The Association of Packaging Technology and Research (PTR)
Satu Jokinen & Virpi Korhonen

RINSE, SORT AND STORE

Findings of a Finnish Package Sorting Study

PTR report 61
2015

ISBN 978-951-8988-48-2 (PDF)

The report is based on a paper presented at the 27th IAPRI Symposium on Packaging 2015, June 8-11, Valencia, Spain

PAKKAUSTUTKIMUS – PTR
Association of Packaging Technology and Research

ISBN 978-951-8988-48-2 (PDF)
ISSN 1235-4546

Pakkaustutkimus – PTR ry
Ritarikatu 3 b A 2
FIN-00170 Helsinki
Finland

www.ptr.fi

Abstract

In Finland, a new Packaging and Packaging Waste Act was adopted on July 3rd 2014, setting new producer obligations for packaging waste reception and recycling rates. The largest reform concerns the collection of plastic packaging from the beginning of 2016. From the consumer's point of view, the new legislation will increase the number of fractions sorted at home.

The objective of this study was to gain understanding of household sorting behavior and experiences, material identification and composition and purity of sorted fractions.

A total of 40 households sorted all their packaging waste (excluding deposit bottles) during one week. Families with children (N=21) in September 2014, and singles (N=9) and couples (N=10) in January 2015. The participants were provided with precise sorting instructions and waste bags: white bags for cardboard and paper, black bags for plastic, and purple bags for other materials. In addition, two large waste sacks were submitted for pickup. The sacks were collected from the families, and each packaging fraction was sorted and weighed individually.

The average amount of packaging waste generated in the study was 29.6 kg per person per year. The ratio of the materials were: cardboard and paper (47%), rigid plastics (23%), flexible plastics (7%), glass (15%), aluminum (5%), and metal (3%).

The majority of the packages, including milk, juice and yogurt cartons, were very clean. Single serving plastic cups had some traces of food waste, mainly on the collar. Cat food packaging (e.g. standing pouches) was mainly unwashed and had therefore contaminated the whole batch. Consumers had some difficulty differentiating paper and plastic, for example with single packaged ice cream flow packs.

Keywords: household, package, sorting, recycling, waste, consumer research.


PIRKKA
Omenatäysmehu

RINSE, SORT AND STORE
Findings of a Finnish Package Sorting Study

Abstract

Content

1. Introduction

In Finland, a new Packaging and Packaging Waste Act was adopted on July 3rd 2014, setting extended producer obligations for packaging waste reception and recycling rates. The largest reform concerns the collection of plastic packaging from the beginning of 2016.

From the consumer's point of view, the new legislation will increase the number of fractions sorted at home. Until now, depending on the community, consumers could already sort their waste up to seven different fractions: paper, cardboard, glass, metal, bio waste, energy waste and mixed waste, plastics pertaining to the last two. It is uncertain how the public will adopt separate packaging fractions and whether the purity of the new plastic packaging fraction meets the requirements of efficient recycling.

Waste analyses can be used in part to estimate the total amount of packaging waste generated in a country. These are mainly mixed waste analyses that have been unreliable due to their disparate objectives as waste studies. Further, packaging found in mixed waste has either been contaminated with other waste or can contain residual food and humidity. Since packages are produced ever lighter, these factors may have a more considerable impact on the measured weights than suggested in the studies that have been carried out. In this study, the focus was on household packaging waste, excluding industry and service sectors of the market.

The objectives of this study were the following:

1. To gain understanding of household sorting behavior and experiences, such as
   a. packaging material identification and difficulty therein
   b. the composition and purity of sorted fractions

2. To develop (a) research methodology for estimating the total amount of packaging waste generated by households.

2. Methods

A total of 40 households in the Helsinki metropolitan area were recruited to sort all their packaging waste for the duration of one week. Families with children (N=21) participated in September 2014, and singles (N=9) and couples without children (N=10) in January 2015.

