

QUANTIFYING THE SOCIO-ECONOMIC IMPACTS OF FOOD

A REVIEW OF TRUE COST ACCOUNTING METHODS



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Acknowledgements

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SUMMARY

Global food systems generate significant socio-economic impacts (or externalities) – both positive and negative – which greatly vary across geographic regions, supply chains, and production systems. These externalities, ranging from inadequate working conditions and child labour (negative) to job creation and community development (positive), are rarely reflected in market prices. True Cost Accounting (TCA) methodologies aim to advance traditional impact assessments by quantifying and economically valuing food systems' external benefits and costs – encompassing health, environmental, and socio-economic dimensions. However, consensus on measurement methods and metrics is lacking. We reviewed existing frameworks, approaches, methods, and data sources used for evaluating and monetising socio-economic externalities associated with food production and consumption. Our analysis of 24 publications (2008–2025) revealed a nascent field with limited evidence, characterised by a strong focus on negative impacts, individual foods or food groups (as opposed to whole diets), and primary production.

Studies predominantly employ bottom-up approaches to capture externalities as static snapshots of dynamic food systems, then apply various monetisation methods – primarily reactive rather than proactive – to estimate their economic value. Our findings show considerable methodological heterogeneity and data constraints – as explicitly mentioned in 71% (n=17) of included records. Thus, future research should prioritise methodological development, testing, and validation across a broad range of value chains, impact categories, and geographic contexts before scaling up data collection efforts. The TCA field must also engage with ethical questions about whether and how to monetise certain types of social impacts, particularly those involving human rights and dignity, while re-examining current modelling assumptions that may not fully reflect power imbalances and rights violations. Addressing these challenges should result in more accurate, comparable, and reliable insights on the true value of food, to guide policy and industry decision-making for sustainable and equitable food systems transformation.

KEY MESSAGES

- We reviewed literature on TCA methods for quantifying and economically valuing food systems' socio-economic benefits and costs.
- Only 24 studies met our inclusion criteria, suggesting that socio-economic externalities remain underrepresented in food-related TCA literature.
- Most records focus on negative externalities, with inadequate working conditions as the most frequently assessed category, while other human rights issues (e.g., forced labour, lack of freedom of association) receive much less attention.
- We identified three main areas for strengthening food-related TCA of socio-economic impacts: (1) Methodological limitations, data constraints, and lack of standardisation; (2) Focus on assessing costs after damage occurrence rather than on prevention or restoration; and (3) Scarcity of rights-based frameworks.
- Current methods represent preliminary attempts that may require fundamental reconceptualisation. Future research should prioritise methodological development and validation across diverse settings before scaling up data collection efforts.
- Addressing these challenges could help realise TCA's full potential to effectively support sustainable and just food systems transformation.

BACKGROUND AND OBJECTIVES

Global food systems play a central role in ensuring food and nutrition security, promoting health and wellbeing, supporting economic development, and strengthening cultural identity. However, they also generate significant socio-economic impacts (or externalities) – both positive and negative (1–3). Externalities are effects of economic activities that impact third parties who are not directly involved in the market transaction, and whose associated costs and/or benefits are not reflected in market prices (4). In food systems, positive socio-economic externalities may include knowledge and skill development for supply chain workers, community empowerment through cooperatives, and the preservation of traditional or indigenous food cultures (5). In contrast, examples of negative impacts comprise unfair labour practices, underpayment of workers, and child or forced labour (5).

Quantifying and monetising externalities through systematic approaches can inform more effective and equitable policy design and resource allocation, enabling decision-makers to account for a wide range of costs and benefits associated with various food system interventions (2,6,7). The term ‘quantification’ refers to expressing socio-economic impacts in non-monetary units (e.g., hours of forced labour, cases of inadequate working conditions, or number of participants attending skills training), while ‘monetisation’ (or monetary valuation) refers to assigning monetary values (e.g., US dollars) to measured impacts. This enables comparisons across different externalities and interventions. However, monetising socio-economic impacts is complex, and carries substantial methodological, conceptual, and ethical challenges (2,6,7). Estimates should therefore be understood as indicative approximations rather than precise values.

In recent years, True Cost Accounting (TCA) and True Pricing have been increasingly gaining prominence in global policy debates (8,9), also thanks to two recent State of Food and Agriculture reports by the United Nations Food and Agriculture Organization (FAO) focusing on the hidden costs of food systems (3,10). TCA approaches apply monetary valuation to capture a wide spectrum of positive and negative externalities along the entire food supply chain (11–13). However, despite growing interest, there is no scientific consensus on definitions, methodologies, or metrics (14). While several studies have proposed approaches for and presented examples of quantification and monetisation of socio-economic impacts within the food sector (15–17), to our knowledge, no prior review has focused specifically on methods for estimating the monetary value of food- and diet-related socio-economic externalities.

This working paper represents the first comprehensive review of frameworks, approaches, methods, and data sources for assessing and monetising both negative and positive socio-economic impacts of single foods, food groups, meals, and whole diets across the full value chain. We identify critical evidence gaps in the available TCA literature and provide recommendations to guide future research, policy, and practical applications for sustainable and equitable food system transformation. The present study complements two additional reviews focusing on food- and diet-related health (18) and environmental externalities (19).

