



Local or long chain foods: what is the more sustainable choice? A case study on apple juice

Perceived sustainability

One of the perceived sustainability improvements in food chains is to shift from long, international food chains to local food chains. Distinctions between local and long chains are not only related to transport distances, but also processing operations and packaging solutions could differ. A comparison of sustainability of local and long chains should take such differences in consideration. This factsheet shows an environmental sustainability impact comparison of apple juice produced in the Netherlands (local chain) versus apple juice produced from a concentrate that is transported to the Netherlands (long chain), see Figure A.

Take home message

The more sustainable choice can be made by quantifying sustainability indicators as water and energy consumption and greenhouse gas emissions (GHG in CO₂ equivalents). Here the AgroChain greenhouse gas Emissions (ACE) calculator was used to visualise, determine and prioritise hotspots. There was little difference between the two chain configurations (Figure B), but the hotspots do show where improvements can be made in terms of energy, CO₂ emissions and water consumption reduction.

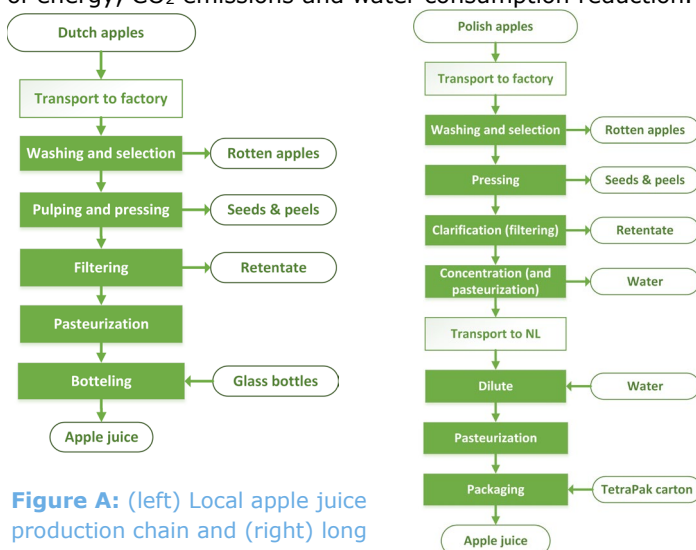


Figure A: (left) Local apple juice production chain and (right) long apple juice production chain

The ACE+ calculator

The ACE+ calculator provides **insights** in the effects of **interventions** on **sustainability** within **boundaries** of the food production and distribution chain.

Insights:

- Hotspots: which chain parts / process steps have the largest impact on sustainability?
- Effects of interventions: how do scenarios compare to each other on sustainability?

Scenarios on food systems and alternative chain configurations including processing that could alter sustainability impact. This supports, for instance, comparison on chain design, ingredient origin, and processing steps.

Sustainability: CO₂-eq, energy, water

Case study

Apple juice is among the most popular fruit juices that are consumed in the Netherlands and is also produced locally.

Main assumptions

For the comparison of a local and long chain for apple juice production (Figure A), the chain setup was based on public information and literature. The last food mile (retail and consumer) was excluded in the scenario comparison. The production process of both apple juices is similar, except that for the long chain a juice concentrate is made, which is later diluted with water before packaging. Furthermore, the packaging material is different. The local juice is put in glass bottles, whereas long chain juice is packed in a TetraPak carton. The generated side streams (except water) go to animal feed in both chains.

Results

Figure B shows the resulting environmental impact in GHG emissions in terms of kg CO₂-equivalents per kg product, blue water (e.g. ground water), green water (e.g. rain water) and energy consumption. The local chain has a slightly higher environmental impact than the long chain for all sustainability indicators, except green water use. The main reasons for the differences are:

- The packaging material: the glass bottle in the local chain is associated with a high energy demand in the production process due to melting at high temperatures.
- The agricultural production of the apples: in the Netherlands the apple orchards are partly irrigated (blue water), whereas the orchards in Poland almost fully rely on rainwater (green water).

Figure C breaks down the GHG emissions and water consumption per chain stage. It shows the hotspots for the chains:

- The agricultural production of apples has the largest contribution to the total GHG emissions and water use.
- Transport is negligible for the GHG emissions in the local chain, whereas in the long chain it contributes for 11%.
- The overall environmental footprint of the local chain can be further improved when reusable (deposit) glass is used instead of recycled glass. The washing process is much more energy-efficient compared to glass recycling. Alternatively, using TetraPak instead of glass would make the local chain also more sustainable.

