

# Can the use of surplus bread decrease the environmental impact of beer? Case-specific evaluation and advice using an LCA approach

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## Aims of the study

- To develop an LCA-model to estimate the environmental impact of beer produced with or without surplus bread.
- To provide case-specific advice to brewers regarding the environmental impact of their operations.

## Raw materials – inputs

Malt, raw cereals, sugars, hops, additives, yeast, enzymes, filter aids, cleansers....

Transport

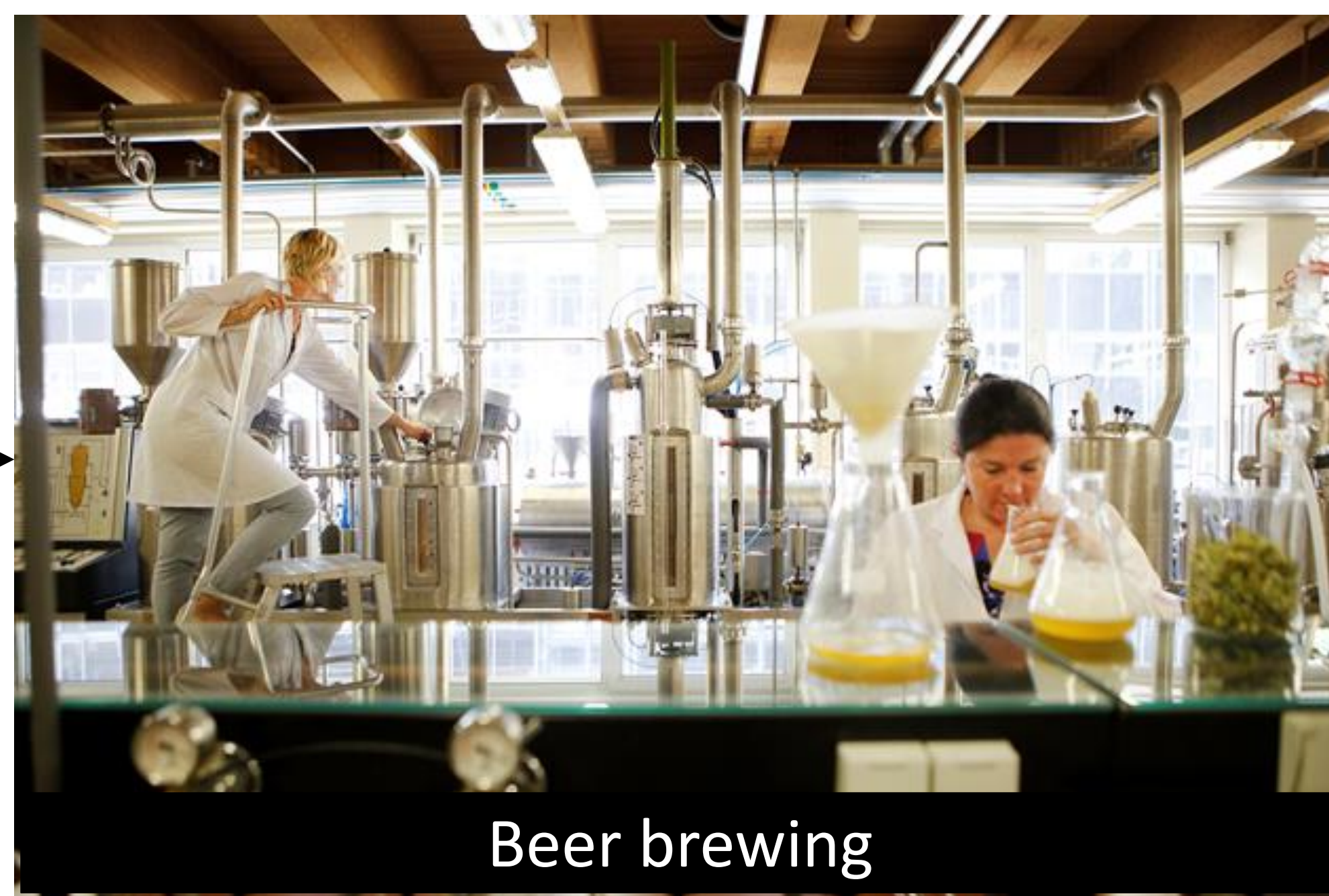
Surplus bread

Processing of surplus bread

Drying, grinding, toasting, freezing ...

## The LCA-model

Based on PEFCR method [1]



Beer brewing

Transport

## Packaging

Glass bottles, cardboard, caps...

Transport

Beer

By-products  
Spent grains, yeast

Waste streams  
Effluent water, other waste streams

[1] PEFCR for beer [https://ec.europa.eu/environment/eussd/smgp/PEFCR\\_OEFSR\\_en.htm#final](https://ec.europa.eu/environment/eussd/smgp/PEFCR_OEFSR_en.htm#final)

## Simulations and preliminary results

	Without surplus bread	With 5% surplus bread	With 20% surplus bread
kg CO <sub>2</sub> -eq per hL beer			
<b>Total</b>	<b>38.01</b>	<b>34.89</b>	<b>32.46</b>
raw materials-inputs	22.55	19.43	17.00
beer brewing	3.51	3.51	3.51
packaging	10.03	10.03	10.03
transport	1.28	1.28	1.28
waste management	0.63	0.63	0.63

## Some important simulation characteristics:

- Used recipe: HOGENT/UGent 'Bijloke' beer
- Packaging: reusable glass bottles (0.33 L, trip rate 30)
- No allocation to beer by-products assumed
- Mass allocation assumed for surplus bread (5% of total impact of bread)
- Processing of surplus bread consisted only drying of the bread.

## Highlights and outlook

- The PEFCR-based LCA model for beer [1] is a useful tool for understanding the impacts of the beer production chain and can be used to provide case and site-specific advice to brewers on how to reduce the environmental impact of their operations. The model will be further tested and evaluated by several Belgian breweries.
- Preliminary simulations indicate that there is a potential to reduce the environmental impact of beer by using surplus bread, although this potential is highly dependent on different brewery and bread processing characteristics. Therefore, several cases will be evaluated to identify the full case-specific environmental potential of using surplus bread in brewing beer.