

Trial Kerbside Collection of Household Organic Waste in Christchurch

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1. Introduction

The management of organic waste is a significant issue in New Zealand due to the quantity disposed and its impact, once landfilled. Typically organic waste (putrescible material and greenwaste) makes up 30% to 40% of the country's municipal waste and in the landfill, contributes to leachate and greenhouse gas emissions. The New Zealand Waste Strategy challenges local authorities to reduce by 95% the amount of greenwaste landfilled by 2010 (MFE, 2002). Consequently, solutions for minimising this problematic waste are needed rapidly, but research and experience in New Zealand are limited. Consequently, this paper reviews experience related to the minimisation of domestic organic waste and presents findings of a kerbside collection trial undertaken in Christchurch during 2005.

2.0 Background

2.1 Home composting

Based on international experience, even the aggressive promotion of home composting will not achieve the very high waste minimisation target set by the New Zealand Waste Strategy for organic waste. Approximately 5% organic waste diversion was achieved in Durham, England when home composting was aggressively promoted and subsidies for compost bins of up to £20 were provided to 20,000 households (www.durham.gov.uk and www.wrap.org.uk). In Seattle diversion of 8% was achieved through community-based Master Composter Programmes (www.seattletilth.org). However, other research indicates that 40% of residents that take part in such programmes will drop out as people lose interest in the schemes, find it too hard to continue or simply do not receive the follow-up support required for on-going success (Lets Recycle, 2005). Even in Christchurch where, through random telephone surveys, 50% of the residents consistently state that they compost at home to some extent (Moore, 2003, 2002), 72,000 tonnes of organic waste, primarily from domestic sources, are landfilled each year (27% of the total landfilled each year in Christchurch).

Undoubtedly home composting of domestic organics is the best use of these organic resources. Home composting can provide a wide range of benefits including:

- The avoidance of collection, transportation and processing costs and impacts;
- Enhanced water conservation, biodiversity and the increased productive capacity of the urban landscape;
- The provision of food, amenity and the beautification of properties often in lower-socioeconomic areas; and
- The promotion of physical activity and an understanding nature and the cycles of life.

Consequently, hygienic methods of home composting should be promoted to reap these benefits regardless of other strategies adopted. But it must be recognised that other methods are required to significantly reduce the organic waste stream. To be successful, these other methods must address the key barriers to composting.

Research both here and abroad identifies three key barriers to home composting (Opinions 2005, Mackenzie-Mohr 2003, Moore 2002 and Taylor & Todd 1997). In order of importance these are:

1. Convenience. People find it too hard and time consuming to compost at home, and/or that its easier to dispose of the material into rubbish collection systems;
2. Limited space. Insufficient space for the compost bin or to use the compost produced; and

3. Knowledge. People do not know how to compost effectively or with confidence and failure discourages further involvement in home composting.

These barriers largely reflect modern lifestyles, modern housing developments and the prosperity of our society. It is significant that the provision of information and education will only address the lowest ranked barrier and that other approaches are required for success. The key barriers of convenience and limited space are most convincingly overcome by the provision of a kerbside collection service for household organic wastes.

2.2 Kerbside Organics Collection

The collection of greenwaste or yard waste at the kerbside is well established throughout the world. It is widespread in America, Australia and in Europe. However, the collection of food scraps along with the greenwaste is most commonly adopted in Europe, where high disposal costs and bans on organic waste disposal to landfill, drive its uptake. Table 1 shows the different processing options adopted by various European countries and includes Christchurch data for comparative purposes.

Approximately 138 million people in the countries listed in Table 1 are provided with kerbside organics collection services and a total of 395 million tonnes are composted each year. It is notable that with composting, recycling and incineration Denmark and the Netherlands have achieved 90% waste diversion from landfill.

Table 1. Waste processing options adopted in Europe and related compost production data.

