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ORIGINAL ARTICLE

Full-cost accounting and redefining the cost of food: Implications for agricultural economics research

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Abstract

Food systems have significant externalities that are not reflected in market prices. A first step to correct parts of these externalities is to make them transparent through "true-" or full-cost accounting. Estimates of the external health and environmental costs of food systems at a global level suggest that they may be about two times larger than food valued at market prices, that is, about 20 trillion US$ of externalities versus 9 trillion US$ of food value in the markets. The agricultural economics profession is challenged to move the true cost research agenda forward by identifying realistic pathways for internalizing some of the large food system externalities. Moving from true cost accounting (TCA) to policy action needs to involve citizens and policy-making bodies because internalizing externalities requires buy-in. This relates for instance, to policy instruments such as product labeling, nudging, and differential taxes and subsidies to incentivize healthy diets and disincentivize food waste. Agricultural economics will need to accompany the implementation of any true cost approaches with scrutiny in terms of the efficiency, welfare, ecological, and distributional effects of such policies.

KEYWORDS
agricultural economics, environment, externalities, food systems and agriculture, health

JEL CLASSIFICATION
D62, I15, Q18, Q51

1 | CONCERNS ABOUT EXTERNALITIES OF FOOD SYSTEMS

Current food systems generate substantial environmental, health, and social costs while failing to provide affordable and healthy food for all (Food and Agriculture Organization of the United Nations (FAO) et al., 2022). For example, estimates suggest that 830 million people are undernourished, and more than ten million lives are lost annually due to unhealthy eating patterns (Afshin et al., 2019). Moreover, there is widespread environmental, land and soil degradation, loss of biodiversity and ecosystem functions, emissions associated with production activities, and exploitation of poor people—including children—in hazardous work conditions (FAO et al., 2022). Such malfunctioning of food systems creates externalities, and we need to ask what the true costs of these externalities are (Mozaffarian et al., 2014).

TABLE 1 Important externalities in food systems

Type of externality	Examples of externalities	Impacts
Social (effects on social rights and human & social capital)	Child and forced labor Discrimination and harassment High and variable prices Underpayment	Poverty, well-being, food security
Environmental (effects on natural capital)	GHG-emissions Air, water, and soil pollution Soil depletion Water use	Contribution to climate change, health effects, reduced ecosystem services loss of biodiversity and species
Health (effects on human health)	Unhealthy diet Obesity Undernutrition Antimicrobial resistance Zoonoses	Human life (mortality and the quality of life), economic (medical costs, informal care, lost working days)
Economic (effects on financial, manufactured, and intellectual capital)	Food waste Tax evasion	Increased food demand, decrease in public funds

Source: Adapted from Hendriks et al. (2023).

Since food systems' environmental and health costs have become increasingly evident, research into the issue has recently picked up. Earlier attempts to quantify the costs of inaction versus the costs of action in certain parts of the food system (e.g., land degradation by Nkonya et al., 2016) have been broadened to include attention to the hidden costs of the whole food system. The issue moved to the forefront in the UN Food Systems Summit deliberations (von Braun et al., 2023). The cost of transforming the food system is increasingly being questioned (Hendriks et al., 2023; Thornton et al., 2023).

The link between market activity and environmental or social harms is not directly visible or reflected in the incentives that drive economic systems. As a result, the economic value of food, which drives the economic choices of businesses, consumers, and governments, may be distorted. When prices provide distorted information and signal disincentives for sustainable and healthy food, the resulting externalities constitute a barrier to attaining sustainable food systems. Externalities arise from several elements in the food system (Table 1). However, market prices do not reflect these externalities (Baker et al., 2020). As a result, externalities are hidden consequences of the choices of food system players that can make sustainable and healthy food less affordable for consumers and less profitable for producers.

This article points out challenges and opportunities for the agricultural economics profession to renew attention to research on food systems externalities and explore steps toward supporting their internalization. We focus here on the negative externalities of the food system, not negating that food has significant positive values for humanity. The cost implications are obvious if the food system did not exist or was fundamentally disrupted—for example, by a volcanic disaster. However, negative externalities do present challenges:

- Internalizing the externalities of the food system requires redefining the value of food by measuring and costing these externalities. Such full cost accounting is a start, making matters more transparent, but there are important considerations to be considered moving beyond cost accounting to determining the economic impact of internalizing externalities;
- Besides the complexities of the political economy and limited public acceptance of the concept of more efficient "right" pricing, distributional effects are associated with internalization policies, especially taxes, and subsidies. Moreover, regional food systems have considerable diversity, resulting in diverse distributional effects.
- As internalizing externalities has transaction costs that probably increase at the margin, optimality criteria need to be considered in any price adjustments. Complete internalization is probably an illusion that would make food even more unaffordable for the poor. Moreover, regardless of pricing and cost, there are likely trade-offs across health and sustainability considerations in food systems.

2 | QUANTIFYING EXTERNALITIES IN UNSUSTAINABLE FOOD SYSTEMS

Problems of externalities created in food systems include preventing societies from achieving their full potential by distorting the information about the value of food

conveyed by market prices (Gemmill-Herren et al., 2021). As the financial returns of companies are based on expected profits, the financial value of investments does not reflect the actual societal benefit that these investments may have (Serafeim et al., 2019). For example, the degree to which the food systems contribute to climate change, deforestation, or poor health is not factored into crucial economic indicators for policymakers, such as the gross domestic product (GDP).