The participants were provided with precise packaging sorting instructions and different waste bags for three fractions: white bags (2 pcs) for cardboard and paper, black bags (2 pcs) for plastic, and a purple or green bag for all other materials. In addition, two large waste sacks were submitted for pickup. The instructions elaborated on examples of packaging of these fractions to help with sorting. The instructions also stated clearly that deposit bottles and cans were excluded from the study. Participants were instructed to empty and rinse the packaging prior to sorting, if necessary.

In September, the families also participated in an online research community study focusing on ready meals and preferences for packaging. Questions about the sorting experiences were included in the community topics. In January, a questionnaire regarding the sorting experiences was collected during the waste sack pick up. The families were rewarded with a gift card, and the singles and couples received a box of chocolates.

The large sacks were collected and numbered, and each sack and packaging fraction was weighed individually. Some packaging was submitted as is, such as large cardboard boxes. The waste bags collected from the families in September were opened and laid out in numbered areas on the floor of a storage facility for content analysis (Figure 1).

Purity of fractions and missorted packaging were noted, and packaging was arranged in piles by materials to be photographed. Furthermore, plastics were separated to flexible and rigid and weighed again to determine their ratio. Some of the yogurt cartons were selected at random and weighed to determine the amounts of residue.

In January, the waste bags were weighed and then opened one by one and discarded after qualitative analysis and separating the rigid plastics from flexibles. Packaging containing visible residue or that were clearly difficult to clean were chosen to be weighed individually. These were then cleaned, dried and weighed again to produce examples of residue correction factors.

The waste bags and sacks had been counted and weighed and their weights were deducted from the waste results as provided materials. Packaging weighing more than 1 kg were also deducted from the results as the frequency of such packaging consumed in a year was impossible to determine. Packaging waste results per week were then calculated to represent results of packaging waste generated per year (52 weeks). The results were weighed to correspond to the ratio of household types in Finland.

Figure 1: Sorted packaging waste laid out by family in September 2014.

3. Results

3.1 Amounts of Packaging Waste

In the study, the average amount of packaging waste generated by the 40 participating households was 29.6 kilograms per person per year. The histogram of the amounts of packaging waste registered in the study shows most households generated less than 40 kg/p/a (Figure 2).

The families generated less waste per person than singles and couples. The average amount of packaging waste for families was 26.6 kg/p/a, for couples 28.9 kg/p/a, and for singles 37.3 kg/p/a.

