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Federal Department of the Environment, Transport,
Energy and Communications DETEC
Federal Office for the Environment FOEN
Economics and Innovation Division

Side streams: Classification and prioritisation by environmental potential

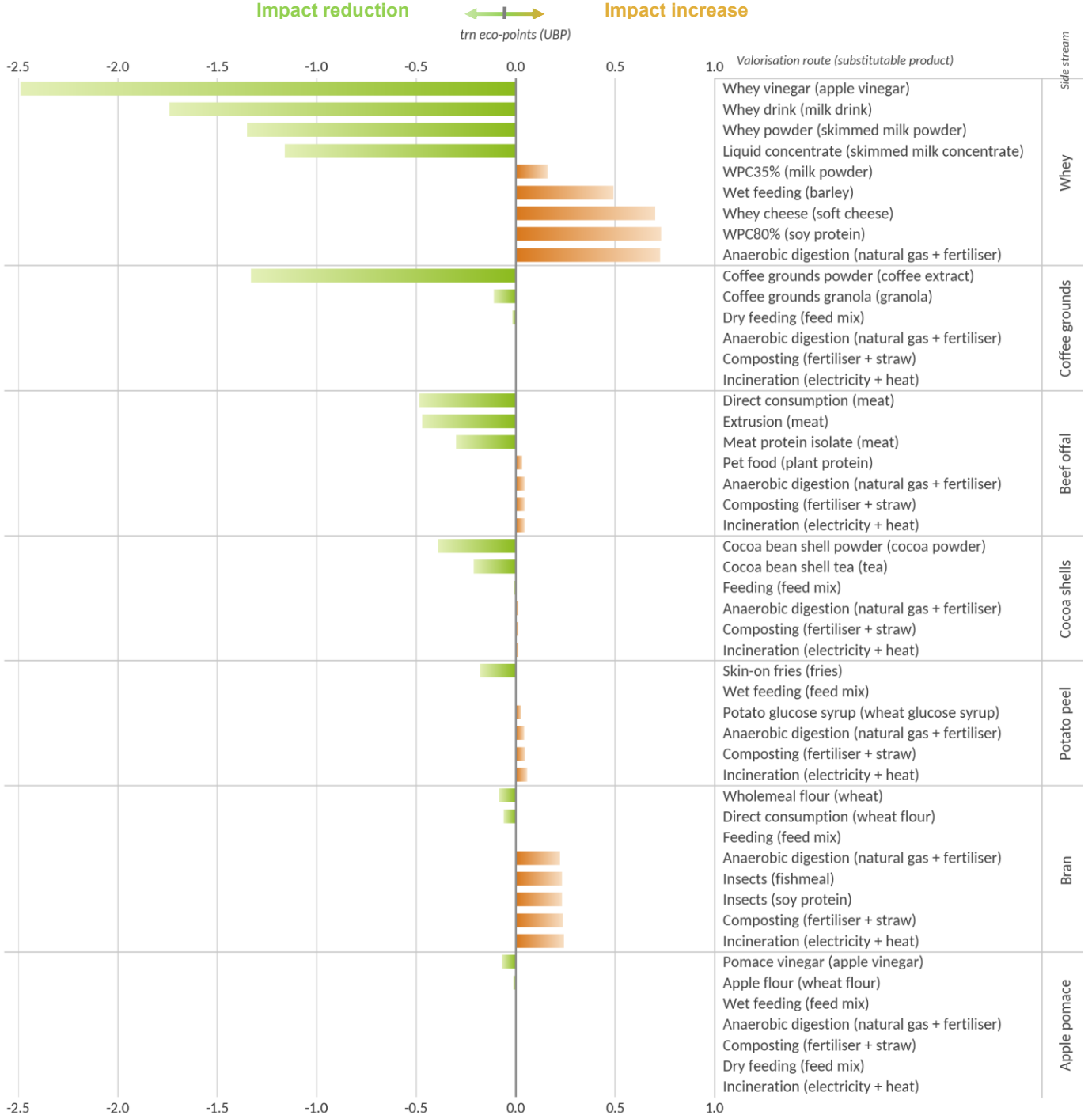
