

Co-Collection of Domestic Food Waste and Garden Organics

The Australian experience



Department of **Environment and Conservation** NSW



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Section 1: Learning from the experience of others

Introduction

The diversion of domestic food waste from landfill disposal through source separated collection services is well established in some parts of the world and is becoming established in Australia.

Co-collection of domestic food waste and garden organics exists at Lismore, Port Macquarie Hastings, Camden and Broken Hill Councils (NSW) and the Colac-Otway and Nillumbik Shires (Vic). In New Zealand, Mackenzie, Timaru and Selwyn District Councils provide food and garden services.

Co-collection trials have been conducted at Chifley (ACT), Willoughby, Camden, Cooma-Monaro, Berridale, Port Macquarie Hastings, Coffs Harbour (NSW) and Burnside (SA). Christchurch in New Zealand has also conducted a trial. During the preparation of this report Kogarah and Woollahra Councils had just commenced co-collection trials. A number of other NSW Councils are also considering trials or the implementation of a service.

Tests and trials of aerobic collection MGBs have been undertaken by the Institute for Horticultural Development (Vic), at Tea Tree Gully (SA) and in the UK. In Australia this style is marketed by Cleanaway as the 'bio-bin' insert which is retrofitted to standard 240 L MGBs.

In terms of processing combined food and garden organics feedstock, the Victorian Councils utilize commercial windrow composting, Camden Soil Mix have tested windrow composting using GORE™ covers, Tryton process using windrow composting and vermiculture at Lismore, Australian Vermiculture process using windrow composting and vermiculture at Broken Hill and Remondis at Port Macquarie Hastings use aerated composting tunnels. Woollahra Council have recently attempted using the Earthpower anaerobic digester and Evergreen Energy Corporation Pty Ltd have engaged Hyder Consulting Pty Ltd to undertake an independent review of the Kompogas anaerobic digestion technology.

DEC has also engaged Hyder Consulting to conduct a Triple Bottom Line Assessment of Domestic Food Organics Management which will be published in early 2007.

Purpose of the Report

This section summarises and interprets the outcomes and lessons of initiatives conducted to date to assist those considering trials or services in the future. Summaries of trial reports, relevant research and interviews with council officers and processors are included in Section 2.

Those considering co-collection trials or the implementation of a service are strongly advised to undertake a detailed investigation of options including consulting the full reports referenced which are generally available on-line.

Findings

The experience documented in Section 2 suggests the following service parameters and results.

Diversion

Overseas experience indicates food diversion of 2 kg per household per week is common. Most Australian trials report diversion in volume and percentage terms making a direct comparison difficult. Burnside report food waste average of 2.47 kg per household per fortnight, or 1.24 kg per week and 36.3% of food waste generated was diverted to the co-collection service. The Lismore service diverts 2.1 kg per household per week of food waste and the Christchurch trial diverted 2.4 kg per household per week.

Lismore captures 86% of all organic materials in the organics service and loses 14% to the mixed waste stream. The Port Macquarie Hastings trial reported a 39% increase in the capture of organics for the weekly service. Coffs Harbour reported a drop of 50% of organics in the residual bin, Chifley 30%, Christchurch 40% and Broken Hill 16%.

Berridale found 8-12% of the organics bin was food waste, in Cooma it was 3-7%, Christchurch 20%, Lismore 18.5% and Broken Hill 5%.

Kitchen Containers

The provision of kitchen containers increases diversion and participation rates. Vented kitchen containers combined with clearly identifiable compostable liner bags increase customer satisfaction levels. However lining bins with paper bags, newspaper or wrapping scraps in newspaper has also proven effective. Provision of containers and bags is efficient if done on a 'by request' basis. There is a need to ensure that the processor can effectively deal with the bag/wrapping input.

Collection Containers

240 L MGBs appear to be the most suitable size for a combined organics service. Aerated bins ('bio-insert' style) are only required for a fortnightly collection frequency, in hot/wet climates or where the end process requires high quality aerobic feedstock (e.g. vermiculture). The design of these may involve some service challenges by way of slower collection rates and branches being caught in the slotted insert. Split bins and smaller MGBs do not appear to be effective.

Frequency of Collection and Integration

Weekly combined organics services appear to provide the highest diversion and participation rates and best customer satisfaction. The reduction in residuals service to fortnightly in a 120 or 140 L MGB supports higher diversion of material into the combined organics service and also increases recycling rates. Recycling services are typically conducted fortnightly in a 240 L MGB. Reduction in residuals service intervals and size of container can be met with some marked initial resistance from residents. Concerns are raised about disposable nappies and the requirements of large families. Incentives for reduced servicing of residuals can overcome a lot of resident resistance.

Contamination

Schemes where the collection contractor is responsible for meeting contamination levels appear to minimize contamination. Integrating complementary contamination requirements in both the collection and processing contracts that involve penalties and compensation can also be effective. Ensuring sufficient funds are available for education and promotion throughout the life of the service is extremely important as is underwriting contractor efforts with enforcement action. The Lismore service obtains 0.5% contamination levels.

Processing

In most circumstances indoor, covered or in vessel composting would be necessary to comply with DEC licensing requirements however this requires specific discussion with DEC.

Anaerobic digestion is not commonly used in Australia for garden organics processing due to difficulties in dealing with the woody content (as has recently been demonstrated with the Woollahra trial and the inability of the Earthpower digester to accept the material). A review of Kompogas anaerobic digester technology¹ ('dry' type digester) for Australian conditions indicates that with appropriate pre-digestion sorting and shredding this type of digester can successfully accept woody material and is common overseas. A recent article in Biocycle² reports research by Woods End Laboratories (USA) which found that for feedstock containing food waste the combination of anaerobic digestion and aerobic composting to produce biogas and compost is a sound option.

Processing should be integrated into the service contract or be informed by the collection contract to ensure compatibility with the collection system.

Product Application

Products derived from food tend to be universally integrated into the processors' existing range of products and marketed normally. The addition of food has some benefits in terms of fertilizer value and so may be more marketable than garden organics compost. Anaerobic digestors can adjust operations to create more or less gas and market energy as well as digestate. A recent tender (Penrith) incorporates purchase priority of end product by the council for use on its parks and reserves. This will aid education on contamination issues as well.

1 Hyder Consulting Pty Ltd, Independent Review of the KOMPOGAS Technology, Evergreen Energy Corporation, www.evergreenenergy.com.au June 2005.
2 Biocycle Journal of Composting and Organics Recycling, Volume 47 No. 9, September 2006, pp42-47, Microbiological Matrimony, Compatibility of Digestion and Composting, The JG Press Inc. Emmaus PA USA.

Education and Promotion

An essential component of all trials and services has been a thorough and well resourced educational and promotional campaign with a number of outreach facets.

Trials

Experienced officers involved in trials or service implementation have recommended conducting a trial testing a variety of configurations before implementing any new service. This is done to fine tune service parameters, tailor the service to the local community and highlight any difficulties prior to full implementation.

Staged Implementation

Some councils use the trial as a method of staging the implementation of a service. Others may stage the introduction of further facets such as the provision of kitchen containers.

Staging may allow for the development of necessary infrastructure upon the awarding of a tender.

Contract Design

DEC provides guidance on contract design in its Model Waste and Recycling Collection Contract (available on www.environment.nsw.gov.au/education/spd_lgov_wastecontract.htm). This should be tailored to the needs of the particular region. Councils should also consider opportunities to assist in the reduction of commercial and industrial wastes and provide an allowance within the contract for the processor to actively seek out commercial feedstock. This should be beneficial to both parties.

Section 2: The Australian Experience *plus*

Introduction

This Section contains summaries of trial reports, relevant research and records of interviews with councils and processors throughout Australia. The full reports are referenced and are in the main freely available on-line. Also included is the summary of a New Zealand (Christchurch) trial, a New Zealand (Timaru) service, evaluations of aerated MGBs, both here and in the UK, and an extract from the Triple Bottom Line study on international experience.

