FH CAMPUS WIEN
UNIVERSITY OF APPLIED SCIENCES

DIE HOCHSCHULE, DIE MEHR KANN.

The Value of Packaging and how to Reduce the Carbon Footprint over the Entire Life Cycle

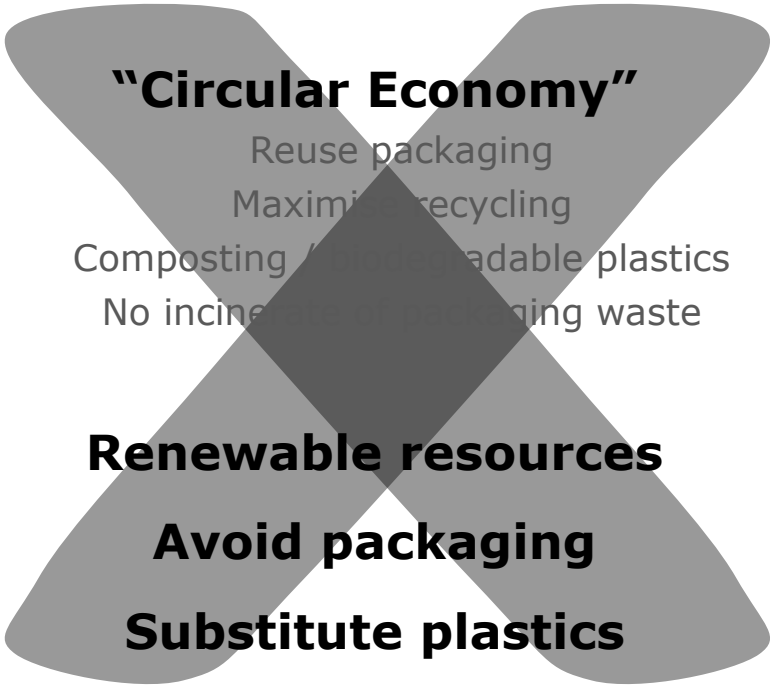
APPLIED LIFE SCIENCES | PACKAGING TECHNOLOGY AND SUSTAINABILITY

Agenda

- Packaging and Sustainability
  - Facts
  - Figures
  - Functionality
- Key findings and conclusions

More than 20 years of experience in sustainability assessment

Are there easy answers when sustainable packaging is asked for?



**These might sometimes be beneficial actions,
but never suitable general objectives**

Water bottle recycling

1000 litres in glass bottles, 80 % recycling

7800 MJ

7 MJ for 1 m^3 of tap water

1000 litres in PET bottles, 40 % recycling

(10 % closed loop + 60 % open loop)

2400 MJ

Circularity may be a <u>measure</u> to achieve certain environmental goals, but cannot be the goal itself!

Facts!

Development of a strategy based on facts

Environmental (and economic) assessment of total life cycle

Definition of measureable goals for reduced environmental impacts

Identification of eco-efficient measures

Consumer perception of packaging

Statements on packaging (Survey no. = 1117)

Food packaging accounts for 0.7 % of the carbon footprint of European consumers

Food's impact on climate	
Share within global greenhouse gas emissions	
Produce + grains	9.5%
Animal agriculture	14.5%
Total agriculture, incl. land use change	**24.0%**
Primary + secondary processing	0.4%
Storage, packaging, transport	0.9%
Refrigeration	1.2%
Retail activities	0.5%
Catering + domestic food management	0.4%
Waste + disposal	0.2%
Total food system	**27.6%**

Source: Quantis Food Report, 2020

On average, only about 3.0 - 3.5% of the climate impact of packed food is caused by the packaging itself.

General packaging causes approximately 1.5 - 2.0% of the carbon footprint of a European consumer.

Packaging of cooking cream

Multilayer pouch

- PE
- PP
- EVOH
- Calcium carbonate

Not recyclable

PET bottle

recyclable

Source: Wohner B, Schwarzinger N, Gürlich U, Heinrich V, Tacker M. 2019. Technical emptiability of dairy product packaging and its environmental implications in Austria. PeerJ 7:e7578 https://doi.org/10.7717/peerj.7578

