foodpath

Report on Food Waste Prevention Intervention Trials in Ireland

TASK WP4

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FoodPath aims to identify existing best practice in consumer behaviour change and food waste prevention, and to apply this through intervention trials in Irish communities. This work will inform Ireland's response to food waste prevention and the achievement of UN Sustainable Development Goal: Target 12.3 'By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses'.

CONTENTS

1 Introduction

1.1 Background

Ireland is one of the countries committed to the achievement of the United Nations Sustainable Development Goals. Goal 12.3 pledges to:

"By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains".

Ireland has been taking steps to reach this goal through the Governmental Climate Action Plan, the Waste Action Plan for a Circular Economy and, more recently, the establishment of the National Food Waste Prevention Roadmap. However, Ireland still generates a significantly high level of food waste. Recent EPA estimates state that Ireland generated approximately 770,316 tonnes of food waste in 2019 with 31.6% of this total originating from households[1]. Despite the implementation of government policies, Ireland is not on track to reach its SDG goal of a 50% reduction of food waste at a household level.

The European Commission recognises that behaviour change interventions can be used to reduce consumer food waste on a household level. The recently established European Food Waste Forum, involves multidisciplinary researchers and practitioners working together to find solutions and develop tools to help reduce consumer food waste. A key initial focus has been exploring drivers for behaviour change. These drivers refer to different behaviours that are influenced by socio-cultural, economic and psychological factors[2]. The project team, represented by CTC, is a member of this Forum and the proposed interventions as part of FoodPath align with the work being explored by others. FoodPath aims to identify and test existing best practices in consumer behaviour change as currently there is limited research and experience in applying this type of intervention to food waste prevention on a national level.

Therefore, this research was carried out to:

- Trial behaviour change interventions to prevent and reduce food waste in Ireland.
- Compare interventions that target food waste habits at a household level and food waste habits at a community level.

This report describes the work carried out investigating the effectiveness of the two interventions developed and detailed in the Work Package 3 report and discusses the quantitative results and qualitative findings from these intervention trials.

1.2 Objectives

The objectives of this report are to document the implementation of the consumer-focused food waste prevention interventions designed and outlined in the WP3 report, conduct statistical analysis of the data collected and provide recommendations on behaviour change interventions to reduce household food waste in Ireland.

The primary outcome of the trials was to assess the amount of food waste generated over the intervention implementation period and study how it varies, over time and across study areas. The hypothesis was that there would be a relative decrease in the amount of food waste generated in the study areas during and after the interventions compared to the control areas.

[1] "National Waste Statistics Summary Report for 2019." https://www.epa.ie/publications/monitoring--assessment/waste/national-waste-statistics/national-waste-statistics-summary-report-for-2019.php. Accessed 10 May, 2023.

[2] "How to reduce consumer food waste at household level." 11 April, 2023. https://knowledge4policy.ec.europa.eu/publication/how-reduce-consumer-food-waste-household-level-literature-review-drivers-levers_en. Accessed 18 May, 2023.

2 Results from Behaviour Change Interventions

2.1 Intervention A - Ennis

To accompany the food waste packs outlined in the WP3 report, a series of communications for delivery via text message were created. The pack was delivered to households on May 11th, 2022. The text messages were sent out to the households every Wednesday for 6 weeks by the waste collector Clean Ireland. This coincided with the waste collection day for brown bin (food waste) and general waste bins.

2.1.1 Breakdown of cost of the pack

Table 1 outlines the costs of the items included in the pack sent to the intervention group in Ennis.

Table 1: Intervention A pack contents and associated purchasing costs for 160 packs

Item	Total cost
Thermometers €2.43 each (inc. VAT @ 23% & delivery)	€389.09
Printed freezer labels €2.85 pack (inc. VAT @ 23% & delivery)	€455.31
Silicone lids/covers €4.18 each (inc. VAT @ 23% & delivery)	€669.33
SFW pocket guide (€0.34 each)	€54.40
SFW fridge magnet (€0.70 each)	€112
SFW scoop measure (€0.60 each)	€96
Boxes (packaging) €0.79 each (inc. VAT)	€126.90
Total	**€1,903**

Based on these costs, the following outlines the overall cost of the packs.

Description	*Cost*
Total cost of 160 packs	€1,903
Cost of posting packs	€600
Total cost (incl. VAT)	€2,503 (incl. VAT)
Cost for one box (incl. VAT)	€15.64 (incl. VAT)

It is important to note that though these were the costs expended on the pack, significant effort and time also went into the design and issuing of the packs, the development and sending of the accompanying texts as well as the subsequent data gathering, which was provided by the project partners, Clean Ireland. These costs are accurate as of 2022. Since this research was carried out, significant inflation may impact future costs.

2.1.2 Waste Characterisation

For both interventions, a waste characterisation study was carried out on the general waste stream. This was carried out using the nationally recommended approach based on a coning and quartering method. This task was undertaken to assess the levels of food waste contained in the residual (general) waste stream. Coning and quartering is a method that is used to reduce a sample size for measurement without creating any bias. In this case, it involves gathering the full sample of waste from the identified collection route and separating it out into four sections. Next, two of the four sections opposite to each other are discarded and the remaining two sections are kept as samples. This process is repeated until a sample size of no less than 100 kg (for this analysis) is reached.

From here the sample is separated out into:

- Organic waste (food)
- General waste
- Fines[3]

Once separated, each category of material is weighed, and a calculation applied to find out what percentage of waste in the sample was food. The following is an example of the calculation: A sample of 100 kg waste was surveyed.

- 50 kg was residual waste.
- 30 kg of waste was made up of organic material.
- 20 kg of waste was made up of fines.

Where encountered, garden wastes were excluded as part of the waste characterisations. According to the EPA standard, fines consist of 60% organic material. With this information, 60% of the total fines (20 kg) is 12 kg and this is attributed to the food waste total. While there may be garden wastes included in these organic fines, as there is no recommended approach to address this, it is assumed that all is related to food wastes. This approach is consistently applied throughout.

Therefore, it can be concluded that 42% (30 kg + 12 kg = 42 kg) of the 100 kg sample of general waste was organic materials i.e., predominantly food waste.

2.1.3 Ennis Waste Characterisations

The pre-intervention waste characterisation survey of the general waste took place the week before the packs were sent out (May 11th, 2022). The post-intervention waste survey took place on the next bin collection day after the final text was sent out (July 5th). The results from the first survey showed that 31.6% of waste in the residual waste stream was food waste. The results from the final survey that was conducted the week after the final text was sent showed that 29% of waste in the sample was food waste. These are the proportions of food waste in the residual waste that will be used in the later calculations of total food waste produced.

Figure 1: Waste Characterisation in progress

[3]Fines - waste that is less than 20 mm in diameter.

National evidence indicates that, regardless of the presence or absence of a brown bin collection service, food waste is not always segregated correctly. This outcome was most recently reported in 2018 when 20% of the general waste and 10% of the MDR was found to be food waste[4]. An updated set of national figures are currently being produced by the EPA, but preliminary results suggest little has changed since 2018. Consequently, it was important to consider the food waste in the general waste bins during this work.

From the waste characterisation surveys it was found that, though all households were provided with a brown bin service, a large proportion of households did not dispose of food waste separately. From the waste characterisation investigation of the waste collected in Ennis during the first wave (i.e. pre-intervention), it emerged that 31.6% of the general waste (MW) was made up of food waste. A similar waste survey conducted in Wave 3 (i.e. just after the intervention) showed that food waste was present at 29% of MW. While subsequent food waste surveys were not carried out, for waves 2 - 5, an average of the pre and post results (i.e. 32.5%) were used to account for the amount of food waste in this waste stream. Additionally, though surveys on the mixed dry recycling (MDR) stream were not carried out, the national value of 3% food waste in the MDR was applied.

2.1.4 Ennis Food waste data analysis

Clean Ireland provided waste collection data from the Ennis collection route involved in Intervention A. It is important to note that Clean Ireland uses 60L brown bins for the organic waste collections. As garden wastes tend to be bulkier and are produced in relatively large volumes, this approach (as opposed to using larger 140L brown bins) is designed to reduce the amount of garden waste disposed of in this stream. Therefore, all organics disposed of in the brown bins are assumed to be food waste.

The data provided by Clean Ireland was broken down into five waves during April 2022 and April 2023. These waves, their associated dates, the actions carried out with the intervention group, and the dates of the waste characterisations are presented in Table 2.

Table 2: Summary of the waves (relating to the data assessments) of main intervention actions

Date	April 10th – May 10th 2022	May 11th – June 22nd 2022	June 23rd – July 23rd 2022	October 2022	April 2023
	Wave 1 (pre-intervention)	**Wave 2 (during intervention)**	**Wave 3 (post-intervention)**	**Wave 4 (post-intervention + 3 months)**	**Wave 5 (post-intervention + 9 months)**
Intervention Group	No information provided	Pack received, regular text communication	No further information provided	No further information provided	No further information provided
Control Group	No information provided	No information provided	No information provided	No information provided	No information provided
	Waste Characterisation of general waste		Waste Characterisation of general waste		

For each dataset, waste data was collected for two groups - an intervention group of 142 households that received the food waste pack and information messages, and a control group of 137 households that did not receive the food waste pack or any additional information.

During Wave 1, no household received any information about food waste in either group. The intervention group received the food waste pack and the information in Wave 2. In Waves 3, 4, and 5, no household received any information or the food waste pack. It was anticipated to see no difference in food waste between control and intervention groups in Wave 1 because this was the pre-intervention period. It was anticipated to find that, starting in Wave 2, and continuing in Waves 3, 4, 5, food waste in the intervention group would be smaller than in Wave 1. It was also expected that food waste in the intervention group would be smaller than the control group in Waves 2, 3, 4, and 5 compared to Wave 1.

[4] Household Waste Characterisation Campaign 2017-2018 - final report https://www.epa.ie/publications/monitoring--assessment/waste/national-waste-statistics/household-waste-characterisation-campaign-2017-2018---final-report.php

The impact of the intervention was explored by evaluating these data using t-tests for the equality of mean food waste in the control and intervention groups. To compare the data across waves, the data per collection was analysed. Firstly, the descriptive statistics of the different waste streams - food waste (FOOD), mixed general waste (MW) and mixed dry recyclable waste (MDR) was compiled. The role of food waste within the other non-food waste streams (mixed waste and dry recyclables) was also assessed so that the overall impact of the intervention (to include the additional impact of food waste in the general and recyclable waste streams) could be estimated (see section 2.1.4.4).

Based on these, the differences in total food waste within the intervention group and between the intervention and control group were explored before, during and after the intervention. Next, the behaviour over the study period of households that did not dispose of food waste in food waste bins in Wave 1 was examined. This group, those that have a food waste collection bin but do not use it, had previously been identified by the waste collector as representing ~30% of their domestic accounts. This is shown and discussed in section 2.1.4.2.

2.1.4.1 Overall waste statistics

Table 3 reports the mean values in kgs and the standard deviations in kgs for the intervention group (I) and the control group (C) for the different waste streams MDR, FOOD, and MW per collection, over the study period, for each wave of waste collection.

Table 3: Mean kg of waste per household per collection for MDR, FOOD and MW waste streams for intervention (I) and control (C) groups (standard deviations shown in parentheses).

Date	April 10th – May 10th 2022		May 11th – June 22nd 2022		June 23rd – July 23rd 2022		October 2022		April 2023	
	Wave 1 (pre-intervention)		Wave 2 (during intervention)		Wave 3 (post-intervention)		Wave 4 (post-intervention + 3 months)		Wave 5 (post-intervention + 9 months)	
Group:	**I**	**C**	**I**	**C**	**I**	**C**	**I**	**C**	**I**	**C**
MDR	11.45	7.71	6.21	6.18	8.99	9.56	6.62	12.96	7.49	7.51
	-7.22	-6.28	-5.34	-3.57	-6.23	-6.11	-7.35	-11.81	-6.66	-6.61
FOOD	4.01	3.8	3.48	3.9	3.44	4.3	4.51	6.97	3.32	4.09
	-4.28	-4.38	-3.9	-4.3	-4.01	-5.02	-4.85	-5.81	-3.9	-4.9
MW	14.94	14.2	14.74	14.49	14.31	12.71	13.16	5.47	13.52	18.23
	-12.16	-12.49	-11.31	-10.94	-11.44	-10.77	-11.73	-5.91	-12.58	-9.64

2.1.4.2 Analysis of mean food waste amounts

In the intervention group, it was noticed that mean food waste has decreased in Waves 2, 3, and 5 compared to Wave 1. These differences are statistically significant (see Appendix 1 (ii), panel (a), column 1). In Wave 4, food waste in the food waste bin increased compared to Wave 1 in the intervention group. However, it can be observed that food waste in the control group was also particularly large in Wave 4, suggesting that the increase in food waste in Wave 4 in the intervention group was not caused by the intervention but was likely related to another external factor. It is important to note, in this instance, that the increase in food waste in this wave is much less than that experienced by the control group. When the attention is focused on the control group, it was found that food waste did not decrease during the study period. A decrease in food bin food waste in the control group between Wave 1 and 2 was observed, but this difference was not statistically significant (see Appendix 1 (ii), panel (a), column 2).

Next, mean food waste volumes are compared between the intervention and control groups. We find no statistical difference (see Appendix 1 (iii) in mean food waste between intervention and control groups in Waves 1 and 2. We do find that the mean values are different in Waves 3, 4, and 5 (in the post-intervention assessments), where food waste in the food bin is considerably lower in the intervention group. The impact of food waste in MW and MDR will be discussed in a section 2.1.4.4.

2.1.4.3 Household behaviours

Next, it was explored whether the intervention changed the use of food waste bins within individual households. This waste collection route had been chosen as it represented a relatively mature section of the town, consisting of a mix of socio-economic groups. Consequently, there were few changes in accounts (which would signify a change in household occupancy) during the study period.

Firstly, the differences in food waste between waves at the household level were looked at, and then households that did not dispose of food waste in the food waste bin in Wave 1 were examined. This latter cohort, those that do not use their brown bin although it had been provided, were of particular interest to the waste collector. They estimated that between 25 - 30% of all their customers fall into this category.

For the initial evaluation, the difference in food waste for each household between Wave 1 and Wave 2, and Wave 1 and Wave 5, was calculated. Figure 2 shows the distribution of the difference in food waste between Wave 1 and 2 for the intervention group. Positive (negative) values in the distribution represent households that have decreased (increased) food waste between waves. The highest bar in the graph shows the large group of households that did not change their behaviour between Wave 1 and 2. The graph shows that there are more households to the right of zero in the distribution, indicating that the intervention has led to an increase in households reducing food waste.

