OPTIMISING KITCHEN WASTE COLLECTION

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1. Introduction

Kitchen food waste in New Zealand typically makes up around 40% of domestic collected waste (150-170kg per capita) making it one of the largest, if not the largest, single fraction of the domestic waste stream (Waste Not Consulting 2007), and therefore an obvious target for diversion from landfill. Preventing kitchen waste from being sent to landfill can also have significant environmental benefits as it is a contributor to the production of greenhouse gases (particularly methane) and leachate when placed in a landfill environment. Furthermore, food waste is a source of nutrient rich organic material which, if subjected to biological treatment, can make a valuable soil amendment and/or provide a source of energy (through capture of methane from biodigestion).

Most local authorities are no doubt aware of the prevalence of food waste in the domestic waste stream and of the potential benefits of separate collection and treatment. However food waste has tended to be the last major component of the domestic collected waste stream to be targeted for diversion. Given the potential benefits noted above, it is perhaps surprising that so few local authorities have attempted separate collection of food waste before now. There are however a number of countervailing factors that have tended to dissuade authorities from collecting food waste. These include:

- Householders can be resistant to separating out food waste as they may perceive there to be issues of odour, mess and insects and vermin associated with separating food waste;
- It is more problematic and expensive to handle and treat than other forms of organic waste such as garden waste;
- Collection is generally perceived by local authorities to present additional costs, as well as difficulties in collection such as potential health and safety issues and the need for sealed vehicles;
- Markets for treated material, although potentially large, have tended to be uneven and slow to develop and have been driven by supply rather than demand, meaning a lack of financial incentive to initiate collections.

This paper looks briefly at how these types of issues have been addressed in the UK and other parts of Europe, and from this a number of key principles for the successful collection of food waste are put forward.

Separate food waste collection systems have been pioneered in Europe, particularly in Italy, Spain, Norway, and Belgium. Experiences in these countries demonstrate participation and capture rates of up to 80% - 90%. By contrast the UK has been slow to offer services for separate collection of food waste with only approximately 15% of councils offering any kind of service – about two thirds of these co-collect the food with garden waste while a third collect the food separately. The separate food waste collection services tend to exhibit capture rates of typically around 25% - 30%, with current UK best practice around 50%, while systems that co-collect food and garden typically capture 10% to 20% of food waste. This contrast between the performance of UK and the rest of Europe provides a useful comparison between the types of services provided and the level of performance achieved.

2. Containment

Collection containment can have a critical impact on householder participation and material capture rates. The containment is the physical element of the system with which householders directly interact and so it is essential that it is user friendly, robust, and reliable and, particularly in the case of containment that will be used in the kitchen, reasonably attractive and easy to keep clean. There is a range of food waste containment options. Table 1 shows the range of kitchen waste containment systems commonly used.

Table 1. Common containment options

Container	Key types	Illustration
Liners	1. Compostable bio degradable plastic – e.g. Mater Bi cornstarch based polymer. Typically either 22 micron for solid sided caddies or 18 micron for vented caddy systems 2. Paper sacks. Wet strength kraft paper liners	 Vented Caddy plus liners
Kitchen Caddies	1. Solid sided caddies for bench top use. Typically 7-10 litres in volume. Material is commonly transferred to a roadside container for collection. 2. Ventilated caddies. These require liners to function. They dry the food waste, reducing odours and insect problems. Using the vented caddy results in a 10% moisture loss if material is	

