Urban farms could be incredibly efficient—but aren’t yet

Enlarge / Rooftop farming in Brooklyn.

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The green revolution that transformed modern agriculture has generally increased its scale. There’s tremendous potential for efficiencies in the large-scale application of mechanization, fertilization, and pesticide use. But operating at that level requires large tracts of land, which means sources of food have grown increasingly distant from the people in urban centers who will ultimately eat most of it.

In some ways, hyper-local food is a counterculture movement, focused on growing herbs and vegetables in the same dense urban environments where they will be eaten. It trades the huge efficiencies of modern agriculture for large savings in transportation and storage costs. But is urban farming environmentally friendly?

According to researchers at Australia’s University of New England, the answer is pretty complex. Within their somewhat limited group of gardeners, urban agriculture is far more productive for the amount of land used but isn’t especially efficient with labor and materials use. But the materials issue could be solved, and the labor inefficiency may be a

product of the fact that most urban farmers are hobbyists and are doing it for fun.

Urban ag

The researchers—Robert McDougalla, Paul Kristiansena, and Romina Rader—defined urban agriculture as taking place within a kilometer of a densely built environment. Working in the Sydney area, they were able to find 13 urban farmers who were willing to keep detailed logs of their activity for an entire year. Labor and materials costs were tracked, as was the value of the produce it helped create. The energetic costs of the materials and labor were also calculated in order to assess the sustainability of urban farming.

The plots cultivated by these farmers were quite small, with the median only a bit over 10 square meters. Yet they were extremely productive, with a mean of just under six kilograms of produce for each of those square meters. That's about twice as productive as a typical Australian vegetable farm, although the output range of the urban farms was huge—everything from slightly below large farm productivity to five times as productive.

For the vast majority of crops, however, the urban farms weren't especially effective. They required far more labor than traditional farms, and, as a result, the total value of the inputs into the crop exceeded the income from selling it. In other words, the urban farmers were losing money, at least by traditional accounting measures. And the farms weren't especially sustainable, with only about 10 percent of all the inputs coming from renewable resources. Again, labor was a major culprit, as it's not considered very renewable, and urban farming is very labor-intensive.

So that all sounds like a bit of a disaster, really. But as mentioned above, things quickly get complex. The urban farmers, as it turned out, bought compost and fertilizer and

used the municipal water supply. Cities, as the authors note, produce large quantities of organic waste that could be used to make compost. While it would require additional labor and land space, it would be easy to make the care of the crops far more sustainable. Combined with the use of collected rainwater, these could get the percentage of renewable contributions up to roughly 40 percent.

Laborious

Then there's the issue of the time spent on labor. The urban farmers don't seem to be especially efficient compared to regular farm laborers, and by all indications they don't necessarily *want* to be. For many of them, it's more a hobby than career; they put in more labor because they enjoy it or find it relaxing. If you start reducing the labor costs to reflect this, things start changing dramatically. If only the material costs of urban farming are considered (meaning labor was set to $0), then the apparent efficiency improves dramatically.

Not surprisingly, ignoring labor costs also makes a big difference financially, with the profit-to-cost ratio going from a mean of 0.62 up to 2.8, indicating that these urban farms would generally be quite profitable.

Labor also makes a big difference in terms of energy use. As they're now operating, these urban farms aren't very different from rural farms, which means they're not sustainable. Shifting to local sources of materials, like rainwater and compost, would drop the energy use dramatically, shifting the farms into territory that's typically considered sustainable. Eliminating labor considerations on top of that would make urban agriculture among the most efficient means of growing vegetables presently studied.

There are two obvious caveats to this work: the small number of farms sampled and the fact that they were all in a single

urban area. This sort of study will obviously need to be replicated in other locations before we can start generalizing about hyper-local produce. But the role of labor in this sort of analysis makes conclusions difficult to generalize. Is it reasonable to discount some fraction of the labor costs when people are doing the farming for pleasure? Do we start considering a tomato plant on a balcony part of an urban farm?

While many of the details are unclear, the overall conclusion seems solid: while urban farms aren’t yet there in terms of sustainability and energy use, the potential for them to outpace their larger urban cousins is definitely there. But it will take an entire sustainable support infrastructure for them to truly arrive.

PNAS, 2018. DOI: 10.1073/pnas.1809707115 (About DOIs).

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