

Brief

Social Capital Assessment in True Cost Accounting of Food Systems

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1 Introduction: Why social capital matters in food system assessments

True Cost Accounting (TCA) is an approach for holistically measuring and valuing the economic, environmental, human, and social impacts of food systems. By revealing these often-hidden externalities, TCA can inform decision-making around food products, diets, and systems to minimize adverse environmental, health, and social effects.

While significant progress has been made in quantifying the environmental costs of food products—and, to a lesser extent, the health costs of diets—the social impacts of food choices and diets remain largely underrepresented in TCA studies. Issues such as labour rights violations, poor working conditions, and (gender) inequality are insufficiently measured, despite their direct influence on human well-being, social equity, and the long-term resilience of global supply chains and food systems.

Agricultural work is among the most hazardous occupations globally and within Europe. According to the European Parliament, agricultural workers face higher rates of injury and mortality than those in most other sectors, along with increased exposure to health risks, heavy physical workloads, and elevated stress and suicide rates (*European Parliament*, n.d.). Moreover, many seasonal and migrant agricultural workers operate under precarious employment conditions. In 2021, an estimated 71% of non-EU seasonal agricultural workers in the EU were not covered by the Seasonal Workers Directive, leaving them without access to key labour rights and social protections. Their temporary or undocumented status frequently excludes them from formal protection systems, increasing their vulnerability (*EESC*, 2024).

Globally, 70% of all child labour occurs in the agricultural sector, including farming, livestock, forestry, fishing, and aquaculture (*FAO*, n.d.), and several agricultural commodities produced under such conditions are regularly consumed in Europe. For example, in the cacao sector, an estimated 1.5 million children still work under hazardous conditions in Côte d'Ivoire and Ghana, which are the world's leading cacao producers (*Forum Nachhaltiger Kakao*, 2025). Similarly, in the coffee industry in Uganda, child labour is common, with children engaged in planting, harvesting, and processing activities (*Bashaasha et al.*, 2025).

These realities underline the critical importance of integrating social impact assessment into food system evaluations. However, quantifying social impacts poses significant methodological and data challenges. Even leading international institutions struggle to operationalize social capital in a comprehensive way. For example, the FAO's 2024 *State of Food and Agriculture* (SOFA) report, one of the most authoritative global assessments of agrifood systems, was only able to quantify three social impact indicators. Moreover, two of these indicators, undernourishment and lost labour productivity, can arguably be classified primarily as human capital measures, as they reflect individual health and capacity rather than

structural social relationships or collective resources. Poverty among agrifood system workers is the only indicator included that can be purely classified as social capital. This indicator captures important economic inequities but does not cover broader dimensions such as labour empowerment, social cohesion, voice and agency, or community resilience.

This narrow operationalization illustrates the methodological challenges that occur because of the fact that existing Life Cycle Assessment (LCA) models do not support quantification of social impacts and remain in early stages of development. Moreover, secondary data suitable for social impact assessment are limited, and existing databases only permit qualitative risk assessments rather than quantification of impacts. Assigning monetary values to social externalities adds another layer of complexity as appropriate monetization methods and factors are still under development. Consequently, social dimensions cannot yet be fully integrated into TCA.

Against this background, this brief aims to:

- Explain the key challenges of integrating social capital in TCA of food systems.
- Explore the Social Hotspot Database (SHDB) as a potential tool to support social assessment within TCA, while reflecting on its strengths and limitations.

2 Review: Social capital in theory and practice

Definition and scope of social capital

Within the TCA framework, social capital refers to the networks and institutions—along with the shared norms, values, and understandings—that foster cooperation within or among groups (TEEB, 2018). It is built upon social structures that promote positive, community-oriented behaviour while discouraging exploitation. In the context of agrifood systems—which include all activities and actors involved in producing, processing, distributing, consuming, and disposing of food—social capital reflects the relationships and structures that shape how food systems function and how they affect individuals and societies.

Assessing social capital within food systems therefore requires analysing the social conditions embedded within these processes, including impacts on workers' rights, community well-being, cultural heritage, and governance. In existing TCA frameworks, such as the *TCA AgriFood Handbook* (True Cost Initiative, 2022) and the *True Price Assessment Method for Agri-food Products* (Galgani et al., 2023), commonly assessed impacts are forced labour, child labour, fair wages, gender equality, and overall labour conditions. Together, these factors provide insight into whether food systems foster fair and equitable societies or contribute to inequality and exploitation. Figure 1 provides an overview of common social capital considerations for each stakeholder group in business contexts. It shows that the materiality of social impacts can vary depending on the type of stakeholder.

