1 From Practice to Policy

New Metrics for the 21st Century

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Context

The authors of the 2016 Nature article, *Fix Food Metrics* (Sukhdev et al., 2016), start by describing the significance that food systems have for humanity, especially small-scale agriculture, in terms of nutrition and employment but also by recognizing the massive environmental costs of commercial food systems with respect to the effects of biodiversity loss, greenhouse gas (GHG) emissions, soil degradation and the decline in fish stocks. They conclude their introduction by saying:

Current metrics for agricultural performance do not recognize or account for any of these costs or benefits. The emphasis on yields or profits per hectare is as reductive and distorting as is gross domestic product, with its disregard for social and natural capital. Food metrics must be urgently overhauled or the United Nations Sustainable Development Goals will never be achieved.

(Sukhdev et al., 2016)

The general appreciation of the need to go beyond measures of agricultural yield is widely recognized and indeed is the motivation for this book. The need for systems-based framings of agriculture, the need to recognize multiple capitals, the need to recognize the true or full costs of agricultural activity, and the need to progress towards actions, which are consistent with the objectives of sustainable development, have collectively spawned a mass of metrics and indicators. These metrics, indicators, and associated frameworks exist at global, national, and community level and focus on different aspects of the multiple dimensions of agricultural systems. Often, they are also related to alternative management practices and policy solutions. However, the sheer breadth and richness of well-intentioned alternatives has driven home the singular advantage of the incumbent performance assessment measure or metric—“yield per hectare”—simplicity. The *status quo* of the agricultural yield metric—and policies that use it as their key performance indicator (KPI)—can be maintained because there is no simple alternative.

Thus, somewhat paradoxically, the variety of solutions that are available to take into account the diversity of food systems, has paralyzed the potential for change and has ensured that the substantive knowledge that exists “beyond yield per hectare” is not widely translated into on-the-ground change in agricultural practice and associated economic, environmental, and social outcomes. This chapter discusses what might be done differently.

Role of Metrics and Policy

The primary motivation for agricultural systems is the provision of food and fiber to satisfy the human needs of current and future generations. The ongoing changes in these systems date back thousands of years, as farmers have sought to make the most of varying environmental, economic, and social contexts. Over the past 100 years, as populations have grown, and life expectancy and purchasing power have increased, the demands on the system have risen and been accompanied by significant changes in technology and management practices that have increased production.

In this framing of the role of agriculture, agriculture policy and decision-making have a clear end goal of ensuring sufficient production to meet current demand. Moreover, in this framing, a metric of “yield per hectare by type of agricultural output” seems sufficient, especially because related environmental and social costs often have effects over a medium-to-longer-term period, and by their incremental nature are often considered small. Thus, where alternative farm practices are being considered, the common measuring stick of whether the same volume of food is being produced seems appropriate (i.e., the incremental effects can be ignored or assumed away).

Of course, the reality is that there are environmental and social constraints on the ongoing or future supply of food in particular places (e.g., owing to the loss of soil quality or loss of local farming knowledge, together with considerable negative consequences of certain production practices). This has led to the development of alternative, more sustainable, farm management practices over many years. Examples include organic and regenerative agriculture, fair trade, holistic management, and community-based natural farming, among many others. Each of these has sought to go beyond yield per hectare as the common measuring stick and instead highlighted the need for a more balanced assessment of outcomes.

However, as each alternative management practice has adopted different measures for performance assessment, the policymaker is left with a choice (between the *status quo* and the alternative) without a standardized information set on which to make the comparison, other than yield per hectare. The lack of a standardized assessment metric that recognizes the need to consider environmental and social consequences thus takes on great significance in changing the *status quo*.

The barrier is not that the environmental and social consequences cannot be assessed (indeed there are many ways in which this has been done) but rather,

there is no standardized approach by which a decision-maker can readily understand, compare, and evaluate the merits of different approaches. These decision-makers include politicians and government officials but also individual farmers making choices about the management of their land and other agri-food sector businesses making decisions about the sustainability of their supply chains.