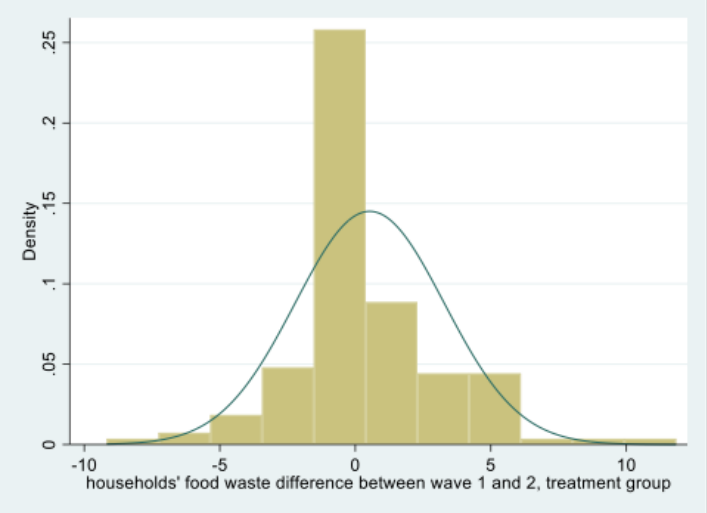


Figure 2: Distribution of food waste difference between Wave 1 and 2, intervention group

A similar assessment was carried out for the control group and this is shown in Figure 3. This profile shows two things: (a) households' food waste behaviour has not changed for this group, as the graph resembles a normal distribution, with households well distributed around zero, (b) a large proportion of households did not change their behaviour, as shown by the values at zero, which capture households that did not increase or decrease their food waste between Wave 1 and 2. This value is much larger than in the intervention group which again suggests that there has been an improvement in the intervention group compared with the control, even at the early stage of carrying out the intervention.

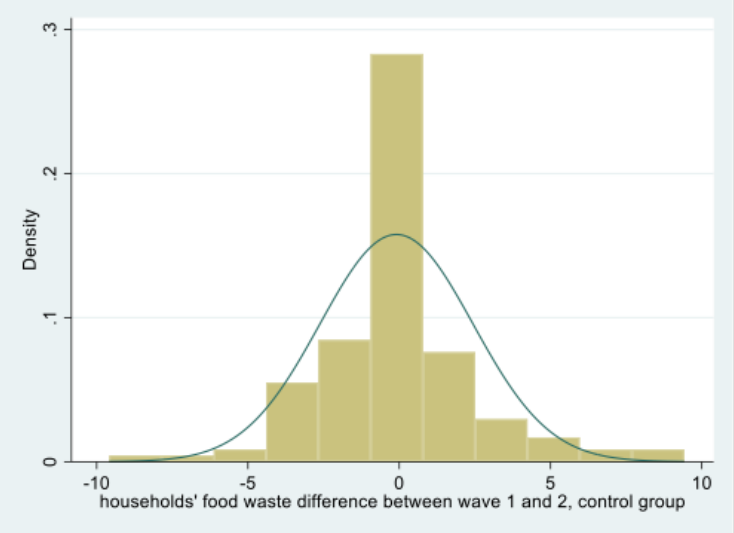


Figure 3: Distribution of food waste difference between Wave 1 and 2, control group

Figure 4 shows if the data between Wave 1 and 5 is compared, a further drop in the number of households with zero food waste change and an increase in households with a positive decrease in food waste in the intervention group can be observed.

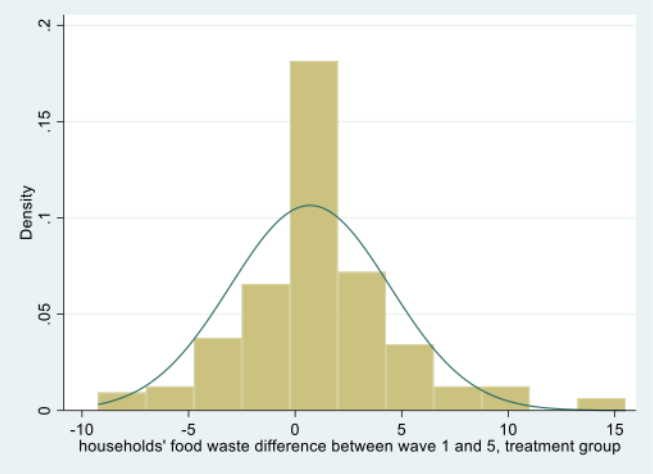


Figure 4: Distribution of food waste difference between Wave 1 and 5, intervention group

In the control group (Figure 5), comparing food waste from Wave 1 and 5, a visual representation of the data shows that there has not been an increase in households reducing food waste, as many households are still distributed to the left of zero.

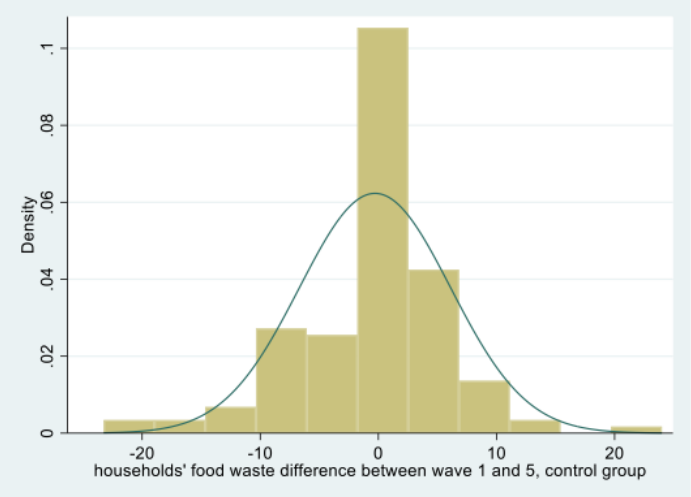


Figure 5: Distribution of food waste difference between Wave 1 and 5, control group

Next, the behaviour of households that did not dispose of food waste in the food waste bin in Wave 1 was analysed. It was found that 50 households in the intervention group did not dispose of food waste in the food bin. These households did not change their behaviour much, with only one household in Waves 2, 3, and 4 and five households in Wave 5 starting to dispose of food waste in the food bin.

2.1.4.4 The role of food waste in the mixed general waste and dry recyclables

As reported in section 2.1.3, food waste is included also in MDR and MW. In this section, the analysis of food waste for the intervention and the control groups is performed considering the total food waste from all bins. The total values for food waste from all three streams are shown in Table 4. The table indicates that a household's average food waste per collection was 9.44 kg in the intervention group and 8.86 kg in the control group in Wave 1. By including the food waste from MDR and MW, food waste in Wave 4 in the intervention group is now smaller than in Wave 1 (when looking at the food bin alone, it had been larger, as set out in section 2.1.4.1 above).

Table 4: Food waste (kg per household per collection), assuming that MDR and MW contain food waste

Total kg food waste per household per collection, all 3 bins	Intervention (142 observations)				Control (137 observations)			
	Mean	Std. dev.	Min	Max	Mean	Std. dev.	Min	Max
Food waste, wave 1	9.44	5.78	0.05	30.66	8.86	6.06	0.00	28.96
Food waste, wave 2	8.46	5.34	0.00	28.31	8.79	5.14	0.00	28.02
Food waste, wave 3	8.15	5.47	0.00	31.69	8.53	5.84	0.00	31.85
Food waste, wave 4	8.99	6.45	0.00	35.98	9.14	6.39	0.00	37.83
Food waste, wave 5	7.93	5.94	0.00	31.53	10.24	4.16	0.00	26.12

Based on these data, t-tests for the equality of mean values for total food waste across the different waves for the intervention and the control groups were performed. The results for the intervention group, reported in Appendix 1 (ii), panel (b), confirm what was found earlier when the data for food waste in food waste bins only was analysed: total food waste generated has decreased post intervention with the differences statistically significant in Waves 2, 3 and 5, compared to Wave 1. Table 4 also shows that in the control group, food waste did not decrease to a statistically significant degree in Waves 2, 3, 4, and 5 compared to Wave 1. In fact, food waste increased in Waves 4 and 5 compared to Wave 1 in the control group. These increases in the control group strengthen the findings for the intervention group and enhance the positive results of the intervention. Scaling up these figures, the level of household food waste generated annually weighs 217 kgs for the intervention group (8.36 kgs per collection) and 242 kg for the control group (9.30 kgs per collection). These numbers are significantly higher than national estimates (equating to about 120 kg of food waste per household or 44 kg per person per year).

2.1.4.5 Intervention impact

To estimate the impact of the intervention, the differences in mean food waste across Waves were calculated. Firstly, the data for the intervention group across the Waves was examined, followed by a similar analysis for the control group. This method is termed 'within-group analysis'. Subsequently, the data between the intervention and control groups across the Waves was compared, a process known as 'between-group analysis'.

Table 5 reports these differences. Panel (a) presents the differences in food waste in the food bin between Waves within the intervention group, within the control group, and between the intervention and the control group, with t-tests for the differences in mean values reported in Appendix 1, (ii). Panel (b) presents the same differences also including the data from food waste contained in MDR and MW. The table shows that food waste was on average 0.53 kg heavier in Wave 1 than in Wave 2 in the intervention group. This difference increases to 0.70 kg between Wave 1 and 5. The negative signs in the control group section in table 5, both panels (a) and (b), indicate that food waste has increased across waves in the control group. When we compare food waste between intervention and control groups, this difference increases in all waves. If we consider food waste in MW and MDR as well as in food bins, this difference goes from 0.90 kg between Waves 1 and 2 to 2.87 kg between Waves 1 and 5 per household per collection. These differences are statistically significant, as reported in Appendix 1 (ii), panel b, column 3.

Considering a conservative estimate of the success of the programme is 1 kg reduction of food waste per household per collection, this leads us to conclude that the intervention has led to a decrease of about 25 kg of food waste per household per year (given the fortnightly collection of waste).

Table 5: Food waste variations within and between different intervention periods. Panel (a) presents food waste from food waste bins only; Panel (b) also includes food waste from MDR and MW.

Kg food waste per household per collection	Intervention group: within group differences		Control group: within group differences		Between group differences	
(a) Food waste from food waste bins only	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Wave 1 - Wave 2	0.53	-2.75	-0.09	-2.53	0.63	-0.31
Wave 1 - Wave 3	0.57	-3.40	-0.49	-3.51	1.06	-0.41
Wave 1 - Wave 4	-0.50	-3.06	-3.17	-7.24	2.67	-0.66
Wave 1 - Wave 5	0.70	-3.75	-0.28	-6.40	0.98	-0.62
(b) Total Food waste from food, MW, and MDR bins						
Wave 1 - Wave 2	0.75	-3.55	-0.14	-4.01	0.89	-0.45
Wave 1 - Wave 3	1.22	-4.21	0.25	-4.81	0.96	-0.54
Wave 1 - Wave 4	0.38	-4.29	-0.50	-6.96	0.88	-0.69
Wave 1 - Wave 5	1.44	-4.99	-1.31	-6.72	2.75	-0.71

2.1.5 Qualitative Assessment

2.1.5.1 Questionnaire

To supplement the quantitative assessment, a survey consisting of 19 questions was developed to assess attitudes and behaviours around household food waste. However, the questionnaire was by text, sent from Clean Ireland which garnered almost no responses. As people have become extra vigilant of links being sent via text message due to an increase in phishing in recent years, it is highly possible that this deterred people from following the link to the survey. Consequently, the limited qualitative data received was not used as part of the overall analysis.

2.1.5.2 Semi-structured Interview

At the end of Intervention A in Ennis, an interview was sought with head of administration and customer service (the main point of contact with Clean Ireland). This interview did not materialise during the timeframe of the project.

2.1.6 Discussion

As discussed in WP3, one of the objectives for this project was to assess the impact of behaviour change interventions regarding food waste. There are many approaches espoused and the approach applied in intervention A was based around using nudges, tools and information to precipitate change. In the introduction to the pack, it was established that the household is part of a wider project being conducted in the town of Ennis. It was intentionally presented in a positive manner - taking into account the fact that people tend to be motivated to do something if other people they know are doing it.

Intervention delivery was an important factor taken into consideration. The stakeholders interviewed in WP2 noted that the person, or group, seen to be delivering the intervention is important since several interviewees commented that interventions linked to community engagement and peer to peer interactions worked best. Clean Ireland has a positive relationship with their customers and choosing to deliver the message through a trusted service provider, independent of other institutional stakeholders, was decided to be the best option for this intervention. Continuity was also noted as being vital to an intervention's success. This was achieved by sending out the messages every Wednesday at the same time for the 6 weeks of the intervention.

Qualitative information for this kind of intervention can be difficult to obtain as minimal direct contact was made by the project team with the intervention groups. This approach was by design to test an intervention that was replicable, without a significant time resource requirement to interact directly with householders. The qualitative questionnaire used to assess attitudes and awareness levels, which was sent out through a link in a text message, garnered very few responses. If repeating this intervention, sending out the survey in hard copy while the packs were being dropped off, or at the end of the intervention period, and collecting them at the next waste collection could be a better option.

The food waste data collected in Ennis indicate that the intervention was successful in reducing food waste amongst targeted households. It was found that:

a) food waste in the food waste bin decreased in Waves 2, 3, and 5 compared to Wave 1 in the intervention group that received the food waste pack and the information on food waste;

b) food waste in the food waste bin did not decrease in a statistically significant amount in the control group in Waves 2, 3, 4, and 5 compared to Wave 1.

c) the total effect of the intervention is estimated to be a reduction of about 1 kg of food waste per household per collection (2 weeks, or 0.5 kg per week) in the short term. Data assessed 6 months after the intervention finished shows that, compared to the control group, the improvements made during the intervention seem to be sustained.

2.1.7 Conclusion

Overall, based on these results, this intervention seems like a successful approach to reducing food waste in Irish households. The data suggests that, on average, a reduction of 0.5 kg per household per week was realised compared to the control group. Importantly, this level of improvement was sustained 6 months after the finish of the intervention. Based on these results then such an improvement, which corresponded to a 16% improvement, could result in a 25 kg annual reduction in food waste per household. This level of improvement is lower than the 30% observed by Van der Werf et al. (2020) though it is important to note that their intervention took place over a 2-week period and the longer-term impacts were not reported.

To conclude, there was a decrease in the level of food waste in the intervention group over the course of the intervention period and this remained down during the months after the intervention finished. It is proposed that this intervention is repeated nationwide in order to achieve the same overall sustained decrease of 16% food waste. The research team suggest that this type of intervention could be rolled out effectively in collaboration with interested waste collectors. The cost of rolling out this type of intervention to 1,000 households in Ireland would be an estimated €15,640, saving an estimated 25,000 kg of food waste annually. For every 62c invested, there is a potential €3 saving for the householder. The packs could cost more than €19.24 per household. Inflation and economies of scale are likely to impact the costs incurred for this pilot intervention should the intervention be carried out at scale.

2.2 Intervention B - Skibbereen

2.2.1 Community Identification

Intervention B was based on changing social norms via a community approach. Once the intervention methods had been identified, it was crucial to the success of the community approach that an engaged community was chosen. Skibbereen in County Cork was selected as active people in the community there had approached members of the research team with enthusiasm during the research application phase. Skibbereen also had several active community groups interested and a suitable central location to provide a focus. Once the community approach was identified, and Skibbereen as the study location was agreed with the Steering Committee, the main local stakeholders were engaged with and a facilitated workshop organised. This commenced a series of activities which took place locally over an extended period.

It is important to note from the outset that this community-based intervention coincided with the Covid pandemic. Though there was great enthusiasm for this intervention approach, both within the team and those involved in the community, Covid impacted every aspect of the intervention - from the ability to directly engage with stakeholders to conducting meetings in person and the availability and capability of key stakeholders to participate.

