



Executive summary

Assessing the environmental and economic impacts of a switch to reusable packaging for orange juice

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1 Rationale

The proposed EU Packaging & Packaging Waste Regulation (“PPWR”) sets targets for reusable packaging. In this context, a study has been carried out with the purpose of providing a broader perspective on impact measurement related to different types of packaging. The study assesses the environmental and economic impacts of a switch to reusable packaging for UHT milk.

The study expands the scope of the EU Commission’s environmental impact assessment¹ in two ways:

1. Inclusion of the packaged product in the analysis to analyse the effects of different types of packaging on food waste, which embodies a considerably larger environmental footprint than that of the packaging itself;
2. Consideration of both environmental *and* economic impacts.

2 Scope

2.1 Packaging types

The packaging types included in the assessment are: i) single-use aseptic carton; ii) reusable aseptic glass; and iii) reusable non-aseptic PET. While single-use carton and reusable glass will ensure long-shelf life (6-9 months) through ambient distribution, reusable PET is expected to have a short shelf life (1 month) and to require chilled distribution. This is because orange juice is highly sensitive to oxygen and, with current packaging technology, reusable PET is expected to degrade faster than glass after each cycle, potentially causing oxygen to enter the packaging which results in a more perishable product.

2.2 Countries

Italy, Spain, Germany, France, Poland and Sweden are the European countries considered in the study. These markets account for 50% out of total juice consumption within the EU-27².

2.3 Data sources and availability

Environmental impacts were taken from a series of publicly available LCAs. Economic data was collected through interviews with market, product and packaging experts within Tetra Pak, as well as interviews with external stakeholders such as the European Juice Association. Margins for actors across the orange juice value chain were available only for France and impacts for other countries were estimated assuming the same relative margins as those in France.

¹ Carried out by the EU commission in preparation of the PPWR

² Eurostat (2023)

3 Results

3.1 Environmental impacts

For each packaging type, environmental impacts of a 1L packaged orange juice are quantified. These consider footprints resulting from: i) the production of 1L UHT milk; ii) the manufacturing of packaging; and iii) the expected food waste. The effect of packaging on food waste (e.g. because of different shelf life) is the main determinant of environmental impacts. This is because agricultural production results in environmental impacts of at least one order of magnitude larger than packaging manufacturing. This study assumes that non-aseptic packaging solutions result in twice as much food waste than aseptic packaging³. Glass is expected to generate slightly more food waste because of breakage during distribution.

- **Climate footprints: 1L orange juice in single-use carton has the smallest climate footprint.** Compared to carton, reusable glass and reusable PET result in higher GHG emissions, respectively 12% and 10% more. At current consumption levels, this translates to an additional annual 16 thousand ton of CO₂ equivalent for reusable glass and 13 thousand tons for reusable PET.
- **Land use footprints: 1L orange juice in reusable PET has a slightly larger land use impacts due to additional food waste.** Compared to carton, reusable PET results in 7% more land use. This is mainly due to the higher expected food waste for non-aseptic packaging. Reusable glass has a somewhat lower land use than carton due to lower impacts of packaging manufacturing and comparable shares of food waste. Overall, at current consumption levels, reusable PET would require additional 1,900 hectares of land, while reusable glass would use 6,000 hectares less⁴.

3.2 Economic impacts

Economic impacts are driven by changes in the retail selling price (RSP) of a 1L packaged orange juice. The PPWR is expected to increase costs for the retailers and bottlers due to several factors, such as heavier and/or bulkier packaging, required one-off capital investments and recurring reuse-system related costs. This study assumes that these additional costs will be fully borne by consumers because of higher prices.

Compared to carton, the increase of RSP for a 1L orange juice is expected to vary between 10% (for reusable PET) and 17% (for reusable glass). The estimated impacts on consumers and producers will be proportionate to the RSP increase. As a result, reusable PET would lead to lower adverse impacts than reusable glass. The impacts for reusable PET are summarised below. Impacts for reusable glass are some 40% higher than those for reusable PET.

A switch to reusable PET for orange juice is expected to impact economic actors in different ways, resulting in winners and losers in the entire value chain:

- **Consumers: reduced consumption and lower consumer welfare.** The RSP increase will lead to a 13% lower consumption of orange juice, approximately equal to a decrease of 50 million litres across the six markets in scope. This will shrink⁵ the orange juice market, with consumers spending around € 23 million less annually on orange juice. Although consumers spend less on orange juice, they experience a loss in

