

The Value of Organic Waste to Households: A Case Study from Cape Town

N. Johannessen. Solid Waste Management Department, City of Cape Town, South Africa.

Noel.Johannessen@capetown.gov.za

A.J. Davison. Solid Waste Management Department, City of Cape Town, South Africa.

Alison.Davison@capetown.gov.za

ABSTRACT

People may consider organic waste a liability: it's smelly, soggy, attracts flies, and potentially generates methane gas in landfills. A feasibility study carried out by the City of Cape Town during 2013 asks whether households can successfully divert kitchen and soft garden organic waste through home composting. Previous studies in 2008/2009 in the CoCT found that green (garden) waste still landfilled comprised approximately 6%, and kitchen waste approximately 5%. This study provided home composting containers to approximately 700 households and gathered data for 9 months. Participants were from four areas within Cape Town, selected to be representative of low and middle income sampled households. This paper details the sample selection criteria, methodology and results; it highlights some recommendations and the real possibility of residents benefiting from this valuable resource.

Key Words: kitchen organics, garden organics, composting, value of organic waste, awareness, behaviour change, waste minimization, segregation at source.

1. INTRODUCTION

1.1 Background

While Cape Town's recycling and waste minimisation has increased significantly in recent years, with between 12-14% of waste entering the municipal waste stream being diverted by City programmes in the 2012/13 financial year, landfills are still the City of Cape Town's (CoCT's) primary method of waste management (CoCT, 2013). The CoCT's Integrated Waste Management Policy (2006) and Integrated Waste Management Bylaw (2009) set out the strategic intent and legal framework to address this, which the City is in the process of doing.

To this end, in 2010/11, the City of Cape Town (CoCT), in terms of its integrated approach to waste management, commissioned a Municipal Systems Act, S78.3 study (reviewing the City's waste management system) which found that the organic waste generated within the City had great potential for further diversion and therefore needed greater attention (CoCT, 2011). This Municipal Systems Act, S78.3 study (2011) found that 1.6 million tons of waste was landfilled in the 2008/2009 year, which is similar to the annual tonnage landfilled in the 2013 financial year. Further, the study found that 6% of this consisted of household garden greens and 5% consisted of household food waste (as illustrated in Figure 1). This equates to an average total of 21kg/household/month (approximately 11kg garden waste per household per month plus 10kg kitchen organic waste per household per month) (CoCT, 2011).

As such, one of the recommendations of the MSA S78.3 study was that the potential for reducing tonnages of household organic waste landfilled (household kitchen organic waste and soft garden waste) be investigated through the promotion of home composting. Assuming an average of 4.33 weeks per month, the Municipal Systems Act, S78.3 study indicated that an average of 4.9kg/household/week of household organic garden and kitchen waste could potentially be diverted from landfill (CoCT 2011).

Subsequently the City of Cape Town carried out a home composting pre-feasibility study among 25 participants in Cape Town, known as the Home Composting Research Project: Phase 1 (CoCT, 2012). Participants were issued the relevant organic waste information, plus a compost container. Data was collected over a 10 month period during 2012, with comprehensive, useable data being received from 44% of the participants.

The study found that an average of 19.5kg/household/month household organic (garden and kitchen mixed) waste per participating household was diverted from landfill through home composting, equating to an average of 4.5kg/household/week (CoCT, 2012). As not all types of organic waste can be diverted using this

type of container, this figure was expected to be slightly lower than the figure of 4.9kg/household/week above, but was still encouragingly high.