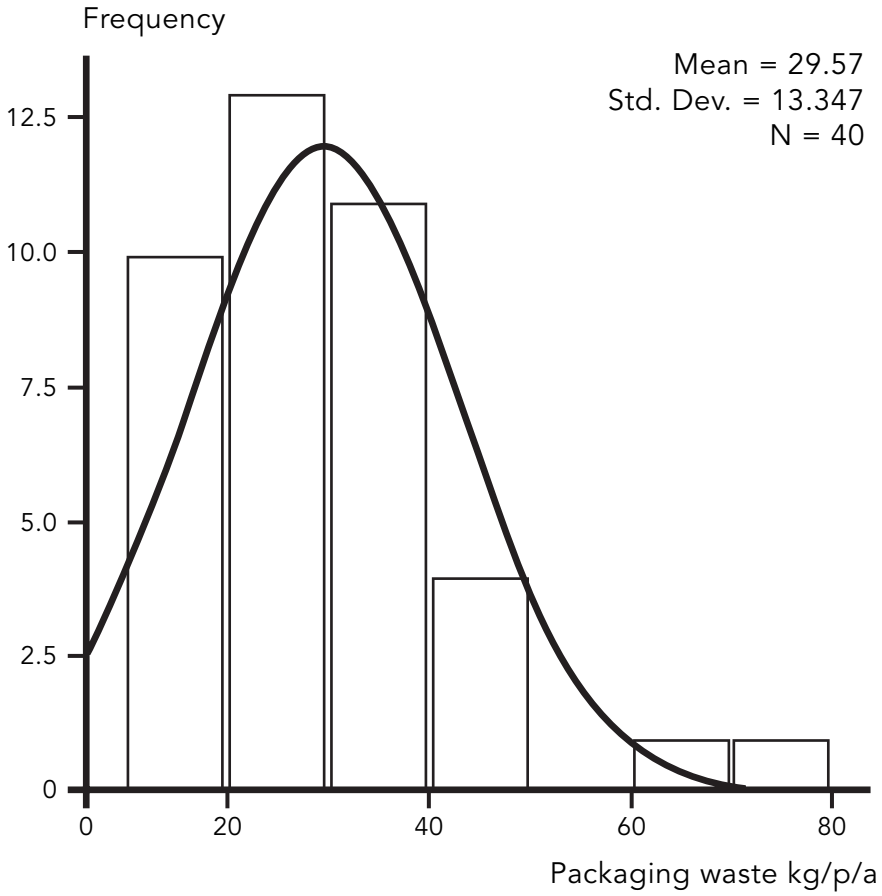

Figure 2: Frequencies of packaging waste amounts generated in the study.

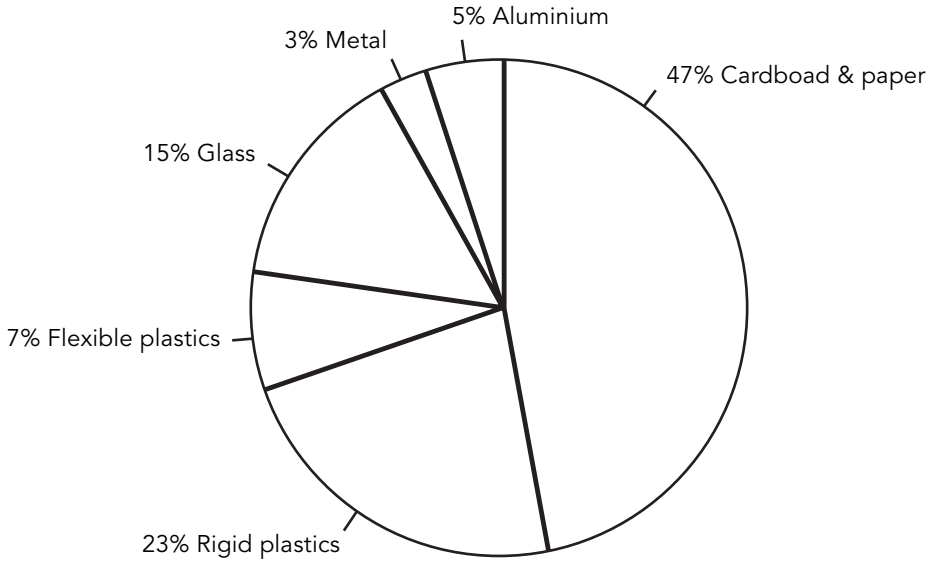

Figure 3: The ratio of the fractions by weight.

Figure 3 shows the ratios of the fractions of packaging waste in the study. Cardboard and paper fraction constituted 47% (13.7 kg/p/a) of the packaging waste generated in the study. Rigid plastics generated the second largest fraction at a 23% ratio (6.6 kg/p/a/), and glass placed third at 15% (4.3 kg/p/a). Flexible plastics were light and accounted for only 7% (2.2 kg/p/a), aluminum 5% (1.7 kg/p/a), and other metals only 3% (0.9 kg/p/a). Altogether, plastics constituted 30% (8.8 kg/p/a) of the packaging waste generated in the study. However, in volume plastics formed as large a fraction as cardboard and paper packaging. For instance, also in the volume example in Figure 4, half of the plastic fraction was flexible plastics.

In Table 1, the results of the study are presented for each fraction by household type in Finland. The total amount of packaging waste generated by households in Finland was calculated to have been 31.7 kg/p/a [1]. With the population of 5 471 753 in 2014 [2], the total amount of consumer packaging waste generated by households would have been 173 455 tons. Out of this total amount, plastic packaging waste (30% of the total amount) would have been 51 434 tons.