LCA Discussion Forum – 6.11.2026

Environmental savings potential of valorisation and recovery routes

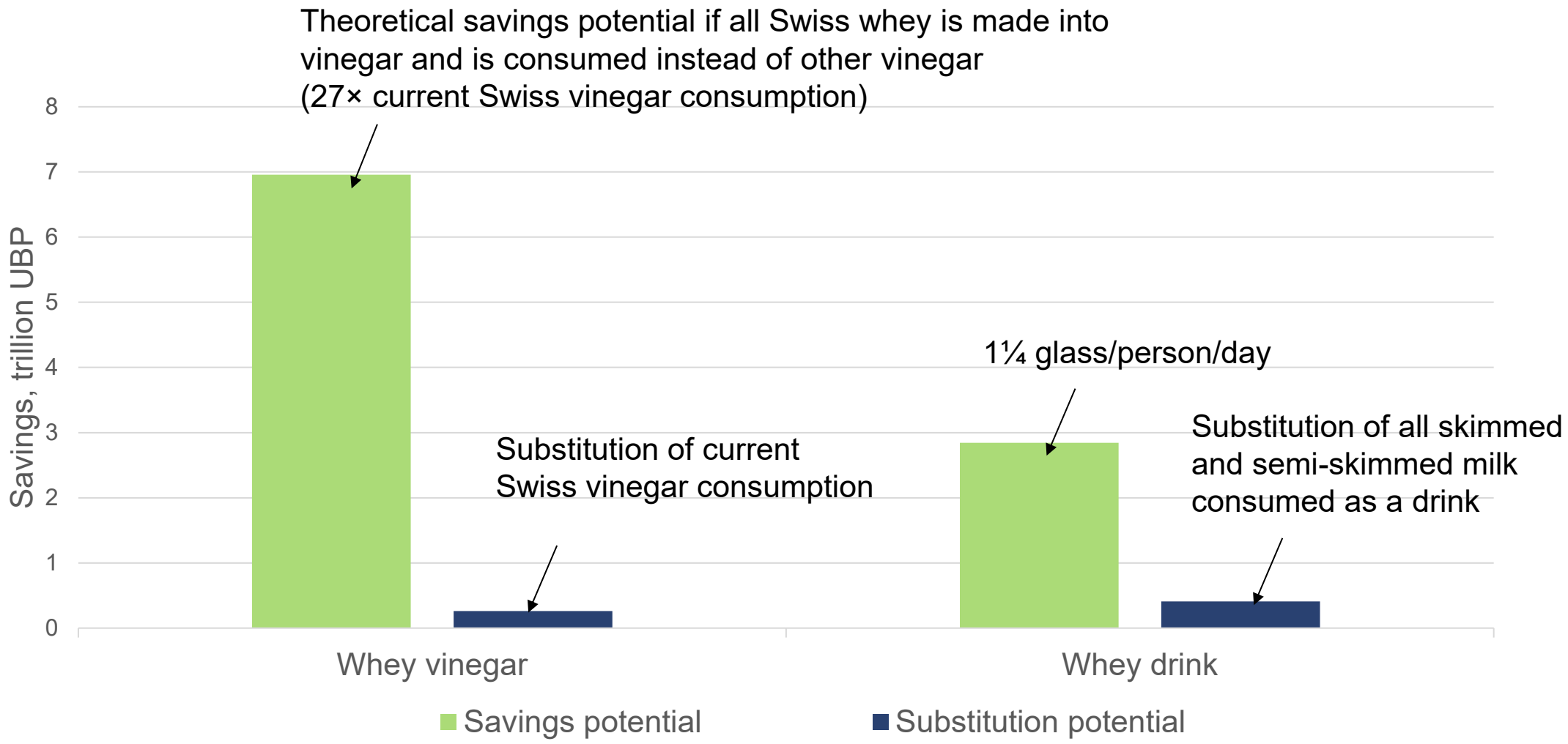
Maximum theoretical **reduction** or, **increase** in environmental impact (trillion UBP),

with full use of the side stream in the respective valorisation/recovery route,

compared with current use.



