

Analysis: Assessing sustainable food production — Certifications like ‘organic’ tell us very little. It’s time to shift focus to outcomes

It wasn’t too long after clouds of desiccated topsoil from farmland in the Southern Plains darkened the skies over Washington, D.C. that Congress took decisive action. In 1935, in response to what would later be termed the Dust Bowl, lawmakers brushed soot off their jackets and [created](#) the Natural Resources Conservation Service within the Department of Agriculture. To reduce soil erosion—and keep skies blue—it incentivized farmers to adopt new farming practices, such as [tilling less](#).

Since then, the Department of Agriculture’s programs have expanded and the practices it encourages have changed, but its approach to agricultural sustainability—encouraging and helping farmers to adopt specific practices—remains. Today, NRCS still offers farmers technical and financial assistance to use no-till farming and over 100 other methods.

That is to say, in 80 years—during which our knowledge of farming’s environmental impacts has grown profoundly—the federal government’s basic approach to agricultural sustainability hasn’t changed. Yet this approach—and its impact on consumer preferences, such as for organic food—doesn’t actually incentivize farmers to improve their environmental performance. Rather, it rewards the use of specific practices under the assumption that those practices are universally better for the environment.

But they aren’t. The environmental benefits of any farming practice depend on geophysical context and implementation. Meanwhile, some rewarded methods, such as exclusive use of organic fertilizers and non-GMO seeds, can be worse for the environment in important ways than the conventional strategies they are meant to supplant.

To really shrink agriculture’s considerable environmental footprint, we need a new model of agricultural sustainability, one that replaces an antiquated practice-based system with an outcome-based one, directly rewarding better environmental performance.



Follow the latest news and policy debates on sustainable agriculture, biomedicine, and other 'disruptive' innovations. Subscribe to our newsletter.

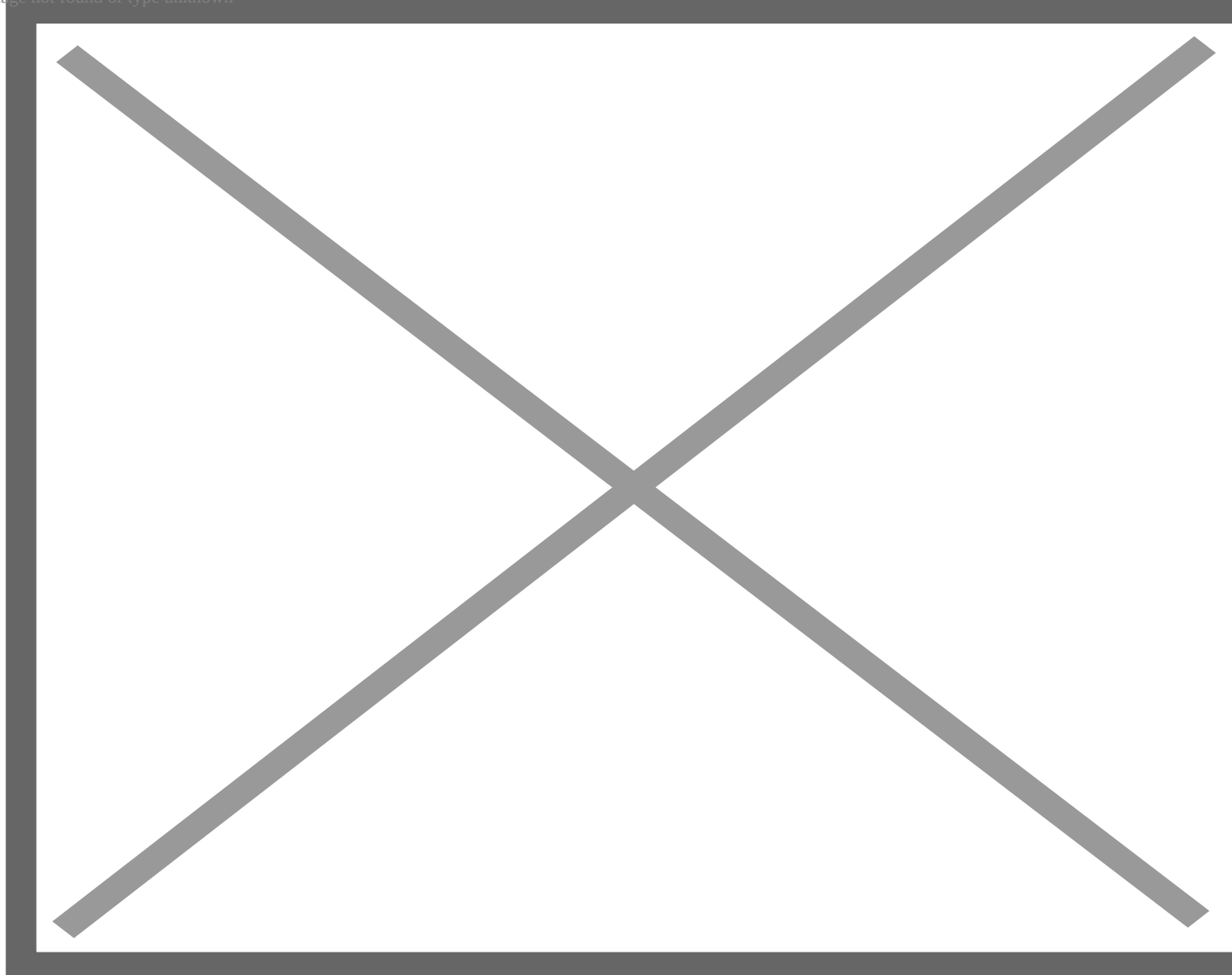
[SIGN UP](#)