Figure 4: An example of volumes of packaging fractions in the study.

Table 1: Fraction results per household type, all households, and calculated to present Finnish households [1].

	All amounts kg/p/a				
Fraction	Singles	Couples	Families	All	**Finland**
Cardboard and paper	14.5	13.2	13.6	13.7	**13.8**
Rigid plastics	8.5	4.9	6.7	6.6	**6.9**
Flexible plastics	2.6	2.8	1.8	2.2	**2.5**
Glass	8.7	4.7	2.3	4.3	**5.8**
Metal	0.5	2.1	0.5	0.9	**1.0**
Aluminium	2.5	1.2	0.9	1.4	**1.7**
Altogether	37.3	28.9	25.8	29.6	**31.7**

3.2 Sorting Behaviour and Experiences

The participants were quite successful in their sorting. Mistakes were made in distinguishing plastics from paper, in such packages as plastic ice cream flow packs that had a paper feel. Also some bags for potato chips with aluminium foil had ended up in plastics, although similar materials in (yogurt) cup lids were mostly correctly sorted to other materials. A small amount of waste that were not packages were also occasionally sorted in the waste bags, such as air balloons, strings, paper towels and gift (wrapping) paper. A single glass deposit bottle had also been sorted to glass, even though such bottles were outside the scope of the study.

> *"Perhaps the greatest challenge was the identification of different materials, and making a decision in cases where packaging consists of more than one material."*

In general the sorted packaging waste was very clean (Figure 5), but a distinctive problem for recycling was clearly cat food pouches. Some of these standing pouches were still half full. Mostly they still had a lot of food left in them but had contaminated all the packaging waste sorted in the same waste bag. In addition to this, some residual foodstuffs were mainly found in the collars of plastic cups.

Most participants stated that they and their families coped well with sorting according to the instructions provided. They said they had already become accustomed to such sorting behavior, but some of them were surprised to see how much packaging waste they generated now that all of it was sorted separately. Some wondered if they had consumed more than usual, some less. Some were surprised by the amount of plastic packaging waste they had generated, and others by the amount of cardboard packaging waste.

> *"The family responded positively. The children were already well acquainted with the topic at school."*

Figure 5: Sorted plastic packaging waste in September 2014.

> *"The study went well. A few times I had to remind the children. I printed dyno-labels for the trash containers, for the type of waste."*

> *"Sorting was very easy. During the week I imagined that there would be much waste, but the end result was moderate. A large amount of cardboard in relation to others was a surprise."*

The participants either stated they experienced no difficulties sorting or that they had several issues. These issues were, recognizing materials, remembering to sort and to sort only packages, cleaning the packages and lack of space to sort and keep the waste for the duration of the week. In addition, the participants mainly stated they gladly sorted the packaging and they felt providing material for recycling was well worth the effort.

"Our only challenge was storing the waste, now they were in the corner of the kitchen floor."

The participants were also asked whether they would implement this sorting behavior if the packaging waste (incl. plastic) recovery point was located at the local shops. Most said they would, but many of them added they wished the collection facilities would be located closer to home or even in the yard where waste collection is already arranged. Only a couple of participants stated it would be too much trouble to carry packaging waste to the closest shop, especially as they usually bought groceries on their way home. Another problem stated was lack of space to store the volumes of packaging waste considering their shopping frequency.

"Probably would not sort, if the packaging should be taken to the nearby shop. I usually shop after work, so this wouldn't happen easily or often enough. Also despite rinsing some of the food packaging will inevitably begin to stink, and keeping them at home for e.g. a week is not desirable. If, instead, the packages could be taken to the apartment complex recycling facilities like other waste, then participation would not be a problem."

4. Conclutions

According to this study, the total amount of packaging waste generated by Finnish households in 2014 was 31.7 kg/p/a and 173 455 tons/a. The Helsinki Region Environmental Services Authority reported 56 kg/p/a (303 351 tons/a in Finland [3]) in a mixed waste study conducted in 2012 in the Helsinki capital area [4]. The reported amount represents the amount of household packaging waste in mixed waste, while the results of this study attempted to represent all packaging waste, excluding only deposit packaging. This also covers the packaging that would have been sorted and recovered for material recycling in other waste fractions.