Negative externalities can contribute to social injustice. They impact power relations and harm marginalized groups, including women, indigenous and minority populations, migrant workers, and other communities. Environmental harm, such as air and water pollution, is often concentrated in places inhabited by marginalized groups. Moreover, when natural, health and social costs can be externalized, producing unsustainable and unhealthy food is more profitable. Adding more salt, poor-quality fats, and sugars to food items and promoting such foods can increase sales despite the adverse effects on health (Stuckler et al., 2012). Furthermore, lack of food safety adds to harmful effects on health, especially in developing countries.

The first step to address externalities is to expose them and redefine the value of food. This can be realized by true cost accounting (TCA), a tool for the systemic measurement and valuation of environmental, social, health, and economic costs and benefits to facilitate sustainable choices by governments and food system stakeholders (Baker et al., 2020; Gemmill-Herren et al., 2021). TCA can serve different purposes for different actors:

- Governments can integrate TCA into local, national, or regional policy and budgeting.
- Businesses can use these structured assessments to minimize negative impacts and enhance positive benefits across value chains.
- Financial institutions can use TCA for reporting, impact investment, and risk assessment.
- Farmers can use TCA as a means to account for the costs and benefits of their agricultural practices.
- Consumers can be users of TCA—for instance, when food is labeled accordingly—to become aware of the environmental and social externalities embedded in the food they buy.

TCA recognizes that the economy's productive assets go beyond the assets currently accounted for and include natural, social, and human capital. Therefore, a TCA assessment typically starts by identifying the goal and scope of the assessment, establishing the unit of analysis, and the system boundaries. Then various externalities are assessed (qualitatively or quantitatively), valued, and aggregated

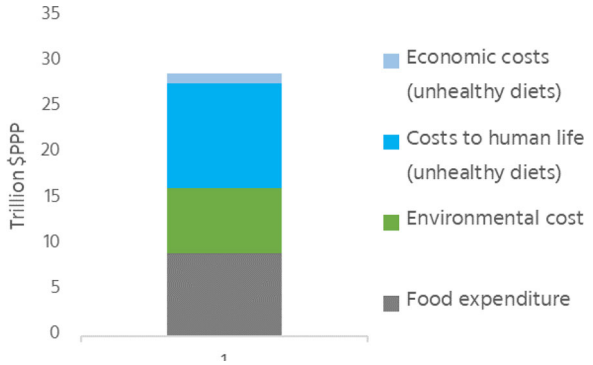

FIGURE 1 Mean estimate of the total annual true cost of food including the external costs in the scope of the analysis.

Source: Hendriks et al. (2023).

(The Economics of Ecosystems and Biodiversity [TEEB], 2018).

Several attempts have been made recently to estimate the true costs of food. A novel analysis was conducted by a working group of the UNFSS Scientific Group to estimate the current food system's true costs and the costs of changes toward a more sustainable food system (Hendriks et al., 2023). The core unit of analysis was the global food system, consisting of global food consumption and production, divided by country and food group. Figure 1 shows the mean estimate by this study for the total cost of food was 29 trillion USD per year. Given that the current cost of food at market prices is about 9 trillion USD, the results show that the true cost of food is disproportionally high.

Among the highest environmental costs are GHG emissions leading to climate change, land use and land-use change leading to loss of ecosystems and biodiversity, and air pollution leading to adverse human health effects.

We must stress that there are substantial uncertainties in the estimates, particularly for the health costs, as impact pathways have yet to be extensively studied (see further detail on the uncertainties and limitations of the estimates in Hendriks et al., 2023). The uncertainties are due to incomplete coverage of impacts, limitations in primary data, deficiencies in modeling impact pathways, and difficulties in monetizing external costs. Further research must include relevant externalities related to undernutrition (which affects human productivity and incomes), zoonoses, productivity losses due to diseases, land use other than cropland, and more. In addition, it is essential to add social costs associated with the underpayment of workers, underearning of farmers, child labor, and harassment throughout the value chain. All these challenges require interdisciplinary approaches for which the agricultural economics profession is positioned well.

3 | CHALLENGES AND OPPORTUNITIES FOR AGRICULTURAL ECONOMICS RESEARCH

There are three sets of challenges and related opportunities for agricultural economists to engage in full-cost accounting approaches and related policy analyses.

First, the agricultural economics profession is challenged to move the true cost research agenda forward by identifying efficient and realistic pathways for internalizing some significant food system externalities. Challenges on that path are conceptual issues, operational and data issues, behavioral change and diets, and climate change linkages of food systems. Improved TCA can give broad indications for pathways to reduce the externalities through incentives and regulations, assisting policies to come closer toward "corrected" prices, reflecting true marginal costs. These corrected prices may not necessarily be higher if externalities are internalized by actors across the food system. Developing such policies requires transparent standards and principles across all applications in accounting, especially in national accounts and GDP, and in business sustainability reporting and audits.

Secondly, moving from TCA to action needs to involve citizens and policy-making bodies, because internalization of externalities requires buy-in form actors across the food system. This relates to policy instruments such as product labeling and differential taxes and subsidies to incentivize healthy diets and disincentivize food waste. Taxation and subsidy policies are likely to be part of efficient approaches in a broader package of internalization actions, including education, information, and nudging. Measures for internalization would have implications for the relative competitiveness of traded goods and will therefore need to be considered in trade policies. Agricultural economics can address these challenges through market analyses, political economy research, and related modeling.

Thirdly, agricultural economics must accompany the implementation of true cost approaches with economic scrutiny and from an interdisciplinary research base. Economic research needs to consider that policy interventions may have externalities of the second degree, that is, newly created externalities of policies that result from internalization attempts. Policies for internalization need to be comprehensively analyzed in terms of their economic efficiency, welfare, ecological, and distributional effects in a dynamic framework.

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