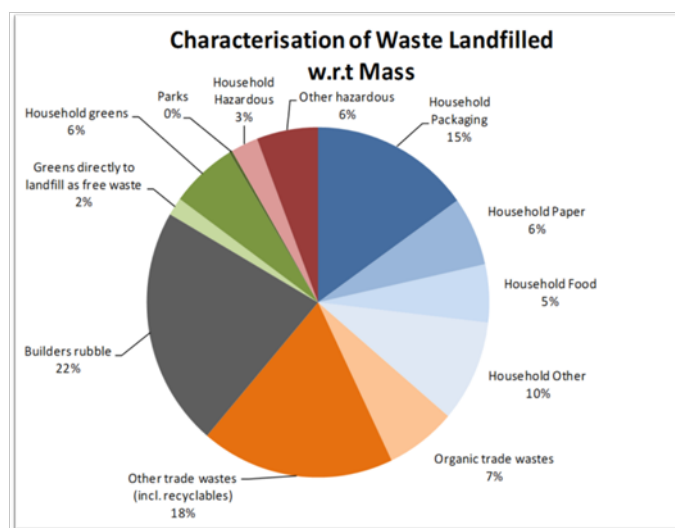


Figure 1. Characterisation of waste landfilled in Cape Town in 2008/2009 in terms of mass in tons (from CoCT, 2011)

International research from Montreal, which focused on developing compost recipes for urban centres such as downtown Montreal, found that households generated approximately 3.9kg/household/week of organic kitchen waste alone (Adhikari, 2005). The Montreal study as well as other international cases recognises the value in organic waste and the need to divert it from landfill; it supports the argument that household kitchen organics are a potential waste resource for landfill diversion.

1.2 Overview of Cape Town's Home Composting Research Project: Phase 2 – Feasibility Study

The encouraging results of the Home Composting Research Project: Phase 1 motivated the CoCT to conduct a larger scale feasibility study during 2013 and 2014, known as the Home Composting Research Project: Phase 2 – Feasibility Study (hereafter referred to as the Home Composting Study).

The Home Composting Study set out to test Phase 1's provisional results on a significantly larger scale, focussing on a sample of formal (brick built) Cape Town households as representative of the CoCT's population.

1.3 Aim

The Home Composting Study's primary aims can be summarised as follows:

Aim 1: To test the following two statements (hypotheses) and compare the potential impact on organic waste tonnages diverted from landfill:

Statement 1 (reflected in this study as **Part 1**): If the CoCT provides convenient home composting tools supported by information and motivation to formal households in Cape Town, this will result in a significant additional quantity of organic waste (garden and food waste) being sustainably diverted from landfill per participating household.

Statement 2 (reflected in this study as **Part 2**): If the CoCT assists in establishing community based or centrally located organic waste (garden and food waste) drop off sites, supported by information to participating centres, this will result in a significant additional quantity of organic waste (food waste) being sustainably diverted from landfill per compost container.

Aim 2: To investigate the sustainability of such an organics diversion project by observing public comment about their new waste management behaviour (this aspect of the study formed a section of Part 1, but the results are recorded separately as **qualitative data**).

1.4 Scope

The scope of Part 1 of the Home Composting Study was defined as follows:

- Formal households within the City's geographic boundaries, with small ($\pm 25\text{m}^2$) to medium size (up to approximately 300m^2) gardens were included;
- Study was limited to a maximum of 700 participants;
- Study was limited to two middle income suburbs and two low income suburbs, selected to be as representative of the entire City as possible (described later), using 2011 census household income and ethnic demographics figures, as well as geographic distribution of the four selected areas, to guide the team;
- Study was spread over 9 months to include the wet and dry seasons;
- Interactions with participants included face-to-face recruitment, provision of verbal and written guidance on composting and data gathering, telephonic and email follow-up on a regular basis, follow-up visits and completion of questionnaires; and
- Participants were expected to utilise the composting containers as per the instructions, record composting data and submit this monthly, interact with the project team on occasion and respond to short questionnaires.

The scope of Part 2 was defined as follows:

- Only already-established organised community centres (two schools and a non-government organisation) were included;
- The centres needed to allow for organics from the public to be dropped off,
- Centres which exhibited interest and willingness to participate and had existing human resources to implement data gathering were chosen;
- Study was spread over 9 months to include the wet and dry seasons;
- Interactions with community centres included face-to-face recruitment, provision of verbal and written guidance on composting and data gathering, telephonic and email follow-up on a regular basis, including follow-up visits; and
- Participating community centres were expected to utilise the composting containers as per the instructions, record composting data, submit this regularly and interact with the project team on occasion.

