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## Navigating Life Cycle Analysis (LCA) Databases; Insights for Shifting Towards Sustainable Dietary Patterns

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Life Cycle Assessment (LCA) databases allow for the environmental impacts of food production and consumption to be quantified, thereby informing sustainable dietary choices<sup>(1)</sup>. In the foodservice sector, LCA data is considered key to assessing environmental performance, accelerating sustainable practices, reducing impacts, and supporting sustainability managers in decision-making processes<sup>(2)</sup>. As nutrition research increasingly emphasises the importance of considering sustainability in dietary patterns<sup>(3)</sup>, developing guidelines for the food service sector and increasing understanding around LCA's are key to the transition towards sustainable practices. Nutritics developed 'Foodprint' a carbon and water grading system using data from LCA's<sup>(4)</sup>. The aim of this study was to analyse carbon and water Foodprint values, and to assess whether results were consistent across different LCA databases.

This study provides a quantitative analysis of data points on 6,614 foods across 11 open-access, peer-reviewed LCA databases. Analysis was conducted to examine the relationship between the carbon and water footprint values for foods and 13 food categories, accounting for differences in country of production (CP) and LCA databases. Foods were assigned a Foodprint carbon (A to E) and water grade (1 to 10) using Nutritics software. Descriptive statistics including univariate analysis of variance (ANOVA) were used to assess the relationship between CP and LCA database when analysing the carbon and water footprints of foods. Scheffe Post-hoc tests were used to identify specific differences between groups when results were significant. Statistical analysis was conducted using Microsoft Excel 2019 and IBM Statistical Package for Social Science Version 28 (SPSS).

LCA data was available for 6,614 foods across 14 master categories and 160 regional categories.

87% of items had carbon footprint values ( $n$  5,755) and 23% had water footprint values ( $n$  1,522). Significant differences were observed between food categories in terms of their carbon and water footprints ( $P < .001$ ). There was no significant difference between LCA databases for the carbon and water footprint of food categories ( $P > .001$ ). The category 'Animal Products' had the highest carbon footprint ( $\mu$  15.23  $\text{co}_2\text{eq/kg}$ ) and the 'Cereals and Grain' category had the highest water footprint ( $\mu$  16247.37L/kg). Across all LCA databases, the highest variation in carbon grades was seen for 'Potatoes', 'Soups', 'Cakes & Desserts', 'Vegetables-General' and 'Grains', and the least variation was seen for 'Creams - Dairy' and 'Lamb'.

The findings suggest that the LCA databases provide consistent results on the carbon and water footprint of foods, and that certain food categories have the highest environmental impact regardless of the LCA database selected. Further research should analyse additional LCA databases that are not open-access, and assess the impact of using primary level product data on outcomes. Additional environmental impacts should also be assessed.

### References

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