Country	Proportion of Waste Processed (%)				Compost Production		
	Landfilling	Thermal Treatment ¹	Recycling	Composting	Kerbside collection (% Population)	Tonnes (million)	Facilities
Denmark	11	50	25	14	33	0.5	134
Netherlands	12	41	24	23	92	1.6	27
Germany	NA	NA	NA	NA	75	9	700
Austria	25	11	24	40	30	3.7	460
Norway	NA	NA	NA	NA	61	0.3	40
Belgium	27	21	37	15	30	0.4	30
Sweden	33	35	25	8	35	0.4	125
France	58	27	8	8	30	378	460
England	81	8	9	2	5	2	325
Christchurch	75	0	13	12	8	0.03	1

Compiled data from: Environmental Signals 2002 – European Environment Agency, www.compostnetwork.info and www.compost.org.uk. ¹ Thermal treatment includes incineration, pyrolysis and gasification.

Increasingly in Europe the collection of household food scraps is undertaken using breathable and compostable bags with ventilated kitchen bins (Figure 1). According to Polargruppen the manufacturer of these bags and bins, municipalities in Europe are now requesting breathable systems in their tendering processes. The reason for this is simple. Residents prefer to use the breathable system. Therefore, municipalities can achieve a higher level of participation and so a greater level of waste diversion. This paper investigates whether this public acceptance and uptake will be replicated in Christchurch.

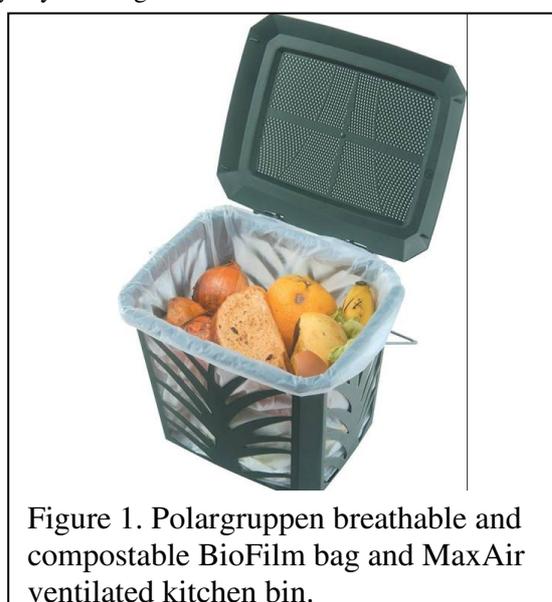


Figure 1. Polargruppen breathable and compostable BioFilm bag and MaxAir ventilated kitchen bin.

In New Zealand, by contrast to Europe, only three Councils collect both food scraps and greenwaste at the kerbside, they are Mackenzie, Timaru and Selwyn District Councils. Although private collection companies offer greenwaste collection services throughout New Zealand, their uptake is often limited in comparison to private rubbish (mixed waste) collection services. According to surveys in Christchurch, approximately 8% of households have greenwaste only collection services compared to 22% of households using private rubbish collection services (Moore, 2003). Analysis of these rubbish wheeliebins found that 75% of the material they collect could be composted or recycled. Clearly these rubbish services contribute significantly to the amount of organics and recyclables landfilled from domestic sources.

2.3 Insinkerators

In sink waste disposal units (insinkerators) offer a further, but perhaps, contentious option for the collection and beneficial use of food scraps. Depending on the wastewater treatment system, organic matter can be digested to create electricity and in the future algae could be grown and harvested from oxidation ponds to create bio-fuel. However, environmentally minded people currently view the use of insinkerators as undesirable, primarily due to: additional loading of the wastewater collection and processing systems; the loss of nutrients into rivers or the sea and its related impacts on aquatic ecosystems (e.g. eutrophication and algal blooms); and because of the need to dispose of the resulting biosolids.

