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Reply to Bawa and Liu: Want sustainable food? Embrace complexity

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Bawa and Liu (1) identify two limitations of our study (2). First, they point out that we only evaluate the potential land use conflict between crops and biodiversity preservation but did not study water use, pollution, or other ways in which agriculture can drive biodiversity pressure. Second, they argue that footprints should be presented for foods on the plate (or in the cup), not on the farm—that is, inclusive of all post-farm-gate supply chain steps.

While both points carry merit, our preceding studies (3, 4) have addressed these issues using other incomplete datasets. The field is working toward assembling a data basis to monitor the complete multistressor, spatial heterogeneity, and farm-to-plate environmental footprint of all foods, but this goal remains incomplete. Most papers spotlight specific aspects while simplifying others. For example, in their comparison of the footprints of coffee and tea (1), Bawa and Liu did not refer to the spatial heterogeneities of production, which was a key contribution of our work. Specifically, while coffee indeed demands over four times the water for every cup compared to tea, as per global average values (5), its biodiversity impact does not proportionately persist across different geographical contexts.

We agree that our methodology does not encapsulate the entirety of agriculture–biodiversity conflicts. Although instructive, such multistressor assessments demand coordinated responses across typically siloed policy domains (e.g., water, land, and energy) (6). Using the land-based metric proposed in our study, we believe that more tractable policy options for mitigating acute agrienvironmental threats can be found and acted upon.

Although an impact metric, per unit of consumption, may provide a generalized yardstick for the public to decipher the impacts of their food choices, its utility is primarily consumer-oriented and does not extend valuable insight to producers and other stakeholders throughout supply chains. Sustainable food system transitions are inherently complex, involving multiple stakeholders who operate within dynamic markets and sociocultural settings, each with distinct capacities to address agri-environmental risks.

Substitution, as rightly identified by Bawa and Liu as a strategy to minimize the ecological footprint, is carefully considered in our paper (2). However, it is crucial to underline that the feasibility of such a shift—from coffee to tea—depends on myriad factors, including regional climatic and soil conditions, the socio-economic implications for farmers, and entrenched global coffee consumption habits (7). A simple composite footprint indicator glosses over the fact that each of these factors must be addressed separately.

Examination of the difference between coffee and tea production's wider environmental footprint provides valuable insights and highlights the need to better align impact metrics with functional consumption units. However, we must avoid the false promise of simple solutions and shifting the burden of a sustainable food transition on single food system actors. Here, our analysis offers critical nuance on agri-conservation conflicts which have been overlooked in policy, industry, and consumer spheres to date. As Bawa and Liu note, we face a real disconnect between consumption activities and their remote production impacts. Addressing this can only be achieved by better optics on this challenge at all scales.

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The authors declare no competing interest.

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