2.2.2 Community Approach

Once the community had been identified, a comprehensive list of the main potential stakeholders was drawn up. Figure 6 below depicts the local groups and individuals identified by a mapping process captured on Miro software (names and information has been removed for confidentiality). The green colour boxes denote key stakeholders who were invited to participate in the first facilitated stakeholder meeting (co-design workshop). This list included those already active in environmentally focused work but also important influencing individuals, organisations and businesses. To start the process, a first kick-off meeting workshop was held online on January 13th 2022. The purpose of this workshop was to introduce stakeholders to the idea of potential interventions to reduce household food waste in Skibbereen and to co-design a project plan. Potential interventions compiled using Miro are outlined in Figure 7 below. A trained facilitator guided the process and a graphic harvester was on hand to capture the discussion and agreement. Figure 8 shows the graphical summary of the workshop and project plan.

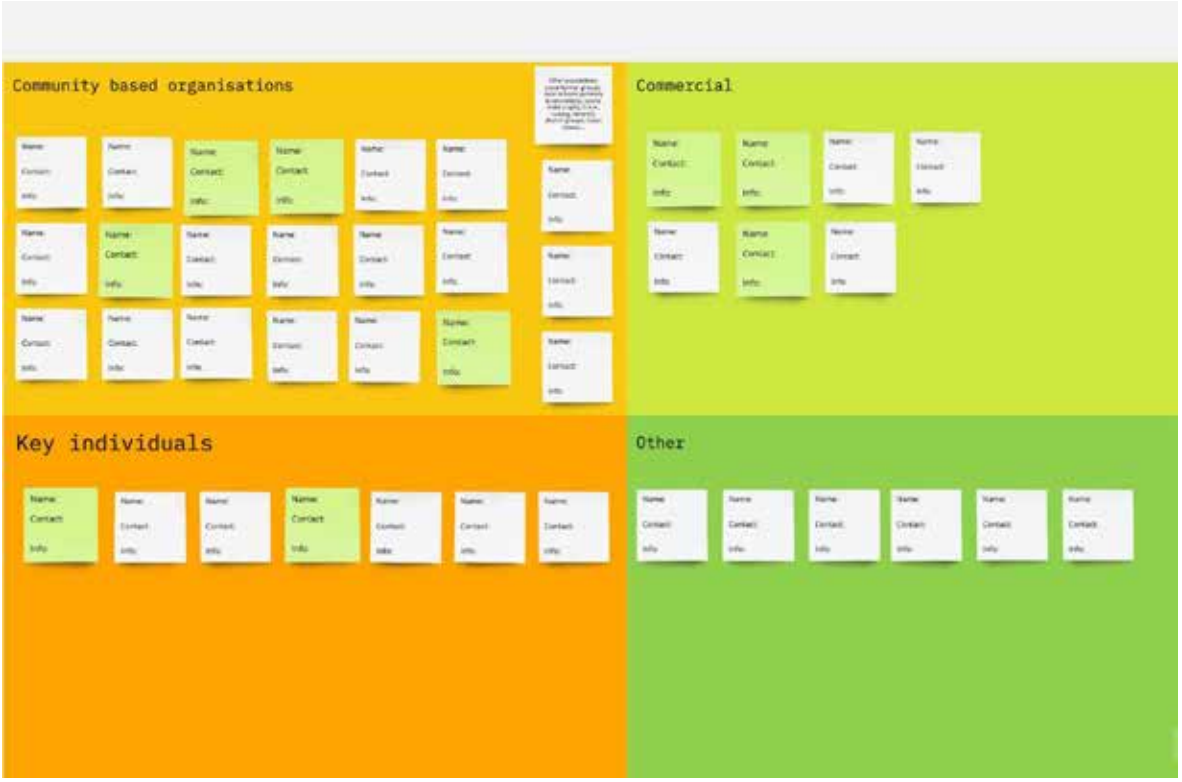


Figure 6: organisational mapping of the main stakeholders in Skibbereen

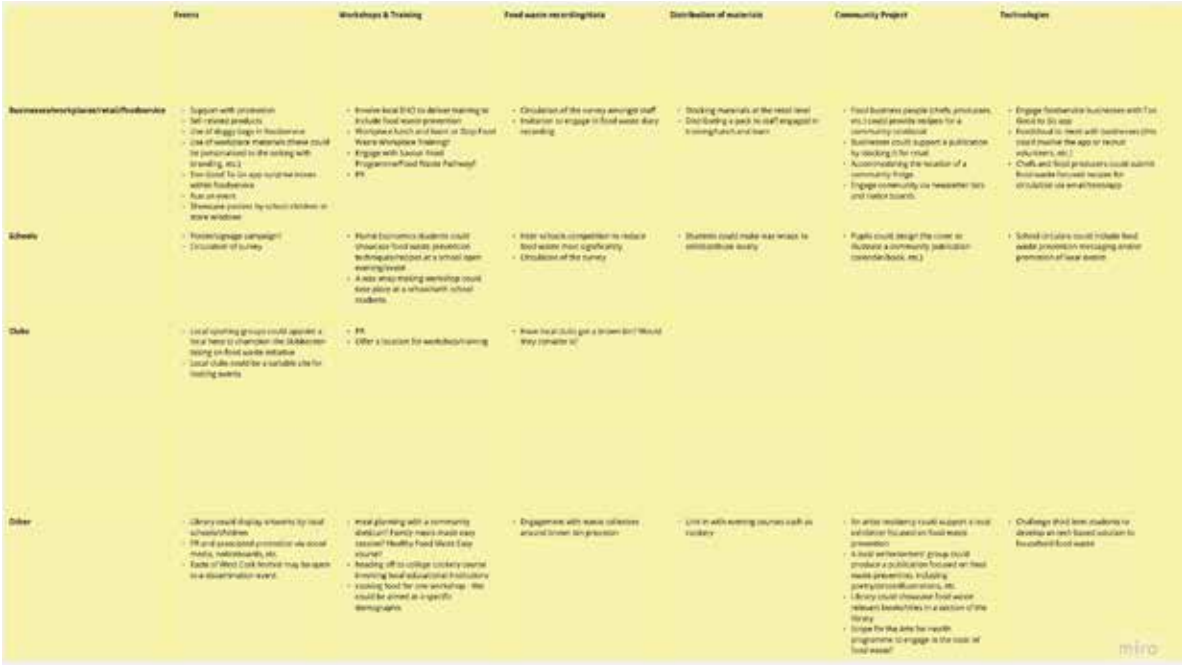


Figure 7: Miro outline of the collaboratively generated actions that were proposed by engaged stakeholders in Skibbereen

It was noted early in this process that, for a successful outcome, it was essential that this intervention was a locally driven initiative, supported by the multidisciplinary project team. During the workshop, it was noted by stakeholders that a locally recognisable brand and associated graphics would be important for them. Consequently, these were developed by graphic harvester Hazel Hurley with support from the project team. 'Skibbereen taking on Food Waste' was the local project name used and the materials produced throughout were based on this theme. Materials were developed based on the needs of the stakeholders. A logo image for the project is available in Appendix 2. A shared profile on Basecamp project management software was created to enable everyone involved to communicate with one another on related events and activities. Through Basecamp, the project team disseminated promotional materials for use by the active stakeholders to share through a variety of communication channels. Promotional work was carried out through existing local networks and groups.

Figure 8: Image produced by graphic harvester Hazel Hurley to summarise the workshop

2.2.3 Timeline of Key Activities

The anticipated timeline was to commence work immediately following the kick-off meeting in January 2022, with planned completion by the end of June 2022 in order to avoid the summer tourist season. However, engaging the group amid Covid proved difficult. Many of those involved were volunteers and ultimately, the timeline of the intervention altered greatly in order to accommodate various challenges met. Main activities took place between March 2022 and February 2023.

2.2.3.1 March 2022, Information Stands - Farmers Market & Lidl and Podcast featuring 'Skibbereen taking on Food Waste'

On foot of the first workshop (online), an initial event for 'Skibbereen taking on Food Waste' took place on Saturday March 26th 2022 involving a public stall at the local Skibbereen Farmers' Market from 10am-1:30pm and outside the local Lidl from 2pm-5pm. An associated press release can be found in Appendix 3 and promotional posters used in Appendix 5. This stall included information about the initiative, who was involved and literature on how to lower household food waste (provided by the national Stop Food Waste programme). Representatives from project partners CECAS (Centre of Excellence for Climate Action and Sustainability), Cycle Sense, and the research project team were at the stall. In order to engage the public and generate a baseline of local attitudes towards food waste, a QR code for a survey was shared with members of the public. Survey 1 can be found in Appendix 5. Each person who completed the survey was entered into a draw with a €100 One4all gift voucher prize. Also present on the day of this kick-off event was Robert Hurden, host of the "Voice of West Cork" podcast. 'Skibbereen taking on Food Waste' was featured in the podcast on April 22nd, 2022. The episode is available at: https://westcorkcommunity.ie/podcast-community-social-west-cork/.

2.2.3.2 April 2022, Composting Workshop and Initial Waste Survey

The next event to take place was a free food waste and composting workshop which was facilitated by an experienced local trainer. This was advertised through the Cycle Sense and Skibbereen Tidy Towns Facebook pages, active email newsletters in the locality, word of mouth in the community and at both stalls on March 26th. The event was held on Sunday April 10th with 25 people in attendance. The event consisted of a composting demonstration, a short talk on preventing food waste, and culminating in a shared meal of soup made by CECAS with vegetables that would have otherwise been wasted. Find details in Figure 9 below.

Figure 9: Facebook post from CECAS, Donal O' Leary facilitating a Food Waste & Composting Workshop as advertised

2.2.3.3 May/June 2022, Promotional Videos

A series of promotional videos were produced to advertise 'Skibbereen taking on Food Waste', including local waste data generated by the waste characterisation survey carried out the previous month. These were uploaded to Basecamp where members were invited to share the videos on their social media platforms. These were a key engagement tool as they outlined the issues, targeted the messaging specifically to the area and provided contacts and links with the local organisations involved, with a view to getting engagement across the social and business spheres. The videos were promoted, the questionnaire was circulated, and the community engaged to solicit information about complementary activities.

Figure 10: Skibbereen Tidy Towns sharing promotional videos via Facebook

2.2.3.4 July 2022, Information Stand - Carbery Show

'Skibbereen taking on Food Waste' was present at the Skibbereen Carbery Show to promote the project. Similar to the farmers' market, a stall was located on-site to engage the public around the topic of food waste, with specific reference to Skibbereen.

Figure 11: Ruth Bullough from Cycle Sense at the Carbery Show

2.2.3.5 September 2022, First drafts of recipe booklet

Development of the school engagement projects began in September 2022 when a positive working relationship was made with Skibbereen Tidy Towns via the local Tidy Towns representative who had strong local connections with both national and secondary schools. She became an integral person in the roll out of Intervention B. Up to this point, local engagement, which was a crucial element of the overall approach, had been intermittent and affected by a series of personal issues that were outside the control of the project team. In many ways, the involvement of this local facilitator was down to luck and the fact that the project team, with support from the Steering Committee, had decided to extend the intervention period for an additional 4-6 months due to the Covid related delay in starting. While not an unexpected result (i.e. local projects are contingent on local leadership), there were valuable lessons learned from the local engagement process that are discussed later.

With the success of the project in mind, and the volunteer nature of Skibbereen Tidy Towns, it was decided to engage with this local facilitator professionally to lead and manage the local work. Through existing relationships in the locality, she was able to develop and build projects that garnered enthusiasm and interest locally. Through this process she determined that working in collaboration with the local schools was an effective mechanism to engage and involve and, based on discussions with both primary and secondary schools, identified a number of projects to undertake. For the primary schools, there was an appetite for the production of a local publication around seasonal food and food waste prevention. This took the form of a recipe booklet with content from local school children, many of whom spoke to relatives of different generations to find out about seasonal food and ways of extending the season and making the most of food. For secondary schools, and the Transition Year students involved, the work involved trialling the online beta version of the Stop Food Waste course (via Teachable) and carrying out household food waste surveys in the homes of the students involved.

2.2.3.6 October 2022, Reuse week with Cycle Sense

For Reuse Week during October, Cycle Sense organised several events showcasing their new compost project. This project involved developing an onsite composting system for food (vegetarian) and garden materials. The development and ongoing use of this was communicated through social media but also at their weekly Tuesday night meetings and involved Skibbereen Tidy Towns/ Skibbereen Community Orchard/ Hospital Community Garden who collaborated as part of Intervention B.

2.2.3.7 November/December 2022, Stop Food Waste Challenge

An in-person Stop Food Waste Challenge was organised to take place once a week on Tuesday evenings from 7pm to 8pm from November 15th until December 6th. Stop Food Waste is the national campaign that provides information to the public on how to lower food waste at home. The Stop Food Waste Challenge is an in-person workshop which consists of four 1-hour meetings, run by Stop Food Waste or local trained facilitators and covers the main steps involved in reducing food waste. To entice people to complete the challenge, a draw for three gift vouchers of €100 were offered to those who successfully finished the challenge. The course was to be given by an experienced facilitator and held in the Family Resource Centre in Skibbereen. The training workshops were promoted through social media and word of mouth (see promotional poster in Appendix 7). Though 13 people signed up through the Eventbrite booking form, on the first evening, only one person turned up and therefore, it was decided to cancel. While this was very disappointing considering the effort that was put into the organisation of the workshops, it was interesting to note the difficulty to engage with people on the topic, especially considering the relative success of any of the composting related workshops/events run during Intervention B. Through informal discussions with local stakeholders, it appears that this 'lack of interest' is down to the topic of food waste prevention which doesn't really engage or interest people in the way that more hands-on activities (e.g. composting, gardening, cooking) do.

2.2.3.8 January 2023, Stop Food Waste Challenge online with TYs

As noted previously, one of the projects initiated by the local facilitator, in conjunction with active stakeholders, was the roll-out/testing of the online Stop Food Waste challenge. This was promoted through Skibbereen Community School in collaboration with the Tidy Towns. The students from Transition Year (TY) were asked to complete the challenge and were entered into a chance to win a €100 euro gift voucher. 94 students completed this online through this promotion. On February 27th 2023, the two winners were presented with their vouchers and a talk was given to the Transition Year students by Colum Gibson from the Clean Technology Centre. The talk centred around the importance of lowering food waste in the context of climate and our environment.

2.2.3.9 February 2023, Young Chef Recipe Booklet release and Information talk about food waste to TYs

The project team supported Skibbereen Tidy Towns to finalise the production of the bespoke recipe booklet including recipes using seasonal foods for each month of the year that local students came up with. The launch of the 'Young Chef Recipes' seasonal recipe booklet took place at Abbeystrewry NS and St Patrick's BNS in Skibbereen in February 2023 where 500 copies were distributed. The recipe booklet is available at: http://online.mobissue.com/jopt/ulmk/ and the schools have decided that they will update it annually and reissue online. Additionally, a bookmark for local school kids on the same theme was distributed to coincide with World Book Day on March 2nd.

Figure 12: Final version of the Young Chef Recipe Booklet

2.2.3.10 April 2023, Final Waste Characterisation and Blog post by TYs

While conducting the second waste survey (as part of the work on the quantitative assessments for Intervention B), a number of videos and pictures were taken for promotional and educational purposes. These were shared with the secondary students who then developed a blog for the Skibbereen Tidy Towns website. This content, developed by local students targeting and communicating to local householders, was promoted locally through the school network, the families of the students and on Skibbereentidytowns.com.

Figure 4: Images taken from the Skibbereen Blog Post

A Table including all activities that took place can be found in Appendix 6.