DEC gratefully acknowledges the help and assistance of the following for the provision of information used in this report:

- Bob Bailey, Manager Waste Services and Building, Port Macquarie Hastings Council
- Aaron Hudson, Remondis ORRF, Hastings
- Peter Oldsen, Director Environmental Services, Broken Hill Council
- Brendan Price, Australian Vermiculture,
- Darren Williams, Waste Management Officer, Colac-Otway Shire
- Phil Klepzig, Manager Northern Rivers Waste and Northern Rivers Quarry and Asphalt, Lismore City Council
- Barrie Blackman, Plant Manager, Tryton
- Tamara Johnson, Waste Service Coordinator, Shire of Nillumbik
- Don Cesco, Team Leader Waste Management, Camden Council
- Brian Gallagher, Solid Waste Manager, Timaru District Council

The information in this section is a summarised version of personal interviews and reports available. Study parameters and terminology differ so that results are not reported consistently and direct comparisons between trials and systems are not always possible.

Some councils appear more than once in this publication. This is the case where a trial had been conducted prior to the implementation of a full service. Both the trial and the adopted service are reported.

Chifley (ACT) Trial Summary³

Objective

The Chifley household organic material collection trial was designed to help determine whether an organic collection service is able to effectively separate organics into a stream for reprocessing as another step towards No Waste in the ACT. The objectives of the household organic trial were:

- To trial the separate collection of food and kitchen waste for reprocessing
- To investigate the amount of food and kitchen waste generated by a suburb containing approximately 1000 residences and monitor seasonal variations over a 10 month period
- To determine the viability of separately collecting food and kitchen wastes from the residual garbage stream and reduce frequency of residual waste collections
- To process the material into a reusable product that meets the Australian Standards

System Parameters

- Education an important part of the trial - information pamphlets and survey questionnaires
- Focus on food waste collection, garden organics allowed in bin but reduced size bin selected deliberately to discourage this
- 85 L combined organics bin serviced weekly for single households
- 240 L combined organics bin serviced weekly for multi-unit complexes
- 5 L kitchen container provided, residents encouraged to wrap in newspaper
- 240 L recycling bin fortnightly
- 140 L residual bin fortnightly
- Contractor collection

³ Household Organic Material Collection Trial Chifley August 2000 – June 2001, ACT No Waste, Australian Capital Territory Government, 2001, www.act.gov.au/nowaste

- Corkhill Brothers windrow composted the material
- The organics bins in the multi-unit complexes were cleaned by the contractor

Results

- Comments received from residents during the trial by telephone included the following:
 - Concern that the fortnightly collections of the residual bin insufficient
 - Residents had organics bins stolen
 - Residents called to discuss odours in the bio-bins and residual garbage bins
 - Multi-unit residents were concerned over the misuse of the organics bins in multi-unit complexes.
- Following announcement of the end of the trial approximately thirty (30) residents rang to express their disappointment that the trial would be finishing. A number of residents requested that the service be continued on a voluntary basis.
- The trial achieved a 90% participation rate.
- The average number of organics bins presented over the duration of the trial was 516 (61%).
- The average tonnages collected weekly over the 10 month period was 3.7 tonnes or 4.3 kilograms (includes garden organics) per household per week.
- The first five months of the trial revealed excellent contamination levels with a bin average of 1.3% however, over the school holiday periods contamination increased to 8%. From early March 2001 until the end of the trial, there was an increase in contamination to above 8%.
- 10% to 15% of the contents of the combined organics bin was food/kitchen waste.
- 40% and 50% of the combined organics bin contents was garden prunings.

Cooma – Monaro (NSW) Trial Summary⁴

Objective

The objectives of the household organics trial were:

- To trial the separate collection of garden waste and food/kitchen/recycle waste. for reprocessing
- To investigate the amount of garden waste and food/kitchen waste generated by approximately 100 residents
- To determine the viability of separately collecting green/food/recycle wastes from the residual garbage stream with a fortnightly collection service
- To determine the viability of a fortnightly domestic waste collection service in conjunction with the current recycling service
- To investigate the viability of processing the material into a reusable product that meets the Australian Standards (4454 – 1999)

System Parameters

- Trial conducted in March, April and May 2005
- Food/kitchen wastes and garden organics from 100 residential dwellings, including houses, townhouses, flats and commercial properties (lodges, etc.)
- Information Pack and Newsletters
- 240 L MGB Cleanaway Organics Bio-bin fortnightly
- 120 L MGB Residual weekly (but requested to place out fortnightly)
- Two 60 L recycling crates
- 10 L kitchen tidy and asked to trial either compostable paper bags or cornstarch bags in their kitchen tidies

⁴ Cooma bio-bin Trial End of Trial Report, Cooma Monaro Council and Shire of Snowy River

Results

- The average number of bio-bins presented over the duration of the trial was 50.1%.
- 78% participated in the trial.
- Contamination levels averaged 0.013% and total levels did not exceed 0.03%. No contamination was found during bin audits in May.
- Low percentages in food/kitchen wastes can be explained by over 50% of participants having chooks/pet rabbits/own compost heaps in their backyards.
- The trial of compostable paper and cornstarch bags was successful, with the majority of participants happy with their performance. A few participants complained that the paper bags would fall apart on the bottom seam if wet organics were placed in the bags, and a few mentioned that the cornstarch bags would start to break down towards the end of each fortnight, making a mess when emptied. One participant complained of odours from their kitchen tidy, so they stopped using it after the first collection.
- Average of 50% of bio-bins were presented each fortnight, put out mainly when full. The continuing effect of drought in the region could have affected these statistics as less garden organics than normal would have been deposited into the bin.
- Bin audits revealed that the contents of the average bio-bin comprised of 5.3% of food/kitchen wastes, 36.3% of grass clippings, 26.6% of leaves, 28% of prunings, 3.2% of paper/cardboard and 13% of Other Wastes. Leaves and prunings showed some seasonal variation as would be expected for the time of year. Survey results showed that 56% of residents used their bio-bin for green/food wastes, 14% for green wastes only, 8% for food waste only and 22% did not use their bin at all.
- Audits on usage by type of residence revealed that houses and townhouses utilised the organic and recycling services. Residents in units tended not to use the organics service.
- 82% of residences stated that a fortnightly collection service would be sufficient for their domestic, organic and recycling needs, while 70% said that a 120 L (half size) bin would be sufficient for their domestic waste needs although they also added that holiday periods (Christmas, Easter, etc...) could create some problems.
- Collection frequency was a concern for some participants. Surveys indicated that in spring/summer a weekly collection was felt to be necessary (volumes and odours being the concern) with a reduction to a monthly pickup in winter.
- 84% stated that they would not be willing to pay extra, expecting the same combined collection frequency for the same waste management charge. 6% were unsure, 8% said yes but were unsure of how much would be fair to pay and 2% stated they would be willing to pay \$0-\$20 per annum.
- The majority of Cooma residents who utilised this service felt that it was necessary to have an organics and recycling collection service and stated that they would like to see this continue.

Berridale (NSW) Trial Summary⁵

Objective

The objectives of the household organics (bio-bin) trial were:

- To trial the separate collection of green waste and food/kitchen waste for reprocessing
- To investigate the amount of green waste and food/kitchen waste generated by approximately 100 residents
- To determine the viability of separately collecting green/food wastes from the residual garbage stream with a fortnightly collection service
- To determine the viability of a fortnightly domestic waste collection service in conjunction with the current recycling service
- To investigate the viability of processing the material into a reusable product that meets the Australian Standards (4454 – 1999)

⁵ Berridale Bio-bin Trial End of Trial Report, Cooma Monaro Council and Shire of Snowy River

System Parameters

- Trial conducted August to December 2004
- Food/kitchen wastes and garden organics from 100 residential dwellings, including houses, townhouses, flats and commercial properties (lodges, etc.)
- Information Pack and Newsletters
- 240 L MGB Cleanaway Organics bio-bin fortnightly
- 120 L MGB Residual weekly (but requested to place out fortnightly)
- Two 60 L recycling crates
- 10 L kitchen tidy and asked to trial either compostable paper bags or cornstarch bags in their kitchen tidies

Results

- The average number of bio-bins presented over the duration of the trial was 69 (69%) bins.
- The total organics tonnages peaked at 2.69 tonne in December with the average tonnage over the period of the trial being 1.67 tonnes or 16.7 kilograms per household, per fortnight.
- Contamination levels were excellent with a bin average of 0.03%, and total levels did not exceed 1.5%. Levels decreased over the duration of the trial until December, when no contamination was found during bin audits.
- 8-12% of the contents of the bio-bins is food/kitchen waste with the majority of organic waste collected being grass clippings and prunings.
- 69% of residents placed their bin out for servicing each fortnight. The majority of residents were only putting their bio-bin out for servicing when the bin was full. Also, during the course of the trial, the state was in a drought.
- 47% of residents used their bio-bin to dispose of food and green wastes, 49% disposed of green waste only and 4% did not use their bin at all.
- Houses, townhouses and commercial properties all utilised the service but residents in units/flats did not use their bio-bin.
- 84% of participants experienced some reduction in their domestic waste stream with an average of 31.8% reduction per household of domestic waste going to landfill.

