

# Food waste and packaging

## Why less packaging is not always better

**Packaging plays an important role in the fight against food waste. But how can we accurately compare the environmental impact of packaging against the prevention of food waste? Studio Spark, Pack4Food and VITO conducted a study, commissioned by OVAM and Fost Plus, to perform such an exercise for six product categories. The results are remarkable to say the least.**

prevent  pack

## Food waste, a global issue

An estimated one third of all food produced worldwide is not consumed. According to the United Nations' Food and Agriculture Organization (FAO), in industrialized countries the majority of this loss—around 40%—occurs after the food has been purchased by the consumer. The total quantity of food and secondary flows (such as peelings) that are lost in all links of the

chain is estimated to be 2.1 million tons a year in Flanders alone. Food loss is therefore high on the European agenda. Flanders is also rallying round the ambition to significantly reduce food loss by 2020. Food waste is not just an ecological problem, but also a relevant socio-economic problem.

## The positive role of packaging

Packaging can play an important role in the fight against food waste, as protecting and preserving products is one of its primary functions. "In recent years, packaging optimization too often focused exclusively on reducing the quantity of packaging", explains Gaëlle Janssens from Fost Plus. "Less is better has been", the reasoning, but this is not entirely true. Reducing packaging definitively has its limits. Those limits are reached when the packaging can no longer perform its preserving or protective role and leads to product loss."

With this mind, we must never forget that the environmental impact of the packaged product across the entire life cycle is usually a lot higher than that of the packaging itself. In this regard,

adding extra packaging—on the condition that it effectively prevents food waste—can be a good thing for the environment. The addition of a little more packaging is more than compensated for by the prevention of food waste. Each gram of food that is no longer lost does not need to be produced.

What must also be considered are a number of social trends that have a profound impact on the packaging debate. Family compositions are changing; there are more single-person households and small families than ever before. They benefit from smaller portions. Here, too, additional packaging can lead to reduced food loss and therefore bring about significant environmental benefits.



# Food waste and packaging

## Society is **evolving**

Well-designed packaging of food and adequate choice of portion sizes can help ensure that consumers purchase the exact amount of food that they need and therefore avoid waste. Moreover, the shelf life of food is increasing. This is due to a number of advances in food packaging technology, including re-sealable packaging, packaging in individual portions, gas-tight packaging with a modified protective atmosphere, active packaging that creates the ideal atmosphere for the product, intelligent packaging, to name just a few.

"The idea that more packaging can sometimes be better for the environment is of course counterintuitive", observes Bart Jansen

from Studio Spark. "Hence this study, in which we examined food loss from the chain perspective, that is, from producer to consumer. The study's objective was to provide clarity about the question of how and to what extent packaging can contribute to preventing food loss and how we can weigh that up against the use of additional or better packaging material." A balance equation was developed to obtain a more rigorous insight into the question of how much food loss must be prevented to compensate for the additional packaging. This equation was then specifically applied to six food categories.

## No **one-size-fits-all**

Not surprisingly, the study revealed that there is no ideal solution that applies to all foods and to all situations. A butcher at the market packs products differently than the large-scale producer that supplies retail supermarkets. Likewise, packaging bread requires a completely different set of requirements than the packaging of meat. Bart Jansen provides a specific example from the study. "Switching from large 800 g loaves of bread to small 400 g loaves is fully justifiable from an environmental point of view

if, as a result, you waste half a slice less and on the condition that it doesn't involve additional car use. As far as meat is concerned, the tipping point is reached far sooner because the environmental impact of meat products is far greater than that of bread. From an environmental point of view, it is better to buy two small packs of ham instead of one large one, if it means that you don't throw away the last third a slice."



## Good to remember

Packaging can prevent food waste. Even though it may be **counterintuitive**, a little **more** packaging can sometimes be the most **sustainable** option - on the condition of course that the packaging prevents food loss.

The **optimal packaging differs** depending on the type of food, the producer, the distribution channel and the end consumer. There is **no universally applicable solution**.

Packaging has an important role to play in preventing food waste, but must be viewed **from a broader perspective** that examines **all steps in the chain**.

# Food waste and packaging

## About the study

### Initiators

The project team, consisting of experts from Studio Spark, Pack4Food and VITO, conducted the study at the request of OVAM and Fost Plus. The team was actively supported by a steering group of representatives from sector organizations

Comeos and FEVIA Vlaanderen, the Interdepartmental Food Loss Work Group of the Flemish Government and the Interregional Packaging Committee (IVC).