1.4.1 Why composting containers?

Three composting methods were considered when conceptualising the Home Composting Study, namely home compost heaps, worm composting and home composting containers.

Out of these three composting methods, the provision of a home composting container per household was chosen as the preferred implementation method, for the following reasons:

- It caters for reasonable volumes of garden waste, as well as most kitchen organic wastes;
- The unit is enclosed, therefore no fly risk and reduced risk of other pests;
- Requires reasonably small amount of garden space; and
- Requires minimal attention, increasing the likelihood of acceptance by a broader range of residents (only occasional aeration and minimal degree of temperature and moisture regulation are required).

It is understood that the home composting container would not be a one-size fits all solution for home composting in Cape Town, but gives the opportunity to confirm whether the majority of residents in Cape Town would consider this composting method as a feasible option for landfill diversion of household organics.

2. PART 1 – INDIVIDUAL HOME COMPOSTING RESEARCH

2.1 Methodology

A project team from the City’s Waste Minimisation Unit, led by project manager Noel Johannessen, began planning for the City’s Home Composting Research Project - Phase 2 in September 2012. It was noted at this time that there was a general scarcity of information on methodologies used or previous home composting projects done internationally. There were certainly no examples of home composting projects of this magnitude anywhere in South Africa, hence the team used general social research methodology knowledge and experience to finalise the site selection and implementation methodology to be used.

2.1.1 Selection of participating areas

Information retrieved from the recently published SA Census 2011 results (STATSSA, 2011) indicated that the City’s population has grown to 3.7 million, with an expected growth of 1.7% per annum. Detailed perusal of this census data, combined with site visits and observations at various suburbs were carried out to inform the suburb selection for this study. It was therefore decided for the purposes of this study to focus on suburbs within the four household income bands between R3 201/month and R51 200/month, as illustrated in Table 1, these account for 48% of households in Cape Town. No Income or 0-R3201/month income bands were assumed to be predominantly living in informal dwellings having temporary jobs or highly dependent on government for financial support, these communities generally have no green/garden waste which is a necessary ingredient for a good composting mixture. The selected areas they could therefore be considered to be representative of the City’s population.

Table 1. Census 2011 Cape Town household income statistics, showing ethnic breakdown (from STATSSA, 2011)

Cape Town Monthly Household Income 2011	Black African		Coloured		Asian		White		Other		Total	
	Num	%	Num	%	Num	%	Num	%	Num	%	Num	%
No income	85 427	19.2%	37 399	10.4%	1 542	10.8%	19 522	8.4%	2 627	14.5%	146 517	13.7%
R 1 - R 1 800	120 800	27.2%	53 104	14.8%	985	6.8%	7 445	3.2%	2 754	15.2%	185 068	17.3%
R 1 801 - R 3 200	102 325	23.0%	55 849	15.6%	986	6.8%	8 633	3.7%	3 051	16.9%	170 824	16.0%
R 3 201 - R 6 400	84 708	14.5%	66 488	18.5%	1 459	10.2%	18 853	8.1%	2 919	16.2%	154 427	14.5%
R 6 401 - R 12 800	35 420	8.0%	62 286	17.4%	2 149	15.1%	37 117	15.9%	2 376	13.1%	139 348	13.0%
R 12 801 - R 25 600	20 520	4.6%	47 952	13.4%	2 852	20.0%	53 255	22.9%	2 046	11.3%	126 625	11.8%
R 25 601 - R 51 200	10 835	2.4%	26 390	7.4%	2 564	18.0%	51 619	22.2%	1 452	8.0%	92 860	8.7%
R 51 201 - R 102 400	3 122	0.7%	6 889	1.9%	1 240	8.7%	26 190	11.2%	577	3.2%	38 018	3.6%
R 102 401 or more	1 615	0.4%	2 257	0.6%	523	3.7%	10 151	4.4%	268	1.5%	14 814	1.4%
Unspecified	9	0.0%	15	0.0%	6	0.0%	41	0.0%	2	0.0%	73	0.0%
Total	444 781	100.0%	358 629	100.0%	14 266	100.0%	232 826	100.0%	18 072	100.0%	1 068 574	100.0%

Ethnic breakdown within the various suburbs, as well as geographic location within the City and suitability for the Study as assessed by site visits was also taken into consideration, resulting in the selection of the four suburbs for participation in the Study. In order for the research to be more manageable the study areas were restricted to one or two waste collection beats within these specific suburbs (a beat refers to the scheduled work programme for one refuse compacting bin lifting truck and crew for one day).