From savings potential to substitution potential



Substitution potential as context

- To put the **results into context**, the FOEN calculated:

  1. How much product would have to be sold to use up the entire side stream, i.e. to fully capture the savings potential?
  2. How does that compare with current consumption of the substitutable product (= current substitution potential)? How much product can be sold at all?
  3. What saving would be achieved by fully using the current substitution potential?

- Aim: **tangible examples** and greater consideration of **feasibility**

- Focus on valorisation products of the 6 most promising side streams (whey, spent coffee grounds, beef offal, cocoa bean shells, potato peel, bran) with the greatest environmental potential

Environmental savings potential and contextual analyses of valorisation and recovery routes



Legend:

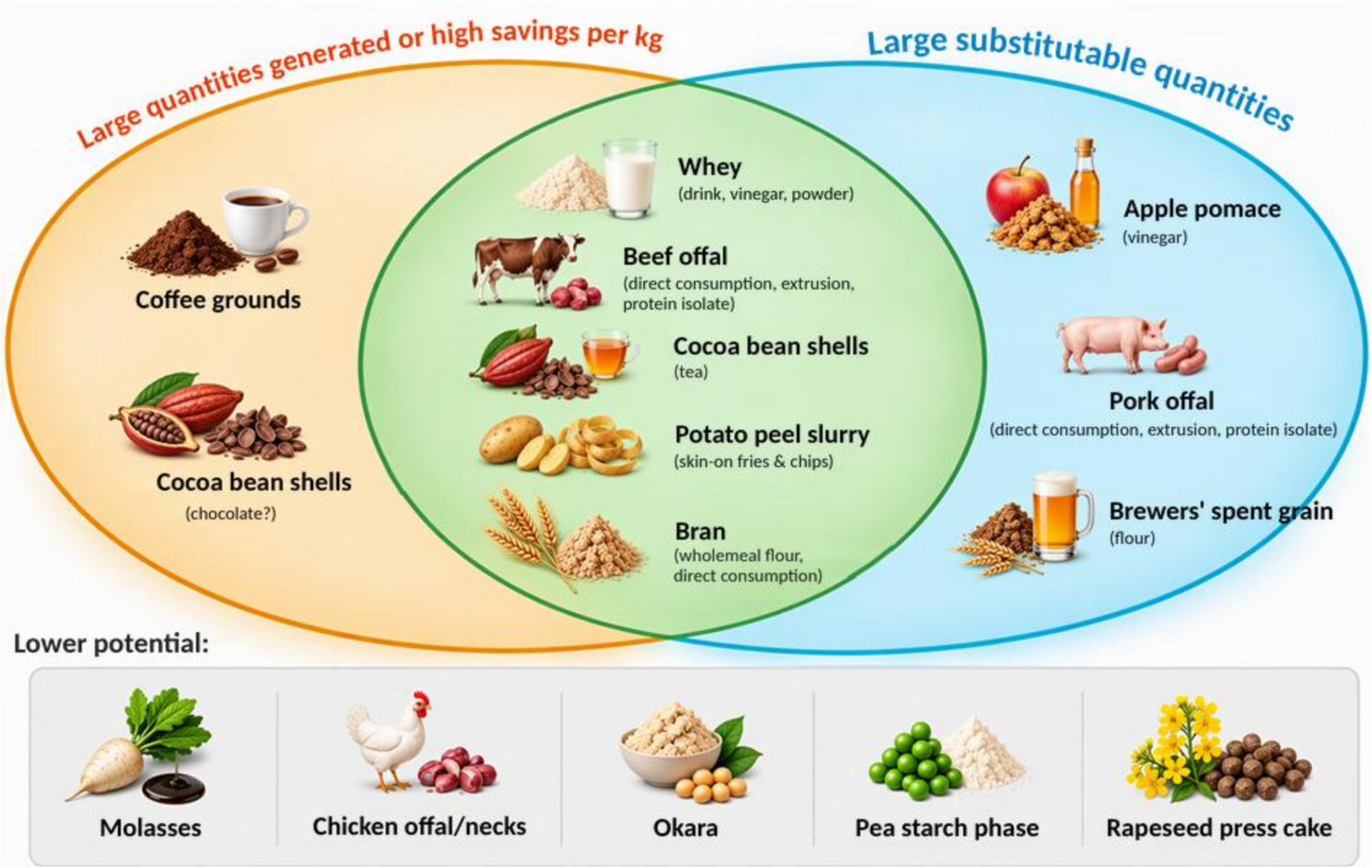
Bars:
Savings potential (Intep 2026): maximum theoretical reduction in environmental impacts when the side stream is fully utilised, compared with its current use.

