐ Used it occasionally ☐ Never used it	✗	✓

	Was the service easy to use?	□ Very easy □ Easy □ Not easy but not difficult □ Difficult □ Very Difficult □ Don't know	×	✓
Perceived barriers	What barriers, if any, did you encounter while putting your food items into your FOGO/GO waste bin? (Select all that apply)	□ Too much hassle to separate food waste from rubbish □ Too much hassle to separate different kinds of food that can and can't go in the green bin □ The bin smelt □ Bin was too full □ Bin attracted flies/maggots □ Bin attracted rates/mice □ Confused about what items were accepted in the bin □ Other (please specify)	×	✓
Attitude towards the FOGO/GO service	How supportive would you be to pay an additional charge for the service?	□ Strongly supportive □ Supportive □ Neither support nor oppose □ Oppose □ Strongly oppose	×	✓