Packaging of cooking cream

6 g / 200 ml

28 g packaging per litre

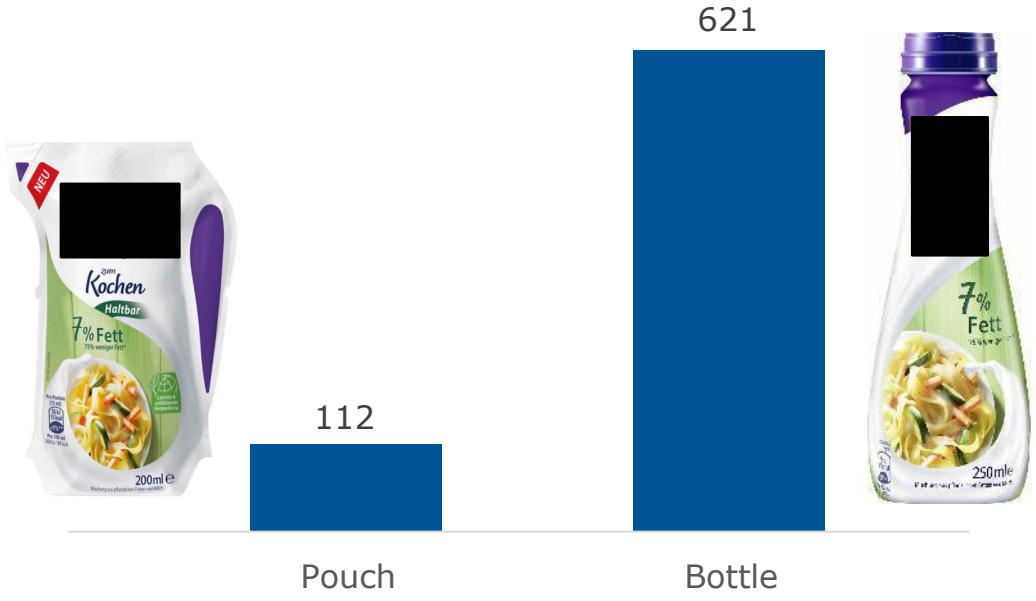
23 g / 250 ml

93 g packaging per litre

Source: Wohner B, Schwarzinger N, Gürlich U, Heinrich V, Tacker M. 2019. Technical emptiability of dairy product packaging and its environmental implications in Austria. PeerJ 7:e7578 https://doi.org/10.7717/peerj.7578

Packaging of cooking cream

gram CO_2eq per litre of packaging on a life cycle perspective



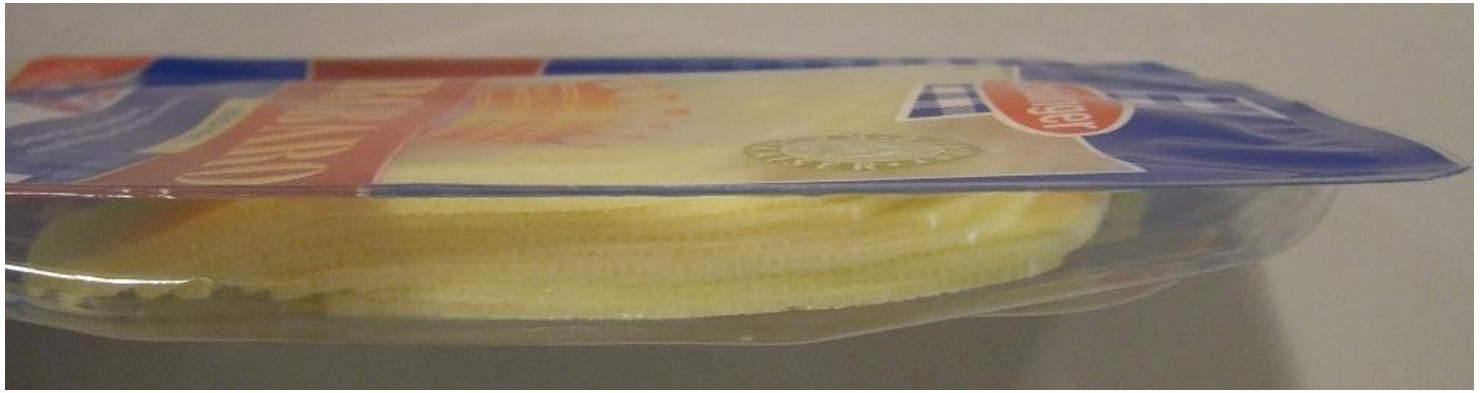
The achieved degree of circularity is NO indicator for sustainability!

