Considerations for reducing food system energy demand while scaling up urban agriculture
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Considerations for reducing food system energy demand while scaling up urban agriculture: Letter

There is an increasing global interest in scaling up urban agriculture (UA) in its various forms, from private gardens to sophisticated commercial operations. Much of this interest is in the spirit of environmental protection, with reduced waste and transportation energy highlighted as some of the proposed benefits of UA; however, explicit consideration of energy and resource requirements needs to be made in order to realize these anticipated environmental benefits. A literature review is undertaken here to provide new insight into the energy implications of scaling up UA in cities in high-income countries, considering UA classification, direct/indirect energy pressures, and interactions with other components of the food-energy-water nexus. This is followed by an exploration of ways in which these cities can plan for the exploitation of waste flows for resource-efficient UA. Given that it is estimated that the food system contributes nearly 15% of total US energy demand, optimization of resource use in food production, distribution, consumption, and waste systems may have a significant energy impact. There are limited data available that quantify resource demand implications directly associated with UA systems, highlighting that the literature is not yet sufficiently robust to make universal claims on benefits. This letter explores energy demand from conventional resource inputs, various production systems, water/energy trade-offs, alternative irrigation, packaging materials, and transportation/supply chains to shed light on UA-focused research needs. By analyzing data and cases from the existing literature, we propose that gains in energy efficiency could be realized through the co-location of UA operations with waste streams (e.g. heat, CO2, greywater, wastewater, compost), potentially increasing yields and offsetting life cycle energy demands relative to conventional approaches. This begs a number of energy-focused UA research questions that explore the opportunities for integrating the variety of UA structures and technologies, so that they are better able to exploit these urban waste flows and achieve whole-system reductions in energy demand. Any planning approach to implement these must, as always, assess how context will influence the viability and value added from the promotion of UA.