- 73% of participants said that a fortnightly collection service would be sufficient for their domestic, organic and recycling needs, while 63% said that a 120 L (half size) bin would be sufficient for their domestic waste needs although they also added that holiday periods (Christmas, Easter, etc.) could create some problems.
- Collection frequency was a concern for some participants. Surveys indicated that in spring/summer a weekly collection would be necessary (volume and odours being the concern) with a reduction to a monthly pickup in winter.
- 92% of participants would not be willing to pay extra for an organic collection service, expecting the same combined collection frequency for the same rates. 4% of trialists were willing to pay extra but didn't know how much and 4% were willing to pay an additional \$41.
- The overall majority of participants in Berridale felt that organics collection was a good idea and they could readily see the environmental benefits of such a service.

Coffs Harbour (NSW) Trial Summary⁶

Objective

Determine what elements will enable the most sustainable delivery of waste services to the domestic sector for collection of organics (including food waste), recyclables and residual waste with maximum diversion of waste from landfill.

System Parameters

- Duration 12 weeks in 2004
- Weekly collection of organics and fortnightly alternate collection of residual waste and recycling
- Tested 240 L versus 140 L organics MGBs and 240 L versus 140 L residual waste MGBs
- Tested kitchen containers versus biodegradable bags versus newspaper
- Use of 240 L designated recycling bin
- Tested effect of education on quality and quantity of recyclables and separation of organics

⁶ Coffs Harbour City Council Domestic Waste Trial, Coffs Harbour City Council, May 2004

- Further elements were examined for Multi-Unit Dwellings in addition to those above including:
 - Use of 140 L recycling MGBs for small properties and
 - 128 households including 24 units and 4 townhouses

Results

The results indicate the following configurations would be suitable for single dwellings:

- Collection of organics on a weekly basis from 240 L MGBs using a kitchen container and newspaper as a transfer receptacle
- Collection of recycling on a fortnightly basis from 240 L MGBs
- Collection of garbage from 140 L or 240 L MGBs on a fortnightly basis (with a Variable Rate Pricing mechanism, although this requires strict controls on contamination of recycling/organics bins)
- 50% drop in level of organics in the residual bin
- Average yield of food waste in organics bin was 9.77 Ls/ household/week

For Multi-unit Dwellings,

- Where a property has space for storage of bins on the property and placement of bins at the kerb, the recommendations for single dwellings will be observed. The following is recommended for sharing of bins:
 - The provision of a bin storage area with adequate access for all residents and service providers
 - The provision of a purpose-built storage area for organics bins (isolated from bulk bins where they occur)
 - That the property may bear responsibility for contamination issues and cooperation of its residents; and
 - That there is a structure in place to ensure bins are collected or a bin-runner service is provided

Port Macquarie Hastings (NSW) Trial Summary⁷

Objective

The aim of the trial was to develop a method to increase participation in the separation of domestic organics, especially fruit and vegetable waste, collected from the kerbside in 240 L MGBs. To achieve this an attempt was made to determine what factors currently inhibit source separation.

System Parameters

- Duration from August to December, 2003
- Existing 3-bin kerbside system to 23,000 domestic premises
- 80 or 120 L garbage MGB
- 240 L recycling MGB
- 240 L MGB for organics, including both garden and foodwaste
- Organics and recycling MGBs are collected fortnightly
- Garbage is collected weekly
- Each premises provided with a 2.5 L kitchen tidy bin
- Bio-inserts (Cleanaway) in MGB in trial area 2
- Weekly organics collection in trial area 3
- Paper bags for food waste in trial area 4
- Trial covered 1,261 premises

Results

- Residents have been encouraged to put fruit and vegetable scraps into the green bin since 2001 and the pre-trial survey results indicate that over 41% of residents were already participating to some extent.
- The trial systems and the motivation behind them were therefore not entirely new concepts to the participants. Another significant factor of the trial locality is the climate: Port Macquarie is a coastal city with generally

⁷ Port Macquarie Hastings Council Domestic Organics Recovery Trial, Midwaste Regional Waste Forum/DEC

high rainfall and humidity which promotes fast plant growth and decomposition of greenwaste and fruit and vegetable scraps – so a high volume of organic material is available for collection and bin odours are a significant issue to residents.

- In terms of the source separation of organic food waste the compostable paper bags have been the most successful, addressing mess, odour and fly problems and also aiding transport to the organics bin. They are popular with residents and achieve significant diversion. There is the added benefit of the paper bags that there is less risk of resident confusion between cornstarch and plastic bags.
- The weekly collection was the most successful, greatly increasing the total amount of organic waste collected fortnightly. While the weekly collection is popular with residents and has been proven to be effective, it is not a costly change (\$18.46 p a. additional per residence). It may be worthwhile to consider (as some residents suggested) a weekly service only through spring and summer months however according to the contractor, the cost saving would be minimal given the requirement for additional vehicles.
- A combination of the weekly collection and the use of compostable paper bags would be the optimal system for capture of organics from domestic premises.

Port Macquarie Hastings (NSW) Service Implementation⁸

Objective

Port Macquarie Hastings tested the waters before their trial by issuing a 10 L kitchen tidy and encouraging fruit and vegetable waste to be deposited into the fortnightly garden organics bin. This proved problematic due to flies, odours, liquid and solid residue in both bins. In moving to a weekly service they gained a 39% increase in the amount of organics recovered and removed the problems. The trial was conducted as a deliberate move in testing services prior to development of new collection and processing tenders. This is seen as a very important part of the process in the development of new services by Port Macquarie Hastings.

⁸ Interview - Bob Bailey, Manager Waste Services and Building, Port Macquarie Hastings Council 2006

System Parameters

- Kitchen containers offered on 22/8/06
- Vented kitchen container and cornstarch compostable bags issued free of charge to residents expressing a desire for the kitchen containers. Yearly bag supply delivered on request
- Bags @ \$10.50/roll of 150, containers @ \$3.55
- In the first week of offer 3000 kitchen containers requested
- Bags marked with a distinctive green band
- 240 L organics bin weekly
- 240 L recycling bin fortnightly
- Residual at 80 L (discount), 120 L and 240 L (premium) with differentiated charging, all on a weekly basis
- Indications in the first two months have shown an increase of 37% in August 2005 to August 2006 and 39% September 2005 to September 2006 in total kerbside organics collected
- Education spend is \$50,000 pa contractor and \$25,000 pa council built into contract
- Processing at Remondis Organics Resource Recovery Facility (ORRF) at same cost as garden organics, currently \$60/tonne
- BOOT facility, council owns in 5 yrs
- MSW and Organics put or pay contracts in place
- \$100,000 provided in contract for provision of kitchen tidies and compostable bags (around \$20 per bin and bag, including delivery), allows 5000 household recipients
- Collection contractor responsible for contamination. Colour CCTV used in collection trucks with contaminated loads rejected. Three strikes and you are out policy

Experience

- When a contract is coming up it is very important to test the service in trials first
- Local conditions important in determining frequency of service e.g. a coastal council with high rainfall and humidity requires a weekly service

- Only \$18.46 per hhld pa additional cost to go from fortnightly to weekly service
- Residual waste should be maintained weekly due to expectations and problematic wastes (disposable nappies, seafood, meat)
- Collect examples of best practice management and trial these in determining new contracts
- Use the DEC Model Contracts and adapt for local conditions and innovations
- Penalties on collection and processing contractors for rejects going to landfill need to be substantially larger than the landfill gate fee
- Use collection trucks to promote the service via signage
- Ability to increase diversion from multi unit dwellings and tourist parks and other sector specific streams should reduce the need for MSW processing
- Build in penalties for collection contractor on contamination to match the payment to processor for excessive contamination

Processor Perspective – Port Macquarie Hastings Contractor, Remondis ORRF⁹

- From the trial using newspaper to wrap food was the best option as it unfolded upon unloading and contamination could easily be picked up
- Fear that the cornstarch bags would encourage the general use of plastic bags in the service
- Do not wish to split bags to inspect contents
- May need to make adjustments to plant if liquids become problematic
- Contracts should allow processor to seek C&I organics for processing. This would allow a lower cost tender response and contribute to the regions waste reduction needs.