Source: Wohner B, Schwarzinger N, Gürlich U, Heinrich V, Tacker M. 2019. Technical emptiability of dairy product packaging and its environmental implications in Austria. PeerJ 7:e7578 https://doi.org/10.7717/peerj.7578

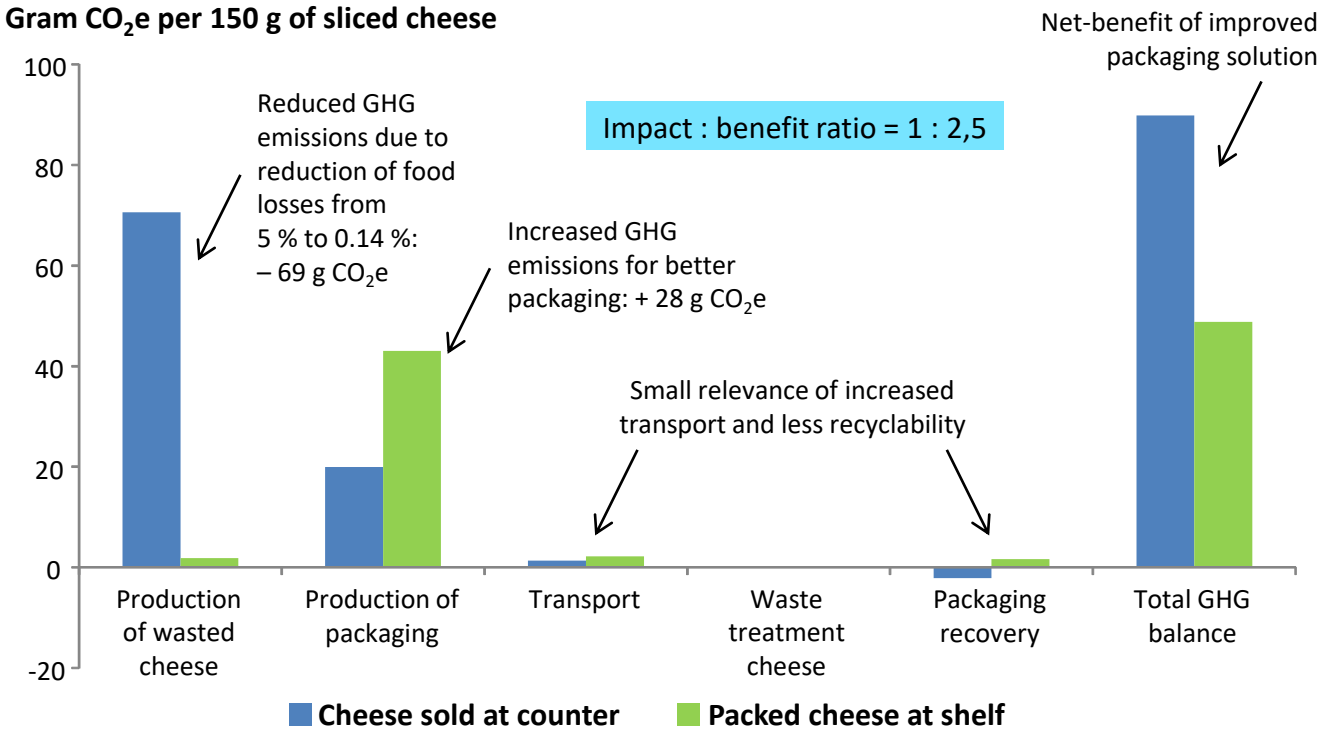
Sliced cheese: Counter or shelf?

5 % waste rate on retailer level, if sold via delicatessen counter

0.14 % waste rate on retailer level, if sold via self service shelf



Carbon Footprint of sliced cheese



Functional unit = consumed amount = 150 g Bergbaron cheese

Consumed amount is not displayed

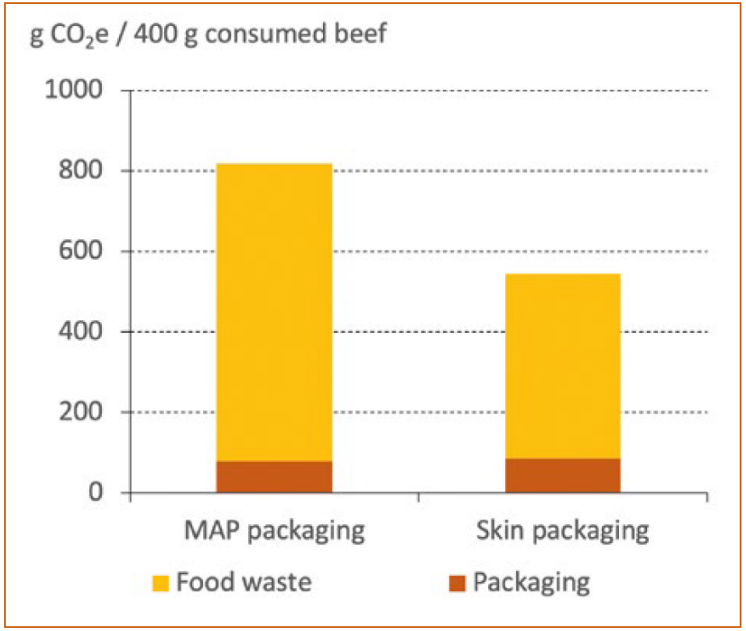
Vacuum packaging for beef: MAP trays versus vacuum skin packaging