Table 2. Home composting study areas

Low Income Areas		Middle Income Areas	
Suburb	Beat number	Suburb	Beat number
Scottsville	3.1.62	Edgemead	2.1.113
Bongweni/Kwezi (Khayelitsha)	3.3.438 and 3.3.437	Heathfield/Elfindale	4.3.226b and 4.2.210

2.1.2 Materials and equipment

The project team wanted to ensure that participating households experienced hassle-free and easy participation. To ensure this, the team developed helpful educational materials, provided useful equipment and as much support as possible, while making sure that reporting demands were not too taxing.

The basic equipment for the Home Composting Study was a Green Genie compost container per household, which had been supplied with an English or Afrikaans instruction brochure. The City supplemented this with an easy-to-understand one page letter and brief instruction leaflet per household, translated into one of Cape Town's three official languages (English, Afrikaans or isiXhosa), this explained exactly what the Study was about, how the participant would benefit, and what was required of them. The team also developed a fridge-magnet that would be a quick guide/ reminder of acceptable and unacceptable organics for composting, as illustrated in Figure 2. Each participant was also provided with an A6 size data collection notebook and pen, as well as a data collection template sheet.

2.1.3 Participant recruitment and delivery of materials

During January 2013, when implementation of the Study was initiated, a service provider recruited participants in the four selected study areas, by means of door-to-door visits to potential participants. They were equipped with all the relevant information and tools to inform the participants adequately about the project and its expectations. Before inclusion into the project, potential participants had to complete a one page questionnaire and only if they agreed to the project conditions for the project period, would the team record their personal details for inclusion.

The project team worked together with the City's Solid Waste bin logistics team for delivery of the compost containers and equipment during February 2013. Each compost container plus accompanying information and tools were prepared for delivery to the participating areas during February 2013. Recruitment of <700 participants were completed by a team of six within a three week period.

Unfortunately, due to logistical problems the Scottsville and Bongweni participants only received all the intended information 1.5 months after the project start, i.e. incorrect information packs were delivered to these areas. As a corrective measure, the project manager personally delivered correct packs to both areas, which resulted in project delays. This resulted in a slow response during the initial parts of this Study in the low income areas, as can be seen in the low reporting levels during these initial months.



Figure 2: Fridge magnet accompanying a participant's composting materials

2.1.4 Participant training

During the selection of the areas the project team made the assumption that most participants in the middle income areas would not require additional training or information other than what was delivered with the compost container. Within the low incomes areas, Scottsville had already received environmentally conscious information and were therefore also considered to be adequately informed.

The team therefore planned to provide additional training workshops to participants from the Bongweni/iKwezi Park community only. The rationale behind this was based on the assumption that these participants would be home during the day due to the area's high unemployment rate. However, the three workshops scheduled either needed to be cancelled or were poorly attended, due to perceived community communication protocol issues, or clashes with other community events. The project team and recruitment service provider then adapted their strategy to provide participants with additional door-to-door composting guidance; this was well received.

2.1.5 Engagement and communication with participants

Communication with participants was initiated by the recruitment service provider with the face-to-face recruitment interviews, using a one-page questionnaire. The City's project team followed this up with a telephonically introduction, followed by email and sms communication to participants midway through the first month of the project, to welcome and remind them to keep record of the organic waste composted at their homes. The City's project team repeated this email and sms communication every month end when data requests were sent out. This was supplemented by ad-hoc visits to or telephonic engagements with participants by the City team.