Practice doesn't make perfect

Over the last several decades, American farmers have improved their environmental efficiency, dramatically lowering the environmental impact per unit of production. In the past 50 years, greenhouse gas emissions per pound of beef have fallen [nearly 30%](#), and since 1982, soil erosion per acre of cropland has fallen [over 30%](#), even as crop production per acre has approximately [doubled](#).

Part of this progress has come from farmers' own drive to increase output while lowering input costs. But federal and state policies, corporate initiatives, and changing consumer preferences aimed at improving environmental sustainability have no doubt also contributed. Federal programs to this end include the Environmental Quality Incentives Program (EQIP) and the Conservation Stewardship Program (CSP), which provide technical and financial assistance to farmers to adopt specific practices. The private sector is increasingly aware of the imperative to improve sustainability, too. The shoe and outdoor wear company Timberland, for instance, announced in 2020 that it would source some of its leather from cattle grazed *regeneratively*, following particular practices and principles. Several food and beverage companies such as Mars Inc., [McDonalds](#), and [General Mills](#) have also set clear targets to reduce greenhouse gas emissions in their supply chains.

Image not found or type unknown



Organic operations in the U.S circa 2017. Credit: USDA

With few exceptions, these efforts are predicated on identifying and promoting specific agricultural practices that are considered to yield environmental benefits. These practices can no doubt come with such rewards. For example, cover crops—plants grown to protect the soil in between periods of commercial crop production—have been shown to reduce [nitrogen leaching](#) and erosion, and [organic farming](#) can reduce harm from pesticide use.

But just *how* beneficial and cost effective is highly variable. For instance, cover crops sequester [more carbon](#) in dense soils. And cattle grazing can sequester carbon in the soil in some climates and regions, but [reduce soil carbon](#) levels in others. Similarly, many agricultural systems and practices have environmental tradeoffs. For example, growing lettuce in a vertical farm, where containers of plants are arranged in vast shelf-like systems, without fertilizers and pesticides may free up land, but some vertical methods still [result in greater greenhouse gas emissions](#) than conventional outdoor production due to the high electricity demand for lighting.

In addition, some practices that consumers assume are environmentally beneficial have a mixed record at best. While organic farming tends to improve soil quality, reduce erosion, and cut pesticide pollution, [one study](#) also found that it produces more nitrous oxide emissions per unit of food than nonorganic methods, while also using more land.

In other words, practices are imperfect proxies for actual outcomes. Rewarding or punishing farmers based on them alone is inefficient at best, and counterproductive at worst.