Beef cuts offered in PET trays with protective atmosphere and PET/PE lidding film are compared with vacuum skin packaging (PET base film with a high recycled percentage; PE top film with barrier layer).

Vacuum skin packaging increases minimum shelf life on the retail shelves from 6-7 days (MAP) to 12-14 days (skin).

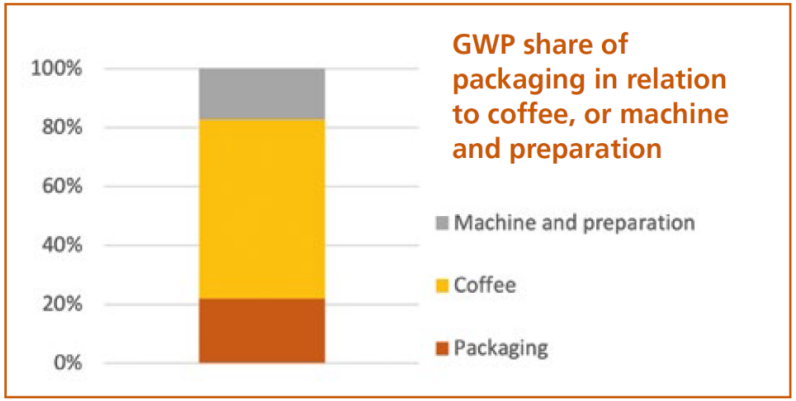
Waste rates in retail sector during three-month test period were 5.8% for MAP and 3.7% for vacuum skin packaging.

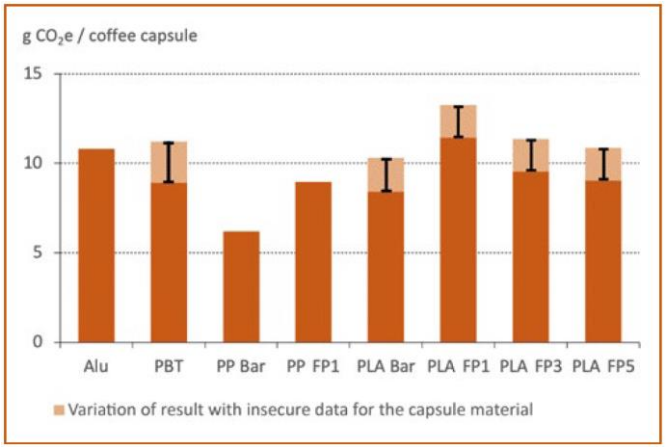
Vacuum skin packaging production and recycling causes 8% more CO_2e emissions. This is offset by the benefits of reduced food waste, which is 42 times higher than the additional impact of the improved packaging solution.



Coffee is valuable

Since the environmental costs of producing coffee beans are so high, it is worthwhile taking measures to make the best possible use of coffee.





Investigated commercial capsule materials: Aluminium (Alu); Polybutylene Terephthalate (PBT); Polypropylene (PP); Polylactic acid (PLA). The capsules made of PP and PLA were examined in 2 variants: a) Capsule and Lid with a Barrier Layer (Bar): Alu, PBT, PP Bar, PLA Bar; b) Barrier in the flowpack instead of capsule and lid; 1-5 capsules per flowpack (FP1-FP5). Current estimated recycling rates: Alu 30%, PP and PLA 5%, PBT 0%.

