Viewpoint: ‘Think globally, act locally’? It’s a buzzy environmentalist catchphrase, but it may not be the best way to address climate change and conservation challenges

Few bumper stickers have made as large of an impression as “Think Globally, Act Locally.” Plastered on the back of fuel-efficient cars all over the English-speaking world, the phrase was inseparable from the broader environmentalist movement of the 1990s. But, as the environmental movement has shifted from a concern with things like pollution and industrial waste, to the inherently more global “climate,” the phrase has lost some luster.

But when it comes to agriculture, the ’90s-era environmentalists were onto something. The food system relies on both the local and the global. Crop production and ruminant grazing depends on local soils, weather, and practices, but profits, consumers, and ultimately decarbonization rely on global forces, like trade in commodity crops, availability of agricultural inputs, and adoption of technologies. Farmers must act locally. But policymakers, corporations, and advocates must think globally.

Making agriculture and, more broadly, the food system sustainable will require understanding and acting within local contexts but with emphasis on global impacts.

But sustainable agricultural programs – particularly those aimed at conservation – often focus entirely on local pollution, landscapes, and problems, without concern for the global outcomes that local policies can enact. Funded by environmental NGOs, the USDA, venture capital, and other investors focused on conservation, these conservation agricultural practices often prioritize local problems at the expense of one of the most important agricultural principles: yield.

When U.S. farmers are paid to take land out of production or simply use less productive practices, farmers elsewhere – often with less-productive farms – are incentivized to make up for diminished agricultural output. If this involves tilling new acres, deforestation, or other practices that cut into carbon stocks, then the conservation and “sustainable” practices in the U.S. become significant sources of global emissions. Forgoing U.S. productivity can mean sacrificing forests, savannas, or prairies elsewhere – either abroad or in different parts of the United States.

These trade-offs are at the core of the debate over “land sparing vs. land sharing.” Land sparers promote high-yielding farmlands as the most sustainable form of production and argue that intensive cultivation on a small amount of land paired with land use policies that protect natural habitats allows for the conservation of larger amounts of less-productive land. Conversely, land sharers believe in integrating conservation into agricultural landscapes. They seek to further hybridize farms and nature, even if that means diminished yields for producers and less land overall that can be left to be “wild” or for other non-commodity agricultural land uses.

Both sides of the debate have their blind spots — crude land sparing can sacrifice local ecological conditions for global yields; and myopic land sharing prioritizes local biodiversity and the aesthetic values of conservation agriculture over global greenhouse gas inventories, deforestation, and even food security.

To achieve a globally sustainable food system will require moving past the dichotomy of land sparing vs.

land sharing and making clear-eyed decisions about these trade-offs. It means embracing conservation practices that benefit local ecosystems as long as they do not reduce yield and productivity.

The case for land sparing

When viewed from a global scale, there is no avoiding the necessity of a land-sparing over land-sharing approach. It is better for biodiversity. It will emit less greenhouse gases and could offset even more when compared to land sharing. This is not to say that increasing agricultural yields will automatically spare wild lands around the world from deforestation, end habitat loss for wild animals, or limit the corporate takeover of peasant and subsistence farmland. Increasing yields risks increasing, rather than reducing, global agricultural acreage if localized social and governance constraints on agricultural land expansion are not in place.

Although land sparing is the ideal policy for global land use, it is rarely championed as the environmentally friendly option. Visceral images of industrial agriculture – from the endless rows of commodity monocrops to the Gulf of Mexico's emerging dead zone – have fueled environmentalists' and conservationists' fears of technology, progress, and agricultural innovation.

Yet when environmentalists turn to images of happy farmers, Instagram-friendly homesteads and wildlife-welcoming agricultural acres as the only sustainable form of farming, they mistakenly throw away the very real benefits of high-yielding agriculture for aesthetics. They play down the ways that efficient agriculture has proven beneficial for sparing land for conservation. For an example, since 1950 global grain production per person has increased by more than 25%, while land use per person has declined by more than 50%.

Despite these benefits, environmentalists, conservationists, and even the U.S. federal government have latched onto the local harms, advocating for reformed agricultural practices that can reverse *some* of these harms, while also reversing all the global benefits.