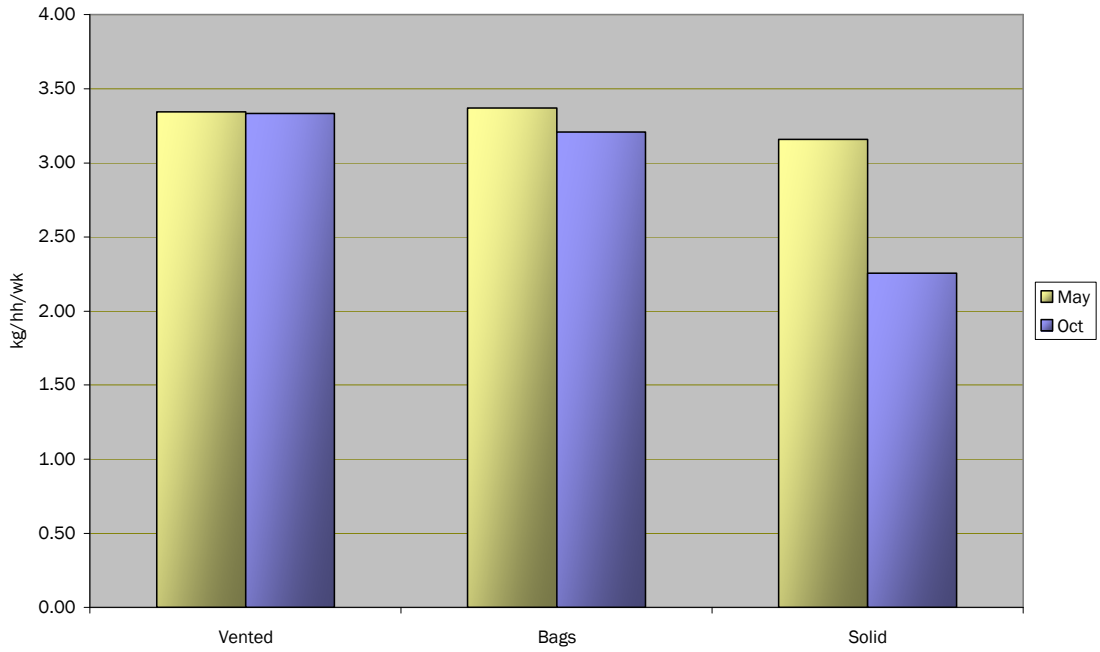
	collected twice a week and a 17% moisture loss if collected weekly. This affects the weight of the material.	Solid sided Caddies with liners
Roadside Containers	1. Lock down lid roadside bins typically 20-45 litres. These require manual emptying and are the most common container option for separate food collection. 2. Wheeled bins (normally 140 L or 240 L) are typically used where food waste is co-collected with garden waste.	 25 Litre Road Side bin with lock down lid

Experience has shown that systems that provide the householder with a clean, easy to use system produce higher rates of participation and capture of food waste. Research in the UK has found that where caddies are supplied, regardless of the type of caddy being supplied, then participation rates are considerably higher (Eunomia 2006).

More mature services in Italy initially supplied residents with solid-sided caddies. The starting perception is that these will store material more securely and will be more acceptable to residents. However, over time, it has become increasingly normal in Italy to supply vented caddies. These allow moisture to evaporate rapidly (moisture loss of approximately 17% for food waste stored for one week has been calculated), thus slowing the rotting process and reducing problems associated with odours, and production of leachate. Currently, UK authorities are tending towards the solid-sided caddies because of the preconception that these are more secure and are more acceptable to residents. Additionally, by supplying a vented caddy, the authority is either compelled to provide a continuous supply of liners or must require that residents supply these themselves.

Unlined caddies, however, require frequent washing and, given the type of material that they are used to store, this is an unpleasant task. The author here speaks from weekly experience! As a consequence such systems are likely to experience a higher drop off rate over time. It appears, then that in the longer term it may be better to supply residents with vented systems and liners and UK research alongside experience from Italy supports this approach. Figure 1 shows the comparative capture rates achieved in the different trial areas in a study conducted in the London Borough of Ealing.

Figure 1. Capture rates delivered by different containment systems in Ealing trial



What is striking from Figure 1 is that capture rates tail off where no liners are supplied. This experience is anecdotally confirmed by reports from In-Vessel Composting facilities receiving food waste from localities where caddies are supplied but liners are not permitted.

Supplying liners clearly adds a cost to the system and it must be calculated whether the additional cost of supplying the liners adds sufficient performance for it to be justified. In the UK it is estimated that to supply liners to households would result in a cost of approximately £68 per tonne (NZ$190) for each additional tonne of material recovered relative to a system where no liners are supplied.

