THE TRUE COST OF FOOD

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The world's population is expected to rise to nearly 10 billion by 2050. That's a lot of mouths to feed. However, the question isn't just whether enough food can be produced for us all, but whether it can be done so sustainably. That would require limiting the adverse effects of agricultural activities—and of the food system as a whole—on the environment and climate. It would also necessitate ensuring an acceptable livelihood for those who produce it.

This question has become even more relevant in light of the global coronavirus pandemic. The resulting labor shortages, border closures, and disruptions to the global food chain have made all too clear the strategic importance of agriculture. Already, governments around the world are calling for increasing the localization of their food supply in hopes of decreasing their country's dependence on extended supply chains. In addition, locked-down consumers have changed their buying and eating habits, purchasing more fresh fruit and vegetables and supporting local farmers. If these shifts increase agricultural intensity, however, the risk to the local environment will also grow. It is therefore important to ensure that the transition takes place sustainably.

It is certainly possible to grow enough food sustainably. To do so, however, requires reducing, to the extent possible, agriculture's negative effects—on the land, air, water, and soil, on biodiversity, and on the lives of growers—and finding ways to offset the remaining detrimental impacts. This requires determining their environmental, economic, and social costs.

This is no easy task. While it is possible to put a value on agriculture's negative environmental costs, its social and economic costs are far harder to pin down.

In this article, we look at agriculture's environmental costs and suggest actions that policymakers and regulators, food companies and retailers, agriculture businesses, and consumers can take to reduce or mitigate them.

Defining Sustainable Agriculture

Sustainable agriculture means different things to different stakeholders. For many, it implies the use of environmentally friendly practices intended to meet the demand for food and reduce the negative effects on land, air, water, and soil, to lower the impact on the climate (and, ideally, sequester atmospheric carbon dioxide), and to support and foster ecosystem services and habitats for various species.

Many of these practices are sometimes referred to as *regenerative agriculture*, an approach to farming that is designed to enrich soil fertility, improve carbon dioxide storage, increase biodiversity, and improve water management.

Reducing agriculture's adverse environmental impacts, however, is only one goal of sustainable agriculture. To be called sustainable, agriculture must address the negative economic and social impacts on farmers, farm workers, and other participants in the global food system. Can farm workers make a living wage, for example, and can they work safely? Sustainable agriculture also helps preserve local communities, cultures, and traditions.