Furthermore, as the focus is commonly on the adoption (or not) of specific land management practices, success might be measured in terms of the extent of adoption of the practice (e.g., hectares under certified organic practices) rather than on agreed, independently determined assessment metrics—for example, concerning environmental impacts, decent work, and community health. As a single farming practice will not be ideally suited to all contexts or for all agricultural output types, the lack of a standardized assessment tool makes it relatively straightforward to claim that a specific practice is unsuited and hence justifies maintaining the *status quo*.

Standard, independent assessment metrics allow each decision-maker to make their own appraisal of the merits of different practice solutions. This situation is taken for granted in the economic and financial space, where financial and accounting data are organized following standard principles and definitions, which allow arms-length assessments of the performance of companies and government policies, notwithstanding the great variety of economic activities and practices that take place. Of course, these metrics suffer from a lack of integration of social and environmental consequences, and that is the issue to be tackled.

The development of broad, standard, independent assessment metrics encompassing economic, environmental, and social dimensions would thus drive:

- Local assessment of how alternative practices can be best adapted to the local context
- Clear messaging to consumers on the relative performance of practices for their chosen agricultural output with respect to economic, environmental, and social impacts
- Access to finance, as investors are able to compare alternatives on a common basis
- Development of a common language to exchange experiences, reduce capacity-building costs, and provide a platform for innovation and adaptation
- Standard and trusted sources of data and methods to support decision-making

Fundamentally, a focus on alternative solutions without allowing individual stakeholders to reach their own conclusions cannot drive change. A focus on alternative solutions together with standard, independent metrics might change the balance.

State of the Art: Instruments for True Cost Accounting

The Sustainable Development Goals (SDG) indicators for measuring progress towards the SDG targets, such as SDG2.4.1 regarding sustainable agriculture areas and SDG12 on sustainable consumption and production, struggle to define metrics that are straightforward to translate in a consistent manner into policy analysis and that support effective monitoring of the food and agriculture system and its impact on the overall ecological and social environments. Metrics based on True Cost Accounting (TCA) could resolve the sectoral divide of current indicators, thus offering support for policy and decision-making, as well as the evaluation of progress towards the SDG goals and targets.

Given the potential for TCA metrics to be applied at farm and business level, as well as at regional and national scales, their use to evaluate progress towards the SDGs can be relevant for the reporting of governments and the agri-food sector alike. In particular, the use of a common framing supports clear articulation of the agri-food sector's contribution to achieving the global goals and targets.

Beyond SDG reporting, the agri-food sector faces a range of challenges to their operation, including the risk of supply chain disruption and the need to respond to consumer concerns about the sustainability of food systems. These challenges are described in more detail in other chapters of this book. As part of the response, companies are developing a range of related but different full-cost protocols for managing risk and dependency on natural, social, and human capital. In the past few years, a number of TCA tools and methods have emerged, including impact frameworks, footprint calculation, capital changes, databases of valuation factors, and ecosystem models. The main methods specific to food systems are impact frameworks, but these do not provide specific, comparable metrics, nor monetary valuation. More importantly, there is no standard scheme of food system footprints. Decision-makers are thus confronted with a confusing range of well-intentioned approaches.

Key Criteria for a True Cost Accounting Tool

Ideally, a True Cost Accounting tool should meet the following criteria:

- Provide a systems' perspective, including upstream and downstream components of the value chain (i.e., input sourcing, production, processing, storage, transportation, consumption, disposal, or recycling) and related societal elements and their area of influence, such as institutions/policies, socio-cultural norms and public health.
- Allow for universal application for local contextualization, with internationally accepted benchmarks: must be applicable across the whole diversity of socio-economic and environmental circumstances that exists in the food and agriculture sector worldwide.
- Support integration across all sustainability dimensions or multiple capitals: economic, environmental, and social, the latter including also human and

intellectual capitals and good governance within the sphere of influence of the entity, or national boundaries.