However, mixed waste totals contain residue from foodstuffs and humidity to some extent. In their manual for mixed waste analyses, the Swedish RVF Utveckling present correction coefficients for estimating the humidity and residue in packaging waste [5]. If these coefficients were applied (for plastics, cardboard & paper 0,56, metal 0,65 and glass 0,95) the amount of packaging waste in mixed waste reduces from 56 kg/p/a (303 351 tons) to 33.7 kg/p/a (182 900 tons/a) [4]. This reduction of 40 % brings the results of these studies closer. Yet, considering the waste fraction representations, the results of this study seem low.

In conclusion, either the correction coefficients are not sufficient or this study was not successful in recovering all said packaging waste. It may be that participants didn't submit all their packaging for one reason or another. At least one participant had confessed to having sorted some packaging to mixed waste during the study. They stated they couldn't be bothered to rinse yogurt and sourmilk cartons. It shows that consumers may rationalize with packaging that is too tricky to wash up and with wasting resources (water, electricity) and money. From this it was concluded that in the future the mixed waste should also be taken into account when conducting such a study, if possible.

Deducting irregular and large packaging from the results also affected the amounts in this study, but a reliable frequency of consumption should be researched before they can be taken into account. Furthermore, calculating a total for the entire country from results from the capital area has its flaws. It is unknown how much and what kind of impact communities and household income levels have on the amounts of packaging consumed, and these factors may be different in the two studies.

What stood out from results of the study was the equal amount of plastic fraction to cardboard and paper fraction (in volume). From the answers to the questionnaire it can be concluded that this may become an issue in at-home sorting. Although most participants stated that they were positive about sorting in such a way in general, they also stated they had limited space for sorting and storing both packaging fractions and waste fractions. This may prove to be discouraging for some, even though recycling was stated as a very positive outcome. This emphasis on positive was clear, even when participants compared it to the efforts of sorting. It can also be concluded that there are some consumers that may feel discouraged to provide packaging to recovery points located at shops instead of the waste reception usually located in the yard.

From the point of view of the recycling process the mistakes consumers make in distinguishing materials can be a problem, but in this study the outcome was quite positive. However, the sorting instructions have to be precise, with sorting examples of packaging emphasizing those that consist of more than one material. Another solution could be pictograms or short sorting instructions on the packages. This would probably further encourage sorting in general, because decisions would be faster and more effortless to make.


Vitafit
Apple juice
MAKO

5. References

1. Official Statistics of Finland (OSF): Dwellings and housing conditions [e-publication]. ISSN=1798-6761. 2013, Appendix table 1. Household-dwelling units by number of person 1960-2013 . Helsinki: Statistics Finland [referred: 7.5.2015]. Access method: http://www.stat.fi/til/asas/2013/asas_2013_2014-05-21_tau_001_en.html

2. Official Statistics of Finland (OSF): Population structure [e-publication]. ISSN=1797-5395. 2014. Helsinki: Statistics Finland [referred: 5.5.2015]. Access method: http://www.tilastokeskus.fi/til/vaerak/2014/vaerak_2014_2015-03-27_tie_001_en.html

3. Official Statistics of Finland (OSF): Population structure [e-publication]. ISSN=1797-5395. 2012. Helsinki: Statistics Finland [referred: 5.5.2015]. Access method: http://tilastokeskus.fi/til/vaerak/2012/vaerak_2012_2013-03-22_tie_001_en.html?ad=notify

4. Pulkkinen et al, 2012, "Pääkaupunkiseudun kotitalouksien sekajätteen määrä ja laatu vuonna 2012", Helsinki Region Environmental Services Authority, p. 42.

5. RVF Service AB, 2005, "Manual för plockanalysis av hushållsavfall", RVF Utveckling 2005:19, ISSN=1103-4092. p. 17+10+6.