Text in green:
Sales volume at which the environmental impact can (theoretically) be reduced the most.

▌: Substitution potential: environmental impact avoided when the currently available quantity of the substitutable product in Switzerland is exhausted (entire quantity substituted by the valorisation product or, where this is exceeded: entire quantity of the valorisation product used up).

Text in black:
Substitution potential: required share of the substitutable product in Switzerland (entire quantity substituted by the valorisation product or, where this is exceeded: entire quantity of the valorisation product used up).

// : Axis break to show the largest savings potentials.


Large quantities generated or high savings per kg
Large substitutable quantities
Coffee grounds
Cocoa bean shells
(chocolate?)
Whey
(drink, vinegar, powder)
Beef offal
(direct consumption, extrusion, protein isolate)
Cocoa bean shells
(tea)
Potato peel slurry
(skin-on fries & chips)
Bran
(wholemeal flour, direct consumption)
Apple pomace
(vinegar)
Pork offal
(direct consumption, extrusion, protein isolate)
Brewers' spent grain
(flour)
Lower potential:
Molasses
Chicken offal/necks
Okara
Pea starch phase
Rapeseed press cake

EU: Current monitoring underestimates losses, and there is a trend towards wider system boundaries

SWEDEN | Processing and manufacturing

53,000 t

Official statistics 2020

Based on existing environmental and waste data

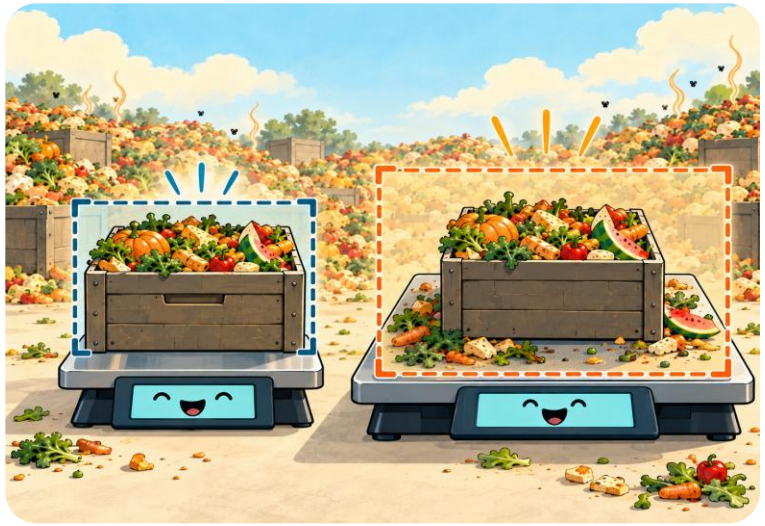
≠

METHODS NOT DIRECTLY COMPARABLE

305,000 t

Official statistics 2022

Targeted company survey and broader interpretation of the EU definition



Company data and a broader definition showed almost six times more losses: a fuller picture, not a real increase.