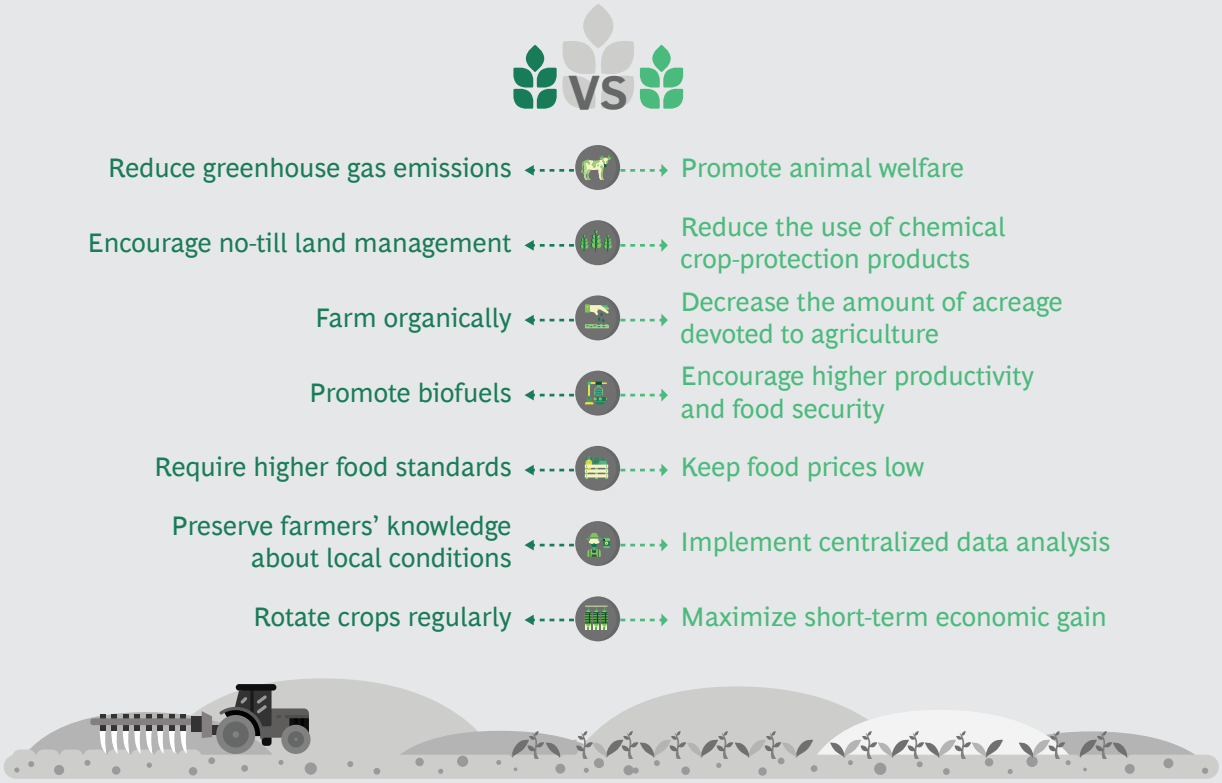
To ensure that agricultural practices—and the entire global food system—are truly sustainable, countries must strike the right balance among often conflicting environmental, economic, and social goals. Environmentalists want farmers to use sustainable, environmentally friendly agricultural practices, such as minimizing the use of fertilizer and chemical crop protection; maximizing no-till farming and cover and catch cropping; and reducing livestock grazing and land-use intensity. Yet such practices could lead to lower yields and thus the need to put more land under cultivation, which in turn would increase farming's impact on biodiversity. Additionally, politicians and consumers may object to the resulting potential increase in the cost of food. Similarly, politicians, the media, and the agriculture industry glamorize small, picturesque family farms as the basis for economically vibrant rural communities, even though small-holder farmers may not be able to make a living. Exhibit 1 shows some of the problematic tradeoffs that must be resolved to develop a more sustainable agricultural system.

In fact, farmers are often blamed for most of the negative environmental effects of the food system, yet the decisions they make about how to farm are not made independently. Food companies, retailers, consumers, politicians, and regulators all influence growers' decisions and the options that are available to them. Consumers, for example, often make purchasing decisions on the basis of price. This encourages retailers, distributors and food companies to consolidate operations and to force producers to lower the prices of their crops in the search for competitive advantage. The result: ruinously low prices for many of the crops that farmers grow.

This, in turn, creates many of the adverse social impacts of the modern farming system. Many farmers and farm workers incur debt, struggle year after year to pay it off, suffer from mental illnesses related to stress, and, in some regions, turn in significant numbers to suicide as a way out of their predicament. According to the *New York Times*, in 2019, more than 10,000 Indian farmers and farm laborers committed suicide, and experts expect that the coronavirus and associated lockdowns will likely further contribute to this long-running tragedy.

Other farmers sell their farms because of their debt, a consequence that has led to an increase in the size of farms overall. Over the past several decades, the average farm size in Germany has doubled, reaching 60 hectares in 2016. Still other farmers and farm workers give up and migrate, sometimes in large numbers, to urban areas in search of more reliable, higher-paying jobs. From 2007 through 2016, about 15% of farms in Germany closed. Such migration causes rural towns and villages to lose the economic basis and social and cultural milieu that give them life, as well as agricultural traditions and local knowledge.