Many USDA-sponsored conservation policies – like pollinator strips, fertilizer reduction, or intercropping – encourage producers to fall on the land-sharing side of the spectrum. While monitoring and rewarding local conservation is easier than tracking the global impacts of high-yielding agriculture, that is not enough to justify its prioritization. Rather than giving conservation agriculture a free pass for what is often purely just eco-friendly aesthetics, and not eco-friendly practices, federally funded conservation programs must be able to navigate the murky waters of agricultural trade-offs to both reduce local harms while maintaining the global benefits of land sparing through intensive agricultural production.

For conservation agriculture, becoming "climate smart" will require federal programs and the many private conservation groups to prioritize yield as a key metric when assessing the conservation benefits of specific practices. Policymakers, grant providers, and funders need a discerning eye on what is legitimately better for the climate and what is magical thinking.

Fortunately, there are win-wins. Some agricultural practices provide the local benefits that conservationists and environmentalists clamor for without sacrificing – and in some cases increasing – average yields. Identifying and subsequently funding these practices ought to be top priority for the federal

government and the private conservation groups who ostensibly *also* care about climate change and deforestation.

High yields, low inputs

The lowest bar to clear for conservation practices to become climate smart is to reduce inputs without lowering yields. Training farmers in appropriate nutrient stewardship and helping fund the necessary infrastructure and technological adoption to back it up, for example, can prevent farmers from spending money on costly inputs that will ultimately be washed away by rain or leached into soils. Programs like the USDA's Environmental Quality Incentives Program (EQIP) provide money for the purchase of equipment that allows for more efficient fertilizer, pesticide, and herbicide application, among other inputs. In some cases, more efficient use of these inputs can increase yields, reduce variability of output, and boost profits , while limiting the ecological impact of fertilizer runoff and pesticide overapplication.

When it comes to direct on-farm conservation practices, like cover cropping or reducing tillage, there are more significant trade-offs. Cover crops protect from soil erosion, can increase soil organic matter, reduce nitrogen runoff, and have implied benefits for soil health. But purchasing seeds adds costs for growers. Some large reviews have shown that cover crops can benefit crop yields, but only when the cover crops do not deplete nutrients that productive crops otherwise need. A recent NASA study of Midwest cover crop adopters found that almost all farmers using cover crops for more than three years saw reduced yields. Similarly, reduced or no-tillage farming – which claims similar conservation benefits as cover cropping – can prove costly to growers if it increases weeds or pests, and rarely results in yield increases.

Deducing when and where these practices should be used requires acknowledgment of the limited benefits on productivity, and the specific local conditions of production. Neither cover cropping nor reduced tillage can be a one-size-fits-all approach to either improving ecosystem services or building a climate-smart food system. But when cover cropping can be employed without reducing yields, the ecosystem services can speak for themselves.

The most challenging conservation practices to justify are those that replace pieces of farmland with trees, pollinator habitats, or native shrubs or grasses. Many of these practices are "edge of field," meaning they are done only on the field margins. Such practices are sometimes implemented on marginal land that isn't currently farmed. However, they can reduce production and induce indirect land-use change when implemented on current farmland or when the edge-of-field plants compete with the productive crops for nutrients or water. Often, these conservation practices have long-lasting effects. Planted perennials, like trees or shrubs, often remain on the landscape for a long time. This makes the question of which conservation practices truly increase output, and which do not, even more crucial. The consequences of kicking yield downstream, and the resultant land-use change, are hard to quantify. What is certain is that ignoring it today sets the stage to ignore it tomorrow.

In some cases, incorporating trees, shrubs, and other native vegetation on marginal land and on field edges can improve yield enough to compensate for any removal of crop acres. A study of practices in Kansas and Nebraska soy and wheat fields found that 71% of narrow windbreaks (1-2 rows of trees) increased yields beyond the footprint of their implementation. But the study is one of few that has looked at the yield and the footprint of the practice. More studies are needed to assess different practices across

geographic regions, crops, and other important factors to optimize windbreak implementation.

