

What Lies Behind European Diets? Water Footprint from fresh to Processed Food in the EU

Topic: Input-Output Analysis: Sustainable Production and Consumption policies (8)

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Increasing awareness of climate change impacts on natural resources has strengthened public concern and reinforced authorities'™ commitment to environmental sustainability and climate neutrality in Europe.

Recent literature has emphasized the role of households as key drivers of environmental impacts, identifying them as central actors in environmental policy design. In this context, shifts in demand, particularly those related to food consumption, can significantly contribute to reducing environmental footprints and fostering the development of more sustainable and resilient economies. Over the past decades, the consumption of processed and ultra-processed food has increased significantly, driven by urbanization, rising incomes, changing lifestyles, and the demand for convenience. Ultra-processed products account for a growing share of daily caloric intake in many countries, particularly across Europe. While these foods offer affordability and longer shelf life, their expansion has considerable environmental implications. Processing, packaging, transportation, and extended supply chains intensify resource use beyond primary agricultural production. As a result, processed food consumption could contribute not only to higher energy demand and emissions, but also to a larger and often less visible water footprint.

In this context, this paper seeks to analyze the water footprint associated with the current food consumption in European Union households. To achieve this, we develop an environmentally extended multi-regional and multi-sectoral input-output (MRIO) model, allowing both direct and indirect consumption effects to be captured along global supply chains. The study presents a novel approach to disaggregate agri-food sectors within MRIO tables into processed and fresh or unprocessed food categories. In particular, this approach allows us to simulate the gradual evolution of the implementation of processed food in the agri-food systems, and to evaluate then the long-term effects in a context of economic growth as well as their environmental implications. This refinement enables a more accurate assessment of the environmental impacts associated with consumption patterns, as these food categories exhibit substantial differences in water intensity.

The empirical analysis is based on the EMERGING MRIO database for the year 2018, extended with environmental water consumption vectors derived from the GLORIA database, resulting in a modelling framework comprising 158 regions and 83 productive sectors per region. This framework allows the identification of both domestic impacts and indirect effects embodied in international trade associated with European consumption.

Following an initial assessment of the environmental impacts of current consumption patterns, the study proposes to evaluate alternative dietary scenarios considered a priori more sustainable: (i) the expected evolution of ultra-processed and processed food in EU, (ii) a sustainable scenario with a reduction in processed and ultra-processed food consumption, replaced by nutritionally comparable non-processed alternatives; (iii) a transition towards the Mediterranean diet; and (iv) the adoption of nationally recommended dietary guidelines in each European Union country. The scenarios are implemented through modifications to household final demand vectors while maintaining consistency within the input-output accounting framework.

Preliminary results suggest that reducing processed food consumption can significantly reduce the water footprint of diets at the European aggregate level, although impacts vary substantially across regions due to heterogeneity in production structures, trade dependencies, and consumption patterns. The implementation of the Mediterranean diet also leads to reductions in water requirements across the analysed countries; however, considerable cross-country differences emerge, with Eastern European countries exhibiting the largest reductions.

Keywords: Multi-regional input-output, water footprint, sustainable consumption patterns, embodied water, processed food

JEL codes: D57, Q25, Q51