### Starting points

Six food categories were selected based on their demonstrative character, their major environmental impact, the volume of consumption, or the overall share of food waste they represent. A mathematical model was developed for the study which enabled the identification of the accumulated climate impact of the food loss in all steps in the production and supply chain, of the share of food that is consumed and of the food packaging. By climate

impact, we mean the carbon footprint, i.e. the accumulated CO<sub>2</sub> emissions. The product's entire life cycle was taken into account, including transport, storage, preparation and food loss when it reaches the consumer.

### Partners

**Studio Spark** is a consulting firm that guides organizations in research, development and marketing activities for sustainable and innovative products and services.

**Pack4Food** is a consortium of Flemish research institutions and 69 companies, whose shared objective is to stimulate innovation in food packaging among food producers as well as suppliers.

**VITO**, the Flemish Institute for Technological Research, is an independent research and advisory center that develops sustainable technologies related to energy, the environment, materials and earth observation.

**OVAM**, the Public Waste Agency of Flanders, is part of the Environment, Nature and Energy policy domain of the Flemish Government, and is responsible for policy related to waste and soil remediation in Flanders.

**Fost Plus** is responsible for promoting, coordinating and funding the selective collecting, sorting and recycling of household packaging waste in Belgium.

# Food waste and packaging

## Bread

A measurement of residual waste in Flanders revealed that bread represents the largest share of food loss. Nearly all of us consume considerable quantities of bread. We also tend to throw away a lot of it because we like our bread to be as fresh as possible.

## Recommendations

Switching from **large loaves** (>750 g) to **small loaves** (<450 g)

The climate impact of the additional packaging is already compensated for when as little as half a slice of bread is wasted. The environmental benefit is conditional, however. If buying smaller loaves leads to additional car trips, the benefit is negated.

## Freezing bread

The additional climate impact of freezing bread is already compensated for when the loss of two slices from a large loaf of bread (>750 g) can be avoided. There is of course a nominal difference in quality compared with fresh bread bought on a daily basis - a difference that not all consumers are willing to accept.

## Switching to pre-packaged bread with a long shelf life

In this system, there is no additional impact compared with the packaging of bread bought fresh on a daily basis, but it does combat waste. Therefore it concerns net gains. Furthermore, the bread does not have to be frozen.

## Switching to pre-baked bread rolls in packaging with a protective atmosphere to bake at home

This switch only becomes interesting if, on average, the consumer wastes a third of a fresh loaf of bread. This rarely happens in reality. This type of bread also has a fairly specific target group and application.

## Baking at the point of sale

Completing the baking process at the points of sale - combined with adapted stock management - has significantly reduced the amount of bread wasted in the production/distribution chain. Recent studies estimate that bread loss in the chain is at approximately 4 %, compared with the previous rate of 7 %.

## Alternatives

Wasting bread can be combatted by intelligent packaging design. Re-sealable packaging, such as drawstring bags or bags with clips or stickers, ensure that the bread doesn't dry out as fast. Lastly, the bread bag can be used to disseminate information, such as tips for avoiding waste.



1 %

If more than 1 % of bread is wasted, the alternative with extra packaging has a more favorable climate impact.

# Food waste and packaging

## Fresh beef and cooked ham

Fresh beef and cooked ham were selected for the meat products case study. They are both characterized by high consumption levels. The climate impact per kilogram of meat is relatively high compared with other food categories.

## Recommendations

Switching to **vacuum skin packaging (VSP)** for fresh meat

The largest and heaviest Vacuum Skin Packaging (VSP) from the sample had a slightly greater climate impact than the Modified Atmosphere Packaging (MAP) for a similar portion. The additional impact is compensated as soon as two percent less meat is lost. In many cases, the climate impact of VSP is even more favorable than

MAP. VSP is usually smaller, which has a positive effect on storage and transport. The greatest obstacle is the purple coloration shift of the meat, which does not, however, constitute a loss of quality. Nevertheless, red meat sells; purple meat less so.

Switching from **large packaging (400 g)** to **smaller packaging (200 or 100 g)** for cooked ham

As soon as the loss of one third of a slice of ham is prevented, the environmental impact of smaller packaging is compensated. The greatest obstacles are price and perception. A packet with

just three slices creates the perception of over-packaging.



Switching from **cling film** to **MAP**

Air packaging with cling film is used at the butcher shop or the fresh deli counter at the supermarket. Switching to pre-packaged portions in Modified Atmosphere Packaging (MAP) that have a

longer shelf life becomes interesting as soon as one third of a slice of ham is lost. However it is better to buy the correct portion at the deli counter if the pre-packed portions are too large.