In Christchurch approximately 22% of households have insinkerators (Moore, 2003) which results in an estimated 12,000 tonnes of food waste entering the waste water system each year. The cost of processing food scraps through the Christchurch Wastewater Treatment Plant, at \$80 per tonne, is comparable to the cost of composting the material in an enclosed compost plant (excluding the cost of organics collection where food scraps could be collected along with greenwaste for around \$90 per tonne). *[Calculation and assumptions: The cost of processing 12,000 tonnes of food scraps at 80% moisture through the Christchurch wastewater system is \$800,000 per year based on the current trade waste charges of \$0.35 per kilogram of suspended solids, plus \$135,000 per year for the landfilling of the resulting 1,000 tonnes of biosolids at \$135 per tonne. Whereas composting through an enclosed system ranges from \$65 per tonne to \$85 per tonne depending on the compost system and scale].*

In contrast to wastewater treatment systems, composting captures and returns nutrients, biomass and beneficial microbes to the soil providing a range of benefits to soil structure, fertility and biology. Composting offers a “closed loop” approach for the organic resources. So on the basis of environmental benefit and processing cost, one could argue that composting is the more desirable option. Consequently, unless Councils in New Zealand have world class wastewater treatment systems that can beneficially capture and utilise both the nutrients and the biosolids, composting the food scraps is preferable.

2.4 Synthesis

Because the use of insinkerators is not desirable and because home composting will only achieve a moderate reduction in waste, Councils in urban areas of New Zealand only have two practicable options for reaching the demanding 95% waste minimisation target set by Central Government:

1. Encourage the uptake of privately provided organics kerbside collection services; or
2. Provide a kerbside service that collects both food scraps and greenwaste.

Both of these options would be advanced by a high waste disposal charge and through prohibiting the disposal of organic waste to landfill. Accordingly, the Christchurch City Council in 2005 performed a kerbside collection trial 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.

3. Methodology

From February to December 2005, the Christchurch City Council collected and composted food and garden waste from 530 households over a 40 week period. Selected households in the suburbs of Spreydon (270 households) and Dallington (260 households) were provided with a 7 litre blue kitchen container and either a 48 litre or an 80 litre wheeliebin for the weekly kerbside collection service (Figure 2).

Prior to notifying the residents about the Council service, the weight of rubbish collected from each area was measured each week, over a 4 week period. An initial survey was performed on the residents to determine their waste habits and to gauge their interest in an organics service. This information was used as a baseline for a further survey that was performed towards the end of the collection trial.

During the first 20 weeks of the trial, residents were asked to wrap food scraps in newspaper prior to placing them into their kerbside wheeliebin. For the last 20 weeks Polargruppen compostable BioFilm bags were provided to each household (3 bags per week), to line the kitchen bins and 100 households received the green Polargruppen “MaxAir” ventilated kitchen bins (Figure 1). An example of the instructions given to residents and the kitchen bin label is provided in Figure 3.

Residents were not given the opportunity to decline the organics collection service. Wheeliebins and kitchen bins were provided to each household in the chosen area and residents were left to respond as they saw fit. Out of 530 residents only one refused to take part in the trial.



Figure 2. Bins provided to households in the trial area.

Free Organics Collection

Over the next ten months you will receive a weekly collection service for your organic waste completely free of charge.

Why recycle organics?

Greenwaste and food scraps make up half the household waste sent to landfill each year. But, if these organics are kept separate from household rubbish, they can be turned into a useful resource – compost.

What to do



Collection day

Your first collection will be

Wednesday 16 February

Your last collection will be

Wednesday 7 December

Please do not put your Wheelie BioBin out after this date it will not be emptied.

Tips

- Do not overfill your Wheelie BioBin, the lid should securely close for collection.
- To be emptied, the lid of the Wheelie BioBin must open towards the road (see label for instructions).
- Regularly wash your BioBins.
- To help keep the Wheelie BioBin clean, put some twigs, leaves or dry greenwaste into the bottom of the bin.
- Store the Wheelie BioBin in a cool shady area out of direct sunlight.

