

An integrated assessment of the environmental and nutritional impacts of different types of meals using life cycle assessment

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Current patterns of food production and consumption are amongst the main drivers of climate change and environmental degradation⁽¹⁾, and have been causally associated with malnutrition, obesity and other diet-related chronic diseases such as cancer, cardiovascular disease, stroke, and diabetes^(2,3).

The benefits of diet evolution towards a more plant-based dietary pattern have been widely examined from an environmental as well as a nutritional perspective⁽⁴⁾. Nevertheless, the magnitude of both the environmental and nutritional impacts of daily food choices at a meal level is less researched but also important. The aim of this research was to evaluate the environmental and nutritional value of a sample of meals offered by an institutional food service provider at the University College London, UK. In this study, four different types of meals (“chilli”, “lasagne”, “curry” and “teriyaki”) and their recipe variations (“meat-based”, “vegetarian”, “vegan”, and “whole food, plant-based (WFPB)”) were analysed for their nutrient composition and environmental impact.

We used life cycle assessment (LCA) to quantify the environmental impacts associated with a sample of twelve meals following the standard LCA methodology (ISO 14040 and ISO 14044). The nutrition composition of meal recipes was calculated using Nutritics (v5.63). To assess and compare the nutritional value of meals in relation to their environmental impact (global warming potential, freshwater eutrophication, terrestrial acidification and water depletion), we utilised the Nutrient Rich Foods Index (NRF9.3)⁽⁵⁾ which was calculated for each meal and used as a functional unit in the LCA.

Meals made with minimally processed ingredients of plant origin had the best environmental performance. On average, WFPB meals had 16 times lower global warming potential (0.18 kg of CO₂-eq.) than meat-based meals (3 kg CO₂-eq.). Interestingly, WFPB meals also had higher nutrient density than the respective meat-based, vegetarian or vegan meals, especially in regards to micronutrient composition (i.e. potassium, magnesium, iron, vitamin A, C and E, folate, selenium). In particular, WFPB meals contained 3 times more fibre and half the amount of saturated fat and sodium (per 100g) compared to meat-based meals. However, they contained 2.5 less protein and 1.5 times less calories (3.95 g and 76.35kcal per 100 g respectively) than meat-based meals.

Understanding the environmental and nutritional impacts of day-to-day food choices can help both consumers and food service providers to make more informed decisions about the types of meals to prepare, offer, and consume. Our findings suggest that minimally processed plant-based meals not only have lower environmental impact than meat-based, vegetarian and vegan meals but they also have higher micronutrient concentration and thus could also better meet the nutritional needs of the population group under study (young adults in the UK).

References

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