2.2.3.11 Social Media

Skibbereen Tidy Towns and Cycle Sense continually promoted 'Skibbereen taking on Food Waste' throughout the course of the intervention. Both have Facebook and Twitter platforms that are linked to other local stakeholders and this facilitated the dissemination and engagement throughout. A dedicated food waste prevention social media campaign was run in the lead up to Christmas 2022. This was based on a previous national campaign run by Stop Food Waste focused on 'Leftovers Day' which is the 26th of December. The campaign provided information tips on a range of food waste related topics (cooking, storing, buying, reuse, etc.) in the run up to Christmas (over 8 days), culminating in celebrating the use of leftovers which is synonymous with the 26th of January. The campaign was promoted and shared by Skibbereen Tidy Towns and Cycle Sense. Campaign adverts can be found in Appendix 9.

2.2.4 Waste Characterisation

As with Intervention A, the direct measurement of food waste was one of the main methods by which the efficacy of the intervention approach was to be assessed. Waste data from the local waste collector was provided and this included organic waste (brown bin), general waste and dry recyclables. The waste characterisation surveys of the general waste were conducted to determine the volumes of food waste present in the general waste stream and they were carried out on-site at the waste collector's premises in April 2022 and again in March 2023. These were timed to coincide with the beginning and end of the intervention. Carrying out surveys at the same time of the year is beneficial as it minimises the potential influence of external factors (e.g. generation of garden waste, changed eating habits, holiday season). While Skibbereen was chosen as the location for Intervention B based on a number of factors, the use of 60L brown bins was beneficial as, similar to Intervention A, this minimises the likelihood of garden waste being disposed of through this waste stream.

The results of the first survey in 2022 showed that 31.6% of waste in the household residual waste stream was food, while in the second survey in 2023, this level had lowered to 20%. These surveys, and the results that they generated were used in the calculation of the food waste data but also for the outreach and dissemination actions carried out as part of the intervention.

2.2.5 Skibbereen waste data analysis

The weight of waste collected in Skibbereen between January 2022 through to the end of March 2023 was analysed to evaluate any impacts associated with Intervention B. Waste data shared by the local waste collection company KWD is available for 16 collections between these dates. Waste was collected fortnightly. Data is stratified into four main waves:

- Wave 1: pre-intervention: January - March 2022
- Wave 2: initial intervention period: March - May 2022
- Wave 3: second intervention period: October - December 2022
- Wave 4: post-intervention: January - March 2023

There is a gap in the data between June - September 2022 as this was the height of the tourist season which, it was determined, would have an impact on waste generation figures. Consequently, this period was discounted from the analysis. The following Table summarises the data collected for the different waste streams over the four waves and estimates the total food waste collected per account/household every 2 weeks.

Table 6: Average waste data in Kg from domestic collections in Skibbereen over the intervention period

Date	Jan - March 2022	March - May 2022	Oct - Dec 2022	Jan - Mar 2023
Kg waste per collection	Wave 1 (pre-in-tervention)	Wave 2 (initial phase of intervention)	Wave 3 (2nd phase of intervention)	Wave 4 (post-intervention)
Food Waste Bin	6.98	7.39	10.35	10.07
Mixed Waste (Total)	17.17	17.70	17.86	17.99
Mixed Waste Bin (food*)	5.32	5.49	5.54	3.60
Mixed Dry Recyclables (Total)	9.49	10.57	9.71	9.10
Mixed Dry Recyclables (food*)	0.29	0.32	0.29	0.27
Total Food Waste	12.6	13.2	16.2	13.9

* Food waste content calculated based on Waste Characterisation results carried out in Skibbereen in April 2022 (food waste = 30%, applied for Waves 1-3) and 2023 (food waste = 20%, applied for Wave 4)

Based on the data analysed over the 4 waves, Skibbereen households dispose of an average of 8.46 kg in the compost bin every two weeks (or 4.23 kgs per week). Over the intervention period, an increase in food waste of about 3 kg per household (every 2 weeks) was observed between Waves 1 and 4 (it was relatively consistent in Wave 2, compared with Wave 1, but increased significantly during Wave 3 and maintained that level into Wave 4). Initially it was suggested that this may be due to increased volumes of garden waste being present in the autumn (in particular, leaves). However, as this higher level of brown bin waste was maintained into the 4th wave (Jan - Mar 2023, when garden waste volumes would be low), this theory does not hold up. Additionally, as the brown bins used in Skibbereen are smaller in volume, these tend to have less garden waste and be mainly made up of food waste. As such, the data did not find any improvement but the effectiveness of this quantitative approach may be limited in such a community setting. This will be addressed in later sections.

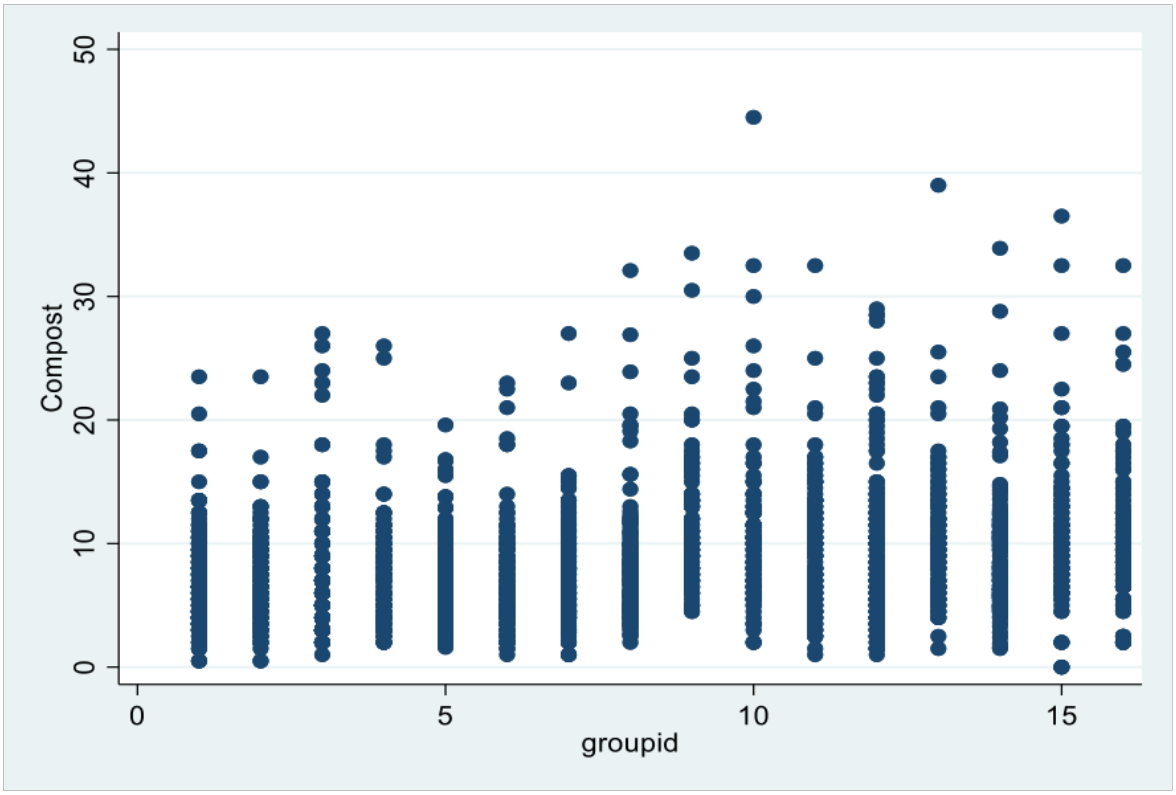


Figure 4: Distribution of weights in Kgs of brown bins collected from households in Skibbereen over the 16 weeks (groupid) covered by the 4 waves

Another potential explanation would be that segregation levels improved with food waste being diverted from the general waste bins. However, the volumes of residual waste (and the resulting food waste content) show little variation across waste collections, with the average residual waste per household per collection (2 weeks) being about 17.66 kg. The analysis over time shows that the food waste content of the general waste collected during this intervention did not change significantly between waves 1 - 3. However, by applying the waste characterisation results from the 2023 waste analysis to wave 4 general waste data, the food waste content of this stream does decrease by ~2 kg per fortnightly collection.

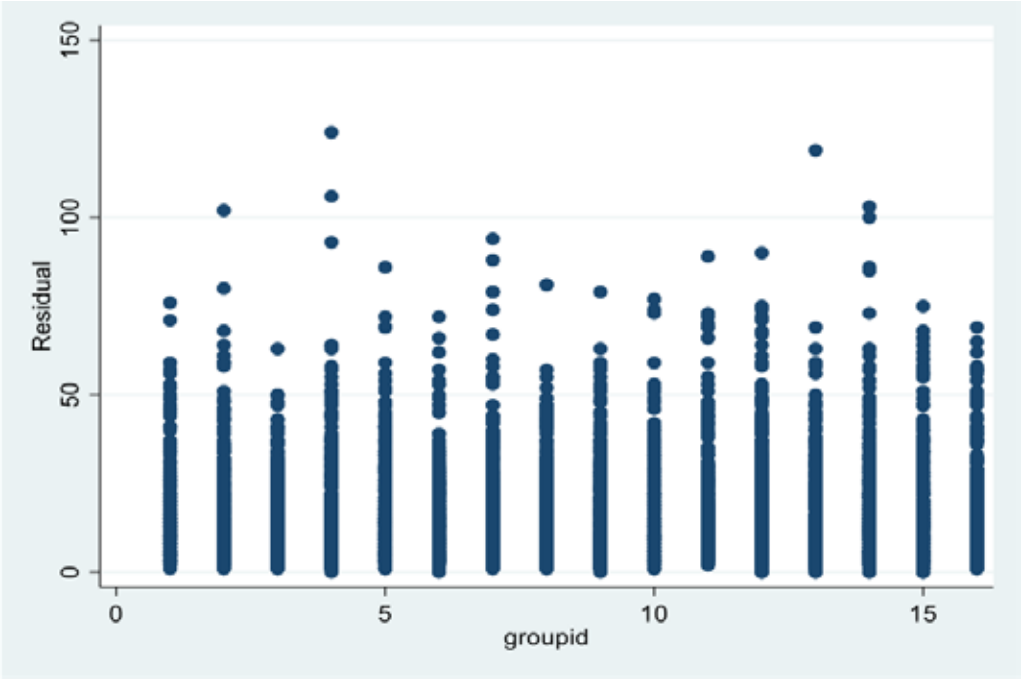


Figure 15: Distribution of weights in Kgs of general waste bins collected from households in Skibbereen over the 16 weeks (groupid) covered by the 4 waves

The data for dry recycling waste (appendix x, (ii)) shows that while there is quite a large degree of variance in the dry recycling volumes presented, though the average dry recycling waste, about 9.65 kg every two weeks, does not change much across collections. These variations across collections appear to be driven by some households disposing of large amounts of dry recycling waste at different collection times. Consequently, in terms of the food waste content associated with these volumes, it is relatively consistent over the 4 waves and these data were not used in the final food waste estimations.

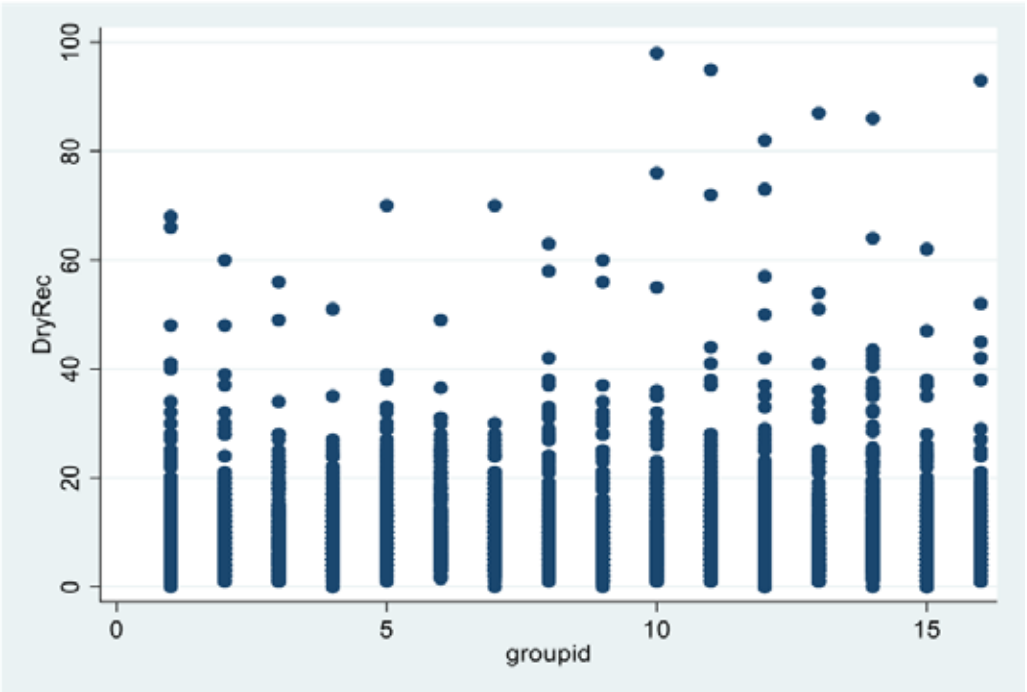


Figure 16: Distribution of weights of recycling bins in Kgs collected from households in Skibbereen over the 16 weeks (groupid) covered by the 4 waves

Combining the results from the food waste and general waste collections indicates that the overall volumes of food waste managed through the local waste collection service has increased slightly over the period of the intervention from 12.3 to 13.7 kg every two weeks. This was largely driven by the increase in the volumes presented in the brown bins, though this increase is offset by the decrease in the estimated food waste present in the mixed waste stream. This 11% increase between 2022 and 2023 equates to ~ 0.68 kg increase weekly or 35 kg over a full year.

2.2.6 Bantry waste data analysis

While the Skibbereen waste data suggested that overall food waste volumes had increased over the period of the intervention, the data was unusual due to the increase in food waste volumes collected in the brown bin. Therefore, to explore these figures, similar data from another townland in the same geographic area was assessed over the same times as the intervention. Bantry in County Cork is relatively close to Skibbereen (30 km) and the waste collector involved in the Skibbereen intervention was also the main collector in that area. According to them, the waste services they provide in both areas are consistent and the demographic and household distributions are relatively similar. Therefore, Bantry waste data was identified as an appropriate 'control' area to compare with Skibbereen. The following Table presents the waste data for Bantry for periods similar to Waves 1 and 4 in Skibbereen (also shown for comparison).

Table 7: Average waste data from domestic collections in Bantry and Skibbereen over the intervention period

Date	**Jan - March 2022**	**Jan - Mar 2023**	**Jan - March 2022**	**Jan - Mar 2023**
Kg waste per collection	Bantry		Skibbereen	
	Wave 1 (pre-intervention)	Wave 4 (post-intervention)	Wave 1 (pre-intervention)	Wave 4 (post-intervention)
Food Waste Bin	5.96	6.87	6.98	10.07
Mixed Waste (Total)	15.98	18.69	17.17	17.99
Mixed Waste Bin (food*)	4.95	5.79	5.32	3.60
Total Waste	21.94	25.56	24.15	28.05
Total Food Waste	10.91	12.67	12.3	13.66

* - Food waste content calculated based on Waste Characterisation results carried out in Skibbereen in April 2022 (food waste = 30%)

The findings from this comparison indicate that, though Skibbereen has more food waste per household, there was an 11% increase in the total food waste generated by the households between Waves 1 and 4 in the area compared with a 16% increase in Bantry over the same period. While there is no definite reason for the increase in total food waste in both communities, one possibility is that, due to more people working from home post-Covid, then more food waste would be generated in households. Additionally, anecdotal references suggest that more people are now spending time in rural communities in West Cork than previously and again this may be a contributing factor. However, such speculative rationale would need further investigation.