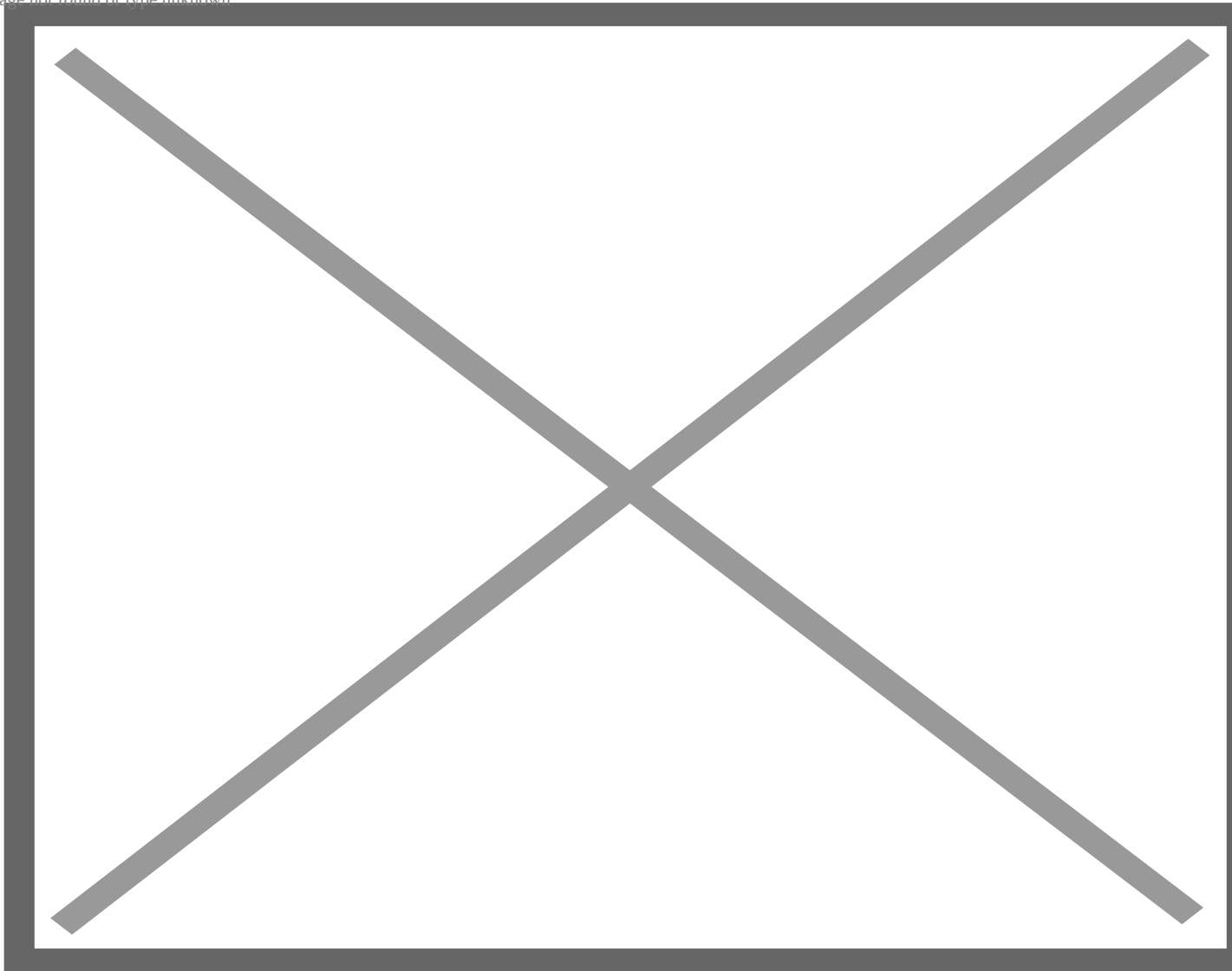
Outcomes first

A practice-based system is far from ideal, but when it was introduced and until recently, it might have been our best option; the ability to measure environmental outcomes, especially at the farm level, was largely impossible. Today, however, our ability to monitor metrics like greenhouse gas emissions and various forms of water pollution at fine scales is rapidly improving.

Soil tests, which can measure levels of carbon, nitrogen, and other nutrients are growing cheaper and easier to use. For example, Quick Carbon, a research initiative from Yale, is developing methods to measure soil carbon with inexpensive, pocket-sized field reflectometers. And companies have developed machinery that automates soil core sampling.