It is when the project team deployed teams into the area to gather data that a spike in the recovery of data was noted. Email and sms communication is not always available to everyone (i.e. there is a perceived inaccessibility associated with computers and cell phone as a result of costs), resulting in the need for physical visits to best recover data.

2.1.6 Quantitative data collection and analysis

Participants were required to record the volume of kitchen and garden organic waste diverted into their compost container. For uniformity they provided this data in litres as the unit of measurement, and the project team recommended temporarily storing the organic waste in a 2L or 5L ice-cream container, to be used as a measuring tool, before transferring the waste to the compost container. At the end of each month, participants were then requested to send the required data via email, sms/ fax or report it telephonically (email was preferred); this data collection phase took place from March to November 2013. The data was captured into an excel spreadsheet for analysis.

To facilitate accurate conversion of this volume (L) into mass (kg) of organic waste diverted through composting, a sample of four participants were issued with hanging scales and requested to record their data for a full month both in volume (L) and mass (kg). This data was used as the benchmark for converting all project data from volume to mass (kg). The following average conversion ratios (translated into densities) for kitchen and garden organics were established for the project:

- Kitchen organic waste – 1L equates to 0.37kg
- Garden organic waste – 1L equates to 0.25kg

Comparative research was carried out on existing studies, and the findings above were found to be consistent with a Department of Environmental Affairs and Development Planning project carried out in 2009 (DEADP, 2009). This project, which investigated a business plan for composting restaurant food waste in the Cape Town city centre, researched many international food waste/composting case studies and reported a density of 0.35kg/litre for food waste collected from restaurants (DEADP, 2009).

2.1.7 Aim 2: Qualitative data collection

In order to address Aim 2, three questionnaires were developed and used during the Study:

Questionnaire 1 was used in January 2013 to gather information about how households had been managing their kitchen and garden organic waste before the project; this was conducted during the face-to-face recruitment phase. (Only key questions are reported on in this section).

Questionnaire 2 was introduced in month nine (end of data collection phase) to check if households were still using their compost container and whether they would recommend further roll-out. This questionnaire was circulated via email, supplemented with face-to-face interviews.

Questionnaire 3 was introduced in April 2014 (13 months after project inception). Households were asked if they were still diverting similar amounts monthly and whether they were diverting any additional waste types; i.e. recyclables and bulky garden waste.

2.2 Results

2.2.1 Quantitative results

2.2.1.1 Participation rates

A total of 677 participating households were originally recruited in January 2013. Of these, 616 participants provided data to the project team at some point during the course of the project, so were considered to be participants in the Study. Of the remaining 61 households, 38 returned the containers due to lack of interest while 23 others reported their compost containers stolen.

Of the 616 participants, the project team consistently received data from an average of 41% (252 participants) per month across all study areas. Please note that the information was not from the same participants, but this would not compromise the quantitative data provided, as none of the data provided was cumulative, but specifically referred to the month in question and could thus be analysed in isolation.

For quantitative reporting purposes, the percentage participants reporting data on any specific month in a particular area was considered to be the active participation rate for that area, but it can be confirmed from field officer visits that all 616 participants were actively utilising their compost containers, but were not necessarily reporting the data each month. Hence the active participation rates are a highly conservative calculation of participation in the practical composting aspect of the Study. However, for accuracy of data, the active participation rate (i.e. participation in data reporting) is reported on.

Between March and September 2013 data was received from an average of 209 participants per month (34% participation), while between October and November 2013, this increased to an average of 401 participants per month (55%). This was mainly due to field officers collecting data door-to-door during these two months. Table 4 illustrates the number of active participants (providing data) on a monthly basis for the complete study area.

Table 4. Monthly number of active participants reporting data during 2013 (n = 616)

March	April	May	June	July	August	September	October	November
200	216	201	195	234	209	210	444	358

Average data provision = 252 active participants per month (= 41%)

Comparing the four study areas, the average active participation rate throughout the study period for Bongweni (Khayelitsha) was 41%, Scottsville was 26%, Elfindale/Heathfield was 39% and Edgemoor was 58%, as illustrated in Table 5.