³ Bain study carried out for Tetra Pak in 2021

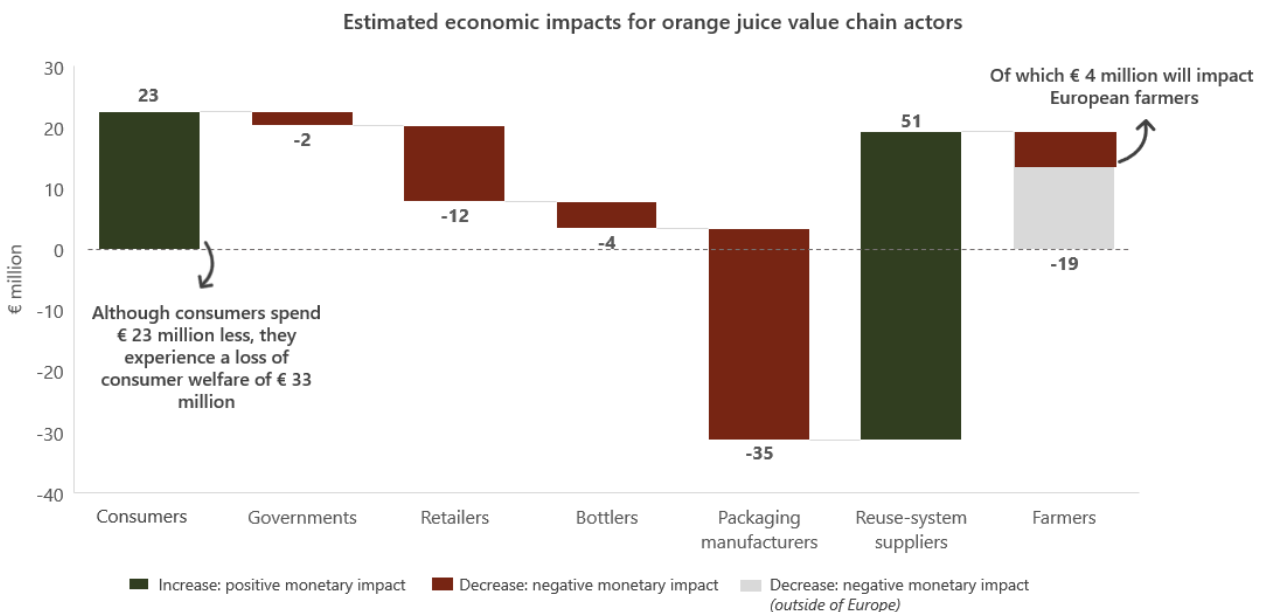
⁴ The measurement of land used (m²) is corrected based on the intensity of the land usage

⁵ Orange juice is considered an elastic product, therefore consumers will decrease consumption at a higher rate than the price increase.

consumer welfare of around € 33 million because of foregone consumption due to the price increase and maintained consumption at higher prices.

- **Governments: reduced tax revenues due to lower total spending on orange juice.** The value added tax collected by governments will change proportionally to aggregate consumer spending, resulting in an aggregate decrease in total VAT of € 2 million (equivalent to an average VAT rate of 10%).
- **Retailers and bottlers: lower annual earnings due to lower consumption.** Retailers and bottlers are assumed to maintain absolute margins per unit sold. Because consumption volumes will decrease, annual earnings for retailers and bottlers will decrease as well, by € 12 million and € 4 million, respectively.
- **Packaging manufacturers: lower annual earnings due to the reusable nature of the packaging.** Based on publicly available LCAs, the study assumes that a reusable PET bottle for juice can be reused 10 times. While with single-use packaging manufacturers sell one package per litre sold, under full application of PPWR they will sell one package per 10 litres, resulting in a € 35 million loss in earnings.
- **Reuse-system suppliers: new suppliers will enter the juice value chain to deliver products and services required for the reusable packaging system to work.** These are suppliers which were not part of the value chain before the introduction of the reuse system, such as the suppliers of reuse-system machinery and services. If we assume a full market shift towards reusable packaging, these actors will perform some € 51 million additional economic activity.
- **Farmers: lower annual earnings in the short-run due to lower consumption.** 20% of orange juice consumed in Europe is locally sourced⁶. In aggregate terms, farmers in the orange juice value chain will lose some € 19 million in earnings, with European farmers losing about € 4 million.

The graph below summarises the above-described monetary impacts for the different actors across the value chain following a full market shift from single-use carton to reusable PET. The lower consumption of orange juice causes reduced earnings for all current actors in the value chain, which are balanced out by increased earnings for goods and services suppliers in the re-use system.



⁶ Interview with the European Juice Association (AIJN)

4 Conclusion

A complete switch to reusable PET packaging in the orange juice value chain will cause:

- Additional 13 thousand tons of CO₂ equivalent emitted annually (+10%);
- Additional 1,900 hectares m² of land used (+7%);
- A smaller European market for orange juice (€ -23 million) which will result in negative economic impacts for most actors in the current value chain: governments (€ 2 million), retailers (€ -12 million), bottlers (€ -4 million), packaging manufacturers (€ -35 million) and European farmers (€ -4 million). However, a market (€ 51 million) for providers of reusable packaging systems and services would be created.

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