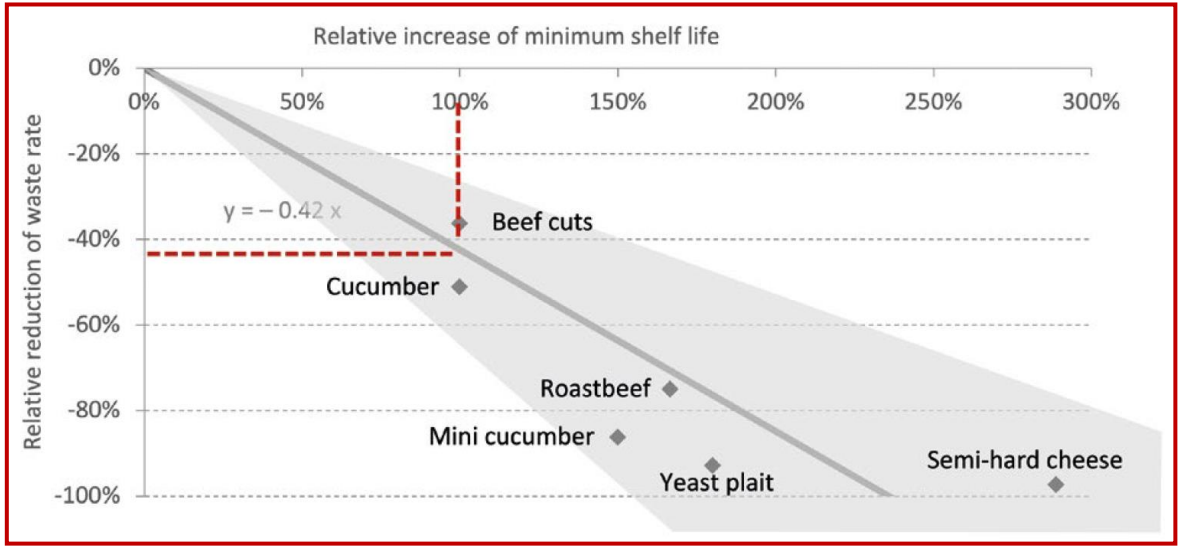
Coffee capsules can be useful, given the risk that some of the coffee brewed conventionally will be thrown away later.

Within the considered capsules the PP capsule with EVOH barrier scored best in regard to the environmental effects investigated.

Correlation between product protection, shelf life and amount of waste at retailers

Optimised packaging

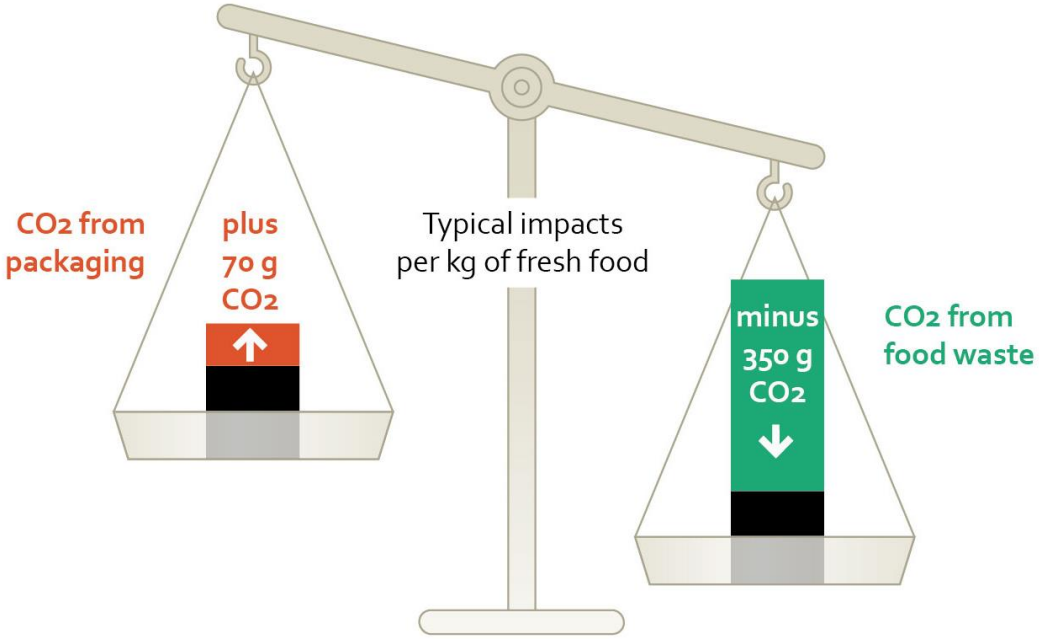
- better protects the packed product
- often extends the minimum shelf life
- can help to reduce waste



