Environmental, Social, and Economic Sustainability Assessment of Food Production Systems

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THIS ABSTRACT IS PART OF THE ACCEPTED SPECIAL SESSION (Multi-Indicator Sustainability Assessment of Food Systems, Products, and Food Process Technologies)

Food systems are at the heart of the 17 Sustainable Development Goals (SDGs). The wide scope of the SDGs call for holistic approaches that integrate ‘siloed’ food sustainability assessments. Here we present a global scale analysis quantifying the status of national food system performance of 156 countries, employing 25 sustainability indicators across seven domains: nutrition, environment, food affordability & availability, sociocultural wellbeing, resilience, food safety, and waste.
We assess the nutritional quality of average national daily diet taking into account >25 essential nutrients and several nutrients of health concern in the consumed food items and their daily dietary reference intakes and maximum reference values, respectively. Next, we compile the environmental footprint through recently proposed approaches in life cycle assessment. The results show that high-income nations score well on most indicators, but poorly on environmental, food waste and health sensitive nutrient intake indicators. Transitioning from animal foods towards plant-based foods would improve indicator scores for most countries.
Focusing on a food product level, nutritional combined life cycle sustainability assessment, aligned with the emerging process developments, can evaluate the suggested solutions on a multi parameter base in terms of sustainability of improved food production. The integration of advanced life cycle assessment with nutritional metrics can provide the first assessment of the real value for the innovative food products currently developed. In this product level comparison, we calculate nutritional adequacy and diversity metrics for over 200 foods and countries. Environmental impacts of food products change when measured on a nutritional basis. Food products can also cover nutritional deficiencies in an environmentally friendly way.
These assessments allow for an improved and more fair comparison between new food products against benchmark sources, taking into consideration the additional respective technology readiness levels of emerging processes.
Our quantitative multi-indicator sustainability assessments can help food producers and policymakers to set improvement targets on specific areas and adopt practices while keeping track of their holistic sustainability performance.