Broken Hill (NSW) Service Implementation¹⁰

Objective

The service was initiated to provide bulking material to aid in the vermi-composting of the offal from the abattoir, which was taking up valuable landfill space at a rapid rate due to the trenching method of disposal required. Bio-inserts were used to avoid anaerobic conditions arising in the bin.

System Parameters

- Weekly 240 L MGB residuals service
- Fortnightly 240 L MGB with 'Bio-Insert' for garden and food organics and shredded paper (not available to multi unit dwellings)
- 7,600 voluntary services. Covers 80% with a current waiting list
- Day labour collection
- Camera on the hopper to reduce repetitive strain injury to the truck drivers neck
- Windrow composting and vermiculture processing by Australian Vermiculture
- Abattoir waste and self haul organics included in the feedstock
- The open windrows are allowed to compost for eight to ten weeks and are turned weekly. The finer material out of this composting process is fed to worms to build up current worm stocks. The coarser material is put back into the composting process

Experience

- Bio-Insert allowed for reduction from weekly to fortnightly service
- The weekly service was not required as the majority of households placed the bin out fortnightly
- Keeps material aerobic which improves the feedstock for vermiculture

⁹ Interview - Aaron Hudson, Remondis Organics Resource Recovery Facility (ORRF), Hastings, 2006

¹⁰ Interview - Peter Oldsen, Director Environmental Services, Broken Hill Council, 2006

- Excellent marketability of products
- Average collection weight of 14.05 kgs/household/fortnight
- Food waste consists of 5% of this amount. A lot of material lost into the residual service, need system changes/incentives to increase this level
- Average presentation 44% fortnightly
- Bio-insert has reduced the weight of material collected
- Bio-insert takes slightly longer to collect, and as such an additional shake of the bin is built into the mechanics of the emptying cycle
- Average residual waste reduced by 16%
- Success depends on education spend
- Initial 20% contamination reduced to 4% and needs to be addressed through education
- Bin audits, acceptable/not acceptable stickers on bins and three strikes and out rule help with contamination
- Waste education expenditure is \$30,000 p.a.
- Offal provides additional value in end product
- Staging of service implementation is worthwhile as it allows collection rates for all services to be established
- No gate fee paid to Australian Vermiculture. Council size reduces the material which is then processed and marketed by Australian Vermiculture
- Abattoir now closed but due to reopen with reduced waste output
- No formal written contract was agreed for the processing of this material. This is now causing problems around the responsibilities of both parties
- Focus on employment generation and as a 'soil generator'
- Key to marketability is value adding the compost and finding solid agricultural markets
- Worked closely with agronomist from with Table Grape Growers Australia to establish markets
- Market sees benefit in adding microbial load into soil
- Material windrow composted and irrigated with leachate from worm beds
- Material with offal is re-ground and some formed into worm beds (regrind necessary as offal supposed to be delivered at <50mm size)
- Wormcast harvested as the high value product
- Worms used are hybrid of local natives and compost worms. The material contains eggs so worms are introduced with the product
- Material effective against salinity
- Aerated Compost Extract also sold
- Product price range \$38 - \$88/m³ additional delivery charges apply
- Orders of 40,000 m³ pa outstrips feedstock availability
- Transported to Menindee and also to Alice Springs at purchaser's cost
- In shed location of grinder limits access and throughput
- Foreign objects, such as metal car parts in loads cause problems to grinder
- Current shortage of feedstock puts annual 40,000 m³ product orders at risk

Processor Perspective – Broken Hill, Australian Vermiculture¹¹

- Australian Vermiculture have an agreement with council for organics processing, both bin collected and council generated
- No gate fee charged but fee received for the abattoir waste

¹¹ Interview - Brendan Price, Australian Vermiculture, 2006

Burnside (SA) Trial¹²

Comprised 1,775 households (10% of the City population) located across six suburbs. Diverted kitchen food scraps by placing the food scraps in a vented kitchen bench-top bin lined with a compostable liner-bag, which was provided to residents with advice to remove it every two to three days and place it in the 'green-organics' bin for kerbside collection on a fortnightly basis. East Waste undertook the fortnightly collection of the bio-organic material and then transported it to the Jeffries Group for processing into compost.

Objective

The Burnside Bio-Organics Trial was formulated by the City of Burnside in conjunction with project partners East Waste, Jeffries Group and Zero Waste South Australia (ZWSA), to assess the viability of diverting kitchen food waste from landfill, where it contributes to the generation of landfill gases and leachates, to the more environmentally sustainable application of compost production and final use as topdressing and soil conditioner.

System Parameters

- Kitchen bench-top bin, ventilated, with a volume of approximately 6.6 litres
- Compostable liner-bags sourced from Norway, manufactured from biodegradable material based on cornstarch, vegetable oil and compostable polymers
- The liner-bags are porous (16 micron in size) allowing for a transpiration rate of 1750 grams per m² per 24 hours, enabling aeration of food scraps and aerobic microbial activity, whilst maintaining waterproof characteristics
- Roll of 100 liner-bags provided free for seven months use (at a rate of use of up to one liner-bag for every two days)
- Residents purchase their own green organics bins, therefore, organics bins were made available free of charge for the duration of the trial for residents who did not own a green organics bin
- A sticker for green organics bins was included with the information packs. Residents were encouraged to place the sticker on the lid of their green organics bin

- Fortnightly collection service was provided in the trial area
- Communications strategy was developed and assessed as part of the trial. It was implemented as if it was for broad scale application across the city
- Special licenses were obtained to allow composting of putrescible material in uncontained windrows at the Jeffries facility located at Buckland Park, South Australia
- Jeffries Group have reported that full compliance was achieved for windrow temperature, moisture and oxygen content, odour levels, surface water and that decomposition of food waste and liner-bags occurred within seven days of stockpiling

Results

- Average food waste presented was 2.47 kg per household per fortnight
- Contamination rates of green organic bins was 2.79% by weight, this resulted from a contamination incident rate of 23%
- A contamination rate within the liner-bags was negligible by weight and where it was found to be present, predominantly comprised incidental wrappers (e.g. cling film)
- Residents involved in the focus groups reported that there was 'little or no odour' associated with the Burnside Bio-basket system

¹² Lang, J, Lawler H, Burnside Bio-Organics Trial: Diverting Food Waste from Landfill, Paper e6464, Enviro 06 Conference Proceedings, 2006

Colac-Otway (Vic) Service Implementation¹³

This service has been available since 1997. 8,500 services provided.

System Parameters

- 'north-south' split 240 L MGB, waste one side (maroon lid), organics (yellow lid) the other, serviced weekly
- 240 L MGB (green) for dry recyclables serviced fortnightly
- Suggest wrapping food in newspaper. Have issued a small bucket in the past and are looking at compostable bags etc.
- Day labour collection
- Windrow composted by Biogrow Mt Gambier (SA) 3hr travel using backloads

Experience

- Only total diversion rates known, not available on food
- Contamination is a big problem, running at 11% by weight in the organics bin. This is blamed on a lack of interest in using the system properly despite the provision of a split bin. Contamination tends to be kitchen bags full of mixed waste and recyclables
- Targeted education around contamination starting. General education spend is \$50,000 per annum
- Biogrow market material to Bunnings as potting mix, compost, mulch
- Complaints in past about size of organics bin, too small when lawns vigorously growing
- Would not look at split bin in future contracts
- Gate fee confidential

Lismore (NSW) Service Implementation¹⁴

The service has been upgraded since July 2006. The old service consisted of a weekly 140 L MGB combined organics service accepting all food scraps, garden waste, paper and cardboard. Residual waste was collected fortnightly in a 240 L MGB and no kerbside recycling service was provided. Complaints were received about the small size of the organics MGB and odour from disposable nappies in the fortnightly residual collection.