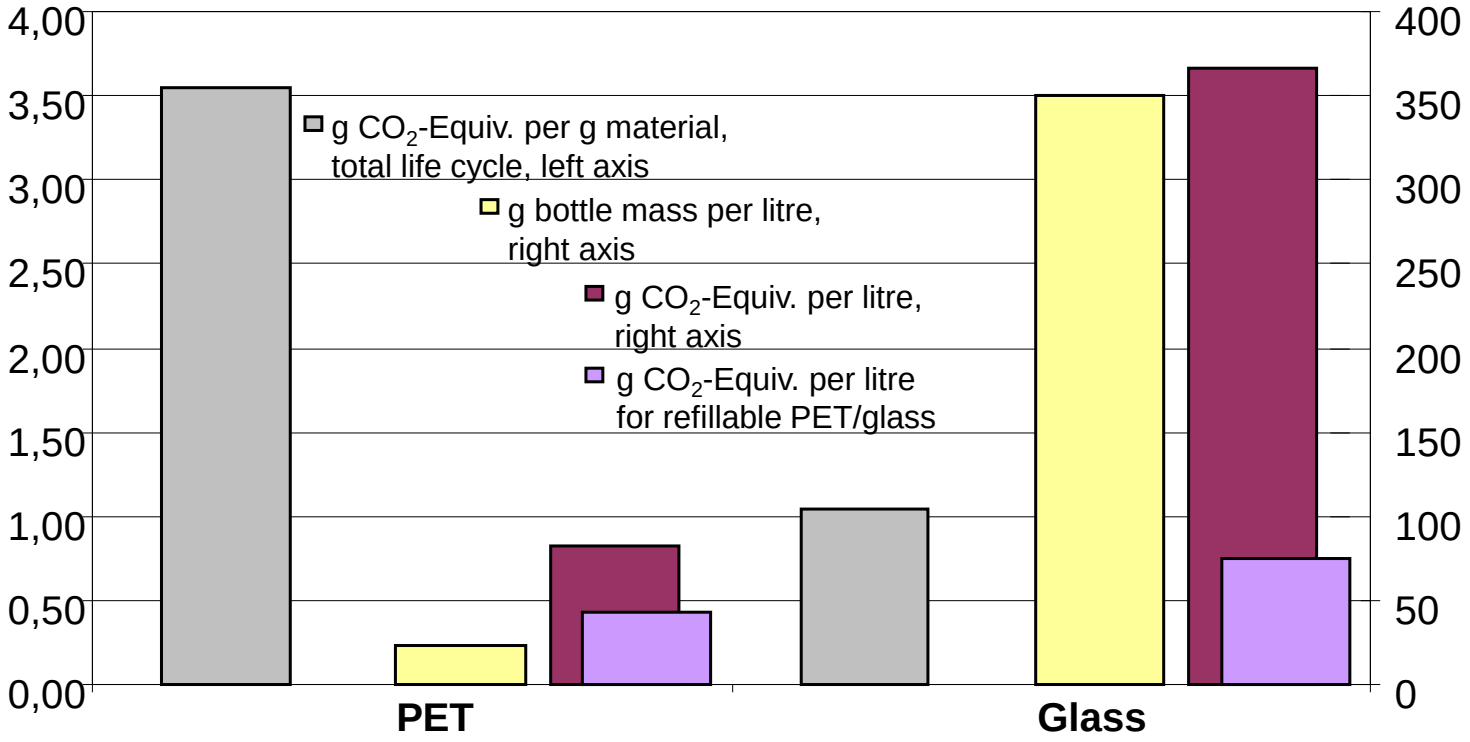
Examples examined in detail showed a first trend: **doubling the minimum shelf life** can **reduce the waste rate** in the retail sector **by about 40%**.

Carbon Footprint of Packaging and Food

Optimized packaging often provides environmental advantages. The reason is that benefits of prevented food waste are usually much higher than environmental impacts of production or optimization of the packaging involved.