When examining the data in more detail, it is interesting to note that the increases in food waste presented in Skibbereen related to increases in the Brown Bin while the increases in Bantry relate more to increases in the overall volume (and estimated food waste) of the general wastes.

2.2.7 Skibbereen waste data analysis - activity-based

Due to the nature of the intervention in Skibbereen, which involved communicating to a wide audience through a variety of local channels and mechanisms, it was difficult to assess which of these, if any, had a positive impact on food waste volumes generated. To explore such activity specific implications, an assessment of the food waste generated by households near where the local activities occurred was carried out. This exercise assumed that those in closer proximity are more likely to have had an interaction with the outreach activities which, of course, is impossible to determine without getting personal information from the public (which was not likely to be forthcoming).

Therefore, the impact of these initiatives, outlined in 2.2.3, were explored at a radius of 0.5 km from each activity, comparing food waste collections before the information campaign and after, with ArcGIS Pro used for this analysis. This analysis did not provide any useful insights. More information on this process is available in Appendix 6.

2.2.8 Qualitative Assessment

As discussed in WP2, questionnaires can be a useful method by which to evaluate the effectiveness of interventions, though they have some limitations. This is why surveys were used in tandem with other impact assessments including semi structured interviews to qualitatively assess Intervention A and B. The following sections detail the findings from the qualitative assessments from Intervention B.

2.2.8.1 Questionnaires

Two questionnaires were created for 'Skibbereen taking on Food Waste'. The first one (Survey 1) was created for the beginning of the intervention to create a baseline in the general Skibbereen area. The second questionnaire (Survey 2) was created to survey school communities after they received the Young Chef Recipe Booklet (post-intervention). This survey was distributed through primary and secondary schools in a letter for parents and through word of mouth. The response to this survey (77 responses) was slightly greater than the response to Survey 1 (65 responses). This survey was circulated soon after the booklet was distributed which may have encouraged people to complete it. It should be noted that although these surveys have some similar questions, they were independent of each other.

In 2021, the EPA commissioned a survey on Food Waste: Attitudes and Behaviours in Ireland[5]. This was the second survey Behaviour & Attitudes Limited ('B&A') was commissioned to carry out to develop a nationally representative understanding of Irish citizens' attitudes towards food waste and food management behaviours (the first which was undertaken in 2020). Some of the questions asked in that study were replicated during the surveys used in Skibbereen to allow a comparison with the national findings. In general, the results of this study found that, across similar questions, responses from people surveyed in Skibbereen were largely consistent with national results. This is taken to indicate that, in terms of overall attitudes, Skibbereen is an area representative of the national sentiments towards food waste.

2.2.8.1 .1 Survey 1 – public questionnaire distributed at beginning of Intervention B

The Survey 1 questionnaire was created to investigate views of the general population in Skibbereen on food waste and to evaluate if there was consistency with the national results. The survey consisted of 17 questions, 13 of them focused on food waste with 4 based on demographics.

The largest group to complete this survey (33%) was between the ages of 55 and 64 (it was only 14% in the national study). This high voluntary response rate may be an indication of the level of interest among this cohort in the food waste issue.

89% of people in the Skibbereen area who answered Survey 1 separate their food waste from other household waste. The same question was asked in Survey 2 where 85% of respondents stated that they separate their food waste from other household waste.

Survey respondents were asked to estimate how much food they believe they throw away each week. 57% of Survey 1 respondents reported that they throw out a little food waste each week. In the 2021 study commissioned by the EPA, Food Waste: Attitudes and Behaviours in Ireland, it was found that 59% of people believed that they waste a small amount of food. This is a very similar result to that found in Survey 1 (shown in red in the following graphic).

[5]"FOODWASTE:AttitudesandbehavioursinIreland."https://www.epa.ie/publications/circular-economy/resources/Food-Waste-Attitudes-&-Behaviours-2021.pdf. Accessed 29 May. 2023.

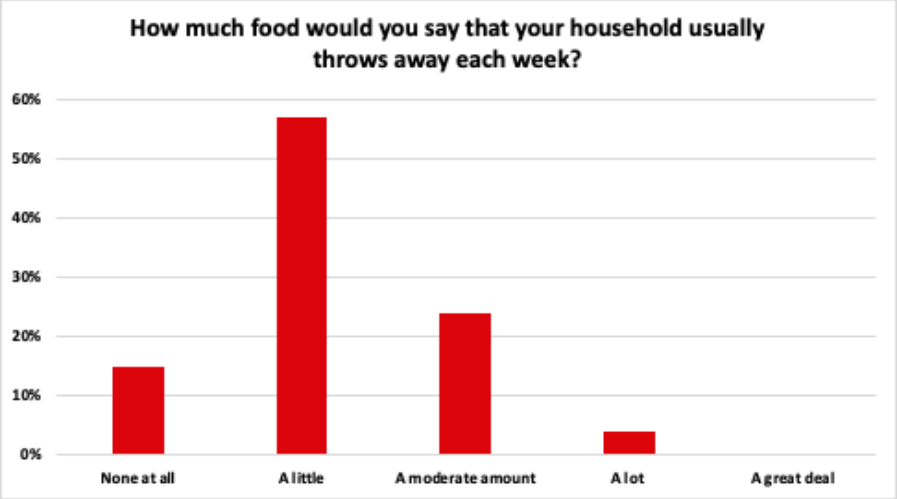


Figure 17: Survey 1 responses to estimated relative quantities of food waste discarded each week

In terms of reducing food waste, it is acknowledged that getting people to adopt good food reduction behaviours is still challenging as many do not acknowledge that they are key contributors to the issue.[6] This is corroborated in the Skibbereen survey results where, despite the national volumes of food waste reported, ~60% of people reported throwing away "a little" food waste. While the self-reporting or direct engagement with the evaluation process (e.g. questionnaires, food waste diaries) have been shown to under-report actual food waste (as noted in Work Package 2), this is clearly an area that needs to be addressed in future local and national work.

Considering the different food types, Fruit followed closely by Veg and Bread/Bakery were the largest food types people surveyed by Survey 1 reported to throw away. This is consistent with the national research carried out by the EPA in 2021 and, based on the international research, shows consistency with other countries as well.

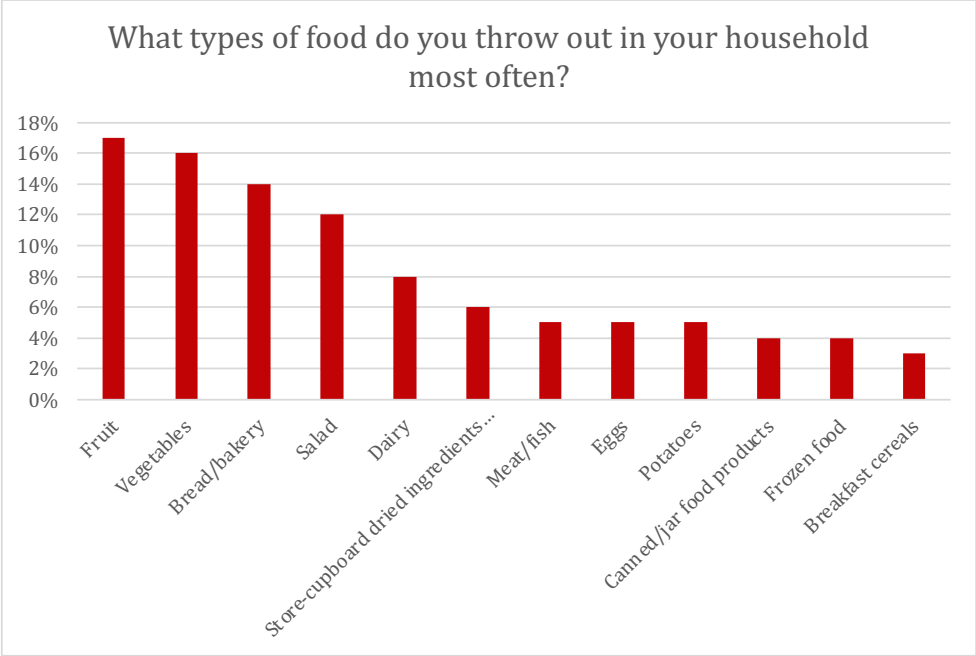


Figure 18: Survey 1 responses to the main types of food waste discarded each week

When exploring people's main concerns about food issues, the way that food products are packaged was the food issue people were most concerned about, followed by wasting food and the environmental impact of food. In the national study, the price of food, food waste and food ingredients were the top three. It is interesting to note that while food waste is a major concern, other issues seem to be more important. This also points to an interesting challenge when it comes to getting messaging to resonate with the public as, what may be deemed important at a national level, can differ from the local issues of note.

[6] "FOODWASTE:AttitudesandbehavioursinIreland."https://www.epa.ie/publications/circular-economy/resources/Food-Waste-Attitudes-&-Behaviours-2021.pdf. Accessed 29 May. 2023.

Regarding the results of the Skibbereen survey, the concerns about food packaging are interesting. This likely points to the concerns that people have about the increased levels of packaging recycling that they need to deal with through purchasing in supermarkets. While this is a legitimate concern, especially in an area where there is a tradition of local produce (which typically has less packaging), the positive implications of packaging (when it comes to the food supply chain) are often overlooked. However, from a communications perspective, it may be possible to leverage this concern to stimulate interest in food waste prevention (i.e. through reducing the amount of food wasted there will be less packaging).

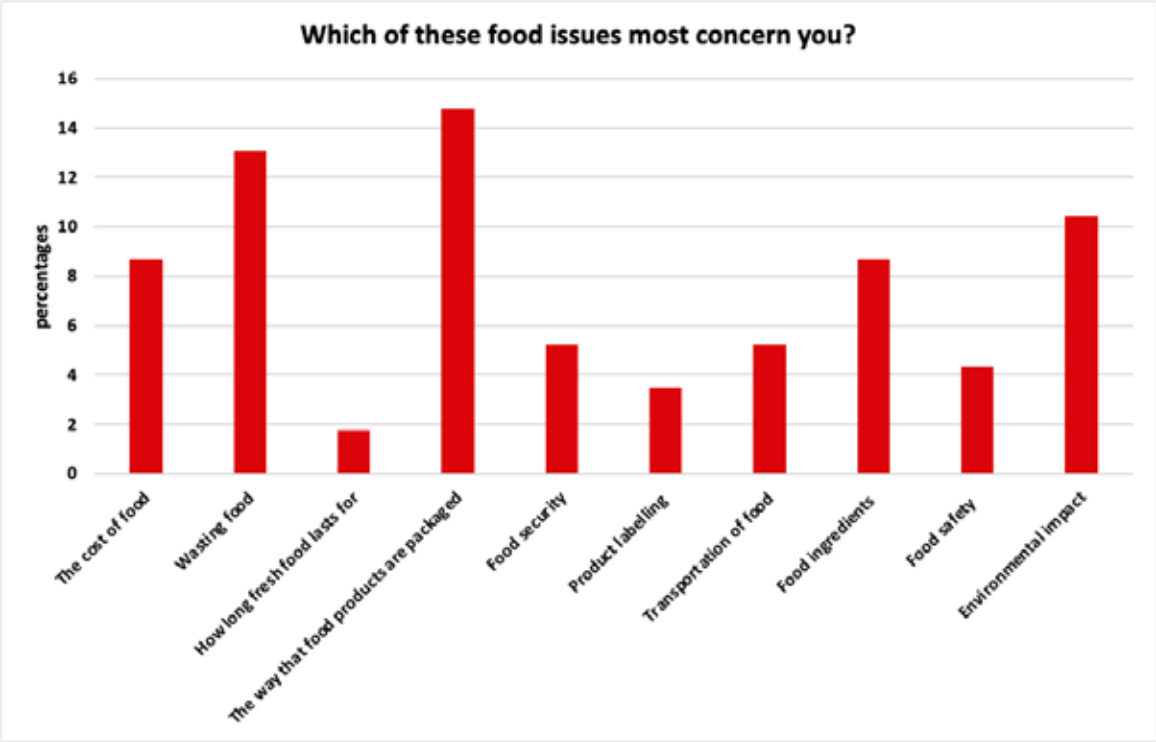


Figure 19: Survey 1 responses regarding the food related issues of most concern

When looking at the food waste issue specifically, 17% of people in Skibbereen noted the 'waste of resources' as being their primary concern. This was followed by financial implications (13%) and the impacts food waste has on the climate (11%). Interestingly, none of the people said they had 'no concerns'. These results are somewhat different to the national results where the strongest response on food waste was towards remorse ('people go hungry'), financial loss ('wasted money') followed by the unnecessary packaging waste from uneaten food.

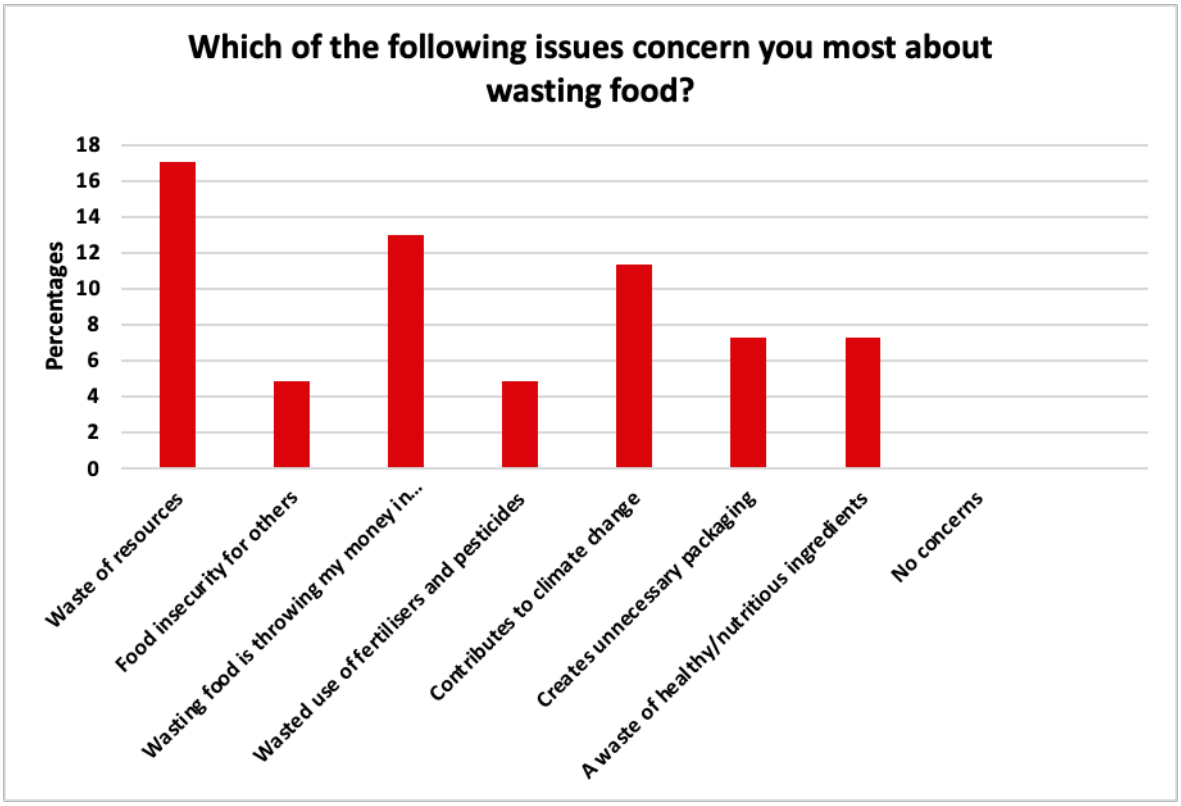


Figure 20: Survey 1 responses regarding different concerns about wasting food

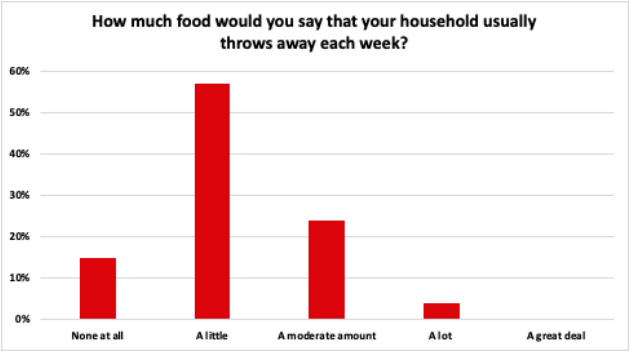
In general, though some specific results from Survey 1 differ slightly to the national B&A study, they are broadly similar with the Skibbereen findings corroborating the findings from the national survey. This points to consistency of issues and identifies Skibbereen as typical.