Figure 3. Information provided to the residents at the beginning of the organics collection trial.

Each week the total number of wheeliebins emptied were counted and a random sample of 80 wheeliebins were weighed along with the weight of the corresponding household's rubbish bag [Note: the Council provides 50 litre black rubbish bags for the weekly collection of household waste]. Each of the 80 wheeliebins sampled were also scored for contamination, cleanliness and odour.

The organic material collected was composted in the Council's outdoor windrow compost plant at Metro Place, Bromley. However, if a city-wide service was provided the material collected would require enclosed composting. At the end of the trial two focus groups were conducted with a representative range of the trial participants and in depth interviews were had with a selected sample of the residents.

4. Results

The results of the 40 week household organics kerbside collection trial performed in Christchurch during 2005 were very encouraging. Below is a summary of the key findings.

1. Participation in the service was very high with 94% of households placing wheeliebins out for collection at least once every three weeks. Most households (77%) placed the wheeliebins out for collection each week.
2. 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 litre organics wheeliebin and by 22% for those with the 48 litre organics wheeliebin.
3. Most households (80%) noticed a reduction in household waste sent to landfill.
4. The average weight of an 80 litre wheeliebin placed at the kerbside was 12 kilograms per week and for the 48 litre wheeliebin it was 6 kilograms per week. Approximately 80% by weight was garden waste and 20% was food scraps in each container.
5. Contamination of the wheeliebins throughout the trial remained very low (estimated to be less than 1% by weight) and fewer than 5% of the wheeliebins 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.
6. 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 litre kerbside recycling crate service provided by the Council.
7. 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.
8. 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 wheeliebin, the wheeliebins were too small, the green 48 litre wheeliebin was hard to manoeuvre.
9. 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.
10. 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 emptied, the bin looks better in the kitchen, the bin was easier to use, the kerbside wheeliebin was cleaner.

11. 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.
12. 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.
13. Most residents (76%) said they were willing to pay \$3.50 per week for the kerbside organics collection service. Estimated costs for the city-wide weekly collection of a 140 litre organics wheeliebin is \$2.60 per household per week.
14. Households that had insinkerators in the trial area (12% of the households) were happy to use the organics collection service.
15. 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 prunnings and weeds).

5. Discussion and Conclusions

Central Government, in setting a 95% reduction target for garden waste is effectively challenging all Councils in New Zealand to ban garden waste from the landfill (with an allowable 5% threshold). Evidence would suggest that very few, (if any) Councils in New Zealand will meet this voluntary target by 2010. International experience also shows that when bans are imposed, the kerbside collection of organic waste is the only practicable means of achieving it. And that a quality service must be provided to encourage a high level of ongoing participation, in order to achieve the high degree of waste diversion necessary to comply with the ban.

It would not be reasonable or politically feasible for any Council to prohibit the disposal of garden waste from landfill, without first establishing readily available alternatives for residents. A ban would be extremely costly to enforce if readily available alternatives were not provided. One could argue that the option of home composting is available to all, but this would deny the underlying barriers to home composting in the urban setting (i.e. convenience, limited space and knowledge). The barriers of convenience and space are most convincingly overcome by a kerbside collection service and a ban should only underpin or reinforce the advances made by such services.

It is notable that in New Zealand no national waste reduction target has been set for domestic putrescible waste, which is likely to reflect uncertainty surrounding this problematic waste. However, this uncertainty is diminishing with numerous waste audits throughout the Country revealing that food waste, by weight, makes up a significant proportion of domestic waste (up to 38% in Christchurch, and 43% in North Shore). Given the increased certainty and amount landfilled, it is reasonable to expect that a future review of the New Zealand Waste Strategy would result in a target being set for domestic putrescible waste. In addition, the two material types (food and garden waste) can effectively be utilised together and have synergistic effects if they are dealt with at the same time (e.g. compost made from a combination of food scraps and garden waste is

more nutritive than composed garden waste alone). This, once more, points to an obvious conclusion. That in order for Councils in urban areas to meet the current national target and any future target for domestic food waste, a collection service is necessary. But the related experience in New Zealand is limited to less than a handful of Councils (e.g. Mackenzie, Selwyn, Timaru) and to a handful of organics collection trials (e.g. Timaru, North Shore, Christchurch (MFE 2005)).