Emissions per gram of Material * Material per Functional Unit



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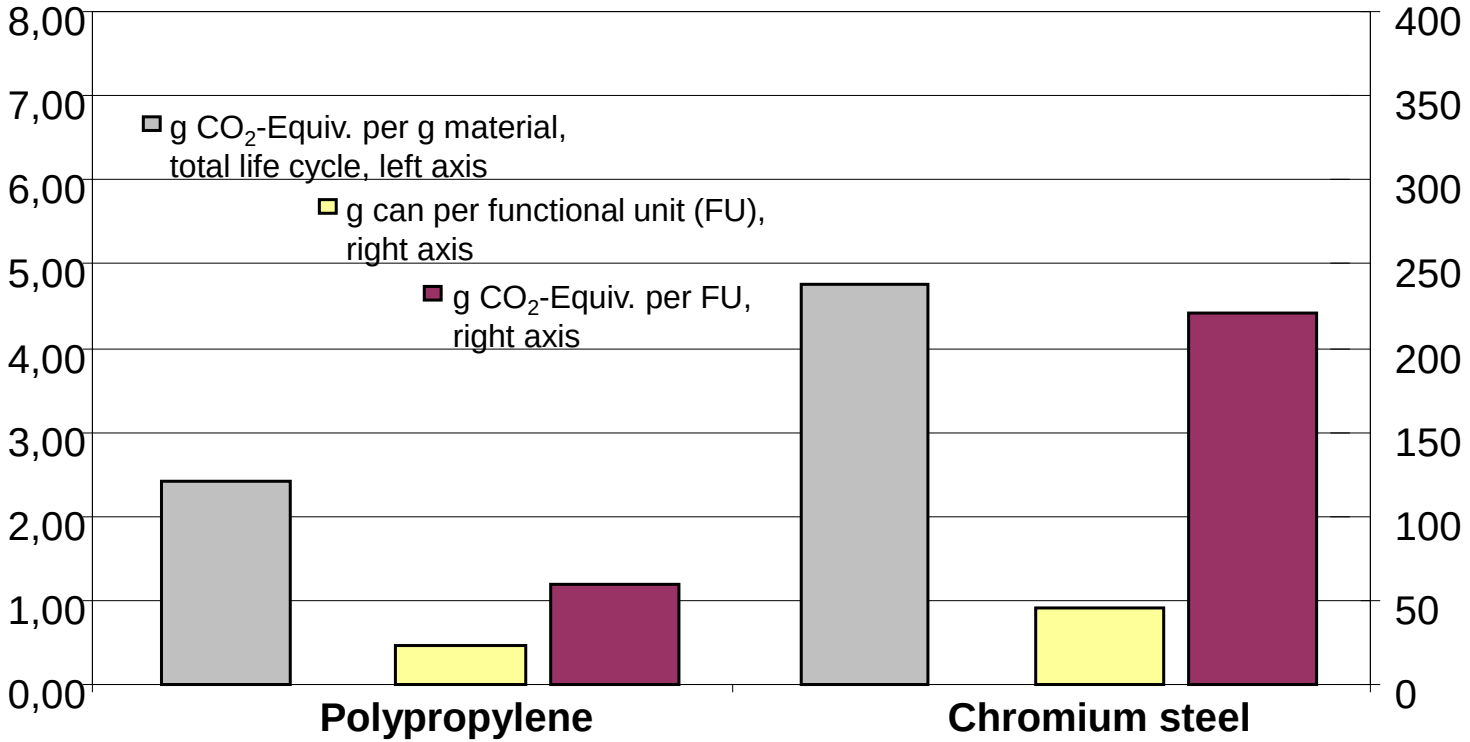
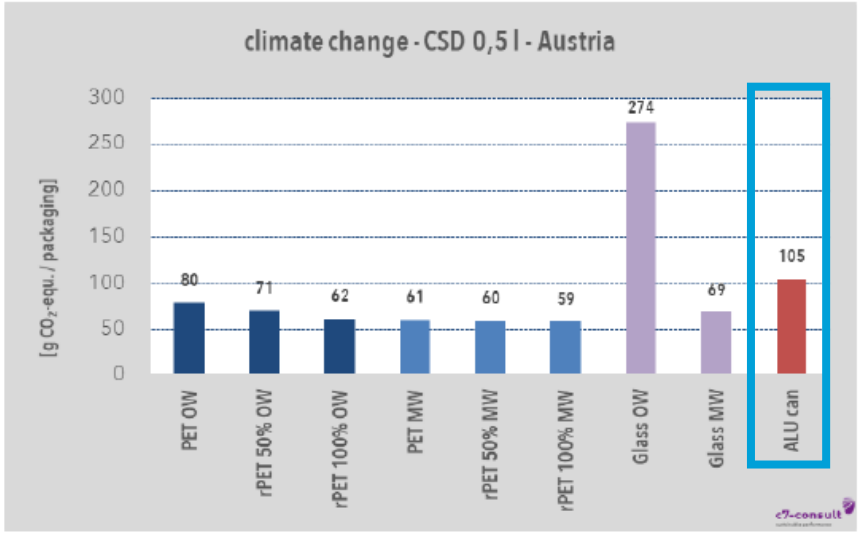