2.2.8.1.2 Survey 2 – targeted questionnaire distributed to families involved in school related projects at the end of Intervention B

Survey 2 was a more targeted survey than Survey 1 in that it was distributed specifically through the Skibbereen school communities after they had been involved in actions directly related to Intervention B. Consequently, this was used to determine the impact of such actions on attitudes to food waste.

Survey 2 focused on the impact that the development of the Young Chef Recipe Booklet had on the households of those children involved. Of those that participated in this survey, 71% had received a booklet with the largest age group to complete this survey (41%) being 35-44. This is a cohort of people who are typically difficult to engage with on food waste (due to busy lifestyles) so this was seen as a positive outcome. In the EPA's B&A survey, only 21% of this demographic responded (though that study did want a representative spread of ages).

Survey respondents were asked to estimate how much food they believe they throw away each week with the Survey 2 results (in blue) being very similar to the national B&A findings. Interestingly, those that claim they throw no food waste out was lower (4%) in Survey 2 (where people would have been made directly aware of food waste) than Survey 1 (15%) and the national study (7%).



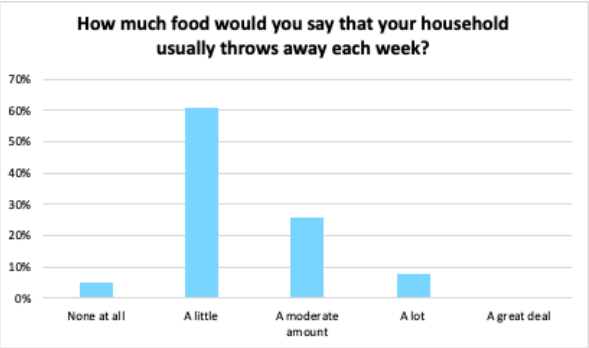


Figure 21: Survey 1 and Survey 2 responses regarding estimated relative quantities of food waste discarded each week

When asked if they had heard about 'Skibbeereen taking on Food Waste', 70% of respondents answered that they had. People were asked to describe how, in their household, the issue of food waste is addressed. 49% of people reported that it is "important to them - they are always trying to minimise it" with an additional 34% having taken some reduction measures and 12% wishing to do something about their food waste. This is an improvement on the national study where the corresponding numbers were 13%, 49% and 30% respectively. This suggests that the impact of the intervention is certainly positive.

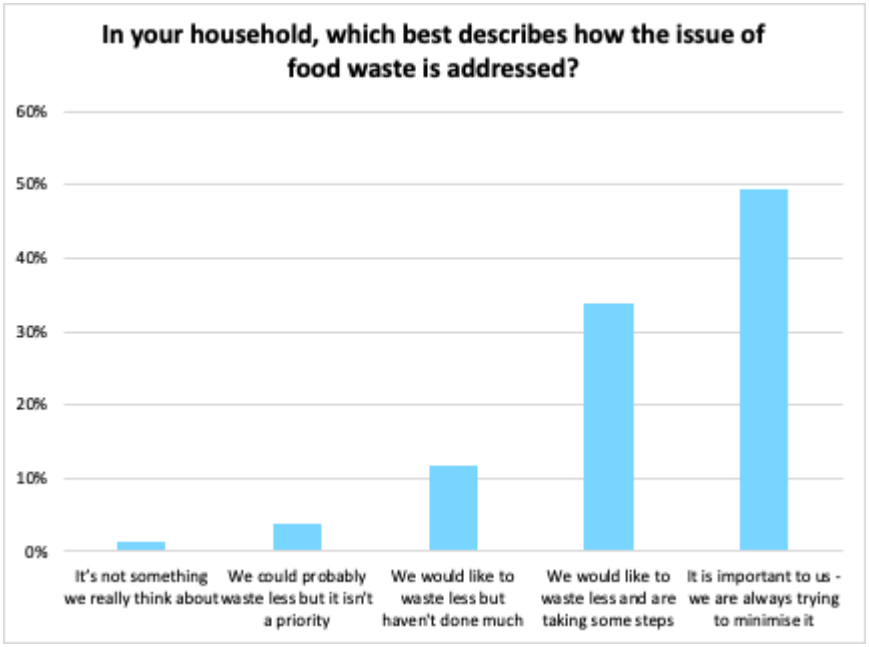


Figure 22: Survey 2 responses regarding how the issue of food waste is addressed in households

This is corroborated by the profiles shown in Figure 25 which show the level of reported concern people had for food waste before and after receiving the booklet. Prior to receiving the booklet, 40% of people expressed moderate concern and 22% "a lot". After the experience of their children receiving the booklet this had shifted to 22% of people expressing moderate concern and 39% "a lot". This result shows the possibility that the process of making the booklet informed this community and stimulated their interest and understanding of the issue of food waste.

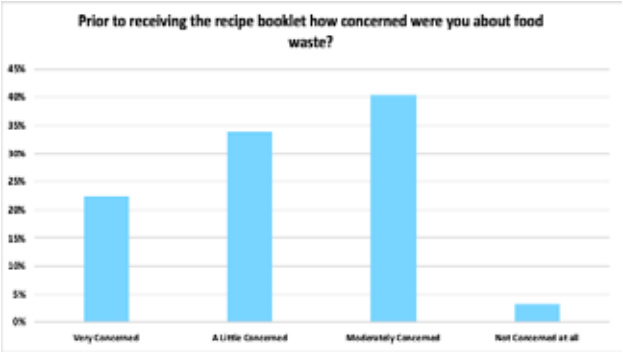


Figure 23: Survey 2 responses comparing the levels of concern regarding food waste before and after receiving the young chef recipe booklet

Survey 2 revealed that saving money is the largest motivator for avoiding food waste amongst the cohort surveyed. Similarly, in the EPA's findings from 2021, 77% of people said they were extremely/ moderately concerned about the waste of money caused by throwing out food[7].

65% of people reported that receiving the Young Chef Recipe Booklet had changed their view of food waste (as shown below). 100% of people reported that they will try the recipes in the booklet.

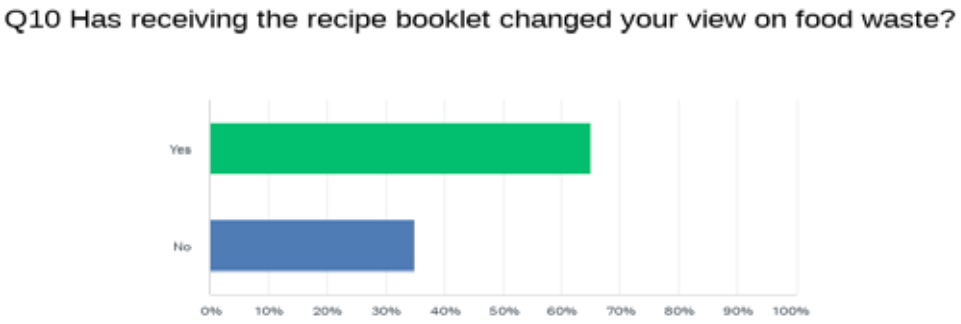


Figure 24: Survey 2 responses outlining whether peoples view of food waste changed since receiving the recipe booklet

In addition to the qualitative results, people were also asked what their thoughts on 'Skibbereen taking on Food Waste' was and below are some of the answers:

- "It's a great idea, it should be done in all towns, villages, townlands, households."
- "A brilliant initiative and the timing is spot on. People need to save money on their groceries now more than ever and like to do their bit for the environment too."
- "Great idea, should be spoken in all schools."
- "Very positive and raising awareness."
- "It's a good idea."
- "This is a great idea as it has started from primary school and the power of children to influence adult activities is very powerful."
- "It's great, children are very involved in the home and more aware and conscious of waste."
- "It's fantastic, very beneficial to the environment."
- "Great, already tried some recipes from the booklet."

While these are not conclusive findings, they do point to the positive impact associated with this locally based and targeted approach.Through fostering a collective interest in the topic of food waste and bringing it into households in an engaging and subliminal manner, this intervention appears to have engaged with the public in a positive way.

[7] "FOOD WASTE: Attitudes and behaviours in Ireland." https://www.epa.ie/publications/circular-economy/resources/Food-Waste-Attitudes-&-Behaviours-2021.pdf. Accessed 29 May. 2023

2.2.8.1.3 Semi-structured Interview with local facilitator

At the end of Intervention B, a semi-structured interview was held with the local facilitator who was also representative and Chairperson of Skibbereen Tidy Towns. She was asked a series of questions about 'Skibbereen taking on Food Waste' (questions asked are contained in the Appendix). The local facilitator was the main point of contact for the majority of the engagement actions applied during the latter phase of Intervention B and was in direct communication with each of the schools that created the Young Chef Recipe Booklet and completed the online Stop Food Waste Challenge.

She outlined that Tidy Towns lends itself well as a lead partner in household food waste interventions because improving the Tidy Town performance for the annual competition is a good motivation. Many Tidy Towns groups struggle with the sustainability aspects of their submission to the Tidy Towns and initiatives to deal with food waste are a good fit.

The local facilitator felt that the topic (food waste) does not attract interest and should be incentivised in some way. For example, a special award linked to food waste might be one way to incentivise actions. Similarly, providing a community-based toolkit around food waste with a variety of options for towns and stakeholders to consider could also be beneficial.

Online project management and meeting applications/tools are very useful. For participants who are involved on a voluntary basis, it is necessary to facilitate what best suits their needs and online meetings helps in this regard. Similarly, online PM tools help as all information is stored in one place and should people become uninvolved (as happens with community-based work) then information is not lost.

Considering what communication channels work best for interacting with the public, it was noted that while social platforms and print media are good, in-person interactions are still the most effective.

It is intended to expand and continue 'Skibbereen taking on Food Waste' into the future, updating the Young Chef Recipe Booklet year on year as well as generating an Irish language version with the local Gaelscoil. These activities will achieve sustained local impact associated with Intervention B.

2.2.9 Discussion

Intervention B, by its nature (i.e. a participatory community approach) proved more difficult and time consuming than Intervention A.

The biggest issue was the level of disruption that occurred throughout, affecting different aspects of the intervention application which meant that the local momentum required to activate a community to coalesce around a topic, never materialised. There was several different 'disruptions' worth noting:

- Social disruption - this intervention coincided with Covid which impacted on the level of community interaction (it was noted that the public were reluctant to show up to events even after restrictions were lifted). Additionally, the wider impacts of Covid on people's openness to change or take on new challenges cannot be underestimated.
- Project team disruption - staff turnover within the project team hampered the establishment of working relationships, and the trust that this brings about, between the local stakeholder groups and supporting researchers.
- Local stakeholder disruption - similar to the project team, there was turnover and changes in the local stakeholders involved. This occurred for numerous reasons including, personal health, lack of capacity, work not aligning directly with their interests, etc. Additionally, some key local stakeholders that were identified at the outset, did not engage. For any community based project, especially those involving volunteers (unpaid), this is to be expected.

The convergence of challenges outlined meant that local momentum was slow to build and, while the flexible nature of the initial plan was designed to invite stakeholders to contribute on their terms, the outcome was a lack of local ownership and intermittent working relationships.

Though involving several local stakeholders in such community approaches is essential, having a clear local project lead proved to be one of the most important factors to success in the later stages of the Skibbereen work (and this was missing at the outset). For addressing complex topics such as food waste, it is unrealistic to expect volunteers and community-based organisations that are not well resourced and/or have other priorities, to fully commit to such initiatives. Therefore, it is not only desirable but imperative to tie into existing initiatives and preferably fund that participation directly.

The timing of any community initiative will always be important but for Skibbereen, an area in West Cork that is highly impacted by tourism and seasonal fluctuations in population, this was especially noticeable. The original plan was to launch the initiative in October/November 2021 and have the intervention activities on the ground completed by June 2022 (the start of the main summer season). However, due to delays in starting (largely related to Covid), by the time momentum was beginning to build after the initial engagement work, the summer began and many of the stakeholders involved had other priorities to attend to. During this summer period people were slow to respond and partake in 'Skibbereen taking on Food Waste' and it was only after the summer season was over, and a dedicated local coordinator was in place, that successful intervention activities began to take effect.

The issue of food waste is a notoriously difficult topic to engage the public on. While there is an appreciation of the seriousness of the issue, thanks to the national publicity surrounding the topic, not many members of the public were actively interested in becoming involved in food waste-based activities. This reflects the 'value-action gap' which is common with many activities related to climate action[8] and was clear during the attempt at running the in-person Stop Food Waste Challenge when only one person turned up. At odds with this were the levels of interest when promoting home composting-based activities, which were generally well attended events (even though food waste prevention was incorporated into these events). These, which are more hands on and viewed as being practical, tend to be more engaging from the outset. However, once people start discussing and exploring food waste during these workshops, they become quite animated and more engaged in the topic.

An important aspect of this work was the invitation to local stakeholders to co-design initiatives of interest to them. This encouraged groups to choose what projects they would like to undertake locally to respond to the issue of food waste in Skibbereen as they understand it. For example, local partner organisation Cycle Sense has a strong ethos around reuse and the circular economy. They had mentioned at the beginning of the intervention period their interest in beginning to compost at their workshop which had been held back by a lack of funding and guidance. With input and assistance from the project team, they readily started their composting workshop series and used these as an opportunity to talk about food waste and brought the 'Skibbereen taking on Food Waste' banner to all events that they attended. This shows the longevity that the community approach can achieve.