New types of sensors, algorithms, and connected devices also enable farmers to track real-time and geographically precise farm data. Equipment from companies such as Arable Labs and the Climate Corporation enable farmers to track environmental metrics like [air pollution](#), [nitrate levels](#), fertilizer use, and methane emissions from cows. Sophisticated models can then use this information—coupled with remote sensing and a number of other geographic, climate, and soil inputs—to estimate overall greenhouse gas emissions and other environmental impacts, and predict the effect of specific interventions such as planting cover crops.

Image not found or type unknown



Air pollution has been declining in the U.S. Credit: EPA

To be sure, these measurements remain somewhat imprecise. And in some cases, it is impossible to assess the impact of one farm's operations without also monitoring the performance of other farms in the region. However, with a well-funded and coordinated effort to improve and cut the cost of measurement tools, it could soon be possible for farmers and companies to monitor and report on many of their most important environmental impacts.

Imagine the opportunities and challenges such a system would create.

Environmental incentives and regulations, certification systems, labels, and food procurement could become essentially practice-neutral. *How* a farmer or company reduces their footprint would suddenly matter far less than *how much* they are able to do so. Not only would they know themselves whether they

have succeeded, and how to adjust their practices to improve, but they would also be encouraged to innovate and could be rewarded fairly for their progress.

Certifications such as organic, meanwhile, would become less relevant. If the specific set of practices entailed in organic farming actually delivers benefits, an outcomes-based system would reward it. But it would equally reward any other combination of practices, be they organic, regenerative, conventional, or some hybrid.

The biggest winner in this system would be the environment. But others also stand to benefit. If every SKU in the grocery store came with an environmental impact label, consumers would be able to make more informed choices about their food. Brand-name companies would have much better metrics to monitor their success in meeting their sustainability goals, and they would also be better able to differentiate themselves based on environmental performance, thereby potentially getting a price premium from environmentally-minded consumers. Collecting and reporting environmental performance data is critical to improving transparency regarding sustainability throughout the supply chain.

Managing tradeoffs

Despite its many benefits, increased reporting of environmental outcomes is neither straightforward nor without its own costs. There will certainly be conflicts about what to measure and how to report it. In fact, there already are. As companies increasingly report on the carbon footprint of their products, some environmental experts [are working](#) to increase reporting of other metrics, like water use and nitrogen balance. And the U.S. livestock industry [is calling for](#) new carbon metrics that would downplay the climate impact of beef and dairy.

In addition, any measurement program will need to accommodate year-to-year variation. Environmental impacts often vary over time depending on weather conditions and other factors. For example, nutrient runoff is likely to occur when it rains after harvest, when growing plants are not pulling up as many minerals from the soil.

Much like a practice-based system, meanwhile, an outcome-based one would also create losers and winners, both politically and financially. And if environmental performance is correlated with other variables like farm size, geography, or demographics, the equity issues could be great. For example, a new program that provided payments to milk producers in the Northeast for having the lowest carbon footprint could draw opposition from producers in other regions. Or programs may benefit the largest farms, at the expense of farmers who operate smaller farms with lower sales than the average U.S. farm. Existing practice-based government programs have [been criticized](#) for being less accessible to farmers who are disadvantaged or beginners. The [same proposals](#) and approaches taken to ensure such programs equitably serve historically disadvantaged populations could be applied to outcome-based programs as well; for example, programs could [set aside a portion of funds](#) for different demographic groups and assess environmental performance within groups.

Corporations across the food supply chain have a lot to gain, too, but not everyone will benefit evenly. Reporting requirements tend to place a higher financial burden on smaller organizations. To combat that,

new environmental reporting programs often limit their efforts to larger companies initially, providing a period for the reporting technology to mature and easing the impact on smaller companies who later take part in the process. The biggest losers here, though, will be any companies who have empty environmental claims exposed. Under a more rigorous and transparent outcome-based system, corporate greenwashing would become more difficult.

Farmers and private companies may understandably resist disclosing data on their operations and environmental performance. Reforming and coordinating public and private policies on data collection, privacy, and use would help set the foundation for better outcome-based systems. So too would providing incentives to report data, such as requiring reporting for farms that receive federal subsidies. Larger companies, like McDonald's and Land O'Lakes, have seen this process unfold in other industries and are already pushing for more visibility in their supply chains. They understand that if they do not voluntarily begin this process on their own terms, they eventually may have to take part under someone else's rules.