Social topics for workers	Social topics for local communities
<ul style="list-style-type: none"> • Occupational health and safety • Remuneration • Child labour • Forced labour • Discrimination • Freedom of association and collective bargaining • Work-life balance 	<ul style="list-style-type: none"> • Health and safety • Access to material and immaterial resources • Community engagement • Skill development • Contribution to economic development
Social topics for users	Social topics for small-scale entrepreneurs
<ul style="list-style-type: none"> • Health and safety • Responsible communication • Privacy • Affordability • Accessibility • Effectiveness and comfort 	<ul style="list-style-type: none"> • Meeting basic needs • Access to services and inputs • Women's empowerment • Child labour • Health and safety • Land rights • Fair trading relationships

Figure 1: Social topics per stakeholder group (adapted from Goedkoop et al., 2020)

It is important to note that social capital is not defined consistently across TCA frameworks. While most TCA approaches distinguish between social and human capital, the boundaries between them are not very well defined and impacts are classified differently depending on the framework. For example, Capitals Coalition's *Social & Human Capital Protocol* (Capitals Coalition, 2019) classifies issues such as occupational health and safety, child labour, and forced labour under human capital, whereas the *True Price Assessment Method for Agri-food Products* (Galgani et al., 2023) treats these as social impacts. Meanwhile, the *TCA Agrifood Handbook* (True Cost Initiative, 2022) considers occupational health and safety as part of human capital, while forced and child labour issues are classified under social capital. As a result, there is currently no universally accepted definition or sharp separation between these two capital categories.

Existing approaches and gaps in TCA studies

The main barrier to comprehensive social capital assessment in TCA is not a lack of conceptual awareness, but rather methodological feasibility, including the absence of standardized quantitative indicators, limited availability of high-resolution social data, and ongoing challenges related to monetization. This is demonstrated by the following examples: In an article on TCA for livestock agri-food systems, Baltussen et al. (2025) acknowledge the importance of social aspects in TCA but highlight the lack of operational data, standardized indicators, and established methods. Crosnier et al. (2025), in a TCA study of bread produced and consumed in Switzerland, focus primarily on environmental impacts and some consumption-related health impacts, while including only two social indicators: overworked hours and agricultural subsidies. Similarly, Florencio et al. (2025), focus on environmental and health externalities in a TCA of fatty fish, without addressing social capital at all. This pattern is also evident in the recently published True Costs of Food Database (Çınar et al., 2026), which presents production-related environmental and health hidden costs of food products. Although the open-access database represents a significant advance in making true cost information accessible, it does not include social impacts due to the limitations in the availability and applicability of social impact data for TCA.

The absence of comprehensive social capital assessment in the literature can be explained by several constraints. First, social capital is difficult to measure because it includes many interconnected social relationships and institutions, such as cooperation among supply chain actors, community well-being, and inclusive local governance. These dimensions are not easy to include in the linear cause-and-effect modelling logic used in LCA. Second, methodological tools for social capital assessment remain underdeveloped. While Social Life Cycle Assessment (S-LCA) offers a conceptual foundation, it lacks the standardized quantitative indicators and mature characterization models necessary for TCA applications. Third, existing product- and supply-chain-specific social data are very limited. Primary data collection is resource-intensive and therefore rarely feasible in TCA studies, leading to reliance on secondary, sector-level data

that support qualitative or semi-quantitative assessments. Finally, the lack of robust monetization approaches for social capital further limits integration into TCA, where aggregation into monetary values plays an important role.