Advise for 'the sustainable choice': local or long chain apple juice?

Overall, the differences between the two chains in terms of GHG emissions, water and energy consumption are not that big. Some postharvest improvement opportunities based on the hotspots are:

- The selected packaging material has a large impact on the GHG emissions and energy demand. Selecting a package based on its footprint can reduce the overall environmental impact significantly.
- For the local chain, GHG emissions could be lowered by optimising the selection and pressing process of apples to reduce losses and thus increase the juice yield.
- For the long chain, energy and GHG emissions could be reduced by changing transportation means and by optimizing the concentration and dilution processes further.
- All side streams go to animal feed in both chains. However, valorising side streams to food (e.g. apple sauce) could improve overall sustainability.

Please take in mind that the comparison of local to long chain is case specific

Learn more about our [sustainability assessment tools](#) and contact us for more information.

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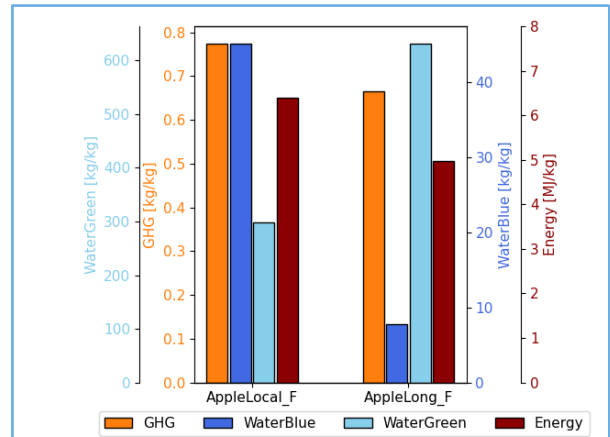


Figure B: GHG emissions, water, and energy consumption for the local and long chain apple juice production scenarios

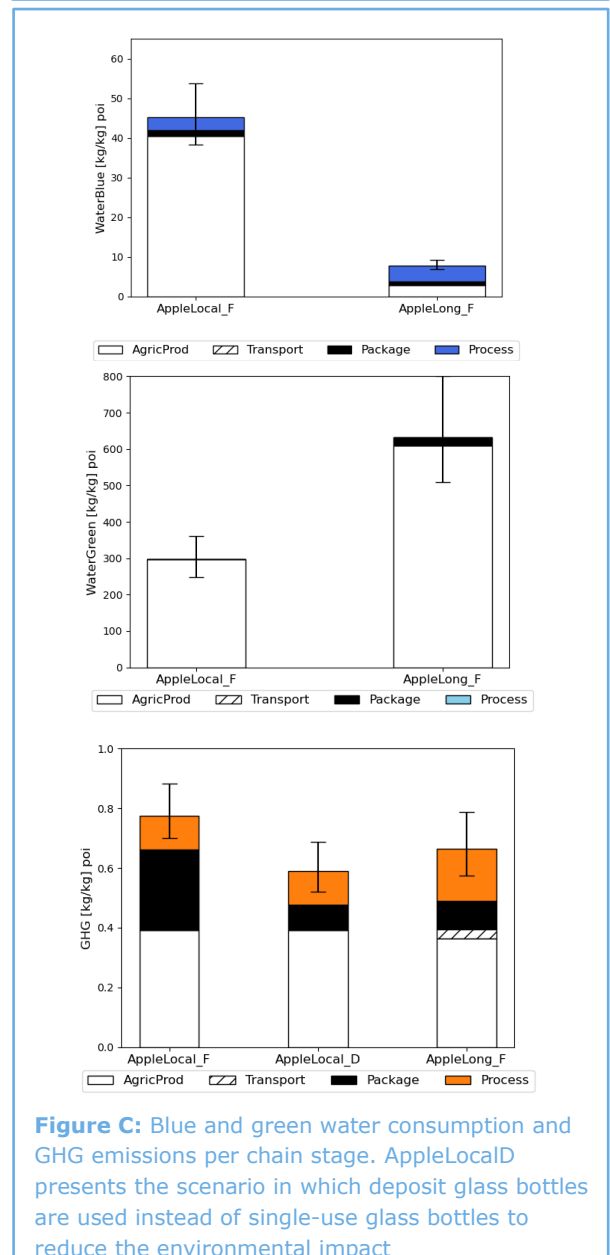


Figure C: Blue and green water consumption and GHG emissions per chain stage. AppleLocalD presents the scenario in which deposit glass bottles are used instead of single-use glass bottles to reduce the environmental impact

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