Environmental footprint of French food products

Justine Catel, Gustave Coste, Arnaud Hélias

Environmental footprint of French food products

Justine Catel[1,2], Gustave Coste[1,2,3], Arnaud Hélias[1,2]

[1] ITAP, Univ Montpellier, INRAE, Institut Agro, Montpellier, France
[2] Elsa, Research group for Environmental Lifecycle and Sustainability Assessment, Montpellier, France
[1] LBE, Univ Montpellier, INRAE, Narbonne, France
E-mail contact: arnaud.helias@inrae.fr

1. Introduction

Product environmental footprint is an eternal compromise: The assessment has to be specific, to best represent production and processing choices in the value chain. Unfortunately, this need for specific data quickly becomes an obstacle and makes the work too big to do on a large scale. In contrast, generic data offer a less expensive result, but these default values only allow for inter-category comparisons, so differentiating products within a category is impossible. This balance between specificity and simplicity needs to be overcome.

French government has initiated, since the end of 2020, a set of experiments to define the modalities of an environmental rating of all food products. This now seems to be possible with the help of the Agribalyse [1] database and its 2,500 'generic' food products. However, the proportions of ingredients in food products are a determining factor for the environmental footprint and reveal intra-category discrepancies. We have developed the PEFAP calculator (Product Environmental Footprint According to Packaging data [2]) which automatically estimates environmental impacts based on the information available on the packaging.

2. Materials and methods

2.1. PEFAP algorithm

Based on the partial list of ingredients (an ordered list, but with often unknown proportions) and nutritional data available on packaging, the algorithm explores the range of possible recipes through a Monte Carlo approach. In each iteration, the masses of ingredients are randomly chosen according to the possible proportions of ingredients and ensuring the best possible preservation of nutrient contents (the nutrients of the product being considered as the sum of the nutrients of all its ingredients). PEFAP retrieves for each ingredient the environmental impacts from Agribalyse and the nutrient data from Ciqual database [3]. It finds the most likely footprint by the convergence of the result over Monte Carlo runs.

2.2. Packaging Data

From a barcode, PEFAP queries the online Open Food Facts [4] database and the user obtains in a few seconds a specific footprint of the product (data table and summary web page of the evaluation). This allows intra-category comparisons and provides more accurate footprints than the generic values from Agribalyse.

2.3. French food products consumption

Footprints have already been calculated for the 150'000 reasonably reliable products of the Open Food Facts database. This includes a subset of 30,000 products with data that are considered fully reliable. This reliability is determined by the number of ingredients in the product that have an entry in Agribalyse and Ciqual, and the completeness of the nutritional data displayed.

These data are used in combination with the average quantity consumed in France for the major food categories [5]. This allows us to see the impact of the diet between food categories and the variability within each of them, linked to the diversity of food products.

3. Results and discussion

Figure 1 shows the EF 3.0 [6] single score for each food category of the fully reliable products. Unsurprisingly, the consumption of animal products has the largest impact and the impact decreases as the water content increases (with beverages appearing as the least impactful categories). But within these broad trends, significant intra-category variability is observed, sometimes exceeding an order of magnitude. This underlines the importance of going beyond a generic value for an environmental footprint and integrating the specificity of the products.