Table 5. Average participation rates for the four study areas (n = 616)

Name of Study Area	Bongweni/ iKwezi Park	Scottsville	Heathfield/ Elfindale	Edgemoor
Number of total recruited participants	137	162	158	159
Average participation rate	41%	26%	39%	58%

2.2.1.2 Mass of organic waste diverted from landfill through composting

As described above, densities of 0.37kg/L for kitchen organics and 0.25kg/L for garden organics were used to calculate the mass of organic waste diverted from landfill. The kitchen and garden organics were

combined for reporting purposes, to obtain combined figures of total tons diverted for the various months and areas.

The active participants (who were reporting data) diverted a total of over **38 Tons** of combined kitchen and garden organics from landfill over the nine month period from March to November 2013. This equates to an average of **16.92kg/household/month** for the duration of the Study, or **3.98kg/household/week**. A detailed breakdown of the mass of combined kitchen and garden organics diverted from the study areas during the Study is illustrated in Table 6 below.

Table 6. Mass of organic waste diverted in each study Area

	Bongweni (Khayelitsha)	Scottsville	Total Low Income Areas	Elfindale/ Heathfield	Edgemoed	Total Medium Income Areas	TOTAL
Total kg (Mar-May)	376.01	1579.21	1955	2952.39	6431.09	9383.48	11338.69
Total kg (Jun-Aug)	1953.51	1013.02	2966	2563.19	4467.91	7031.10	9996.63
Total kg (Sep-Nov)	3699.95	4358.72	8059	4159.78	4795.00	8954.79	17013.45
TOTAL (tons)	6.03 T	6.96 T	12.98 T	9.68 T	15.69 T	25.37 T	38.35 T
Average monthly participants	50	38	88	62	92	154	252
Avg kg/participant (entire period)	120	182	147	156	171	164.86	152
Monthly average kg/participant	13.37	20.27	16.35	17.31	19	18.32	16.92
Weekly average kg/participant	3.09	4.68	3.78	4	4.39	4.23	3.98

The similarities between the kg/participant/week (equivalent to kg/household/week, as discussed in section 1.1. above) must be highlighted between the different areas, as well as the comparative research done elsewhere. With the low income areas diverting an average of **3.78kg/household/week** and the medium income areas, **4.23kg/household/week**, there was only a 0.45kg difference observed between the average diversion rates from the different areas. These figures also compare closely with **3.86kg/household/week** reported for the Montreal study, an estimate of **4.94kg/household/week** reported by the MSA S78.3 Study, and **4.5kg/household/week** reported in the City's Home Composting Project – Phase 1 (Adhikari, 2005; CoCT, 2011; CoCT, 2012). This similarity suggests a consistency in results, indicating scope to successfully introduce a similar organic waste composting programme in middle, as well as low income areas in Cape Town.

2.2.2 Aim 2. Qualitative research

Questionnaire 1 (January 2013) tested the organic waste management behaviours before the Study began. Questionnaire 2 (November 2013) tested the utilisation of the composting container, and recommendations for further rollout. Questionnaire 3 (April 2014) tested continued utilisation of the composting container, and any additional recycling behaviour. Tables 7 to 9 illustrate the key results of these questionnaires.

Table 7. Summary of key Questionnaire 1 results.

Questionnaire 1 (Jan 2013; n=616)	Qu 1: How are you currently disposing of your kitchen organics?	Qu 2: How are you disposing of your garden organics?
	Wheelie bin	Wheelie bin
Scottsville	99%	95%
Khayelitsha	94%	85%
Edgemoed	77%	61%
Heathfield	91%	84%
Average	90%	81%

Table 8. Summary of key Questionnaire 2 results.

Questionnaire 2 (Oct-Nov 2013 n= 331)	Qu 1: Did you utilize the container as prescribed?	Qu 2: Will you continue diverting organics?	Qu 3: Should the CoCT do mass roll out or give option to public?
	Yes	Yes	Option
Scottsville	78%	90%	93%
Khayelitsha	79%	77%	42%
Edgemoor	92%	91%	95%
Heathfield	87%	90%	81%
Average	84%	87%	78%

Table 9. Summary of key Questionnaire 3 results.