- Apply to multiple scopes and purposes, from enterprise performance assessment, through product standards, to organizational strategies for policy, planning and reporting.
- Reflect various value use perspectives, from government, through B2B (business to business) and B2C (business to consumer), to small and medium-sized enterprises (SMEs) and local communities.
- Allow for indicator selection, including quantitative, qualitative, and monetary valuation: indicators vary from being outcome-oriented (indicating trend and status) to process indicators (assuming that management systems are in place for better management, but without precise causal link), with different data quality levels (related to the timeframe, type, and methodology), and rating, weighting, and aggregation levels; and
- Work within a common standardized reporting framework to drive comparability, translating the complex true costing process into a simple dashboard or index.

While these are ideal criteria, there is a substantial amount of work that has been completed to suggest that satisfying these criteria is within reach. To see this through, however, it is necessary to pull apart the components of an ideal TCA tool, each of which can be standardized in progressive fashion and designed to connect over time.

Leading Pathways Towards Standardization

Standardization is required in five areas: conceptual frameworks, metrics, data, valuation, and reporting. This section considers each area in turn, highlighting the advances that have been made and describing the “best in class” approaches that are currently evident. There are undoubtedly overlaps, as the approaches do not neatly belong in any single area but in fact, that itself has been part of the challenge. Where a single approach attempts to standardize across multiple areas, they generally fall short, as each area raises different standardization challenges and involves different stakeholders and expertise.

Conceptual Frameworks

Frameworks are the conceptual structure that provide the basis for the selection and combination of variables under a fitness-for-purpose principle. Frameworks including non-financial values drive improved organizational behaviors, but results depend on context-specific assumptions and on what is considered most relevant for different stakeholders.

Several frameworks have been developed by international accountants and industry coalitions in the past seven years, including: PwC’s Total Impact Measurement and Management framework (n.d.); KPMG’s True Value

framework; EY's Total Value framework; the Natural Capital Coalition's Natural Capital Protocol; WBCSD's Social and Human Capital Protocol; the Roundtable for Product Social Metrics' Product Social Impact Assessment; and the Impact Institute's Framework for Impact Statements (de Groot Ruiz, 2019).

The only framework that was developed in cooperation with inter-governmental entities and that contemplates policy usage is the TEEBAgriFood framework (The Economics of Ecosystems and Biodiversity, 2018). The TEEBAgriFood framework is comprehensive and inclusive, offering a common language to describe diverse and complex food and agriculture systems coherently and comparably across many spatial scales (national, regional, farm), and to account for hidden costs and benefits of these systems. The strength of the TEEBAgriFood framework is the systematic categorization of the "what" of evaluation, so that assessments of food systems can be seen within a broader context. However, it is not prescriptive on metrics and units, and, in order to retain universality across a range of evaluation approaches, it does not formalize impact pathways.

Metrics

Metrics, often expressed as key performance indicators (KPI) are revealed by identifying the relevant themes and impacts to be the focus of assessment in any given context. TCA is better understood by distinguishing two steps: classical impact assessment (the well-known "environmental impact assessment" extended into sustainability assessment, complete with environmental, social, and economic assessments) and the more recent expression of sustainability assessments in monetary terms. It is the first step that is the focus at this point.

TCA-based KPIs should be identified based on issues of risk and importance to stakeholders, thus selecting indicators that address the highest-priority issues. A meaningful way forward in terms of standardization is for impact assessment to follow the Food and Agriculture Organization of the United Nations (FAO) Sustainability Assessment of Food and Agriculture systems (SAFA) Guidelines (El-Hage Scialabba *et al.*, 2014) that suggest universal impact themes. The SAFA Guidelines developed targets and indicators specific to enterprises' performance, and hence the use of SAFA for TCA-related policy will require the identification of appropriate policy targets. A study comparing SAFA and the 2015 SDGs showed a high level of convergence between the SAFA themes and the SDG targets (El-Hage Scialabba *et al.*, 2016). Thus, using the TEEBAgriFood Evaluation Framework, the SAFA themes, and the SDG targets offers a sound basis for the identification of TCA KPIs, reflecting the relevant themes and impacts.