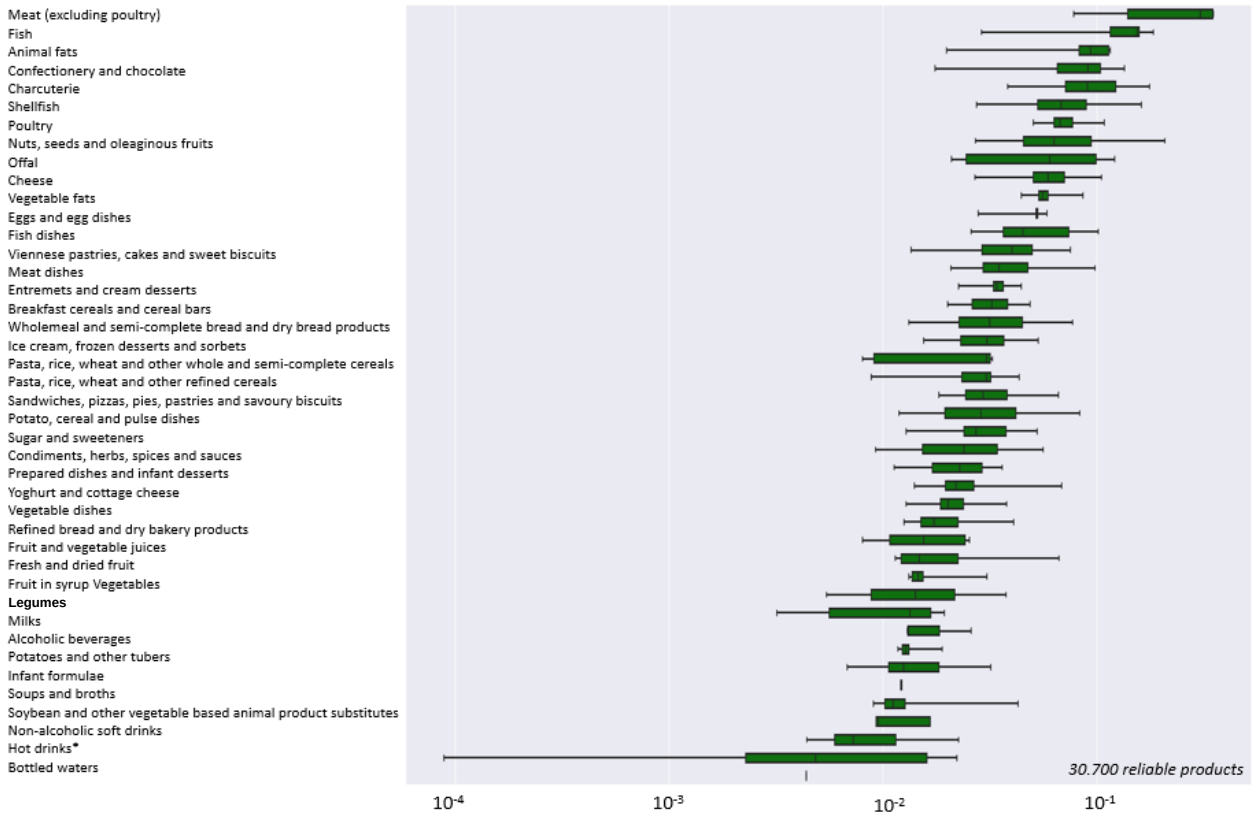

Figure 1 : Tukey box plot of single scores of EF 3.0 method for food categories for one French consumer (mPt/day). Outliers were removed by bounding the data sets between 2.5% and 97.5%, the x-axis is in logarithmic scale. Due to inconsistency in the data, a correction factor has been applied to the hot drinks category.

4. Conclusions

The creation of this algorithm makes it possible to better specify the characteristics of food products and makes environmental footprints more reliable. It is also a tool for assessing the impact of food consumption. It allows describing the effects of (1) diet changes (i.e. inter-category consumption changes), (2) product changes (i.e. intra-category consumption changes) and (3) their respective importance (inter- versus intra-category) to identify the most important drivers for a less impactful diet while ensuring the nutritional intake.

5. References

[1] ADEME. 2020. AgriBalyse v3.0. https://doc.agribalyse.fr/documentation-en/ Accessed 30-11-2021
[2] ANSES. 2020. CIQUAL French food composition table https://ciqual.anses.fr/ Accessed 30-11-2021.
[3] Open Food Facts. 2012. Open Food Facts https://fr.openfoodfacts.org Accessed 30-11-2021
[4] Coste G, Hélias A. under review. PEFAP : Estimating the environmental footprint of food products from packaging data. J Open Source Softw.
[5] ANSES. 2017. National Individual Food Consumption Study 3 - INCA 3 (in French). Maison-Alford, France, Anses Publication. 535pp https://www.anses.fr/fr/system/files/NUT2014SA0234Ra.pdf
[6] Zampori L, Pant R. 2019. Suggestions for updating the Product Environmental Footprint (PEF) method - EUR 29682 EN, JRC115959. Publications Office of the European Union, Luxembourg

Acknowledgement - The authors thank Open Food Facts contributors for creating the database this approach relies on.