This does not mean that that a local authority must commit to supplying liners in perpetuity. One option is to supply residents with an initial stock of liners to get them started and clear instructions on the type of replacements that can be used and where these can be purchased. In the UK Biodegradable cornstarch liners are now stocked by all the major supermarket chains, while in Italy they can be purchased from shops and even vending machines.

3. Communications

One of the key issues with respect to collecting food waste is the participation of the householder. For householders to be willing to participate in food waste collection systems they must firstly be

motivated to do so. This motivation can arise from either a desire to 'do the right thing' such as 'being good to the environment', from a desire to provide some benefit to the self such as avoiding costs, inconvenience, or prosecution - or from some combination of the above. Messages regarding the need to recycle are generally widely and well understood, and many people see this as one of the primary ways in which they can be kind to the environment. The environmental benefits of separating out kitchen waste however are less well understood (anecdotally many otherwise well informed people consider that because food is 'natural' and will break down in landfill there are no problems associated with depositing it in landfill), and consequently people are less likely to be motivated to separate out this material (Eunomia 2006).

Education on the need to separate out food waste therefore needs to include simple easily understood messages that communicate the importance of separating out food waste. Climate change has recently had a very high profile in the media and there is therefore an opportunity to build on the profile of climate change through communicating the message that not putting food waste in landfill will help avoid production of greenhouse gases from this source.

Other perceptions among householders that can discourage participation in food waste collection are that it will be smelly, messy, and lead to flies and vermin. Communication in respect of these issues is key in two ways: Firstly these concerns need to be addressed directly to overcome initial resistance to using the systems; and secondly the actions necessary to operate the food waste collection system without it becoming odorous, messy or attracting flies and vermin need to be spelled out clearly. It is of crucial importance to keep messages simple, precise and focused, and to not dilute them with an over supply of information, as this can lead to a loss of cognition of key messages. Messages should also be highly visual and use clear graphics for presentation. This helps people to understand what actions are required without having to study the information closely, as well as to aid in communication with members of the community for whom English is not their first language. In addition key messages should be repeated on bins and provided in the form of fridge magnets or calendars so that they are visible in places where householders will receive continual reminders. Messages should also be repeated and reinforced on a regular basis as people move in and out of the area. Figure 2 provides an example of food waste related communications from Lambeth Borough Council in London.

Figure 2. Lambeth Borough Council Organic Waste Collection Communications

Figure 3 below is a extract from a calendar produced for the Reggio Emilia Authorities in the Emilia Romagna Region of Italy. The calendar from which this was taken covers a year and shows through the use of the symbols below what materials are to be collected on what day. Note that it is clear what is being asked even though the information is in, what is for most readers, a foreign language.

Figure 3. Calendar produced for Reggio Emilia Authorities, Emilia Romagna Region, Italy

4. Collection

A key issue in respect of collection is whether food waste should be collected separately or together with other organic waste such as garden waste or cardboard. This is a complex question and the answer is likely to differ depending on the circumstances of the local authority. Experience in the UK and Europe has shown however that there are a number of important advantages to collecting food waste on its own.

When food waste is collected with garden waste no charge is generally applied in order to encourage householders to use the system (In the UK garden waste can be charged for but food waste cannot, meaning if the two are co-mingled no charge can be applied). When garden waste is collected at no charge it has the effect of pulling material into the collection system that was previously managed by the householder (for example by being left in situ, home composted or taken away by a gardening contractor). This means that the costs of collecting and treating this material must be paid by the local authority concerned. In the UK the impact of collecting garden waste for free will typically add an additional 200kg per household per annum to the quantity of waste collected.

Markets for collected material can be critical to the overall viability of an organic waste collection system, and key to being able to secure and sustain markets is the quality of the product. In this respect, the quality of material can be more easily controlled in separate collection systems. Operators can identify contamination, refuse to collect it and post notices on contaminated bins. This is more difficult when it is mixed with garden waste and emptied mechanically.