While existing literature is not short on methods and processes, common KPIs have yet to be defined for comparative TCA assessments. Table 1 presents a synthesis of KPIs structured according to the four capitals of the TEEBAgriFood framework. It is based on a short analysis by the authors of selected agri-food sector company reports and various valuation and impact frameworks and protocols. It is not intended to present a definitive list but rather give an indication of the KPIs

found in most agri-food business sustainability evaluations that might form the basis for standardized core KPIs for TCA assessment and reporting. While Table 1 gives a potential core set of KPI, there must always remain room for customization for different stakeholders and situations.

Also required for inclusion in policy discussions are agreed thresholds. In this space, progress by the Science Based Targets Network (<https://sciencebasedtargets.org>) and relevant SDG targets provide a starting point for standardization concerning environmental themes and could point to the potential for other themes. It is important to note that TCA-based indicators will run across all SDGs, thus providing an opportunity to integrate economic, natural, human, and social accounting within a unified framework.

Data

The next challenge is data. The choice of data and evaluation methods used depends on the purpose of evaluation, spatial scale, and scope of the value chain, which depends on the expected application. Furthermore, data quality, valuation factors, scoring system, time, and budget constraints affect output accuracy, data correctness, compatibility, user-friendliness, and transparency. All these factors make it difficult to interpret and compare TCA assessments.

There is simply no space in this article to give credit to the tremendous amount of data and modelling that exists for capital changes associated with food system activities. Thus, spatial and contextual boundaries for measurement do not need to be considered from scratch, nor the understanding how the footprints align to capital changes, and capital changes to subsequent capital changes, along the chain of outputs and outcomes. For instance, the integrated assessments models that are used to determine the social cost of carbon connect economic modelling to climate modelling. A similar process of attaching

Table 1.1 Potential Core TCA Key Performance Indicators

<i>Economic</i>	<i>Natural</i>	<i>Human</i>	<i>Social</i>
Wages	Air (GHG, air pollutants)	Health and safety	Nutrition and
Taxes	Water (use and pollution)	Education, skills,	food security
Employment	Soil (occupation and	and knowledge	Overall mission
Profit	pollution)	Fair treatment of	Corruption
Investment	Biodiversity (land use	workers	Provision of
Intangibles	change, eco-toxicity, eco-		infrastructure
(brands,	system complexity, habitat		and technology
transparency)	encroachment, regulation)		
Livelihoods	Raw materials (food and		
	fiber) and energy		
	(provisioning)		
	Waste		
	Recycling		

Source: Authors' synthesis.

economic modelling (or collating agreed economic valuations from literature) to food system modelling is a feasible start for food impact costing (Lord, 2020). The data challenge is rather to establish the agreed definitions for measurement to work within the conceptual framework and facilitate the derivation of KPIs.

Agreed data definitions are the focus of work on the United Nations System of Environmental-Economic Accounting (SEEA), which has a component for Agriculture, Forestry and Fisheries (SEEA-AFF) (Food and Agriculture Organization of the United Nations and United Nations Statistical Division, 2020). It provides definitions underpinning environmentally focused national aggregates that provides a baseline for TCA. It also supports accounting of carbon footprints, water footprints, flow accounts for nitrogen and phosphorous, pesticide use, and food loss. Generally, however, this footprint accounting is too coarse for impact valuation, as its contextual scope is limited for land areas used for agriculture, forestry, aquaculture, and the maintenance and restoration of environmental functions.

Thus, to complement the SEEA-AFF, the SEEA Ecosystem Accounting (SEEA-EA) (United Nations Statistics Division, 2021) can be used. It is spatially specific to ecosystems, while recognizing that capital changes and impacts do not accord with national boundaries. This is essential for accounting for food system impacts, as the spatial resolution at which to measure footprint for food system impact valuation is important. The SEEA-EA includes both accounting of quantities and qualities of capital and valuation in its scope. The SEEA-EA offers a conceptual discussion about non-financial capital accounting that could underpin a version for food systems.