System Parameters

- New service in place from July 2006
- 240 L MGB for recyclables serviced fortnightly (yellow lid)
- 240 L MGB for organics (all food waste and garden organics) serviced weekly (green lid)
- 140 L MGB for residual waste serviced fortnightly (red lid)
- Sell kitchen tidies
- Paper and board still collected in organics bin. Whilst could go to recycling bin this is not particularly encouraged as market for paper and board is poor
- Day labour collection
- Windrow composting and vermiculture by Tryton, including both bin collected and drop off material
- Gate fee for processing of garden organics is \$40/tonne and combined organics \$46/tonne
- Commercial organics service optional. CBD uptake 60 – 70%. Clean feedstock supplied

Results

- High level of customer satisfaction with new service
- Additional volume in organics MGB combined with restricted volume in residual MGB led to dramatic increase in organics collected
- Contamination 0.5% in organics bin
- Waste Minimisation officer and part time education officer employed

¹³ Interview - Darren Williams, Waste Management Officer, Colac-Otway Shire, 2006

¹⁴ Interview - Phil Klepzig, Manager Northern Rivers Waste and Northern Rivers Quarry and Asphalt, Lismore City Council, 2006

Need strong resourcing of education and promotion backed up by refusal to service (3 strikes and out rule)

- Strong emphasis on schools and use of media
- Coloured lids have aided diversion
- Considering vented kitchen tidies and compostable bags
- Council looking to take over size reduction and composting then supplying Tryton with required feedstock and selling or utilising the remainder internally
- Annual auditing assists in policy decisions and level of resourcing by council¹⁵. The 2006 audit found that:
 - Organics bin consisted of garden organics (73% or 8.2 kg/hh/wk), food organics (18.5% or 2.1 kg/hh/wk), compostable paper (4.2% or 0.5 kg/hh/wk), soil/dirt (2.7% or 0.3 kg/hh/wk) and other organics (1.3% or 0.1 kg/hh/wk)
 - Contamination in organics bin lowest to date at 0.5% or 51 grams/hh/wk
 - 86% of all organic materials go to the organics bin and 14% to the mixed waste stream
 - Organics bins were on average 42% full (103 ltr/hh/wk)

Processor Perspective – Lismore Contractor, Tryton¹⁶

- No problem in dealing with food waste
- New bin system resulted in much cleaner feedstock but the industry needs to engineer out the problem of light plastic (bags)
- Windrows turned with excavator, size reduced twice, composted for 3-4 months and screened
- Some compost fed to worm beds and cast harvested
- Liquid extract also derived from cast
- Market demand has risen markedly in last 12 months
- Mainly agricultural markets
- 3 products, compost/mulch, cast and liquid extract

- Compost purchasing is hampered by the cost of freight to the customer
- Nutrient value is higher due to addition of food, provides additional value to product
- Paper in feedstock is not a problem and breaks down well
- Have Biodynamic Farmers Association registration. Good market in organic farming
- Renewing contract with council for another 5 years
- 3 staff and manager on site

Nillumbik (Vic) Service Implementation¹⁷

'GRO 3-bin system,' (Green, Recycle, Other) commenced July 2003 including combined food and garden organics collection. Change 'compelled for safety, environmental and economic reasons' as 43% rubbish was food waste. Council target of zero landfill by 2020. Service to all urban and rural residents. 19,500 services provided.

System Parameters

- Food and garden (green lid) 120 L MGB weekly (includes meat, bone and seafood)
- Recycling (yellow lid) 240 L MGB fortnightly
- Residual (red lid) 120 L fortnightly
- Instruction NOT to wrap organics in plastic, biodegradable bags or newspaper, otherwise rejected by processor (As of December 2006 residents are now able to wrap food scraps in newspaper.)
- Commercial windrow composting of material by Green Planet (Epping)
- Internal (council) waste contract for collection

¹⁵ Lismore City Council Domestic Waste Audit Summary, September 2006

¹⁶ Interview - Barrie Blackman, Plant Manager, Tryton, 2006

¹⁷ Interview – Tamara Johnson, Waste Service Coordinator, Shire of Nillumbik, 2006

Experience

- Started out using biodegradable bags, however not readily available and became problematic
- Too much newspaper in the system caused problems for the windrow processor. New processor (Green Planet) has informed that newspaper can now be used
- Change to mechanical sort decreased non organic rejects from 70% to 10%
- All material size reduced and contamination screened out at end
- Contamination rate is 10% thought to be caused by fortnightly residual bin, laziness, and the community being forced to put food in the green bin
- Education spend \$35,000 pa
- Acceptance now of reduced rate and capacity of residual bin, although people with babies (disposable nappies) and large families may have problems
- Early there was strong resistance to requirement to put food in green bin. People were strongly offended by this. People expected bins to be cleaned out by council
- Main advice – Do a Trial First!

Camden Council (NSW) Implementation¹⁸

System Parameters

- 240 L MGB Organics weekly – including garden, fruit and vegetable waste (no meat bone or dairy). Not undertaken in rural areas
- With varying charges based on the size of the bin, the use of the smaller bins is rewarded
- 240 L co-mingled MGB for recyclables weekly
- Kitchen tidies not provided. No specific instruction on wrapping
- System not widely promoted apart from in waste brochures and stickers on bins indicating fruit and vegetable scraps acceptable with no meat

¹⁸ Interview - Don Cesco, Team Leader Waste Management, Camden Council, 2006

- Day labour collection
- Camera on the hopper for OH&S and contamination purposes
- Processing by Camden Soil Mix in open windrows

Experience

- Minimal amounts of contamination. Regular bin inspections conducted and tagged bins are not collected. Drivers also inform head office of problem premises
- Contamination monitored and actioned
- Very few complaints on the service
- No particular problems experienced

Timaru (NZ) Service Implementation¹⁹

- Population 42,000

Objective

- The Timaru District Council introduced a three bin collection system from July 2006. The contents of the previous 240 L MGBs contained approximately 67% organic waste. The collection of food (17%) and garden waste (50%) was a logical option to help maximise diversion of waste from landfill.

System Parameters

- 17,300 properties serviced.
- 240 L MGB for organics collected weekly. All food and garden, plus shredded paper and food contaminated paper/cardboard. (17,596 bins).
- 240 L MGB for recyclables collected fortnightly, (18,514 bins).
- 140 L MGB for garbage collected fortnightly on alternate week to recycle bin, (18,172 bins).
- The organic bin is called 'compost' on the lid to help residents make the link to finished composted product.