## Alternatives

New developments in nanotechnology are expected to produce better packaging materials in the future. Re-sealable packaging does not increase the shelf life of meat products, but it does prevent them from drying out and losing their aroma and flavor. Oxygen absorbers in packaging ensure that residual oxygen is eliminated. This prevents oxidation and aids in the retention of the pink color. Intelligent packaging with sensors and indicators are highly promising, but are not yet ready for universal application. Reliability, limited applicability and cost are holding back their widespread introduction.



2 %

6 %

If more than 2 % of beef is wasted, the alternative with extra packaging has a more favorable climate impact.  
If more than 6 % of cooked ham is wasted, the alternative with extra packaging has a more favorable climate impact.

# Food waste and packaging

## Fresh salad and tinned green beans

Consumers only buy fruit and vegetables that look fresh. This means that the chain imposes strict quality standards for fruit and vegetables intended for the shelf. Packaging can play a role in prolonging the shelf life of vegetables and better align portions to the needs of the consumer.

## Recommendations

### Switching from a whole head of lettuce to a small bag

This is useful when the loss of product reaches 15%. This is particularly interesting for smaller households - for whom a whole head of lettuce is often too much. It also has a positive effect on

water consumption. Whereas a whole head of lettuce is washed at home, bagged lettuce is washed on an industrial scale and is therefore more efficient.

### Switching to smaller packaging for pre-cut lettuce

Switching from large re-sealable or non-re-sealable 300 g or 400 g bags to bags of 100 g or 200 g or even to the smallest portions of 40 g or 80 g of lettuce is already useful when the loss rate reaches 5 %. A larger re-sealable bag will continue to protect the salad against moisture loss after it is first opened, but the protective atmosphere is lost, reducing the remaining shelf-life.

The climate impact of a re-sealable bag, usually produced from a heavier film and fitted with an additional sealing mechanism, is also approximately the same - and in some cases even greater - than the smaller, thin-walled bags with a protective atmosphere and micro perforations (EMAP).

### Switching to smaller tins of green beans

Switching from large tins (400 g) to smaller tins (200 g) is useful when the loss of green beans reaches 15%. This corresponds to

approximately 34 g of green beans by drained weight.

## Alternatives

New packaging technologies can optimize the ripening of fruit (neither too slow nor too fast). Individual packaging for cucumbers, for example, prevents the product drying out and prolongs its shelf life. Optimization of the gas composition and the use of breathable films can prolong the shelf life of pre-cut fruit and vegetables.



5 %

15 %

If more than 5 % of lettuce is wasted, the alternative with extra packaging has a more favorable climate impact.  
If more than 15 % of green beans is wasted, the alternative with extra packaging has a more favorable climate impact.

# Food waste and packaging

## Cheese spread

The case study of cheese spread focuses entirely on loss in the distribution-consumer chain due to the product's limited shelf life. The sealed packaging creates an optimal environment for its shelf life. However, once the packaging is opened, the cheese must be consumed quickly.

## Recommendations

Switching from **the standard packaging** (150 à 200 g) to **individual portions** (16 à 20 g)

The impact of the additional packaging for individual portions is compensated when the loss rate is as little as 2 to 3 %. This quantity of cheese is less than the quantity necessary for a quarter of a sandwich (approximately 5 g).

Switching from a **large family pack** (300 g) to a **smaller standard pack** (200 g)

The additional impact of the standard pack compared with the larger family pack is already compensated for when the loss rate reaches 1.5 %.

## Alternatives

Smaller portions and individual portions are a definite recommendation for cheese spread. They are also useful for other types of cheese and liquid dairy products. There are additional opportunities available using re-sealable packaging and packaging which enables easy emptying.



2 %

If more than 2 % of cheese is wasted, the alternative with extra packaging has a more favorable climate impact.

# Food waste and packaging

## Carbonated soft drinks

Belgian households consume great quantities of carbonated soft drinks, meaning these represent a major share of the total food lost. Once the packaging has been opened, the flavor and fizziness of the drink quickly deteriorates. This is the primary reason why consumers throw away part of the contents.

## Recommendations

Switching from **large to smaller packaging** for home consumption

When it comes to large PET bottles between 1.5 to 2 liters, the additional impact of smaller PET bottles of 0.5 liter or 33 cl cans is reached when the loss rate reaches 20 %. This is the equivalent of approximately one glass.

## Alternatives

Soft drink producers are looking for solutions to make cans re-sealable.



19 %

If more than 19 % of soft drink is wasted, the alternative with extra packaging has a more favorable climate impact.

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