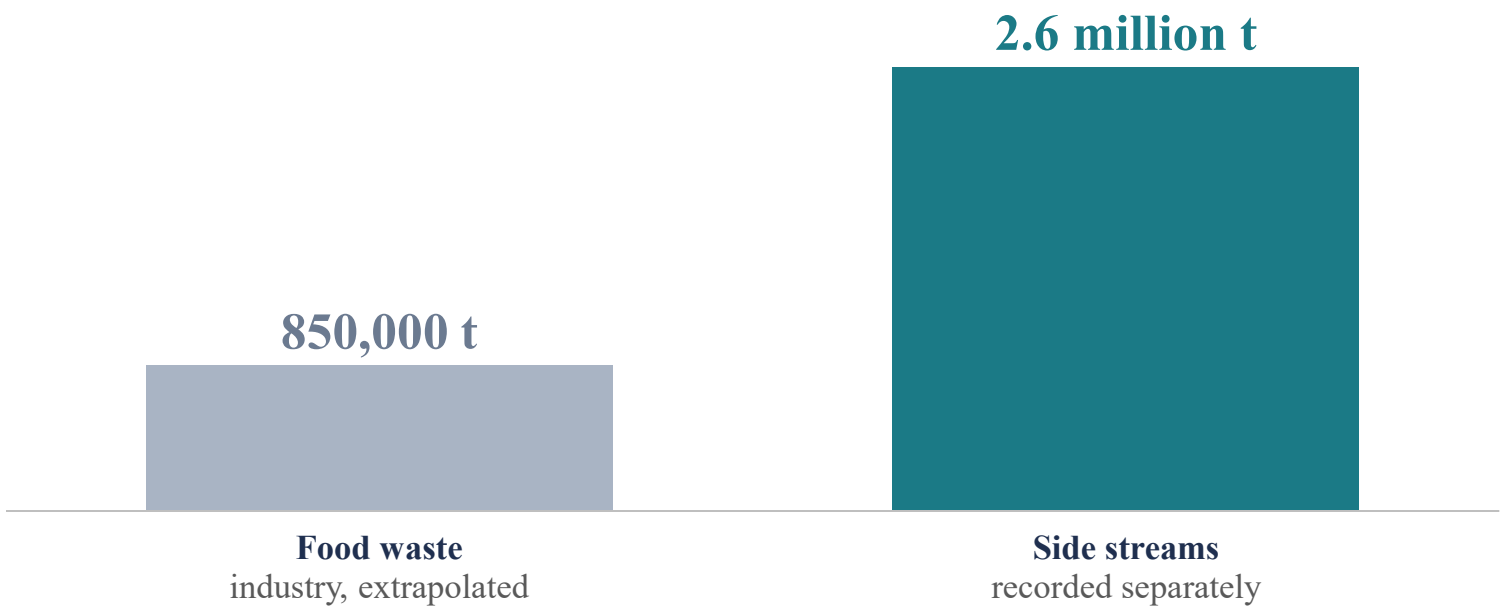
Implication: As EU monitoring captures processing and agriculture more completely, side streams move into focus too. Their exclusion today does not make them irrelevant.

Sources: Swedish official food waste statistics 2020/2022 · SMED (2023), method report · RETASTE 2026, programme (M. Eriksson and J. Stephansson, SLU; C. Giordano, LUKE)

Sweden: Side streams amount to three times industrial food waste

Preliminary extrapolation for the whole sector; side streams fall outside food waste reporting and were recorded separately.

Food waste and side streams, Swedish food industry
t per year, preliminary extrapolation



NUTRITIONAL VALUE

Side streams can also be nutritionally relevant.
Example from Italian bread, pasta and bakery chains: their nutrient index is about 5 times that of food waste.