¹⁹ Report from Brian Gallagher, Solid Waste Manager, Timaru District Council, 2006

- The above bin sizes were the 'standard package'. Residents were given the choice of selecting smaller bin sizes for organics and recycling (same fee) with a higher fee for a larger 240 L garbage bin.
- Council allowed a six-month amnesty period for people to swap bins if they were unsure of what their bin size and bin number requirements were.
- The service is provided to all residential, commercial and industrial properties.
- Greater flexibility was allowed by the council in bin choice, e.g. 2 recycle bins and 1 garbage where organic waste was almost nil for businesses.
- Businesses and special situations are serviced weekly
- In special situations, e.g. multi units, businesses and small space areas a wheeled cart system has been provided to ensure the three-way separation of waste continues. The system comprises three 45 L crates stacked vertically on shelves. This service is being supplied to approximately 200 properties or 1% of the total services and the crates are collected weekly.
- The council has a 15 year contract with Envirowaste Services to collect and process organics. The council owns the site and fixed in-ground assets at the compost site. The contract also includes the collection of the other bins, recycling sorting and processing, landfill and transfer station operations.
- The GORE™ Cover system is used to compost the organic material. This is an aerated windrow system with Goretex fabric covers, which are placed over the windrows, to maintain temperature, moisture and aerobic conditions during the process, as well as minimising odour. This compost process takes 8 weeks with a 1 month minimum maturation period. This system is now licensed under European Union conditions as an enclosed system capable of destroying all pathogens during the compost phase. This aspect was important for council in minimising potential risk from the end compost products.
- Biodegradable bags were trialled for organic separation in kitchens, but were not introduced. The trial use of these bags was well received. Overall extra cost and potential to run out of bags and use plastic alternatives were the main reason these were not introduced. Food waste may be wrapped in newspaper instead.
- Consideration of tags and scanning equipment was an extra cost that was not introduced because of the limit on the total project budget.
- The council also implemented a comprehensive information programme prior to the introduction of the new service. This will be followed up with ongoing education, proactive reinforcement of good practice and enforcement as required.
- Branding and logos for the new system were a key part. '3-2-1-Zero Waste to Landfill' was developed as a logo and message to the community.
- The council is in the process of reviewing its solid waste bylaw and it is likely that a landfill ban on organic waste will be introduced.

Experience

- 74% diversion of waste from previous kerbside collection was achieved by composting (54%) and recycle (20%) for the period July 06 to November 06.
- Average presentation rate of organics bin is 68% of 17,596 bins during October 2006.
- Average weight of the organics bin presented is 20.7 kg per week.
- Average weight of the organics collected is 14.4 kg/property/week for the 17,300 properties serviced.
- Contamination rate for the organics bin has been measured at 0.1% by weight for the above period.
- In the initial 3 bin trial the average weight of the organics bin was 21.7 kg with a range from 2.95 kg to 90.25 kg.
- Having an encompassing contract provides an effective link between the collection and composting operations. This helps ensure that any messages from the compost site or the collection aspect regarding contamination are followed up and acted upon without deliberation on apportioning blame to rectify issues. Overall ownership and quality assurance of the process is enhanced.
- There has now been a good response from the community to the new service and it is expected that the contamination rate will improve, as a dedicated person will commence bin audits. Reinforcement will be provided as well as enforcement for people who get it wrong. Providing samples of the finished compost to these

people will help strengthen the link between organic waste in the bin and how it ends up as compost.

- Quality assurance is being finalised to ensure the compost complies with NZS5545.
- A two year market development programme is being undertaken for the agricultural sector .
- There is a need to complete audits of other waste streams to confirm the quantities of total organic diversion.

Christchurch (NZ) Trial²⁰

Objective

- To replicate the best practise found in Europe for the collection of household organics
- To determine how best to deliver kerbside organics collection services to the public and in 2007 plans to undertake a consultation process aimed at prohibiting the landfilling of organic waste in Christchurch by 2009
- System Parameters
- Duration from February to December 2005
- 530 households
- 7 L kitchen container
- Weekly garden and food collection in either 48 L or 80 L MGB
- Instructed to wrap kitchen waste in newspaper for first 20 weeks
- Instructed to use compostable biofilm bags for last 20 weeks
- 100 hhlds provided with vented kitchen containers
- All food including meat and bones included
- Residual waste collected weekly in 50 L garbage bags
- Organics processed at councils windrow composting facility

Results

- Participation in the service was very high with 94% of households placing MGBs out for collection at least once every three weeks. Most households (77%) placed the MGB out for collection each week.
- Compared to pre-trial measurements, the weight of council rubbish bags collected in the trial area fell by 40% for those households with the 80 L organics MGB and by 22% for those with the 48 L organics MGB.
- Most households (80%) noticed a reduction in household waste sent to landfill.
- The average weight of an 80 L MGB placed at the kerbside was 12 kilograms per week and for the 48 L MGB it was 6 kilograms per week. Approximately 80% by weight was garden waste and 20% was food scraps in each container.
- Contamination of the MGBs throughout the trial remained very low (estimated to be less than 1% by weight) and fewer than 5% of the MGBs sampled had contamination in them, mostly glad wrap and plastic bags. The frequency of plastic bag contamination fell once each household was provided with BioFilm bags 20 weeks into the trial.
- Resident satisfaction with the service was very high with 97% of residents considering the service to be good or very good. This is comparable to the satisfaction level achieved by the 45 L kerbside recycling crate service provided by the council.
- The most common reasons given for finding the service good were: convenience, easy of use, regular collection, better for the environment, reduced household waste, fewer trips made to the dump, the compostable BioFilm bags.
- The most common reasons given for finding fault with the service were: the closed blue kitchen bin smelt and got dirty, smelly residues were left in the bottom of the kerbside MGB, the MGBs were too small, the green 48 L MGB was hard to manoeuvre.
- Of the 100 households that received the green ventilated kitchen bins and BioFilm bags most (85%) preferred to use them over wrapping food scraps in newspaper and using the blue closed kitchen bins.
- The most common reasons given for preferring the BioFilm bags and green ventilated kitchen bins were: no smell, no mess, fly proof, no condensation or smelly liquid in the bottom of the bin, no need to clean the bin each time it was

²⁰ Moore, T, Trial Kerbside Collection of Household Organic Waste in Christchurch, Christchurch City Council, 2006

emptied, the bin looks better in the kitchen, the bin was easier to use, the kerbside MGB was cleaner.

- Most households (82%) never or rarely smelt an offensive odour generating from the green ventilated kitchen bins compared to 55% when the closed blue kitchen bin was used. For those households using the closed bins, offensive odour was often or always found 20% of the time, compared to 2% when the breathable system was used.
- The most common reasons given for not liking the closed blue kitchen bin and newspaper system were: smell, mess, having to rinse the bin each time it was emptied, having to handle the food scraps a second time (when wrapping them in newspaper), would prefer to recycle the newspaper, don't have sufficient newspaper to wrap the food scraps. When asked if the smell and mess associated with using the newspaper and closed kitchen bin would put people off separating their food scraps for composting, 30% said it would.
- Most residents (76%) said they were willing to pay \$3.50NZ per week for the kerbside organics collection service. Estimated costs for the city-wide weekly collection of a 140 L organics MGB is \$2.60NZ per household per week.
- Households that had insinkerators in the trial area (12% of the households) were happy to use the organics collection service.
- Households that composted at home prior to the introduction of the service (22% of the households) were happy to use the service, often for things they did not compost at home (e.g. meat, bones, tissues, cooked food, rose prunings and weeds).

Aerated MGB Evaluations

Cleanaway introduced a retrofit system for aerating MGBs into Australia, called the 'Bio-Insert.' Unfortunately this has caused problems with nomenclature where combined food and garden organics services in Europe are classed as 'Bio-Waste' services. Trials of this system have been conducted at Tea Tree Gully, Moonee Valley and Broken Hill. The Institute for Horticultural Development (Vic) have also conducted an evaluation of the inserts for Cleanaway. Bexley Council (UK) have tested another style of aerobic MGB.

Bexley Aerobic Bin System Trial (UK)²¹

- 12 month trial in London Borough
- Residual waste weekly
- Co-collection of organics fortnightly in a MGB incorporating vents and spacers
- Recyclables fortnightly
- 10 L Kitchen container
- Wet strength paper bags and sacks for the MGB
- Overall capture rate for 'home compostable food waste' was 48% at its maximum and 26% at its minimum
- Overall capture rate for 'non-home compostable food waste' was between 21 – 38%
- 192 system user households
- 158 satisfied on bin size, 28 too big, 6 too small
- Largest single group of 52 said bin was fine
- 20 said fortnightly collection too infrequent, 19 said too big and awkward, 15 said too smelly to use
- Material taken to a Cleanaway in vessel composting facility
- Aerobic bins offered a clear performance advantage over other tested systems
- Paper sack liner assists collection efficiency

Evaluation of Bio-insert for containment of organics in mobile garbage bins²²

The conclusions from this report are:

- The bio-insert supplied adequate ventilation for aerobic decomposition and drying of the added organic materials. In the standard bin, anaerobic conditions were prevalent.
- Significantly higher rates of weight loss were observed with the bio-insert in winter, spring, and summer compared to the standard bin. Lower average rates of

²¹ Bexley Council & network recycling, Bexley Aerobic Bin System Trial 2004/5 Trial Report from Three Perspectives *What Actually Happened *The Householder View* The Local Authority Experience, July 2005.