Even if thin windbreaks are effective for some crop systems in the Great Plains, there is not enough guidance for growers to ensure that their practice is one of the almost-three-quarters that increases yields. For example, the USDA offers cost-shares to windbreaks that are wider than one or two rows. While these wider windbreaks would have the intended benefits of protection from soil erosion, reduction of wind damage to crops, and provision of additional sources of income for farmers, their implementation and adoption requires balancing those benefits with both the local and global impacts on yields.

For practices even smaller than windbreaks, like pollinator strips at the edges of fields where shrubs, grasses, and forbs are planted, the smaller footprint lowers the burden of any necessary yield increase to offset implementation. Pollinator strips are great tools to increase local pollinator biodiversity and build resilient strategies of pest management, but meta-analyses have found little to no evidence of yield increases associated with their implementation.

Realistically, most commodity crops – like wheat or corn – are wind pollinated, and thus do not require pollinators. Even with a complete collapse of all pollinators, there would be less than an 8% drop in global agricultural yield. But this ignores the value of pollinators for fruit, vegetable, nut, and other crops that employ pollination services that truck honeybees and other insects to farms to ensure pollination. A 2021 USDA Economic Research Service report estimated that the pollination service industry was worth roughly $250 million to $320 million, representing an important source of income for beekeepers, but also a significant cost for producers in need of pollination. Pollinator strips have been found to increase pollinator visits to farms, but are unlikely to replace pollination services.

The benefits of pollinator strips come down to what they provide for local biodiversity and wildlife habitats. These factors are not trivial. While the seriousness of the declines in insect population is debated, there is intrinsic value in maintaining local biodiversity and not turning agricultural regions into the dystopian landscapes that environmentalists fear they already are. Weighing these benefits against things like yield and global land-use implications is difficult but requires a clear-eyed assessment of local and global impacts, rather than a one-size-fits-all approach either in favor of high-yielding agriculture, or in favor of a romanticized vision of on-farm conservation.

What the data says

Demystifying sustainable agriculture has implications for both federal policy approaches to conservation and to the cultural and social ways that we relate to food. Aesthetic-forward assessment of farming – whether in the land-sparing or land-sharing direction – cannot be the backbone of agricultural decarbonization, conservation planning, or anything else, really. As agricultural information becomes increasingly available, the pros and cons of different practices will become clearer. Using that information, studying it, and making decisions based on data and clear criteria will be crucial for the future of policymaking and agriculture, more broadly.

In the meantime, maintaining clear principles about what should or should not be funded, especially at the federal level, will be crucial. Specifically, USDA conservation programs ought to consider – not necessarily prioritize – yield in their assessment of practices.

The USDA funds on-farm conservation through such programs as the Conservation Stewardship Program (CSP) and EQIP. Since USDA programs are oversubscribed by as much as 3 to 1, the decisions about which applicants receive grant funding are all the more crucial. Even as the Inflation Reduction Act offers a new flush of cash for conservation programs, demand for conservation funding will likely outpace supply.

Both CSP and EQIP fall under the auspices of the National Resource Conservation Service (NRCS). NRCS creates national and state priorities to guide each funding cycle. For the past two years, conservation program applications have been sent through an electronic portal, called Conservation Assessment Ranking Tool (CART). Using the national- and state-set priorities, CART identifies the applicants that will deliver the most cost-effective and biggest conservation wins across 47 natural resource concerns.

As understaffed NRCS offices receive more conservation applications than ever, the emphasis on streamlining application through CART should be applauded. But while CART lists "Plant Productivity" as a key resource concern, and acknowledges where some conservation practices are yield enhancing, it does not use yield as a central metric of assessment. NRCS can look to some voluntary carbon offset programs, like Climate Action Reserve's Soil Enrichment Protocol, which takes into account any yield penalty accrued from incorporating soil carbon sequestering practices and lowers the number of credits given if yield is reduced by more than 5%.

Ultimately, thinking globally and acting locally are both constrained by a lack of usable and useful information. We are beginning to cross a threshold into a new age of on-farm information technologies – sensors, satellites, and drones can produce detailed data about soil nutrient levels, moisture, plant growth, and even run-off. And with every year there is better and more proven global carbon and land-use accounting. But we are still far from perfect information.

One day we may be able to fully weigh the benefits and impacts of every on-farm decision on the local and global scale. Until that is true, we must rely on the data we have and the priorities we can set, and yield must be high on that list.

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