A more surprising source of resistance may come from today's institutions for sustainable farming, and especially the organic standard, which would face competition from a new regime and potentially lose market value. Organic certification represents big money to farmers and consumer brands—who sold over [\\$50 billion worth](#) of organic products in 2019—and plays a dominant role in some food companies' marketing.

Benefits aside, then, it is inevitable that not everyone would cheer the arrival of an outcomes-based system.

Charting a path

An outcome-based system might seem like a pipe dream. But experience from other sectors tells us it is not, and that companies and governments can drive the change.

On the private-sector side, other industries have already started to put environmental performance programs into place. Typically, they encompass several elements: measurement standards, data exchange standards for moving information with the supply chain, reporting standards, and tools and services to assist companies in collecting data and reporting. While these programs are technically voluntary in the beginning, at some point they are adopted by enough companies that everyone is expected to participate, and they effectively become required.

In the apparel industry, for instance, the Sustainable Apparel Coalition (SAC) sets the standards used by companies ranging from big brands like Nike and The Gap to smaller ones like Fjallraven and Vera Bradley. The Coalition has over 250 member companies and organizations, including manufacturers, retailers, brands, universities, and NGOs. The SAC helps companies monitor environmental and social labor impacts across the supply chain, including metrics like greenhouse gas (GHG) emissions, wastewater effluent, and waste management.

The industry drivers for these programs are often the large brands, which are under constant scrutiny from consumers and NGOs for all manner of social responsibility topics. Once one or two major players start

collecting and reporting data, others feel pressure to follow suit and will generally benefit from the work the early players have already done to develop the necessary tools. Over time, as the systems evolve, more types of data are usually added.

Governance of these programs is typically done within a formal industry coalition, funded by the major players in the industry. While this may have a bit of a “fox guarding the henhouse” feel, it has proven to be effective, especially thanks to external scrutiny and competitive forces among members. In most mature organizations, such as the SAC, key NGOs and research organizations are also formal members of the coalition alongside companies. A big advantage of “inside” players creating the initial standard is that they are aware of their largest impacts and know what data will be easiest to collect, so are well positioned to create initial standards that are effective at a reasonable implementation cost.

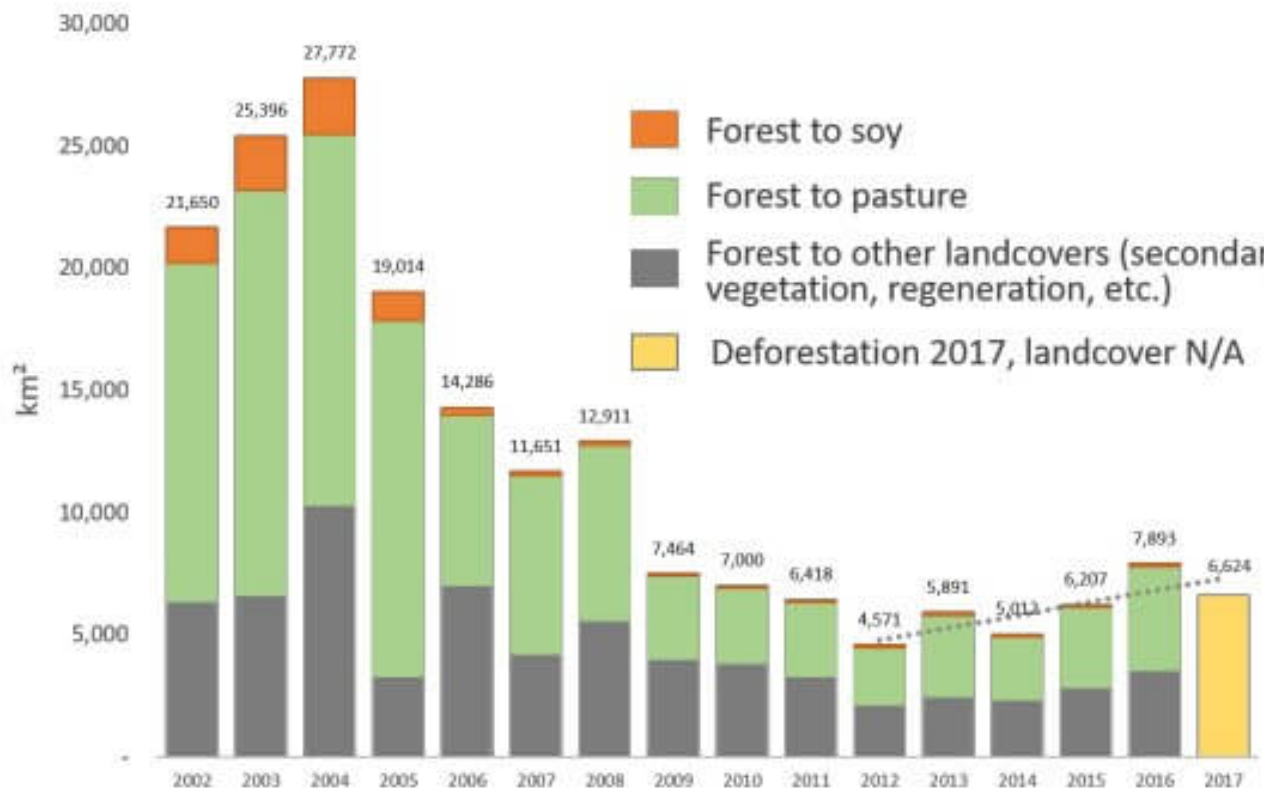
A food industry equivalent to the SAC might consist of packaged food brands, restaurant chains, grocery stores, grain distributors, feedlots, and farms. They would report aggregated data through the supply chain, which would also be available for parties at any point to publish as part of their own scorecard. At first, the coalition could focus on a small number of critical impacts that are also relatively straightforward to measure, such as GHG emissions or water use per unit output. Although most of the largest North America food and beverage companies do not currently report GHG emissions from their supply chain, there is nevertheless movement in this direction.