²² Wilkinson K, Henderson, B, Evaluation of bio-insert for containment of organics in mobile garbage bins, Final Report for Cleanaway, April 2001.

- green organics collected per household could mean significant savings for kerbside collection services.
- The bio-insert and standard bins do not result in effective pathogen reduction. However, the risk to public health is probably no greater for kerbside collection of organics than other disposal options (e.g. home composting).
- The contents of the bio-insert bin were less compacted, drier and more uniform than the contents of the standard bin. In the standard bin, the lower layers of green organics were especially dense, wet and putrid. The better the condition of green organics collected in the bio-insert should cause fewer problems for compost facility operators receiving the feedstock.
- A collection frequency of 4 weeks is feasible for green organics. If food organics is also collected, a 2 week collection frequency (as a minimum) is recommended to prevent the build up of excessive leachate and odours.

Broken Hill Trial – Council report²³

This is a summary of the Manager Environmental Services Report to the council's Environmental Services Committee.

Background:

Council previously resolved to conduct a dedicated green waste and kitchen organics collection trial consisting of 400 bio insert bins. This was a voluntary trial and 80% of selected residents decided to participate. The collection service commenced in November 2002 on a weekly basis on Wednesdays.

Outcomes:

For the period from November 2002 until the end of May 2003 the following statistics were collected:

- Total number of bins collected 3638 bins
- Average number of bins collected per month 520 bins
- Average number of bins collected per service 130 bins
- Total weight collected 52.35 tonnes
- Average weight per bin per collection 14.38 kgs
- Average weight per bin per month 57.52 kgs

- It should be noted that less than half the bins were presented on a weekly basis. Therefore it is considered that a fortnightly collection is the best option when the expanded collection commences. This would also enable the collection to occur utilising the existing resources, however the servicing of the trucks may have to occur at different times
- The material collected has been almost contamination free and the product can be used in the composting process without further processing. Odours from the product are organic as a result of the aerobic conditions in the bio-insert bin
- Overall the trial has been very successful and has been well received by the public

Survey Results:

A survey was conducted in May to determine the success and acceptance of the trial. Council received a 56% response rate which is high for general surveys.

Question 1: On a scale of 1-10, with 1 being very difficult and 10 being very easy 96% of the participants rated the bio insert at a 7 or better with 76% rating it at a 10.

Question 2: 84% of the participants indicated that they had no problems with odour from the container.

Question 3: 95% of the participants found it easy to prepare prunings for the bio insert bin.

Question 4: 55% of the participants noticed that the waste placed in the container began to break down.

Question 5: 93% of the participants indicated that they received enough information on how to use the bio insert container.

Question 6: 99% of the participants indicated that they were able to dispose of more garden waste using this system than otherwise with their existing 240 L bin.

Question 7: 99% of the participants indicated they thought it was important to have a separate container for green waste.

Question 8: Average Usage of the Service

35%	-	Weekly
44%	-	Fortnightly
13%	-	3 Weekly
8%	-	Monthly

²³ Broken Hill Council, Manager Environmental Services Report No. 40/03, Environmental Services Committee, July 3, 2003, Subject: Dedicated Green Waste Collection Service, S13/1

Question 9: 100% of participants supported continuation of the service.

General Comments by respondents: Of the general comments received 75% provided good to excellent comments and 26% wanted more recycling services.

Broken Hill Bio-Insert Trial – Cleanaway report 2002²⁴

This is a summary of the Cleanaway report on the same Broken Hill trial.

Bio-Insert suited the worm farm application, as the material needed to be finely shredded and in good condition before it was fed to the worms. Material in anaerobic condition is not palatable to worms and disrupts the delicate environment in the worm farm.

Council bought 400 of the specialised bins from the company to commence their own trial for their unique vermiculture application. In early October 2002, council chose 400 households to participate in the preliminary Bio-insert trial.

Residents were asked to put all 'kitchen organic waste', including meat and dairy products, into the distinctive bin with the lime green lid.

The 400 Bio-insert bins are currently being emptied weekly but council has found that residents do not have the need to put them out so frequently, especially during the drought.

The waste is also reduced in the Bio-insert as it starts breaking down quickly and, since there have been no reports of odour, council has deemed weekly collections unnecessary.

Council will reduce collections to once per fortnight when the system is expanded into another 1200 households in July 2003.

Collections are yielding an average of two tonnes per week which equates to roughly 13-14 kg per bin.

Preliminary reports have shown the material is in excellent condition with negligible contamination. Peter Oldsen believes this is due to the unique look of the bin with its internal bracket system.

The quality of the material being delivered to the processing facility is also remarkable. Cory Simmons from Regional

Vermiculture Australia said he was "very impressed" with the results of the Bio-insert after three months. "The Bio-insert assists us in our composting and vermiculture operations because the material is delivered to us in an aerobic state," he said. "The composting process that we would otherwise have to get started has already begun. The material is also nitrogen-rich which is great for the composting process and the worms love it".

The material out of the Bio-insert bins does not need to be shredded and is added directly to the other green waste material which has been through the course shredder.

This material forms the base of the windrows. The partially processed abattoir by-products in the 3:1 mix is placed in the middle and covered with mature compost which acts as a 'bio-filter'.

International Review²⁵

Residential collection of food waste has been well established in parts of Europe since the early 1990s and is increasingly being used in the US and Canada to achieve landfill diversion targets. Food waste collection is also growing quickly in the UK, following delays caused by the restrictions imposed after the outbreak of foot and mouth disease in 2000.

United States of America

The most prominent trend is to combine food waste with existing green waste kerbside collection to form a co-mingled household organics stream. Where green waste collections are not offered, or offered as a periodic rather than weekly service, food waste is being collected as a separate stream. The decision to offer a food waste collection service at kerbside has frequently followed the development of a commercial and industrial food waste programme.

Materials Collected in the Food Waste Stream

Most jurisdictions offering food waste collection allow residents to add a range of soiled paper products, and many commingle the collection with yard trimmings. Some jurisdictions even extend collection to include diapers and pet waste. The most common food exclusions are meat and dairy.

²⁴ Cleanaway, Broken Hill City Council Puts The Cleanaway Bio-insert To Work For Worms, www.cleanaway.com.au 2004.

²⁵ DEC & Hyder Consulting, summarised from TBL Assessment of (Domestic) Food Organics Management, 2007.

Containers

Most jurisdictions which offer food collection provide residents with a kitchen pail, usually 2 gallons (approximately 8 L) in capacity. Some jurisdictions encourage residents to line the pails with either biodegradable or conventional plastic bags, or wrap food waste in paper. Food waste is then set out with whatever other household organics are accepted in either a dedicated bin (most often 30-38 gallon capacity), clear biodegradable bags or combined with garden waste in a large single bin (up to 90 gallons), where a garden waste service already exists.

Frequency

Collection frequency of food waste is almost exclusively weekly, except in Seattle, which has fortnightly collections. In some cases, a reduction in the frequency of garbage collection from weekly to fortnightly has accompanied the introduction of a kerbside household organics collection system.

Yields and Recycling Rates

Data on yields of food waste from collection systems in the US is patchy and variable. Most of the data that has been published was collected during trial periods of limited duration or combined with garden waste data. In addition, most jurisdictions report figures on a different basis. No data on diversion rates (as a function of total organics present in the waste stream) or percentage food waste in the household organics stream was found.

Canada

Food waste collection at kerbside has become widespread and the following jurisdictions now offer programmes, using different collection models: Guelph, Northumberland, Pembroke, Hamilton, Toronto, Markham, Durham, Niagara, St Thomas, Ottawa, all in Ontario Saint John and Moncton. New Brunswick Edmonton, Alberta.

Materials Collected

A large range of materials are accepted together with food waste. In some areas, yard waste is collected commingled with household organics. However, because of the significant difference in the amount of yard waste that is generated in the winter months in Canada, a significant number of jurisdictions prefer to collect it separately. This means that a smaller bin can be used for household organics.

