Smarter metrics will help fix our food system

Think less about bigger crop yields, and more about better lives, says **Pavan Sukhdev**, *as more-comprehensive evaluation techniques are unveiled.*

Today's food systems are broken. Our diets are the leading cause of disease. Some 800 million people worldwide still suffer from hunger, while more than 2 billion are overweight or obese. As much as 57% of global greenhouse-gas emissions come from food-related activities, which include everything from clearing land for agriculture, to growing, gathering, processing and packaging, to transporting farm goods and disposing of waste.

I never fail to be astonished at the inadequacy of the metrics we use to evaluate these systems. The most common yardstick is 'productivity per hectare'. This measure of the yield or value of a particular crop relative to the area of the land on which it was grown is too narrow. We need alternatives that account for the interacting complex of agricultural lands, pastures, inland fisheries, natural ecosystems, labour, infrastructure, technology, policies, markets and traditions that are involved in growing, processing, distributing and consuming food.

We've seen benefits from broader metrics elsewhere. Health experts know to look beyond calorie counts to understand nutrition. Policymakers are less willing to accept gross domestic product as a proxy for national well-being and are turning to expanded measures of progress. And some private-sector leaders are looking beyond financial profit and loss, and assessing the impacts of their business on natural, human and social capital.

At last, after 4 years of work involving more than 150 people, including myself, there is a framework and methodologies for more-comprehensive food metrics. The effort has culminated in a report released this week by the United Nations Environment Programme called 'The Economics of Ecosystems and Biodiversity for Agriculture and Food' (TEEBAgriFood). It demonstrates how to capture the complex reality of food systems through a wide-angle lens. If this work helps to divert even a fraction of brain power and political will from maximizing yields to maximizing broader benefits, it will make for healthier people, communities and ecosystems.

TEEBAgriFood sets out an evaluation approach that accounts for the impacts of the food system on livelihoods, equity, food security, health, greenhouse-gas emissions, water quality and biodiversity. This approach can reveal effects that are invisible using assessments that consider only the production and marketing segments of food-value chains. The insights gained can support better decision-making for policymakers, farmers, agribusinesses and civil society.

For instance, one study based in New Zealand (H. S. Sandhu *et al. Ecol. Econ.* **64**, 835–848; 2008) used a broader framework to compare conventional and organic agriculture, and found that important, non-marketed, ecosystem services have much higher value in the organic sector. Researchers considered the benefits provided by 15 conventional and 14 organic fields used for crops such as carrots, peas and wheat. These benefits included two 'provisioning' ecosystem services (food and raw materials) and nine 'regulating and supporting' services, such as pollination, biological pest control and nutrient cycling. Organic farming practices such as composting and maintaining vegetation cover lead to higher biomass and diversity, below and above ground. Conventional agriculture suppresses these and diminishes soil health, farm biodiversity, water quality and air quality. The study found that the total economic value of ecosystem services from organic fields ranged from US$1,610 to US$19,420 per hectare per year; that from conventional fields ranged from $1,270 to $14,570 per hectare per year.

This analysis only partially employed the TEEBAgrifood framework because it covered only production. To investigate other trade-offs and impacts, researchers should also compare food affordability and the impacts of nutrition, human health and social equity between the two agricultural systems.

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A second example concerns pesticide policies. In the late 1980s, Thailand began encouraging the use of pesticides to increase agricultural yields. In 2010, productivity gains started to fall and policymakers became increasingly aware of pesticides' harmful effects on the environment and health. Researchers examined the effects of increasing taxes to make pesticides more expensive, and of encouraging farmers to adopt non-chemical forms of pest management (S. Praneetvatakul *et al. Environ. Sci. Policy* **27**, 103–113; 2013). They considered the costs of enforcing food-safety standards. They also examined the risks of exposure to chemical agents. These risks were higher for farm workers than for consumers, so the researchers argued for an increased environmental tax. This, combined with support to encourage a switch to new farming practices, would deliver the greatest benefits most effectively, the researchers argued. Standard productivity measures could not have helped to assess such nuanced effects.

We need many more studies to show how considering broad impacts leads to conclusions that differ from those based simply on market prices of output. Several pilots are planned or under way, and I encourage more researchers to test the evaluation tool in studies of farming, food products and policy scenarios, as well as in dietary comparisons. If we can keep the pressure of evidence strong for just five years, I expect to start to see large changes in how agricultural, health and environmental ministries across the world set policies, incentives, subsidies and taxes.

Only if we diagnose our food system honestly, can we heal it. ■

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