Valuation

Here, the challenge of monetary valuation is distinguished from data definition and management recognizing the additional considerations that are involved in establishing appropriate monetary valuations, especially concerning environmental and social dimensions. Nonetheless, as with the data area, there are widely practiced approaches in the valuation space, and many different monetary evaluation techniques are available¹, for instance from the Natural Capital Protocol Annex. Furthermore, with regard to standardization, there are a range of valuation databases that can be further developed and applied (such as TEEB ecosystem services valuation database (www.es-partnership.org/esvd/) that draw upon a combination of pre-loaded, or user-defined, data sets to model the distribution of ecosystem services across areas of interest) and also progress in discussions via the SEEA, projects on wealth-accounting, such as being led by the World Bank through their Changing Wealth of Nations (Lange *et al.*, 2018) work and the corporate-level Value Balancing Alliance (www.value-balancing.com) that is aiming to harmonize impact valuation factors.

Initially, general valuation factors could be determined, with appropriate caveats. This might build into a database of shadow prices at a pragmatic level of resolution—that is, having sufficient spatial, temporal, and contextual detail

to avoid gross errors but coarse enough to make compiling the database feasible. In broad terms, it is more important to get estimates that point in the right direction, with enough resolution to distinguish sustainable production methods and gather a collective weight willing to promote and use scientifically based food impact costings, rather than wait for synthesized and standardized modelling efforts to emerge from a myriad of scientific projects.²

Reporting

The general disclosure of content, according to the scope of reporting, is an important step towards credibility, let alone comparability of TCA outcomes. Currently, reporting on impact valuation is as diverse as there are entities engaging into impact valuations, making comparisons and “fair play” impossible.

The Global Reporting Initiative (GRI) offers Sustainability Reporting Standards (www.globalreporting.org/standards/), which consists of different modules: Principles, disclosures, and management approach (GRI 101–103); Economic (GRI 201–206); Environmental (GRI 301–308); and Social (GRI 401–419). SDG reporting for businesses leverages the GRI Standards, which are the world’s most widely used sustainability reporting standards, and the Ten Principles of the United Nations Global Compact.

However, countries’ evaluation of SDG progress remains challenged by a lack of benchmark data on the SDGs and how to report on their achievements. The SDG National Reporting Initiative (www.sdgreporting.org) provides information about key policy and technical considerations for SDG reporting.

For policy analysis, decision-making and monitoring of effective food system transformation, a dashboard would boil down the complexity of non-financial reports into clear messages, as hotspots, trade-offs and synergies are easily visualized. Furthermore, the aggregation of quantitative, qualitative, and monetary valuations into an index offers the kind of simple metric that policymakers need, in the same fashion as gross domestic product.

The Way Forward for Scaling-Up TCA Adoption by Policymakers

Towards a TCA Index

Traditionally, TCA translates non-financial environmental and social costs and benefits into monetary terms. It is intended that individual monetary metrics “speak” to decision-makers, especially when resource allocation needs to be made. For instance, quantifying excess fertilizers’ effect on future drinking water quality and the attendant mitigation costs decreases interest in subsidizing fertilizers to boost yields, as costs are shown to exceed benefits.

For businesses, integrated profit and loss statements (IP&L) give an overview of all material impact that results from the organization’s activities. The impact addressed in the IP&L is usually organized by type of capital, thus stating the

triple bottom line, while addressing different stakeholders: investors value-creation statement; stakeholders value-creation statement (license to operate); external cost statement (do no harm of operations); and SDG contribution statement (de Groot Ruiz, 2019).

Given the variety of challenges in valuation for a range of social and environmental impacts, the integrated evaluation and comparison of TCA assessments by governments will require the development of a suitable composite index, built by scoring, weighting, and aggregating indicators. Robust indexes are useful to policymakers, owing to their ease of understanding of complex issues.