EXHIBIT 1 | Countries Must Balance Potentially Conflicting Sustainability Goals



Source: BCG analysis.

No agricultural system can be called truly sustainable if it doesn't address the detrimental environmental, economic, and social effects for the benefit of all. Countries are already beginning to assess and abate agriculture's negative environmental impact. Alleviating its social and economic consequences will require further analysis. But by gaining greater insight into agriculture's environmental costs and how to reduce them, countries can begin to build a fairer, more sustainable food system for all.

Shouldering the Costs of Farming

Agriculture's negative environmental effects are many and impact local and global environments. The majority of the resulting costs are borne by society as a whole and not reflected in the price of food or the economic decisions that farmers make in the course of planting, growing, and harvesting their crops and managing livestock. We recently conducted a study of Germany's agricultural system in an effort to quantify, as fully as possible, the true costs attributable to its adverse environmental impacts. (See the sidebar "The Cost of Food in Germany.")

For example, farmers bear the costs of soil degradation and compaction in the form of higher production expenses and lower yields. However, society at large shoulders the costs of air and water pollution, including deteriorating public health and the expense of mitigating pollution and providing potable water.

Similarly, the costs of global warming as a result of the greenhouse gases released in the course of farming—primarily from livestock production and soils but also from the manufacturing of fertilizers, chemical crop-protection products, and animal feed—are borne entirely by society. So, too, does society incur the costs of the short-term effects of raising livestock, including the pollution of waterways from manure

THE COST OF FOOD IN GERMANY

No two national food systems are alike. Countries vary greatly in terms of their terrain, the mix of crops that they grow, the average farm size, their agricultural practices, the standard of living, their food consumption patterns, and the cultural role that food plays. These and other factors determine the environmental costs that are generated by a country's agriculture industry but that are not priced into the cost of the food that consumers buy.

The German agriculture industry makes up a small proportion of the country's overall economy. It accounted for €21 billion, or just 0.7% of the country's 2018 GDP. Despite that and the fact that the country is heavily industrialized, almost half of Germany's land is devoted to agriculture.

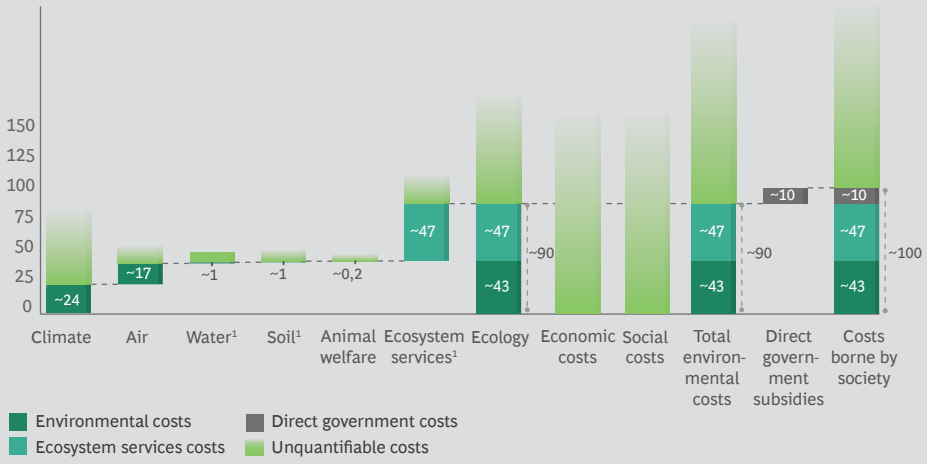
We estimate that the environmental cost attributable to Germany's agriculture industry was about €100 billion in 2018. Of that, approximately €43 billion was due to agriculture's adverse effects on the climate (because of the release of greenhouse gases from the raising of livestock, land use changes, and the use of chemical crop-protection products), on the air and water (in the form of pollution), on the soil (in the form of degradation), and on animals' welfare (as a result of livestock farming). (See the exhibit below.)