In terms of collection logistics, if food and garden waste are collected together it is advisable to collect weekly to avoid problems with odours etc. In the winter months particularly this can mean large vehicles configured for handling high volumes of garden waste collecting mostly food waste and operating well below capacity. Logistics can be more finely tuned when food waste is collected separately. For example in Priula, Italy, food waste is collected in small single operative vehicles. Food waste is essentially very dense material and effectively self compacts when collected, meaning no compactor units are required. The vehicle is a tipping chassis with a high sided load area (essentially a mini dump truck) that has flaps for easy access at the side. These are very cheap vehicles (approximately €30,000 /NZ$ 60,000 each), and with a single operative can service approximately 700 households a day, thus keeping operating costs very low. Figure 4 below shows an example of the vehicle used in Priula, Italy.

Figure 4. Single Operative Collection Vehicle, Priula, Italy

Keeping kitchen waste separate also crucially enables treatment options to be maximised. Collecting food and garden waste together means that the material will normally need to be treated using a more expensive In Vessel Composting (IVC) process. If food waste is collected separately then only the food fraction needs to be treated in this way and garden waste collected can potentially be treated using a cheaper windrow process. Furthermore, if food waste is collected separately then it leaves open the option of treating it through an Anaerobic Digestion process which can have environmental advantages such as the recovery of energy using the methane generated by the process.

5. Whole System Considerations

A final key factor in the performance of kitchen waste collection systems is the collection system of which it is a part. In particular the collection system used for residual waste can have a significant impact on how the food waste collection performs. Where collection systems provide large or unrestricted collection of residual waste at no direct cost to the householder there is little incentive for householders to participate in food waste collections. User charges, in particular weight based user charges are particularly effective in encouraging householders to participate. In Italy user charges are a key component is driving participation and capture rates of up to 90%. In the UK however direct charging for collection of household waste is specifically prohibited through primary legislation (Section 45 [3] of the Environmental Protection Act 1990). This means that councils have looked to other mechanisms to restrict residual household waste. Of increasing popularity among councils is the collection of refuse fortnightly (also referred to as

Alternate Weekly Collection [AWC]). Approximately one third of UK councils provide AWC schemes for refuse. This has cost advantages as well as restricting capacity, and savings can be used to help provide additional recycling services – such as food waste collection. Evidence is clear that AWC systems result in higher participation and capture rates with captures and participation roughly double that where weekly collection systems are provided (Eunomia 2007).

Recent preliminary evidence from a series of trials being run by the Waste Resources Action Programme (WRAP), however indicates that some of the best performing food waste systems are where refuse is collected in sacks. This provides a hint that the type of residual containment could be an important factor as sacks are perceived as less secure from dogs and vermin than solid containers.

Kitchen waste collection tends to be viewed as an additional cost over and above the cost of providing other 'core' services. When assessing the viability of kitchen waste collection systems however, it needs to be looked at in the context of overall system cost and itself viewed as one of the core parts of the system. If kitchen waste is collected separately then it can result in a reduction in the quantity of residual waste that must be collected and treated (and attendant reductions in landfill costs and possible collection efficiencies). Furthermore if food waste is effectively removed from the residual waste then it makes the collection of the residual at reduced frequencies more feasible. Removing food from residual waste reduces problems with odours, flies and vermin that may be associated with material that is not collected for two weeks.

6. Summary & Conclusions

Food waste collection systems tend to be hard to get right, and there are probably more examples of poorly performing systems than high performing systems. However it is by no means impossible to develop and deliver a top performing system. Neither is it necessarily more difficult or expensive to do so. Key principles to achieving a high performing system are to focus on the needs of the householder and making sure that systems provided are easy, clean and convenient to use, and that there is no room for doubt in householders minds as to how or why to use the system. It is then important to consider how the material is to be used and to collect it in a way that will optimise its value, while ensuring efficiency and flexibility of collection. Finally, calculation of the costs and benefits of kitchen waste collections need to be considered in terms of whole systems costs, accounting for potential savings from reduced tonnages (and potentially, reduction in collection frequency) of residual waste.

7. References

Eunomia Research & Consulting (2006) Kitchen Waste Collections: Optimising Container Selection.

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