Widely known indexes include the Human Development Index, the Quality of Life Index, the Gender Empowerment Measure, the Environmental Sustainability Index, and the Global Ecological Footprint. Indexes are constructed for easy interpretation of trends covering a number of KPIs.

If reliable, scientifically sound, and transparently developed KPIs are available, composite indexes can be developed through Multi-Attribute Utility Theory (MAUT) techniques (Talukder et al., 2016). MAUT is a branch of multi-criteria decision analysis—a structured approach that quantitatively evaluates alternatives in decision-making by considering indicators and their weighting alike, thus allowing incorporating multiple indicators into an evaluation process. The MAUT technique can generate indexes on a 0 to 1 scale, where a score near 0 indicates bad performance and near 1 indicates good performance in terms of targets and indicators.

Developing a TCA Composite Index requires the following steps: (i) main thematic targets are defined within an underpinning conceptual TCA framework; (ii) default KPIs (metrics) for the defined TCA targets are selected; (iii) data for the selected KPIs is collected; (iv) application of the MAUT technique to generate an index score for each target; and finally, (v) transformation of the index results into a dashboard.

This proposed approach to developing indexes and dashboards is capable of handling the typical incommensurability (or lack of common measures) of TCA KPIs, as this method can aggregate indicators by considering only indicators' scores—that is, the score of the index depends solely on the relative performance of the indicators and it is transparent and replicable.

Food system assessments have historically been challenged by aggregation, double counting, and bias in under or overestimating costs of impacts (depending on temporal, spatial and contextual details). These challenges are unlikely to be completely resolved by TCA. Thus, what TCA should aim for is robust and reliable descriptions of trends, in order to understand systemic improvements. This argument favors an index approach over monetary valuations, exact shadow pricing, and value transfer.

Food impact costing does not need to get the perfect answer, and food systems in particular include myriad connections that are impossible to precisely determine. Agreement, credibility, and the opportunity to intervene in market failure in the direction of food system transformation are the guiding principles for assessment and reporting.

Who Needs to be Involved?

To date, each stakeholder group in each area has defined their own approach, according to specific yet varying scopes. While this diversity is natural and has been welcomed, wider adoption requires increased harmonization and coordination. Luckily, all existing frameworks are tending to converge on similar processes (such as described in the natural, social, and human capital protocols) to be followed in terms of setting the scope and acquisition of data.

However, the selection of appropriate indicators, measurability, and valuation remains a stumbling point. An eventual agreement on what KPIs to select and how to define them will require the cooperation of all public and private parties. Furthermore, what should be included in valuation and measurement choices depends on stakeholders' agreement, with science guiding, rather than establishing, pathways.

Thus, despite the methodological feasibility of a TCA Composite Index, its development process will require the participation of a range of actors, from innovators such as the current TCA practitioners gathered under the umbrella of the Global Alliance for Agriculture and Food Community of Practice, through government and intergovernmental institutions concerned with food and agriculture sustainability, as well as finance and economy experts, as comparable food system impact valuation is the main innovation brought by TCA.

Overall, the participation and leadership of governments in developing TCA standards is crucial, especially in terms of ensuring public ownership, accountability, and enforcement. As highlighted by Organisation for Economic Cooperation and Development Development Cooperation Director Jorge Moreira da Silva:

The challenge lies in defining and measuring impact ... Different countries, public and private organizations are using different yardsticks to measure different elements. To counter the risk of 'impact washing', public authorities have a responsibility to set standards and ensure they are adhered to.

(Organisation for Economic Cooperation and Development, 2019)

Where to Start?

Ultimately, an agri-food system focused TCA standard would guide practitioners on what to measure and disclose in terms of footprints, while providing a set of quantities on which to base shadow prices. The FoodSIVI report (Lord, 2020) argues that the United Nations SEEA EEA and the FAO SAFA Guidelines offer a blueprint for such a standard for agreeing on the spatially and contextually explicit footprints needed to incentivize impact reduction and track progress toward food system transformation targets.