Accordingly, the Christchurch City Council in 2005 undertook a trial that aimed to replicate the best practise found in Europe for the collection of household organics. The results from the Christchurch trial are compelling. Residents were very supportive of the service and continued to separate their organic wastes to a high level throughout the year. If the results of this trial were extrapolated to the whole City, 29,000 tonnes would be diverted from landfill, resulting in a saving to the community of \$5.5 million each year in waste disposal costs (assuming the avoidance, on a pro-rata basis, of disposal costs set out in Table 1). When other financial benefits are taken into account, such as: extending the life of the landfill by 5 years; 370,000 fewer kilometres travelled to the landfill; fewer trips to refuse stations; and the productive use of the compost, the overall benefit to the community of collecting organics amounts to \$12.5 million. This saving to the community effectively offsets the cost of the organics collection service (estimated to be \$185 per tonne or \$11 million per year for collection and composting of Christchurch's organic wastes).

Table 1. Community Costs Associated with Domestic Organic Waste Disposal

Collection system (Total Tonnes)	Proportion & amount able to composted		Disposal cost of compostable material	
	%	Tonnes	\$ per Tonne	\$ per Year
Black Bag (33,000 tpa)	49	16,170	206	3,331,020
Wheeliebin (20,000 tpa)	67	13,400	273	3,658,200
Refuse Station (60,000 tpa)	25	15,000	135	2,025,000
Insinkers (12,000 tpa)	100	12,000	80	960,000
TOTAL (125,000 tpa)		56,570		9,974,220

Residents overwhelmingly preferred to use the breathable and compostable BioFilm bags and the ventilated kitchen bins compared to the closed kitchen bin and the wrapping of food scraps in newspaper. Significantly fewer odours were experienced using these bags, and both the kitchen bin and the kerbside wheeliebin were left cleaner when the bags were used. One third of the trial participants considered that the mess and odour associated the closed bin and newspaper system would put them off continuing with the service. If these public perceptions were acted upon, it would mean that 8,700 tonnes of waste would not be diverted from landfill, at a cost to the community of \$1.6 million each year. Consequently, almost all of the cost associated with providing the BioFilm bags (approximately \$0.09 per bag or \$2 million per year) would be paid for each year, simply through avoided waste disposal costs. Add to this the value placed by the residents on convenience, improved hygiene and not having to smell or clean the collection bins, and the payback is obvious.

This paper concludes that in order to meet the Ministry for the Environment's target of 95% greenwaste diversion from landfill, Councils have no alternative but to ban the disposal of greenwaste to landfill. This paper has shown that the only effective way for Councils in urban areas to meet this ban, is to provide or encourage the separate collection of household organics. Experience in Europe has been replicated through the Christchurch trial. Residents strongly preferred to use breathable organics collection systems because of ease of use and improved hygiene. This trial has demonstrated that the benefits of providing a breathable system can outweigh the costs. It has also shown that if the full costs associated with the disposal of organic waste in Christchurch are considered, organics collection is not only good for the environment, it is financially viable as well.

6. References

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Taylor, S. & Todd, P. (1997). *Understanding the determinants of consumer composting behaviour*. Journal of Applied Social Psychology, 27, 7, 602-628.

Equipment Suppliers

1. BioFilm bags and ventilated kitchen bins: www.polargruppen.com
2. 48 litre kerbside wheeliebins: www.norsemanplastics.com
3. 80 litre kerbside wheeliebin and 8 litre closed kitchen bins: www.rotaform.co.nz