We also estimate that the costs related to the loss of ecosystem services—including the ability of properly cared-for land to naturally manage and maintain air and water quality, the value inherent in biodiversity, and the availability of cultural services such as recreation and tourism—total approximately €47 billion.

Adding in approximately €10 billion in direct government subsidies and tax abatements in support of agriculture brings Germany's total environmental costs to about €100 billion. If we were to include all the unquantifiable costs—the economic and social challenges inherent in Germany's evolving agriculture industry—the total would be far higher.

German Society Bears at Least €100 Billion in Environmental Costs from Agriculture

Annual cost, 2019 (€billions)



Source: BCG analysis.
¹Costs arising from the loss of ecosystem services in water and soil are included in the ecosystem services category as a whole.

and the hospital care and research that is needed to counter the growing ineffectiveness of antibiotics owing to their overuse by farmers to maintain livestock production levels.

Then there is the considerable cost to society of the loss of ecosystem services. These services enable greater species diversity, cleanse wetlands, and regulate the global climate. They also produce foods and industrial inputs and provide recreational pastimes. Perhaps the Amazon rainforest provides the best example of a lost ecosystem service. Because some of the rainforest has been converted to land for agricultural purposes, the rainforest sequesters less atmospheric carbon dioxide than it used to.

Sowing Solutions

Reducing the environmental, economic, and social costs of farming will go a long way toward creating a truly sustainable agriculture system. But it will require making significant changes in the food that consumers eat and in how it is grown, distributed, and sold.

Reducing Environmental Costs. Farmers need to carry out their activities using practices designed to reduce the environmental impact of farming—such as no-till farming, cover crop planting, precision farming, and lessening the use of chemical crop protection—even though they are not enough to entirely eliminate farming's environmental costs. Our study of Germany showed that such practices would reduce the country's environmental costs by only 30%. Most of the rest must be reduced through the combined societal efforts of farmers, consumers, and other stakeholders to change our food system holistically. A more sustainable food system requires addressing our current production and consumption patterns. It is essential, for example, that farmers, distributors, retailers, and consumers reduce the amount of food that is lost or wasted—about 1.6 billion tons annually. Estimates of how much food is lost or wasted, especially in developed countries, run as high as 30% of total production, and most of that occurs after farmers bring their products to market or to distribution facilities.

Dietary changes, too, would contribute significantly to the effort. Reductions in the consumption of red meat, and especially beef, would make an outsized dent in the environmental costs of agriculture. And if beef were priced at a level that truly reflected its environmental costs, consumption would likely decline rapidly. In Germany, for example, if all the environmental costs of producing beef were factored into the price that farmers charge, beef prices would increase five- or sixfold.

And because the environmental costs of producing a particular crop or product vary significantly from region to region, rebalancing the global trade in food so that more food is grown where it generates the fewest environmental costs (including those generated by food transport) could also lower such costs on a global basis.

Limiting Economic and Social Costs. Even though they are difficult to quantify, it is equally important to achieve the economic and social goals of sustainable agriculture. This means making sure agricultural activities are economically viable for both farmers and their employees—a step that can lead, in turn, to the continued economic and cultural health of rural areas. Economic viability is critical at a time when farmers are finding it more and more difficult to hold onto their farms and pass them on to the next generation. The costs of owning or renting land, buying seeds and fertilizer, purchasing chemical crop protection, and investing in new technologies and equipment are rising, even as the prices for the crops that farmers grow continue to decline.

Several options are available to support farmers and farming communities economically and socially. For example, governments could subsidize growers that practice sustainable farming and pay them directly for the ecosystem services that their land and practices provide. Regulators could also devise and enforce policies that govern safe working conditions and adequate pay for farmers and farmworkers.