Questionnaire 3 (April 2014 n= 239)	Are you still diverting organic waste to your compost container?	If yes, are the amounts the same, less or more?	Do you separate any other <u>Recyclable</u> waste material
	Yes	The same	Yes
Scottsville	85%	72%	91%
Khayelitsha	85%	73%	43%
Edgemoor	85%	77%	69%
Heathfield	56%	45%	50%
Average	78%	67%	64%

These results suggest 90% of the enlisted participants (616) used to throw their organics into the wheelie bin while one year later the majority (78%) of the sample who responded to the questionnaires (239 participants) are still diverting their organic waste away from landfill and into their compost containers. This bodes well for the introduction of such a diversion program within the City of Cape Town. In addition, numerous individual positive comments were received from participants, indicating a general acceptance and excitement about the opportunity to use a home composting container.

3. PART 2 – CENTRALISED COMMUNITY COMPOSTING RESEARCH

3.1 Methodology

3.1.1 Recruitment of participating organisations

As interest and willingness to participate were key considerations, the project team considered already-established organised community centres (2 schools and a non-government community organisation), with which the CoCT already had existing relationships. Further to this, the considerations outlined in the project scope, as well as geographic distribution of the centres across the City of Cape Town was considered, and the following organisations were recruited to participate:

- Protea Park (A primary school in Atlantis area)
- Kenmere (A primary school in Kensington area)
- Abalimi Bezekhaya (A food garden community organization operating in Philippi and Khayelitsha areas).

3.1.2 Materials, equipment and participant engagement

Each centre received approximately 20 compost containers to be placed onsite, with accompanying note books and information packs, identical to those used in Part 1 of the Study. In addition, each centre was provided one hanging scale for weighing the waste, as well as 20 x 20L sealed buckets, which were used for storage purposes as well as a measuring tool for the organic waste.

Project champions in the two schools were engaged with and given the same level of support and guidance as the participants of Part 1 (the project team did not wish to skew the results by favouring the centres). In the case of Abalimi Bezekhaya, individuals in the community group received similar training about home composting from an independent service provider. Further detail of data gathering and provision was left to

the discretion of the participating centre, with minimum requirements instituted for accurate monthly data provision. The centres provided data over a six month period.

3.2 Results

Table 10 illustrates the individual and average results from the communal composting institutions, indicating a slightly lower average per composting container of 13.1kg/container/month, compared to 16.92kg/container/month for the individual households. Individual composting may thus be more effective, but schools and community organisations should not be ruled out as an option for the rollout of communal composting in the City of Cape Town.

Table 10. Summary of results of centralised communal composting

No	Group	Area	Total containers	Total kg	Comment
1	Kenmere Primary	Kensington	17	1918	Only 12 containers were used during the project period.
2	Protea Park Primary	Atlantis	16	669	Only 12 were used.
3	Abalimi Bezekhaya	Khayelitsha	20		Containers were issued to individual homes. We did not receive any data from Abalimi.
			Total	2587 kg	

Communal Composting average per container (excl. Abalimi) = 13.1kg per month or 3.03kg per week.

4. CARBON FOOTPRINT IMPACT

Landfill gas production results from chemical reactions and microbes acting upon the waste as the waste materials begins to break down, approximately forty to sixty percent is methane, with the remainder being mostly carbon dioxide. By diverting the household organic waste from landfill and by applying the IPCC Guidelines for National greenhouse gas inventories (2006) to phase 2 data of just over 38ton of organic waste, split as follows (Kitchen/food- 16,4ton and Garden- 22ton), we calculate that the long term gas emissions would be equivalent to 48tCO₂e (The calculation was done by Melusile Ndlovu from Sustainable Energy Africa).

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Assuming an average of 19.5kg of general waste generation weekly (COCT, 2012), it can be deduced from the data received in the Home Composting Study that at least 20% of this (3.9kg/household/week) is compostable organic waste. Compostable waste, if diverted, is a resource that can enhance the soil quality in residents' gardens, improve its moisture retention and sink carbon back into the soil (Armien, 2014). This can clearly be seen in the photographic evidence and comments provided by participants, which supports the quantitative and qualitative data presented in this paper.