Collection Systems

A range of collection systems exist in Canada, depending on whether food waste is commingled with yard waste. A variety of collection models have also emerged, with varying frequency of organics and garbage collection, and number of streams. The conventional three stream system, involving recyclables, organics and garbage, is common but another model, called 'wet/dry recycling', has also been implemented in a number of communities, mainly for cost reasons and to enhance diversion (in the wet/dry system there is no resulting garbage stream), although this model has not been without its problems.

Yields and Recycling Rates

Jurisdictions in Canada almost exclusively collect more than food waste in their kerbside household organics programme, and therefore all data available (collected mainly from trial periods) incorporates, as a minimum, the weight of the co-mingled soiled paper products. In Ottawa, where an organics programme is being piloted, a generation rate of 9 kg/month of organics from each household was observed during the winter months, when no garden waste is generated. This equates to 2.1 kg per week of non-garden organic waste. In Toronto, where food waste is collected with a range of soiled paper products but separately to yard trimmings (which are placed at kerbside in plastic bags), trial data of 8.8 lbs or 4 kg per week from each household has been reported. In Hamilton, Ontario, which trialled household organics collection over a one year period between 2002 and 2003, average household yield was 100-150 kg over the year, equating to 1.9-2.9 kg per week. Based on the assumption that 90% of the organics diverted is food waste, per household yields range from 1.7-3.6 kg of food waste per week.

Participation Rates

Little quantitative data has been found on set out and participation rates in Canada. However, results from the pilot programme being run in Ottawa (started in 2002) demonstrated that set out rates were increased in situations where a kitchen pail was provided for food waste and where fortnightly rather than weekly garbage collection was offered.

Europe

Europe has led the way internationally in the collection and processing of source separated household organics. In the mid-1980s, pilot projects were initiated in Germany, Austria, Switzerland and Netherlands, with the aim of composting the organic waste fraction of municipal waste. Since then, significant work has been done in optimising collection systems, increasing public participation and developing processing technology and standards. In 1999, EU Directive 99/31/CE targeted a reduction in disposal of the biodegradable fraction of MSW over the next 15 years. To date programmes have been initiated in a number of European countries aimed at implementing source separation for organic waste.

Collection

Collection practices in Europe range from separate door to door collection of source separated household organics (such as prevails in Italy) to co-collection with garden waste in a single co-mingled bin (as is common in Austria). In the UK, most jurisdictions including food waste have added it to existing green waste collection.

Materials Collected

The organic fraction of MSW collected varies from country to country in Europe, including: household and garden waste, called VF (vegetable and fruit) or VFG (vegetable, fruit and garden) residues, e.g. the Netherlands; pure organic household wastes, including material of animal origin, e.g. Sweden; and organic household waste including material of animal origin as well as certain amounts of garden waste, e.g. Germany, Austria. In the UK food waste collection is still in its infancy and data is only available from a small number of pilot studies. However, a number of jurisdictions have commenced regular food waste collection.

Collection Systems

In general, two collection systems are in place in Europe:

- Collection of source separated food waste and other household organics in small dedicated bins, excluding yard waste; and
- Collection of all organic waste including household organics and yard waste in a single (larger) collection bin.

The first system is the typical model employed in Italy, where collection using small containers and 'biobags' (watertight bags that completely contain food waste) occurs 'door to door' as often as 5 days per week. This intensive collection system has been adopted to address the different properties of food waste as opposed to yard waste (for example, its higher putrescence and moisture, and bulk density) and to improve the ease of participation for households. It is believed that this approach has raised participation rates and yields. Recent trials in Spain have followed this system.

The second system is the more common model found e.g. in Austria and the UK where green waste has traditionally been collected at kerbside. Typically larger bins (140-240 L) are used and collection frequencies vary. In parts of Europe, large volume on-road containers are also used, particularly for multi unit dwellings. In some cases, these road containers are by 'invitation only' (they require key-access). This system is mainly implemented to ensure minimum contamination.

In general, the experience in Europe has been that food waste collection is most successful when carried out door to door and integrated into the total waste management system.

Yields and Recycling Rates

In Austria food waste is collected together with small yard trimmings suitable for addition to a biobin. Total annual arisings ranged from 24-74 kg per person, with an average of 48 kg across all of Austria. Food waste was assumed to make up between 55 and 66 percent of the bio-bin arisings, which equates to food waste generation of between 0.5 and 0.6 kg per person per week with a possible peak value of 0.9 kg per person. This represents recovery rates between 33 percent and 60 percent.

Study leaders also concluded that while commingled organic waste collection enhances overall yields of organic material, the yield of food waste is reduced when it is co-collected with garden waste. In places where food waste is collected together with garden waste, garden waste typically makes up 40-70 percent of organics collection weight.

In the UK, food waste in household garbage has been estimated at 194 kg per household per year. This is equivalent to 1.4 kg per person per week, assuming a household size of 2.7. However, ongoing yields of between 50 and 75 percent (or 0.7-1 kg per person per week) are being projected as feasible in the UK, depending on whether the food waste collection is co-mingled with garden waste or a dedicated food waste programme is implemented. Recent experience of regular collection in Somerset has demonstrated yields of 1.9 kg per household per week, or 0.7 kg per person if a household size of 2.7 is assumed.

In central Europe with less frequent organics collection and collection via on-road containers, the percentage of food remaining in the residual garbage stream has often been reported at 30-50 percent. High figures have particularly been reported in the Netherlands where meat and fish are excluded from food collection. In contrast, it is claimed that Italy has achieved residual organics in garbage of 15 percent because of the high collection frequencies and use of watertight 'biobags'. In Austria, where food waste collection has been established for over ten years, garbage generally contains 11-23 percent residual organics, averaging 17 percent nationwide.

Set out and Participation Rates

Ten years after the biobin was introduced in Austria, average participation rates have been measured at 43 percent, with a range between 34-49 percent. Extended trials in Somerset in the UK have demonstrated participation rates of between 20 and 50 percent. Estimates offered by UK councils based on anecdotal data have suggested participation rates as high as 50-90 percent. Trials carried out in Spain have observed participation rates between 40 and 70 percent.

Participation rates have not been reported for Italy but studies have concluded that cutting down the collection frequency for the residual garbage stream is an important factor in increasing participation.

Contamination Issues (Overseas)

In general, when accompanied by a well designed collection system and adequate community education, contamination in food waste collected from kerbside appears to be very low and cause no problems at composting facilities. Most often information on contamination tends to be general with comments such as 'contamination is not really a problem' or levels stated at generally less than 5 percent.

Contamination is controlled in a number of jurisdictions by an active enforcement programme at kerbside where loads are visually inspected by the contractor and rejected if contamination is noted. The container is marked with a sticker giving the reason for rejection. Active enforcement at kerbside is often needed if garbage collection frequency is reduced following the implementation of food collection.

High levels of contamination have also been observed when multi-family dwellings have been included in collection programmes. San Francisco, which led the way with residential food waste collection in the US, has opted to include only single family residences in their collection programmes because of the contamination difficulties that medium and high density housing can introduce.

- Plastic bag waste appears to be the most prominent contamination problem for food waste collection services, with its main impact being as a visual/physical contaminant.

The use of watertight bags to contain the food waste and line the bins prior to collection has been found to assist in eliminating the nuisance factors of odour and pests, to keep the bins clean and reduce the need for frequent cleaning, and to offer the option of delivering food waste separately to garden waste (even when a single 240 L bin is used at kerbside). Conventional plastic bags also retain their strength and can be placed directly on the roadside or within the provided bin. However, if plastic bags are used, it would be necessary to install additional equipment at the front end of the composting process to remove them from the food waste stream.

In some places, residents are encouraged to either use kraft bags or wrap the food waste in paper (when a bin is used for collection). Paper or paper bags have the disadvantage of not being waterproof and suffer reduced strength over time due to moisture in food. However, they pose no contamination issues during subsequent processing. Biodegradable plastic bags have been trialled in the US, but performance, cost and availability have been significant barriers to their widespread implementation.