Recent work in the literature has explored the integration of social risk assessment approaches within TCA of food products and diets. These studies seek to address the persistent gap in social capital assessment by incorporating social sustainability considerations and identifying potential social hotspots along food value chains, even where direct quantification or monetization is not possible. Two studies from Bellon et al. (2024, 2025) apply TCA frameworks to compare palm, rapeseed, and coconut oils, and dairy milk with plant-based alternatives, respectively. In both studies, social capital is addressed through a social risk assessment approach using the SHDB. Due to the limited availability of product-specific social impact data, the authors use the SHDB to approximate labour-related social risks embedded in supply chains. Another example is provided by Michalke et al. (under review), who assess the TCA of food products and diets by applying SHDB-based social risk assessment methods. Their approach evaluates social risks across multiple food items within a diet and aggregates results at the diet level. This allows for the identification of products linked to higher risk sectors or sourcing regions, as well as potential social risk hotspots within supply chains. The study demonstrates how social risk metrics can be incorporated into diet-level TCA analyses, thereby expanding the sustainability perspective beyond environmental and health impacts. While these studies represent an important step toward integrating social dimensions into TCA, the authors note that social impacts remain narrowly defined and are not monetized, reflecting broader methodological limitations.

Taken together, these studies represent a methodological advance in TCA research by explicitly incorporating social sustainability considerations. At the same time, they reveal a shared limitation. Current approaches rely on risk-based proxies rather than quantified or monetized social impacts. Within this context, the following chapter presents a detailed description of the SHDB, its methodological foundations, and its role in supporting social capital assessment within TCA assessments.

3 Social capital assessment with the Social Hotspot Database

The SHDB is a secondary, global database developed to support S-LCA by identifying potential social risks embedded in global supply chains. Unlike environmental LCA databases, which quantify physical flows and emissions, the SHDB focuses on risk exposure related to social and socioeconomic conditions associated with the production of goods and services.

The SHDB covers 57 economic sectors aligned with the Global Trade Analysis Project (GTAP) classification and includes data for over 140 countries. It integrates information from a wide range of international sources, including International Labour Organization, World Bank, Food and Agriculture Organization, Organisation for Economic Co-operation and Development, and

United Nations Educational, Scientific and Cultural Organization. The database compiles approximately 160 social indicators, enabling the assessment of social risks linked to labour conditions, human rights, community impacts, and governance across supply chains (Bennoit Norris et al., 2019).

The SHDB can be used to inform TCA assessments by assessing social risks. It provides a systematic approach to identifying social risk hotspots, which can inform where social capital is likely undermined along food supply chains. The SHDB captures several dimensions of social capital through risk indicators related to:

- Labour rights and decent work (e.g. child labour, forced labour, freedom of association, fair wages, working hours)
- Health and safety (e.g. occupational toxins, hazards, injuries, fatalities)
- Society (e.g. Indigenous rights, gender equity, high conflict zones)
- Governance (e.g. corruption, legal system)
- Community and infrastructure (e.g. access to sanitation, drinking water, and hospital beds)

The SHDB uses a semi-quantitative social risk assessment approach, solely based on the above-mentioned secondary data. Indicators are classified into qualitative risk levels (low, medium, high, very high) based on statistical thresholds, expert judgment, and literature review. These qualitative risk levels are then combined with labour intensity data, measured as working hours per unit of economic output, to calculate the social risks.

The resulting metric, medium risk hours equivalent (mrheq), expresses social risk per functional unit (e.g. per kilogram of food product). One mrheq represents one hour of work performed under medium social risk conditions. Higher mrheq values indicate greater potential exposure to social risks along the supply chain.

Fehler! Verweisquelle konnte nicht gefunden werden. illustrates how social risks are calculated and displayed in the SHDB. Labour inputs are shown as inventory results, representing the working hours required across processes and sectors involved in the production of the final product. In this example, the inventory results correspond to labour inputs in the German fruit and vegetable sector. These labour hours are multiplied by characterization factors that reflect the level of social risk, ranging from low (0.1 mrheq per working hour) to very high (10 mrheq per working hour). The resulting risk assessment values express social risk in medium risk hours equivalent (mrheq). In simple terms, the social risk represents the number of labour hours along the supply chain that are likely to be exposed to social risks, relative to a medium risk benchmark.