Silvia Zingale · Agroscope
More on this in her presentation

Implication: Without side streams, a food waste definition leaves out about three quarters of the industrial volumes, and with them much of the realistic potential.

Sources: Joar Stephansson (SLU), RETASTE 2026, personal communication, preliminary extrapolation · Zingale & Nemecek, Agroscope/WASTEWISE, "Nutritional Losses embedded in FLW and Sidestreams", 2026

System boundaries of food loss & waste monitoring in Switzerland

1



Feeding counts as food loss

Switzerland includes flows diverted to animal feed — making avoidable downgrading visible while LCAs still credit substituted feed.

2



Broad ‘avoidable’ incl. by-products

All flows that are technically avoidable today and edible or convertible into edible products; classification by technical/logistical barriers.

3



System-level avoidability

A loss is avoidable when prevention is feasible through cooperation across the value chain and public actors — not just a single actor.

4



Dynamic updating

As new products, approvals, or technologies emerge, streams can be reclassified from unavoidable to avoidable or from higher to lower barrier levels. Previous years are recalculated to be comparable.



Why this makes sense

Captures full prevention potential and enables prioritization:

- by environmental impacts (LCA)
- and by the technical/logistical barriers framework.

(more details in this report, chapters 4.6.2 and 2.2.4)

Source: Beretta et al. (2025), ZHAW / FOEN | Report (PDF)

Concept for classification of avoidable food losses by barriers

Classification	Technical barriers	Logistical barriers
1 (low)	Products **already on the market in relevant quantities** → utilisation easy. *(e.g., okara, buttermilk, wheat bran)* 	By-products **easy to transport/store**; preservation already established. *(e.g., wheat bran)*
2 (medium)	**No current products/applications** yet, but no technical/health/legal barriers. *(e.g., coffee grounds)* 	**Hard to transport/store** (perishable/ high water), yet **produced centrally** in large volumes at few sites. *(e.g., whey from large processors)*
3 (high)	**Technical/health/legal barriers** must be solved before food use. *(e.g., potato peels with excessive solanine; coffee silverskin without novel food authorisation)* 	**Hard to transport/store** and produced at many **decentralised** sites. *(e.g., whey from mountain dairies)*

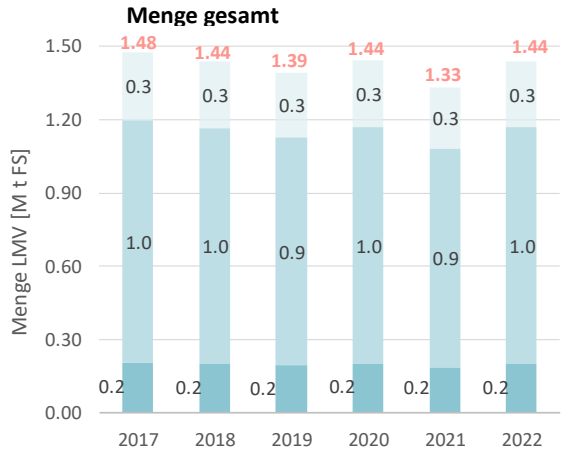
Source: Beretta et al. (2025), ZHAW / FOEN | Report (PDF)