One of the most notable existing efforts is [Field to Market](#), which brings together farmers, businesses, conservation groups, and universities and public sector voices. Field to Market’s tools enable farmers to enter management data, such as the conservation practices they use, to estimate their current environmental footprint. Initiatives like this also typically involve NGOs, universities, or other organizations to provide technical assistance to help farmers to set goals and make changes to their operations. While moving in the right direction, Field to Market is still fundamentally practice-based in that it estimates farmers’ environmental performance based upon their current practices. But over time, as sensors and other technologies become more accessible, it and similar efforts could be recalibrated to measure key metrics like nutrient runoff, nitrous oxide emissions from fertilizers, or methane emissions from cattle.

As it stands, an increasing number of food and beverage companies are reporting GHG emissions and setting emissions reductions targets. Some are going further. In 2020, Just Salad became known as the one of the first U.S. restaurant chains to add carbon labels to its menus. Other chains and retailers such as supermarkets should follow suit as soon as possible, reporting not just on emissions, but other environmental impacts as well.

Ultimately, consumers could accelerate the adoption of an outcome-based system through a willingness to pay premium prices or through organized pressure campaigns. Consumer backlash against poor worker conditions in sweatshops helped stimulate the creation of the Sustainable Apparel Coalition. And we’ve seen organizations like Greenpeace publicly shame companies in a way that has sometimes successfully prodded them into action. For instance, Greenpeace’s work linking corporations’ meat products to Amazonian deforestation and protesting McDonald’s purchases helped lead to the [Soy Moratorium](#), an industry-led voluntary agreement to end purchases of soy from deforested land.

Figure 4. Annual Deforestation and Converted Landcover in the Brazilian Amazon from 2002 to 2017



Estimations by Earth Innovation Institute using spatially explicit data from Prodes, TerraClass, LAPIG and IBGE Brazil
 Grassland areas projected for 2014-2016
 Figures on soy 2012 onwards by AgroSatelite and Soy Moratorium report

Credit: Daniel Nepstad and João Shimada

Yet industry initiatives, no matter how results-oriented and evidence-based, have clear limitations. For measurement, reporting, labeling, and sustainable procurement programs to have positive impact, they must either substantially decrease the number of farms with large negative environmental impacts or motivate large numbers of farmers to shrink their footprint. And that will only work when a majority of companies, markets, and products are included in an industry effort, as demonstrated by the Roundtable on Sustainable Palm Oil. Although about one-fifth of palm oil production was certified as of 2017, there was little demand for [certified palm oil](#) in major purchasing countries such as China, India and Indonesia.