Name	Category	Inventory result	Characterization factor	Impact assessment result
> 1A Wage assessment	Social Hotspot 2022 Category Method - Midpoint			0.01877 1A mrheq
> 1C Workers in poverty	Social Hotspot 2022 Category Method - Midpoint			0.02184 1C mrheq
> 1D Child Labor	Social Hotspot 2022 Category Method - Midpoint			0.02247 1D mrheq
> Overall Country-Sector Risk of Child LaborVH	social-issue/unspecified	0.00200 work hours	10.00000 1D mrheq/work hou...	0.02003 1D mrheq
> Overall Country-Sector Risk of Child LaborHR	social-issue/unspecified	0.00031 work hours	5.00000 1D mrheq/work hours	0.00156 1D mrheq
> Overall Country-Sector Risk of Child LaborMR	social-issue/unspecified	0.00085 work hours	1.00000 1D mrheq/work hours	0.00085 1D mrheq
> Overall Country-Sector Risk of Child LaborLR	social-issue/unspecified	0.00032 work hours	0.10000 1D mrheq/work hours	3.16059E-5 1D mrheq
> 1E Forced Labor	Social Hotspot 2022 Category Method - Midpoint			0.02339 1E mrheq
> 1F Excessive WkTime	Social Hotspot 2022 Category Method - Midpoint			0.01649 1F mrheq
> 1G Freedom of Assoc	Social Hotspot 2022 Category Method - Midpoint			0.01383 1G mrheq
> 1H Migrant Labor	Social Hotspot 2022 Category Method - Midpoint			0.01709 1H mrheq
> 1I Social Benefits	Social Hotspot 2022 Category Method - Midpoint			0.00770 1I mrheq
> 1J Labor Laws/Conv	Social Hotspot 2022 Category Method - Midpoint			0.00393 1J mrheq
> 1K Discrimination	Social Hotspot 2022 Category Method - Midpoint			0.02252 1K mrheq
> 1L Unemployment	Social Hotspot 2022 Category Method - Midpoint			0.01966 1L mrheq
> 2A Occ Tox & Haz	Social Hotspot 2022 Category Method - Midpoint			0.02510 2A mrheq
> 2B Injuries & Fatalities	Social Hotspot 2022 Category Method - Midpoint			0.02986 2B mrheq
> 3A Indigenous Rights	Social Hotspot 2022 Category Method - Midpoint			0.01371 3A mrheq

Figure 2: Example of SHDB risk assessment displayed in OpenLCA (German fruit and vegetable sector)

However, the method remains risk-based rather than impact-based: mrheq values do not represent actual harm or benefits experienced by workers or communities. Moreover, SHDB results cannot be monetized due to a lack of monetization factors that fit with the SHDB methodology, meaning that social risks identified through the SHDB cannot currently be translated into monetary values for TCA. More fundamentally, social risk indicators and monetized impact estimates capture different types of information. Risk assessment results describe the likelihood and severity of potential social issues, whereas monetized impact values represent quantified impacts or damages. As a result, even if monetization were technically feasible, social risk results should not be directly aggregated with environmental and health costs in TCA.

When interpreting social risks derived from the SHDB, several sources of uncertainty must be considered. The database does not measure observed social impacts directly. Instead, it provides risk proxies derived from secondary data sources and expert assessment. Therefore, mrheq values should be understood as indicators of potential exposure to social issues rather than evidence of actual harm. These risk estimates depend on the availability and quality and regional coverage of the underlying country- and sector-level datasets.

This can be illustrated using the example of child labour. In the SHDB, country–sector risk levels for child labour are derived from a combination of multiple secondary data sources, including UNICEF estimates of the share of children engaged in labour, the Children’s Atlas classification of severity of child labour, and Save the Children’s End of Childhood Index, which reflects school attendance and broader child well-being. These sources are combined using fixed weights, with UNICEF estimates accounting for 50% of the overall risk score and the other two indices contributing 25% each. As a result, the assigned child labour risk level combines information on the likelihood of occurrence and severity of child labour, rather than direct evidence of child labour occurring in a specific supply chain or production site. The accuracy of the assigned risk levels depends strongly on the completeness, timeliness, and geographic coverage of the underlying data, which can vary considerably across regions and sectors.

In addition, the scaling of risks is not always intuitive. The SHDB assigns fixed characterization factors to each qualitative risk level (0.1 for low, 1 for medium, 5 for high, and 10 for very high risk). This means that even small changes in the underlying data can move a country–sector

combination into a higher risk category and lead to a large increase in the calculated risk value. For example, when child labour risk shifts from “high” to “very high,” the risk value doubles from 5 to 10. This approach is designed to highlight potential hotspots, but it can make differences between sectors or regions appear larger than they actually are. Importantly, these values reflect potential exposure to risk, not actual child labour cases or harm experienced by children.