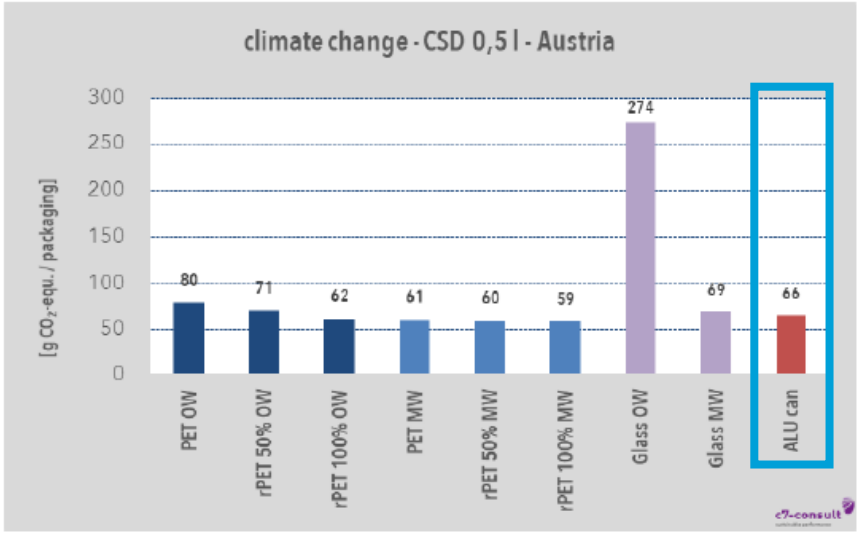
Another important issue - Recycled content

Increase of secondary material in aluminium cans for lemonade

40% Recycled content



90% Recycled content



CSD – Carbonated soft drinks

- 37%

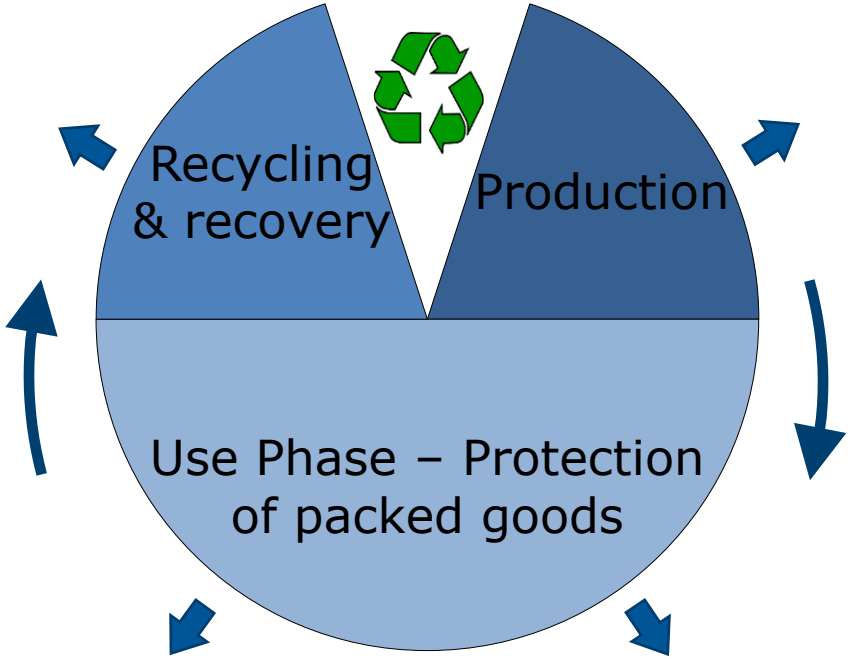
Functionality!

Optimized function of packaging is the most important environmental benefit

Quantify and communicate the ecological benefit of the packaging function

Dimensions of packaging in the total life cycle

Environmental benefits due to recycling, cascade use and thermal treatment



Environmental benefits due to ecodesign and increased material efficiency

Environmental benefits due to reduced food waste resp. avoided damages to packed products; Benefits due to reuse

Sustainable design “Formula”for a circular, resource-efficient economy

\+ Optimised material production *
Small material demand per functional unit

\+ **High Functionality / Quality / Use-benefits**

\+ Optimal recovery/recycling-mix

= **Low ecological, economic & social impact**

**Priority on functionality,
then raw material and recycling aspects**

Conclusions: The most important sustainability aspects of packaging

- Packaging can significantly contribute to waste prevention.
- Holistic assessments help to find solutions, which are actually sustainable.
- There is no good or bad packaging material per se.
- „Design for Recycling", „Re-Use" and the use of recyclates help to reduce environmental impacts across the life cycle.
- When products are lead in cycles, take care that environmental impacts are minimized.
- Packaging should be avoided, if product protection or other requirements are not necessarily needed and not more (pet) food waste is generated.

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