Measuring the effectiveness of a community-based intervention such as that applied in Skibbereen was always going to be challenging. The project team, with input from the steering committee determined in advance that an evaluation of the average volumes of food waste produced per household should be an effective method, especially if a control area in the same general area was used as a reference. However, considering the size of the community assessed (over 400 households), and the many factors contributing to food waste generation at any one time, then this approach may have been unrealistic for short term evaluation. On the qualitative assessments used, while survey 1 (random evaluation of the attitudes of the public) took some time to generate responses, the targeted survey 2 was more effective in garnering responses quickly. However, for both surveys, before and after comparison were not possible as, to minimise bias, surveys were left to people to decide whether to participate in or not. In both cases (quantitative and qualitative) the assessment methods were developed by the project team and presented to the local stakeholders for their agreement. Possibly, through using a co-design process with local stakeholders, rather than presenting the project team's planned approach for agreement, may have resulted in a better, more innovative way being developed of assessing the effectiveness of the intervention.

The projects developed in the latter stages of the intervention by the local tidy towns group which targeted families through working with school children and teenagers in transition year proved to be very effective. While the project team were initially somewhat sceptical of this approach, the outputs and overall level of engagement, both during and after the projects, was noteworthy. This points to the importance of community led interventions as local stakeholders will typically have the insights and appreciation of the interest areas of the local community as well as the contacts to make actions happen.

[8] Ganglbauer, E.; Fitzpatrick, G.; Comber, R. Negotiating Food Waste: Using a Practice Lens to Inform Design. ACM Trans. Comput. Hum. Interact. 2013, 20, 1–25.

2.3 Overall Conclusions from Interventions

The overall conclusions from the two interventions are summarised here.

- Both interventions trialled were based on specific behavioural theories and, while there were successful outcomes in both cases, these should be viewed as building blocks for future work, which is needed when it comes to understanding how best to effect change when it comes to food waste.
- In a recent EPA study, it was found that Irish households threw away an estimated 221,000 tonnes of food waste in 2021, equating to about 120 kg of food waste per household or 44 kg per person per year[9]. The results generated through the detailed direct measurements carried out in both Ennis and Skibbereen suggest a higher level of food waste is being generated with values of ~240 kg and 300 kg respectively (equating to 80 and 100 kg pp annually respectively).
- For any future funding of community level interventions aimed at reducing food waste, it is recommended that established groups/organisations are invited to apply for funding to support interventions from a suite of options. A call that is too broad can lack focus. An inflexible set of initiatives may not appeal to the community and may ignore the specifics of a local context. Supporting such funded initiatives with established technical and organisational support (such as that provided by CTC who had run Stop Food Waste and been involved in other community-based projects) will help ensure the success of such projects.
- The short-term quantitative results from Intervention A in Ennis were quite positive and it appears that the improvements made (16% reduction in overall food waste per household) were sustained after 6 months. If this level of improvement was realised across the 1.2 million households in Ireland, this would equate to an annual reduction of 30,000 tonnes, reducing the volume of food waste generated by Irish households from ~ 218,000 tonnes to 188,000 tonnes.
- Intervention B in Skibbereen did not result in food waste reduction for the community involved, in the timeframe measured during the project. However, there were positive and well received engagement activities that took place, particularly in the latter stages once local momentum had been fostered. For example, by project end, ownership of the initiative by the local community had occurred, with plans to continue with 'Skibbereen taking on food waste', including for example, to continue with future editions of the schools' Young Chef Recipe Booklet.
- The qualitative assessment associated with Intervention A in Ennis was not effective. The project team deliberately did not interact directly with householders to minimise any bias that would be introduced through more sustained or personal contact. However, a more direct approach could have been used after the intervention was completed to better understand the self-declared changes in attitudes and/or behaviours observed.
- It is necessary to be mindful of the time of year when organising any food waste interventions aimed at householders. Busy Christmas and summer periods should be avoided as they do not reflect normal periods of household activities when information and interventions may take hold.
- For community-based intervention success such as intervention B, it is crucial that budget is set aside to cover people's time to manage and lead such projects. The success of community-based projects is often left to the great volunteer nature of those involved but, without a consistent and paid local project leader then the chances of success are much more limited. To this end, it is important that there is clarity about what funding is available from the outset. This provides clarity to prospective collaborators who may not have capacity to partake without funding or may be able to look to other avenues to cover overheads.
- Use of existing channels/initiatives - In both interventions, established networks were integral to the delivery of the interventions. In the case of Intervention A, the local waste collection company was a vital contributor and mechanism for the distribution of the food waste pack. In Intervention B, the well-established Tidy Towns group and local schools were suitable channels for public engagement. In both cases, the willing involvement of the private waste collection companies greatly facilitated the process of gathering useful and representative data by which the interventions were analysed.
- Food waste is a hard sell at times so combining with other, more tangible topics, helped. For example, in line with findings from other research, it was found that the topic of composting has broad public appeal, while food waste on its own is not a topic that most people are readily interested in[10]. This was shown to be the case during Intervention B where composting initiatives were well attended and training on food waste reduction was not well subscribed.

[9] "Food Waste Statistics for Ireland - Environmental Protection Agency." https://www.epa.ie/our-services/monitoring--assessment/waste/national-waste-statistics/food/. Accessed 17 August. 2023.

[10] Examining the Relationship between Consumers' Food-Related Actions, Wider Pro-Environmental Behaviours, and Food Waste Frequency: A Case Study of the More Conscious Consumer https://www.mdpi.com/2071-1050/15/3/2650.

APPENDICES

Appendix 1

(i) Waste descriptive statistics for mixed dry recyclables (MDR), food waste (FOOD), mixed waste (MW), and Total waste (MDR+FOOD+MW) for the intervention and control groups at household level per collection in kgs.

Kg food waste per household per collection								
Wave 1	Intervention (142 observations)				Control (137 observations)			
Variable	Mean	Std. dev.	Min	Max	Mean	Std. dev.	Min	Max
MDR	11.45	7.22	0.00	51.17	7.71	6.28	0.00	30.33
FOOD	4.01	4.28	0.00	20.50	3.80	4.38	0.00	24.00
MW	14.94	12.16	0.00	61.83	14.20	12.49	0.00	71.33
Total	30.40	16.03	1.50	87.33	25.71	16.40	0.00	83.00
Wave 2	Intervention (142 observations)				Control (137 observations)			
Variable	Mean	Std. dev.	Min	Max	Mean	Std. dev.	Min	Max
MDR	6.21	5.34	0.00	41.88	6.18	3.57	0.00	19.25
FOOD	3.48	3.98	0.00	19.67	3.90	4.30	0.00	23.67
MW	14.74	11.31	0.00	50.00	14.49	10.94	0.00	48.00
Total	24.43	15.08	0.00	84.71	24.57	12.82	0.00	61.08
Wave 3	Intervention (142 observations)				Control (137 observations)			
Variable	Mean	Std. dev.	Min	Max	Mean	Std. dev.	Min	Max
MDR	8.99	6.23	0.00	34.25	9.56	6.11	0.00	30.25
FOOD	3.44	4.01	0.00	17.75	4.30	5.02	0.00	29.25
MW	14.31	11.44	0.00	51.75	12.71	10.77	0.00	52.00
Total	26.74	15.64	0.00	87.25	26.57	15.33	0.00	72.50
Wave 4	Intervention (142 observations)				Control (137 observations)			
Variable	Mean	Std. dev.	Min	Max	Mean	Std. dev.	Min	Max
MDR	6.62	7.35	0.00	69.50	12.96	11.81	0.00	52.25
FOOD	4.51	4.85	0.00	18.50	6.97	5.81	0.00	36.50
MW	13.16	11.73	0.00	55.25	5.47	5.91	0.00	28.75
Total	24.29	17.31	0.00	102.50	25.40	16.07	0.00	85.50
Wave 5	Intervention (142 observations)				Control (137 observations)			
Variable	Mean	Std. dev.	Min	Max	Mean	Std. dev.	Min	Max
MDR	7.49	6.66	0.00	34.75	7.51	6.61	0.00	44.50
FOOD	3.32	3.90	0.00	15.50	4.09	4.90	0.00	23.25
MW	13.52	12.58	0.00	56.25	18.23	9.64	0.00	28.00
Total	24.32	17.69	0.00	93.75	29.82	11.13	0.00	72.25

(ii) Table: T-tests of within group differences in mean food waste across waves, considering only food waste in food waste bins (panel a), and for total food waste, also including food waste in MDR and MW (panel b)

	(1)		(2)		(3)	
	Intervention group differences		Control group differences		Between group differences	
(a)	t-test	p-value	t-test	p-value	t-test	p-value
Wave 1 - Wave 2	2.29	0.01	-0.43	0.66	1.96	0.03
Wave 1 - Wave 3	1.99	0.02	-1.64	0.94	2.57	0.00
Wave 1 - Wave 4	-1.93	0.97	-5.12	1.00	4.03	0.00
Wave 1 - Wave 5	2.21	0.01	-0.52	0.69	1.57	0.06
(b)						
Wave 1 - Wave 2	3.20	0.00	0.19	0.42	1.94	0.02
Wave 1 - Wave 3	3.55	0.00	0.79	0.21	1.70	0.04
Wave 1 - Wave 4	1.21	0.11	-0.45	0.67	1.03	0.15
Wave 1 - Wave 5	3.48	0.00	-2.33	0.98	3.96	0.00

(iii) Table: T-tests of equality of mean food waste between control and intervention groups (between groups analysis)

	t-test	p-value
Wave 1: FOOD control > FOOD treatment	-0.44	0.20
Wave 2: FOOD control > FOOD treatment	0.83	0.65
Wave 3: FOOD control > FOOD treatment	1.57	0.05
Wave 4: FOOD control > FOOD treatment	3.84	0.01
Wave 5: FOOD control > FOOD treatment	1.46	0.07

Appendix 2 'Skibbereen taking on Food Waste' Logo

Appendix 3

Press Release for 'Skibbereen taking on Food Waste'

Skibbereen taking on Food Waste Today!

Reducing food waste is acknowledged as one of the main climate actions that householders can take on a daily basis. Not only does cutting food waste reduce Greenhouse Gas emissions, through more local and seasonal food purchases we can help the sustainability of our local communities.

In response to this, a diverse local group came together in January 2022 and has now planned a series of events and activities under the banner, **'Skibbereen taking on Food Waste'.** This initiative, which will work with local groups and events, is being supported through an EPA funded research project called FoodPath. Led by the Clean Technology Centre (CTC) at Munster Technological University, the project aims to address food waste in Ireland in line with the UN Sustainable Development Goals. This community initiative aims to identify, in a place-based way, how food waste projects in Ireland can effectively help reach national and international reduction targets.

On **Saturday March 26th**, the group kick things off with a food waste awareness stall at Skibbereen Farmers' Market and local supermarkets. This will allow people and groups to learn more about the initiative and how they can become involved – we will also have some food waste prevention goodies available free of charge - so keep an eye out! In order to gain a better understanding of the food waste situation in Skibbereen we will have a householder survey which we would like people to fill in (available on paper or online). There are prizes up for grabs for anyone who fills in the survey which will be open for a two week period.

From there, we will engage with members of the public through a variety of public events, including an upcoming **food waste and composting workshop** with Donal O' Leary (**at CECAS, Myross Wood House on Sunday April 10th from 11am - 1:30pm, free event, lunch included**).

Next, there will be the **Cycle Buffet as part of Bike Week** (May 14-22) which will include a food waste theme. Then it is hoped that the group will publish an intergenerational community publication which will tie in with History Day. Stay tuned (e.g. to local media and community publications) for more events and activities taking place over coming weeks and months

The **'Skibbereen taking on Food Waste'** initiative is about supporting anyone or any group that wants to get involved. It is hoped that the actions outlined above will act as a springboard for more local initiatives on food waste prevention and reduction. Businesses and organisations are invited to get involved. So if you have an idea, or just want to learn more, please contact sarah.oconnor@ctc-cork.ie

The following infographic was produced by Hazel Hurley Design and illustrates the discussion at the first stakeholder meeting. Anyone who is interested is welcome to join the group.

Globally, it's estimated that one third of all food produced for human consumption is wasted. Wasting food means wasting all the energy and resources that went into producing it. This waste contributes to climate change.

Appendix 4 Posters used for Skibbereen Stall Promotion

Appendix 5 Skibbereen Questionnaire

foodpath

ENNIS QUESTIONNAIRE

Introduction

Be in with a chance to WIN a €100 one4all voucher by just completing this survey. In May you received a FoodKit to try to help you tackle food waste in your home. From May 18th until June 22nd you received texts giving tips on how to use each item in the kit. The following survey is to hear your opinions about the Food Kit.

The data collected from this survey will be used for statistical analysis and to inform policymakers and future research. The survey should take approx. less than 10 minutes to complete. Your participation is voluntary, and your responses will remain strictly confidential and anonymous. Thank you for your time.

Q1	Did you find that the food kit helped you during the previous 6 weeks? Yes No	
Q2	At home, do you currently separate your food waste from other household waste (e.g. with a brown kitchen caddy)? Yes No	
Q3	If yes, did you separate your food waste before receiving the kit or did the kit influence you to start separating your food waste?	
	1.Yes, I have always separated my food .	
	2. I started separating my food after receiving the kit.	
Q4	When it comes to food waste, do you think you are more concerned, less concerned or at the same level of concern since you received the food kit?	
	1. More Concerned. 2. No Change 3. Less Concerned.	
Q5	Do you think the level of food waste you throw away has lowered in the previous 6 weeks? Please select one.	
	1. Yes, by a little. 2. No. 3. I don't know.	
Q6	Up to 30% of the waste in the average household bin consists of food. Do you think you are below, above, or in line with this average?	
	1. Above average. 2. In line with the average. 3. Below average.	
Q7	How would you personally rate yourself on a scale of 1 -10 at managing food waste, with 1 being poor and 10 being fantastic?	
	0 1 2 3 4 5 6 7 8 9 10	
Q8	What types of food do you throw out in your household most often? Please rank your top four answers 1 - 3, with 1 as the most commonly wasted item.	

Bread/bakery	Store-cupboard dried ingredients (e.g. rice, pasta, flour,
Vegetables	lentils,
Fruit	Store-cupboard canned/jar food products
Meat/fish	Frozen food
Dairy	Potatoes
Salad	Breakfast cereals
Eggs	Other (please specify)

Q9	Which of these food issues most concern you? Please rank your top three answers 1 – 3, with 1 as the issue that concerns you the most.	

The cost of food	Food miles - the distance that food travels
Wasting food	ingredients in food (e.g. salt, fat, sugar, additives)
How long fresh food lasts for	Food poisoning (e.g. Salmonella, E. coli)
The way that food products are packaged	Genetically Modified (GM) foods
Supermarkets running out of food	The welfare of animals
Food product labelling (e.g. 'use by' date, storage	No concerns
instructions)	Other (please spec

Q10	Do you do any of the following before you go shopping since receiving th
	Checked what was already in the fridge to see what I needed to buy.
	Checked what was already in the cupboards to see what I needed to buy.
	Checked what was already in the freezer to see what I needed to buy.
	Made a list of the food I needed to buy. Planned most of the meals I/we w

foodpath

ENNIS QUESTIONNAIRE

Q11	Which object in the food kit did you find most helpful?	
	Measuring Scoop.	
	Silicone Lids.	
	Fridge Thermometer.	
	Freezer Labels.	
	Pocket Guide.	
	Shopping List Magnet.	
Q12	Which object in the food kit did you find least helpful?	
	Measuring Scoop.	
	Silicone Lids.	
	Fridge Thermometer.	
	Freezer Labels.	
	Pocket Guide.	
	Shopping List Magnet.	
Q13	Which object(s) in the food kit will you definitely continue using?	
	Measuring Scoop.	
	Silicone Lids.	
	Fridge Thermometer.	
	Freezer Labels.	
	Pocket Guide.	
	Shopping List Magnet.	
Q14	Did you find the texts useful	
	Yes. No.	
Q15	Please indicate your gender: Male Female Non-Binary Third Gender.	
Q16	Who in your household is responsible for most of the food shopping?	
	Me.	
	Someone else.	
	Both me and other people.	
Q17	What age are you?	
	Between 25 and 34.	
	Between 35 and 44.	
	Between 45 and 54.	
	Between 55 and 64.	
	Between 65 and 74.	
	75+	
Q18	How many members of your family (including yourself) live in the same household?	
Q19	Which of the following options best describes the house in which you live?	
	Apartment Block.	
	Terrace.	
	Detached House.	
	Semi-Detached House.	
	Town House.	