Another limitation is the use of secondary sector level data. The SHDB aggregates information across broad sectors and countries, which can mask important contextual differences. For product-specific assessments, this may result in risks appearing high or low due to generalized sectoral conditions rather than the actual practices associated with a particular product or supply chain. When doing risk assessment for food products, product grouping within the SHDB introduces another level of uncertainty. Certain products can only be clustered into broad categories, such as legumes being included in the “vegetables and fruits” sector. Consequently, beans, lentils, and chickpeas are assigned the same social risk profile as all other fruits and vegetables, regardless of crop-specific production conditions or regional differences. In practice, the only factor differentiating risks within a sector is labour intensity relative to producer price, which oversimplifies real-world conditions. Finally, it is important to note that animal welfare is not covered by the SHDB. Social risk results therefore reflect only human and societal dimensions of production and should not be interpreted as a comprehensive assessment of all social aspects of food systems.

Despite these limitations, the SHDB also offers opportunities to assess social risks. It provides a comprehensive and globally consistent dataset for social risk assessment across supply chains. Most importantly, the SHDB makes social risks visible where primary data and monetization methods are lacking, allowing TCA studies to include social capital assessment to a certain degree. It provides a valuable foundation for incorporating social considerations into TCA, but SHDB-based social risk assessment should be understood as a tool to indicate social risk hotspots rather than as a precise measurement of social capital impacts.

4 Conclusion and way forward

This brief shows that integrating social capital into TCA assessments of food systems remains conceptually recognized but methodologically constrained. While social capital is widely acknowledged, its inclusion in TCA studies is limited due to practical limitations in methods, data, and valuation.

Social capital is difficult to assess because it includes many social and institutional aspects, such as how workers are treated, how decisions are made, and how communities are supported. These aspects are not easily captured using the current LCA methods that form the basis of most TCA studies. In addition, S-LCA is still developing and does not yet offer standardized indicators or mature models that can be applied consistently across food products and supply chains. Data availability is another challenge in social capital assessment,

as product and supply chain social data are limited. As a result, TCA studies rely on secondary, sector-level data that allows for qualitative assessment of social risks. Finally, underdeveloped monetization methods and factors prevent social capital being fully integrated into TCA.

Within these constraints, SHDB-based social risk assessment represents a feasible and meaningful step forward. Although it does not measure social capital directly, the SHDB allows TCA studies to identify where social risks are concentrated along food supply chains. By highlighting potential hotspots related to labour rights, working conditions, governance, and community well-being, the SHDB helps reveal areas where social capital is likely being negatively impacted. SHDB-based social risk assessment can complement environmental and health impact assessments in TCA, support product or sector-level comparison of social risks, and inform prioritization of policy action and sourcing decisions. However, SHDB outputs should be interpreted as diagnostic information, not as quantified impacts. They are effective when combined with contextual knowledge.

Advancing social capital assessment in TCA will require coordinated progress across several fronts. Future research should focus on improving data availability and coverage. This includes developing more disaggregated sector and product data and combining secondary databases with targeted primary data collection where feasible. While methodological development for quantitative social impact assessment is highly necessary, future research should also explore hybrid assessment options. Combining SHDB-based risk assessment with TCA could provide an understanding of social capital dynamics while remaining scalable. Even though a fully quantified and monetized social capital assessment in TCA is not currently possible, SHDB-based social risk assessment provides a practical way to begin addressing social capital in TCA of food systems. Continued methodological development, improved data, and interdisciplinary collaboration will be essential to move from risk screening toward more comprehensive and meaningful social capital assessment in the future.

In addition to these research needs, expert discussions highlight several practical directions for future development. One important consideration is whether the current TEEB AgriFood definition of social capital is sufficient for practical application, or whether further work is needed to clarify and better define social capital within agrifood systems. At the same time, new initiatives aim to improve data availability and expand access to monetisation approaches and hidden cost estimates for food products, including social impacts. For example, the True Price Dashboard aims to present the total cost of products by integrating environmental and social externalities is intended to be made freely available to researchers in order to support methodological progress. In parallel, the FOODCoST project focuses on the valuation of impacts and the development of more harmonised approaches, including ongoing work comparing multiple TCA methodologies to support greater consistency in assessments. Additionally, they work on methodologies to incorporate animal welfare considerations into TCA frameworks. Overall, near-term developments are likely to emphasise methodological convergence, clearer conceptual definitions, and the expansion of social impact assessment that can be applied more consistently across food systems.

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