Stakeholder Actions

Most stakeholders throughout the supply chain—including farmers; manufacturers of seeds, fertilizer, and chemical crop protection; retailers; and consumers—say that they support a sustainable agriculture system. Reaching that goal, however, will require more action by the stakeholders in the global food system.

The effort needed will also be significant, given the sheer complexity of the food chain. But there are many viable options available to policymakers and regulators, food companies and retailers, agriculture businesses, and consumers to promote sustainable agriculture, mitigate the harmful effects that do so much damage to the environment, and support farmers both economically and socially.

Policymakers and Regulators. Governments can take several steps to promote sustainable agriculture. Regulations could encourage farmers to use chemical crop protection and fertilizers responsibly and to reduce food loss. Levies on certain foods could help steer consumer demand toward more sustainably grown options and pay for some of the external costs of farming. Farm policies should focus on growing and producing food sustainably rather than rewarding the maximization of yield. And trade policies could be used to manage the types of crops destined for export and how they are grown as well as to deter the importation of crops. Import limits on Indonesian palm oil, for example, could significantly reduce the illegal deforestation of land on which much of the crop is grown.

To support farmers in their efforts to practice sustainable agriculture, governments should also consider directly subsidizing certain practices (such as proper and humane livestock management) or making payments to farmers for the ecosystem services they provide. And governments should carry out and support research and the exchange of information on sustainable farming practices. The European Union recently published *Farm to Fork Strategy,* which calls for more guidance to growers on reducing the use of chemical crop protection and fertilizers, increasing the amount of farming done organically, and limiting food loss. The strategy also includes educating consumers on nutrition labeling and on the environmental, economic, and social aspects of food production.

Food Companies and Retailers. The companies that make and sell the food consumers buy have a major role to play. Food companies must reduce significantly the amount of food they waste, especially in the transport and processing of input crops. And retailers must cut down on food waste by using different sales practices and by donating unsold food.

Both can also encourage sales of sustainably grown food through pricing and promotions and by providing greater transparency into their supply chains and the sources of the food they sell. By using the power of their brands, they can do much to encourage consumers to take part in the sustainability effort.

Agriculture Businesses. The companies that produce seeds, chemical crop-protection products, and fertilizers are coming under increasing pressure to develop more sustainable products. Seed varieties that require fewer chemical crop-protection products and that are less damaging to the environment are one such product. Innovation is key, not only in seeds and crop protection but also in precision farming and other approaches that use digital technologies to enable farmers to grow crops more efficiently while maintaining yields. And agriculture companies need to provide more economic support for farmers through fairer pricing and distribution of their products and by working with farmers to help them use their products responsibly.

Consumers. A large share of the crops grown is destined directly for the tables of consumers, so the food choices they make have far-reaching consequences for promoting sustainable agriculture. Pricing mechanisms can, of course, determine consumer demand for sustainably grown food. But consumers themselves must be willing to take part in the effort as well.

To do so, consumers should demand greater transparency into where their food comes from and how it is grown. They, too, can reduce food waste at home. But their most profound contribution may be in changing their diets so that they eat less of the foods that create high external costs, such as red meat. Governments and food companies should support this effort by educating consumers on the benefits of a healthy diet that contains sustainably grown food.

Growing Together

The example of Germany shows that the environmental costs of growing, distributing, and consuming food are huge. However, it's no longer possible to claim that these costs are the sole responsibility of farmers. Stakeholders throughout the food chain play a role in creating these costs, and it is their responsibility to help reduce the costs to the extent possible—while ensuring an adequate supply of food and addressing the economic and social issues.

The effects of the coronavirus pandemic on the food system has highlighted the need for countries to determine how to produce enough food locally for their growing populations, an undertaking that may increase the negative environmental, economic, and social effects of their food systems. Numerous options are available for carrying out this effort in a sustainable manner, including promoting smart farming practices, enacting more supportive government policies to reduce food loss and waste, and helping consumers rethink their diets. The question isn't whether societies have a way, it is whether they have the will.

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