Thank you again for your time and responses

If you'd like to go into the draw to win a 100 euro gift voucher enter your details below (all information will be kept private).

Appendix 6 List of Skibbereen Activities

Activity	Date activity took place
Information Stands – Farmers' Market & Lidl	26th March 2022
Podcast featuring 'Skibbereen taking on Food Waste'	26th March 2022
Composting Workshop	10th April 2022
Initial Waste Survey	24th April 2022
Promotional Videos	May 2022
Information Stand - Carbery Show	21st June 2022
First drafts of recipe booklet	September 2022
Reuse week with Cycle Sense	October 2022
Stop Food Waste Challenge	15th November - 6th December 2022
Stop Food Waste Challenge online with TYs	January 2023
Young Chef Recipe Booklet release	14th February 2023
Information talk about food waste to TYs	27th February 2023
Final Waste Characterisation	28th March 2023
Blog post by TYs	24th April 2023

The map below shows, in red, the households where waste was collected from, and in blue, the 7 locations of the intervention activities. Note, on the top right of the picture, the location of the composting workshop, about 9 km from the town of Skibbereen. The descriptive statistics of composting, dry recyclables and residuals was calculated for households within 0.5 km from each of the food waste information locations before and after the activity took place to assess the local impact of the initiatives. As an example of the geocoding analysis, the map in Figure 18 shows in light blue the households within a 0.5 km radius from the Abbeystrewry National School.

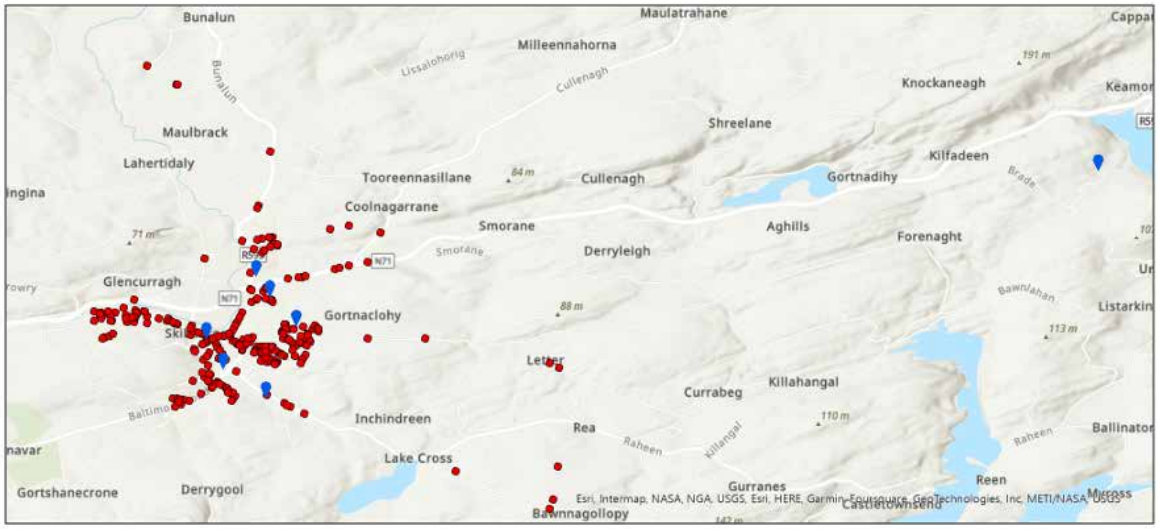


Figure 25: Spatial distribution of households where waste data was collected from (in red) and the intervention outreach locations (in blue)

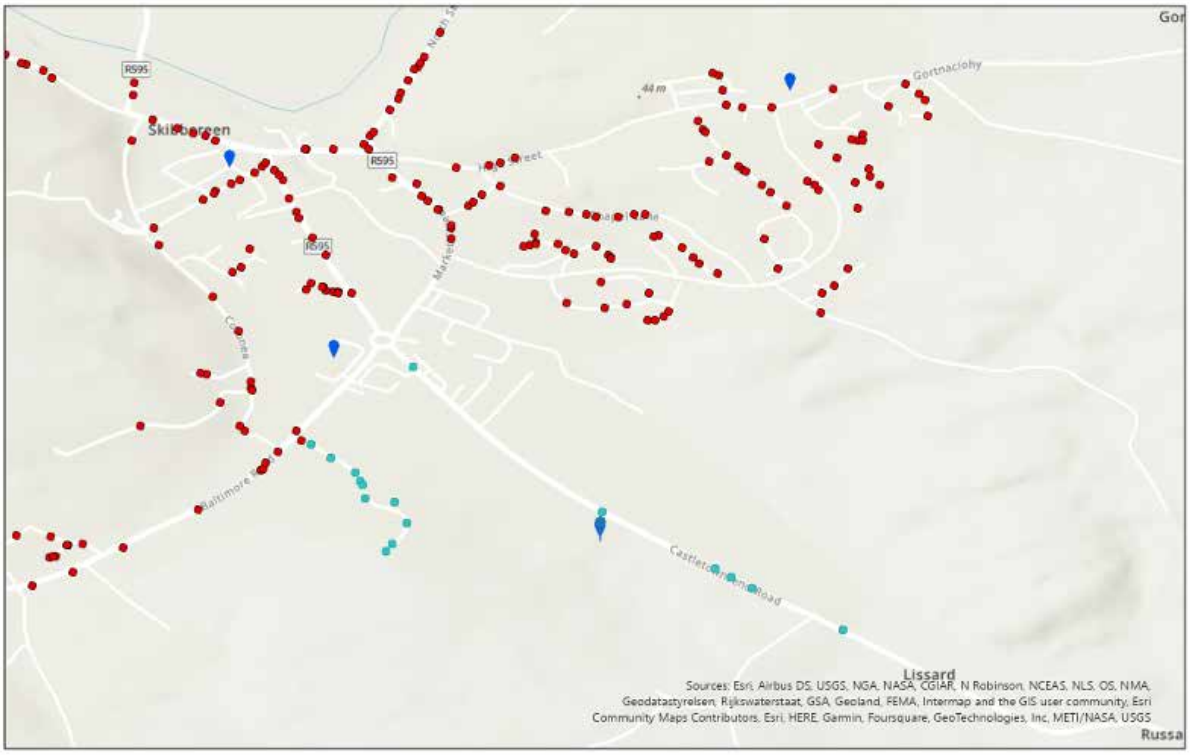


Figure 26: households within a 0.5 km radius from the Abbeystrewry National School are shown in light blue

To compare the waste data before and after the information campaign at Abbeystrewry National School and St. Patrick's Boys National School, we looked at the data from waste collections 13, 14, and 15 (corresponding to waste collections during this activity). The impact of the information campaign around Skibbereen Community School is examined by looking at the waste data from waste collections 15 and 16 (again, corresponding to waste collections during this activity). This analysis does not show particular differences in compost waste before and after the information campaign.

Table 8: analysis of waste data from households within 0.5km of the schools involved in the activities carried out during intervention B

Abbeystrewry National School and St. Patrick's Boys National School information campaign impact										
		Compost			Dry recyclables			Residual		
Waste collection	House holds	total	mean	median	total	mean	median	total	mean	median
13	40	161.00	9.47	9.00	265	7.16	6.00	603.00	17.74	14.00
14	40	160.40	9.44	8.10	403	10.33	8.50	651.00	18.08	14.50
15	43	152.00	10.86	10.00	344	8.39	8.00	717.00	18.38	13.00
Skibbereen Community School information campaign impact										
		Compost			Dry recyclables			Residual		
Waste collection	House-holds	total	mean	median	total	mean	median	total	mean	median
15	56	166.50	9.25	10.25	409.00	7.72	7.00	874.00	20.81	15.50
16	58	215.00	10.24	10.00	521.00	9.14	8.00	859.00	17.90	13.00

Similar analysis was carried out for the other physical activities carried out during the intervention. From the analysis of waste data from households within 0.5 km of these main interventions, before and after each, the evidence found did not provide any conclusive results.

Appendix 7 Poster to advertise Stop Food Waste Challenge

Appendix 8 The bookmark developed to accompany the booklets

Appendix 9 Images of Skibbereen Tidy Towns and Cycle Sense promoting National Leftovers Day

Appendix 10: Skibbereen Taking on Food Waste on Cycle Sense and Skibbereen Tidy Towns webpages

In case you haven't seen it already, here is the link to the online issue. Issue 2 is currently being compiled and will include recipes in Irish from students of Gaelscoil Dr. Uí Shúilleabháin. A small team of TY students from Skibbereen Community School will assist with translations, design and layout during Social Placement week later in April. 'Tá ocras orainn' thinking about the mouthwatering recipe creations we have collected from the school.

Leading up to National Leftovers Day on 26 December, *'the second most yummiest day of the year'* we ran a social media campaign of tips to manage our food waste in the days leading up to the day. This was a successful event since a number of followers mentioned to our committee members how useful they found the tips. Since 26 December comes around every year we include all the tips here for future use.

Appendix 11 Raw Data from Skibbereen

Reported below are the descriptive statistics and box plots for the three waste streams: compost, dry recyclables, and residual waste.

(i) Compost

Compost waste (kg)							
Date	Waste collection	Mean	median	Max	Min	Standard Deviation	Households
01/02/2022	1	6.99	6.50	23.50	0.50	3.76	157
15/02/2022	2	7.21	7.00	23.50	0.50	3.48	149
01/03/2022	3	6.71	6.00	27.00	1.00	4.55	177
15/03/2022	4	7.07	7.00	26.00	2.00	3.86	151
29/03/2022	5	6.93	6.60	19.60	1.60	3.19	182
12/04/2022	6	6.62	6.00	23.00	1.00	4.06	148
26/04/2022	7	7.42	6.50	27.00	1.00	3.97	143
10/05/2022	8	8.14	7.20	32.10	2.00	4.84	129
11/10/2022	9	11.34	10.50	33.50	4.50	4.74	125
25/10/2022	10	10.92	10.00	44.50	2.00	6.60	96
08/11/2022	11	9.57	9.25	32.50	1.00	4.88	136
23/11/2022	12	9.55	8.50	29.00	1.00	5.95	183
31/01/2023	13	10.14	9.50	39.00	1.50	4.89	124
14/02/2023	14	9.09	8.10	33.90	1.50	4.70	140
28/02/2023	15	10.93	10.00	36.50	0.00	5.97	99
28/03/2023	16	10.11	9.50	32.50	2.00	5.28	113
Total		8.46	7.80	44.50	0.00	4.92	2,252

(ii) Dry Recyclables

Dry Recyclables waste (Kg)							
Date	Waste collection	Mean	median	Max	Min	Standard Deviation	Households
01/02/2022	1	9.80	8.00	68.00	0.00	7.65	344
15/02/2022	2	9.18	8.00	60.00	1.00	6.59	331
01/03/2022	3	8.60	7.00	56.00	1.00	6.26	349
15/03/2022	4	9.06	8.00	51.00	0.00	5.47	329
29/03/2022	5	10.83	9.00	70.00	1.00	6.69	350
12/04/2022	6	10.03	8.50	49.00	1.50	6.13	287
26/04/2022	7	10.27	9.00	70.00	0.00	5.97	341
10/05/2022	8	11.40	10.00	63.00	1.00	7.41	324
11/10/2022	9	9.14	7.00	60.00	0.00	6.98	335
25/10/2022	10	9.50	7.00	98.00	1.00	9.03	349
08/11/2022	11	10.16	8.00	95.00	1.00	8.61	339
23/11/2022	12	10.02	8.00	82.00	0.00	8.58	363
31/01/2023	13	8.12	6.00	87.00	1.00	8.32	328
14/02/2023	14	10.74	8.50	86.00	0.00	8.62	342
28/02/2023	15	8.39	7.00	62.00	0.00	7.05	340
28/03/2023	16	9.15	8.00	93.00	1.00	8.14	339
Total		9.65	8.00	98.00	0.00	7.48	5,390

(iii) Residual Waste

Residual waste (kg)							
Date	Waste collection	Mean	median	Max	Min	Standard Deviation	Households
01/02/2022	1	17.27	14.00	76.00	1.00	13.08	310
15/02/2022	2	17.46	14.00	102.00	1.00	14.35	301
01/03/2022	3	15.81	12.00	63.00	1.00	10.81	304
15/03/2022	4	18.10	14.00	124.00	0.00	15.66	309
29/03/2022	5	17.21	14.00	86.00	1.00	13.49	314
12/04/2022	6	16.89	15.00	72.00	0.00	11.94	295
26/04/2022	7	18.63	15.00	94.00	1.00	14.90	314
10/05/2022	8	17.58	14.00	81.00	1.00	13.08	301
11/10/2022	9	16.45	13.00	79.00	0.00	12.92	305
25/10/2022	10	16.67	13.00	77.00	1.00	13.16	315
08/11/2022	11	18.88	15.00	89.00	2.00	14.38	300
23/11/2022	12	19.44	16.00	90.00	0.00	14.83	338
31/01/2023	13	17.19	14.00	119.00	0.00	13.72	289
14/02/2023	14	19.40	15.00	103.00	0.00	15.92	317
28/02/2023	15	17.84	15.00	75.00	0.00	13.91	309
28/03/2023	16	17.52	14.00	69.00	1.00	13.14	309
Total		17.66	14.00	124.00	0.00	13.80	4,930

Appendix 12 Semi-structured interview questions

- In terms of 'Skibbereen taking on Food Waste', what worked well?
- What could have been better?
- What was your motivation to get involved in this research?
- If a local community approach to reduce food waste were to be conducted elsewhere, what kind of approach would you recommend?
- In your view, is the Tidy Towns a suitable partner for such an intervention?
- What would encourage engagement with other local stakeholders in Skibbereen?
- In Skibbereen, what barriers to action are there in terms of managing household food waste?
- How would you target "young wasters" (young people, young families or single person households who typically generate high levels of food waste)?
- Do you think that 'Skibbereen taking on Food Waste' will have some continuity in the future? If yes, how would you like this to be sustained?
- Do you think Covid impacted the outcomes of this intervention? If yes, how?
- What communication channels work best in Skibbereen in terms of getting word out about activities such as Skibbereen taking on Food Waste?
- From a project management point of view, which methods of communication did you find most useful (e.g. Zoom calls, in-person meeting, use of Basecamp, etc.)?

foodpath

Preventing Household Food Waste

The design of consumer focused food waste prevention interventions in Ireland.

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