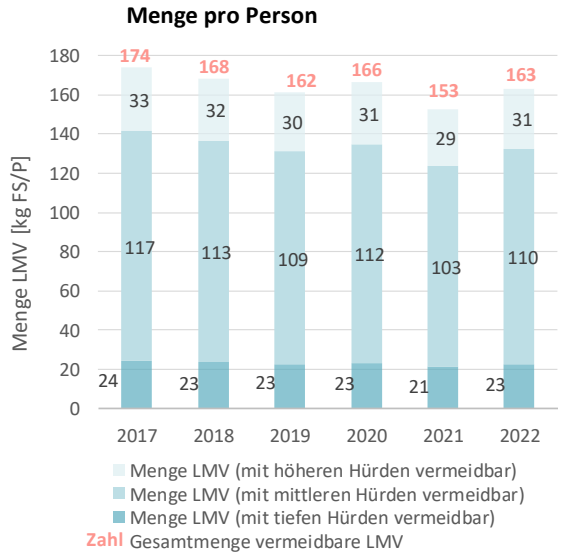
Legende

Menge			Hürden		
Gering	Mittel	Hoch	1 = Tief	2 = Mittel	3 = Hoch

Einteilung der Futtermittel	Ø2017-2022 Menge FS [t/a]	Ø2017-2022 Menge TS [t/a]	Wasseranteil %	Technische Hürden Bewertung	Logistische Hürden Bewertung
Futtermittel pflanzlichen Ursprungs					
Reis (Bruch-)	59'543	51'802	13%	1	1
Andere getrocknete Hülsenfrüchte (Bohnen, Linsen, Wicken, Lupinen)	563	495	12%	1	1
Kartoffeln (Knollen)	69'168	15'217	78%	2	2
Kakaoschalen aus Südamerika (Cd-belastet)	1'903	1'713	10%	2	1
Kakaoschalen aus Afrika und Ozeanien	4'440	3'996	10%	1	1
Nebenerzeugnisse aus Verarbeitung					
Nebenerzeugnisse der Müllerei, Weizen	132'574	115'533	13%	1	1
Reis	1'886	1'679	11%	2	2
Andere Nebenerzeugnisse der Müllerei	21'434	19'732	8%	2	1
Biertreber, frisch	77'965	17'152	78%	1	2
Biertreber, trocken	29'603	26'642	10%	2	1
Zuckerrübenschnitzel	324'536	97'605	70%	3	2
Melasse	53'647	42'917	20%	1	1
Raps-Rübsen	117'173	106'627	9%	2	1
Soja	255'621	224'947	12%	2	1
Maisnebenprodukte	15'192	13'369	12%	2	1
Nebenprodukte der Kartoffelindustrie	25'059	3'759	85%	3	2
Nebenprodukte der Fruchtsaftindustrie	16'542	7'286	56%	2	2
Futtermittel tierischen Ursprungs					
Mager- und Buttermilch, flüssig	6'000	510	92%	1	2
Molke, flüssig (an Schweine verfüttert)	630'592	56'445	95%	2	2
Mager- und Buttermilchpulver	5'968	5'783	3%	1	1
Molkepulver	3'704	3'593	3%	1	1
An anderer Stelle nicht genannte Futtermittel					
Gemüse	11'031	1'324	88%	2	2
Äpfel	2'110	348	84%	1	3
Abfälle aus der Kaffee- und Schokoladeproduktion	250	247	1%	2	2
Teigwaren	1'810	1'629	10%	2	1
Total	**1'868'000**	**820'000**			

Ø2017-2022 % Menge LMV [t FS/a]		Technische Hürden 1	2	3
Logistische Hürden	1	14%	24%	0%
	2	4%	39%	19%
	3	0.1%	0%	0%





Source: Beretta et al. (2025), ZHAW / FOEN | Report (PDF)

Barriers & opportunities

For side streams with high environmental potential:

Consumer acceptance

- Openness largely present in Europe
- Key arguments: health potential, proven environmental benefits
- Key criteria: familiarity, “natural” ingredients, safety
- Trial products are well rated

“Bran in my bread? Sure, as long as it’s natural!”

Technology & logistics

Technology mostly mature enough; in some cases logistics is the bigger challenge

Regulation

Regulatory framework largely established, no “novel foods”

Sales

Increase side-stream sales: targeted marketing, further product innovation, export markets

Next steps

Results of substitution potentials are currently provisional
(only for internal use)

PROVISIONAL

1



Review by an external reviewer

2



Integration into the report, publication and communication

3



Improve background data on consumption of individual products

Thank you!

Questions and discussion

Psst… I’m bran.
I’d rather end up in your bread than in the feed.



Hey, I heard that!