In the short term, a pragmatic approach could be that stakeholders develop standards for each of the constituent elements of TCA, including agreeing on: a

universal conceptual framework, core metrics and KPIs, data definitions, valuation impact factors, and reporting standards. Current stakeholders' activities are pointing at solutions in each of these tasks, but coordination is needed to align efforts. In addition, further work is required to develop a TCA Composite Index, with the committed participation of government officials occupying SDG-related roles.

Among the array of efforts, a pathway towards improved environmental and social outcomes for agri-food systems is emerging. The coordination and standardization of agri-food system assessment using TCA as a focal point can be a core part of the solution.

Notes

- 1 Monetary valuation techniques include: the market-based approach (market prices, hedonic pricing), revealed preference technique (travel cost method, hedonic price method), stated preference approaches (contingent valuation, choice experiments), subjective wellbeing valuation, cost-based approaches (compensation costs, defensive expenditure, damage/repair costs), and value transfer.
- 2 Although with appropriate focus the synthesis of results from multiple projects might indeed take less time than imagined.

References

- de Groot Ruiz, A. (2019). Framework for Impacts Statements Beta Version (FIS Beta). Impact Institute. Available at: www.impactinstitute.com/framework-for-impact-statements.
- El-Hage Scialabba, N., Rocchi, S., & Guttentstein, E. (2016). SAFA for Sustainable Development. Food and Agriculture Organization of the United Nations. Available at: http://www.fao.org/fileadmin/templates/nr/sustainability_pathways/docs/SAFA_for_sustainable_development__01_.pdf.
- Food and Agriculture Organization of the United Nations (2014). Sustainability Assessment of Food and Agriculture Systems Guidelines. Food and Agriculture Organization of the United Nations. Available at: www.fao.org/3/a-i3957e.pdf.
- Food and Agriculture Organization of the United Nations and United Nations Statistical Division. (2020). System of Environmental-Economic Accounting for Agriculture, Forestry and Fisheries (SEEA AFF). Food and Agriculture Organization of the United Nations. Available at: <https://doi.org/10.4060/ca7735en>.
- Lange, G., Wodon, Q., & Carey, K. (2018). The Changing Wealth of Nations, 2018: Building a Sustainable Future. World Bank. Available at: <http://hdl.handle.net/10986/29001>.
- Lord, Steven. (2020). Valuing the impact of food: towards practical and comparable monetary valuation of food system impacts. A report of the Food System Impact Valuation Initiative (FoodSIVI). University of Oxford, Food System Transformation Group, Environmental Change Institute. Available at: https://foodsivi.org/wp-content/uploads/2020/06/Valuing-the-impact-of-food-Report_Foodsivi.pdf.
- Organization for Economic Co-operation and Development. (2019). Impact Investment needs global standards and better measurement. Available at: www.oecd.org/newsroom/impact-investment-needs-global-standards-and-better-measurement.htm.

- PwC. (n.d.). Total Impact Measurement & Management. Available at: www.pwc.com/gx/en/services/sustainability/total-impact-measurement-management.html.
- Sukhdev, P., May, P., & Müller, A. (2016). Fix Food Metrics. *Nature*, 540(7631), 33–34. doi:10.1038/540033a.
- Talukder, B., Hipel, K.W., & van Loon, G.W. (2018). Using multi-criteria decision analysis for assessing sustainability of agricultural systems. *Sustainable Development*, 26(6), 781–799. <https://doi.org/10.1002/sd.1848>.
- The Economics of Ecosystems and Biodiversity (TEEB). (2018). Measuring what matters in agriculture and food systems: a synthesis of the results and recommendations of TEEB for Agriculture and Food's Scientific and Economic Foundations report. Available at: http://teebweb.org/wp-content/uploads/2018/10/Layout_synthesis_sept.pdf.
- United Nations Statistics Division. (2021). System of Environmental-Economic Accounting – Ecosystem Accounting. Available at: https://unstats.un.org/unsd/statcom/52nd-session/documents/BG-3f-SEEA-EA_Final_draft-E.pdf.