Thus, while industry efforts hold potential—especially in concentrated markets such as in U.S. food, retail, or processing markets—they must be complemented by government efforts, which can require all companies to comply with environmental performance standards. These could be modeled after successful standards in other industries, such as fuel efficiency standards for automobiles or Energy Star

for electronics, which manufacturers are largely free to meet in whichever way works best for them. The U.S. Department of Agriculture or Environmental Protection Agency could follow this model in agriculture by requiring, for instance, that food manufacturers or retailers meet performance standards that gradually grow more stringent. This would push regulated companies to source from lower-impact producers, help producers reduce their impacts, or reformulate products or product offerings. For example, Tyson could source lower-greenhouse gas beef or shift some of its production from conventional beef to lower-carbon plant-bases or cell-cultured meats.

Another potential regulatory model is cap and trade. Current cap-and-trade systems primarily require electricity generators, industrial producers, and fuel suppliers to meet greenhouse gas emission standards, while providing flexibility in how to meet them. [Evidence](#) suggests that when well designed and implemented, these systems help achieve emissions reductions more cost effectively than command-and-control policies. While such systems [generally exempt agriculture](#), they could in theory be applied to cover any part of the supply chain, given sufficiently accurate data on emissions. Cap-and-trade systems have also been applied to regulate nutrient pollution from agriculture, such as in the Chesapeake Bay Watershed. Improvements in nutrient measurement, monitoring and reporting could take such programs even further.

Beyond standards and regulations, government agencies could provide incentives for farmers and companies to voluntarily improve their environmental performance.

For example, federal lawmakers [have proposed](#) paying farmers for every ton of carbon they sequester and [supporting](#) similar private-sector payment schemes. A problem for these programs is how to accurately measure environmental outcomes such as soil carbon. Yet, just as with other initiatives, that issue will be overcome with time through continued investment in data collection, modeling, and reporting as well as accepting that a certain level of inaccuracy is inevitable.

Still, even with perfectly accurate measurements, there will always be tradeoffs in creating and shifting toward pay-for-performance systems. A key question will be whether to only pay farmers who improve their performance from current levels, or whether to also pay farmers who are already high-performing. Paying only those who improve should generate the greatest environmental improvement. However, paying “early-adopter” farmers who are already high-performing would broaden support for any new program and make it more politically feasible to launch.

Ultimately, no single effort—whether an industry standard, a new government program, or a consumer campaign—is sufficient to realize the full potential of outcome-based systems. Rather, industry, government, and individual efforts all have their strengths and weaknesses and must work in tandem, complementing one another.

Measure what matters

In the debate over farming practices—organic vs. conventional—the discussion has reached a dead end. Calls for “[fusion farming](#)” now acknowledge that both families of approaches offer important tools.

But how do we dissolve the fault lines? Doing so requires a way to quantify progress on the things we care about—namely, environmental outcomes. We want to see real progress on reducing greenhouse gas emissions, nutrient pollution, biodiversity loss, and many other negative environmental impacts of agriculture.

Systemically measuring those outcomes would of course not put to rest debates about farming, bound up as those discussions are with deeper ideological commitments to visions of the ideal society and humanity's relationship to nature. Indeed, an outcome-based system would force us to confront our most deeply felt commitments. The mere possibility of discovering that many forms of conventional, industrial agriculture perform well on environmental metrics could be a frightening prospect for some, as it would leave exposed deeper roots of their beliefs about how we should be feeding ourselves.

Nonetheless, while the old adage says, “don't ask the question if you're not prepared for the answer,” the health of the environment and the future of human societies demand that we ask important questions and open ourselves to uncomfortable answers. An outcome-based system extends the possibility of dramatically reducing the environmental footprint of farming, but it also calls for courage.

Linus Blomqvist is a PhD student at the UCSB Bren School. Linus is a former director of the Food & Agriculture and Conservation programs at The Breakthrough Institute and co-author of the Ecomodernist Manifesto. Follow Linus on Twitter [@linusblomqvist](#)

Dan Blaustein-Rejto is a food and agriculture analyst at The Breakthrough Institute. He holds a Master's in public policy from the University of California Berkeley. Find Dan on Twitter [@danrejto](#)

David Douglas is Vice President of Applied Invention and former Chief Sustainability Officer and Sr. Vice President of Cloud Computing at Sun Microsystems. Follow David's blog [here](#)

A version of this article was posted at [The Breakthrough Institute](#) and is used here with permission. Check out The Breakthrough Institute on Twitter [@TheBTI](#)