The weekly organic waste diversion for households (3.98kg) found in Part 1 of this Study exceeds that of the centralised drop off (3.03kg) model (Part 2), but development of such centres should still be encouraged as there are many organizations that could benefit from their development, for example community food gardens, schools, NGO's/ CBO's, etc., specifically related to the benefits described above, which link to food security.

The evidence reflects that there is a high level of interest for this type of diversion project/program as evidenced by the 41% active participation rate which was a very conservative measure as discussed under the results section above.

We can expect a projected household organic waste diversion of approximately 143ton per month (1,721 ton per annum) if all formal dwellings in the participating areas (Edgemoor, Scottsville, etc.) divert the average kilograms for those areas. This projected figure excludes bulky greens and cooked food waste.

Regarding the impact on the carbon footprint which composting the organic waste has, compared to landfilling, the project teams' initial calculations indicated that significant carbon savings could be realised if home composting was implemented at a large scale. The fact that the current global environment makes many decisions based on the carbon footprint of activities means that this aspect of home composting's value cannot be ignored. .

5.2 Recommendations

The Home Composting Study creates an evidence-based, compelling argument, both in terms of positive behavioural change, and significant tonnages of waste diverted from landfill, supporting the initiation of a home composting program rollout in municipalities such as Cape Town within the next two financial years (2014-16). However, careful consideration should be given to the scale and geographic areas of inclusion.

It is important to note that a carefully designed public awareness and education program should be linked with the introduction of a home composting program as evidenced in increased participation after the City's team adapted the communication strategy.

Due to the limitations of the specific compost container used in this Study (exclusion of cooked foods, oils, etc.), there is a need for further investigation of additional home composting technologies which could facilitate the composting of additional fractions of household organic waste.

ACKNOWLEDGEMENTS

The City of Cape Town hereby wishes to acknowledge the participants of this project from all of the areas involved, without your willingness to participate, the City would not have learnt all that it has about the organic waste fraction within the current domestic waste stream and its benefits to the household and the City as a whole, or been able to demonstrate the potential effectiveness of home composting in Cape Town. Furthermore, the City of Cape Town wishes to acknowledge the support and assistance received from the different Solid Waste Management branches within the City.

REFERENCES

- Adhikari, B.K. (2005), Urban Food Waste Composting, Master of Science Thesis submitted to Department of Bioresource Engineering, McGill University, Montreal.
- Change, I. P. O. C. (2006). 2006 IPCC Guidelines for National Greenhouse Gas Inventories. *Institute for Global Environmental Strategies, Hayama, Kanagawa, Japan.*
- City of Cape Town (2011). MSA Section 18(3) to Assess Alternative Service Delivery Options, RFP: 554C/2008/9. Report compiled for City of Cape Town Solid Waste Department by Akhile Consortium in terms of RFP 554C/2008/9.
- City of Cape Town. (2012). Report on the City of Cape Town Solid Waste Management Home composting research project: Phase 1 – Pre-feasibility study. Internal Project Report, Authors: Davison, A.J, Poswa, K.K.
- City of Cape Town (2013). 2012/13 Fourth Quarter's Progress Report on the Directorate and Department's Performance. Item UTS 15/09/13, Minutes of the Utility Services Portfolio Committee Meeting, 02 September 2013. pp. 33-50.
- Department of Environmental Affairs and Development Planning. (2009). Project report and business plan for a composting facility to recycle restaurant food waste in the Central City Area of Cape Town and Epping. Report compiled for the Department of Environmental Affairs and Development Planning by Kitchen Compost cc. in terms of tender EADP14/2008.
- STATSSA (2011). 2011 South African National Census – Cape Town, Edgemoed, Heathfield, Khayelitsha and Kraaifontein Profiles (December 2012). Compiled by Strategic Development Information and GIS Department, City of Cape Town, using 2011 Census data supplied by Statistics South Africa.