METHODOLOGY

We employed a structured literature review to comprehensively identify, categorise, and synthesise existing frameworks, approaches, methods, and data sources for economically valuing the hidden socio-economic impacts of food systems. We opted for a structured – rather than a systematic or scoping – review approach because preliminary searches revealed limited evidence on the monetisation of socio-economic externalities, indicating a nascent field with evolving methodologies. A structured review offered the flexibility to surface and analyse widely different approaches beyond the rigid constraints of systematic or scoping reviews (20,21), in alignment with our objectives of providing a foundational overview of current knowledge on conceptual and methodological advances in food system-related TCA of socio-economic impacts and generating insights into key areas of consensus and divergence within this emerging field.

We followed an evidence synthesis protocol based on adapted versions of the PRISMA Statement Extension for Scoping Reviews and materials from The Campbell Collaboration (22–24). Our review aimed to address the following research question: What frameworks, approaches, methods, and data sources are available for quantifying and monetising socio-economic externalities associated with the production and consumption of individual foods, food groups, meals, and/or whole diets?

We examined records published between 2008 and 2025. January 1, 2008 was chosen as the start date to capture the ‘modern era’ of food system-related TCA (25,26). Earlier studies represented isolated efforts and focused mainly on environmental pollution or occupational health, with little attention to socio-economic externalities (27). Around 2008–2010, TCA began to consolidate as a systems-thinking research field, supported by growing concern over diet-related health crises, sustainability debates, and emerging policy initiatives linking nutrition, environment, and equity (26,28–30).

Search strategy and evidence selection

A comprehensive search strategy was developed by an evidence synthesis librarian and refined through peer review by three members of our research team to ensure relevance and completeness. The final strategy incorporated a wide range of keywords and subject headings to capture three main concepts: (1) TCA and True Pricing; (2) socio-economic impacts; and (3) food production, processing, packaging, distribution, retail, home consumption, and waste disposal. Searches were conducted across several academic databases and grey literature sources (Annex Table 1).

The latest academic database searches were performed on April 30, 2025, comprising Scopus, EconLit, and Web of Science Core Collection. The full search strategy for Scopus is provided in Annex Table 2. Grey literature searches were executed between March 6 and April 30, 2025, across eight sources: the United Nations Environment Programme (UNEP), the Global Alliance for the Future of Food, the International Food Policy Research Institute (IFPRI), the Alliance of Bioversity International and CIAT (Bioversity-CIAT), the Food and Land Use Coalition (FoLU), FAO’s Knowledge Repository, the True Price Foundation, and Fairtrade. Non-academic databases that could not be systematically searched were manually searched by two team members, who used relevant keywords and filters, and screened the identified records for eligibility.

In total, the search strategy yielded 2,321 citations, which were imported into Covidence systematic review software (<https://www.covidence.org>). Of these, 804 duplicates were

automatically removed, and an additional 3 were manually excluded, resulting in 1,514 unique records. Titles and abstracts of these publications were screened, with 96 studies marked as potentially relevant. Full texts were then retrieved and assessed, resulting in the final inclusion of 24 records. At each screening stage, eligibility was evaluated by a single reviewer against pre-defined inclusion and exclusion criteria (Table 1), with a second reviewer cross-checking 15% of citations and a third team member resolving discrepancies.

Eligibility criteria

Table 1 lists the inclusion and exclusion criteria used to assess study eligibility – organised according to the Population, Concept, Context (PCC) framework (31).

Table 1. Inclusion and exclusion criteria for evidence selection

Aspect considered	Inclusion Criteria	Exclusion Criteria
Population and Context	Records focusing on single foods, food groups, meals, and/or whole diets in any geographical / population settings, covering any number of food system value chain stages, from primary production through home consumption and waste treatment	Records exclusively focusing on non-food systems or sectors (e.g., energy, construction)
Concept	Studies discussing methods to quantify and monetise socio-economic externalities (positive and/or negative) of foods and diets, including methodological approaches and models	Studies solely examining environmental and/or health externalities, without a socio-economic dimension Records performing socio-economic impact assessments without economic valuation Studies lacking clear methodology for socio-economic externality quantification and/or monetisation
Evidence sources	Academic manuscripts in scientific journals Working papers, reports, guidelines, inventories, and tools from relevant organisations Books and book chapters from academic publishers	Publication types other than those listed under the inclusion criteria Records for which full texts could not be accessed through institutional subscriptions, open-access platforms, or Interlibrary loan services
Timeframe	Studies published between January 1, 2008, and April 30, 2025	Records published prior to January 1, 2008
Language	English language publications	Non-English language records

Data extraction

One independent reviewer extracted relevant information from all included studies using a standardised data charting form – developed following the JBI template (31) (Annex Table 3). To ensure comprehensiveness and consistency, the data extraction form was pilot tested prior to the full data charting process. Key variables of interest extracted from each record comprised:

- Full citation and publication type;
- Study scope and context (i.e., geographic focus, country income groups, supply chain stages considered, and reference periods of input data);
- Research questions addressed, level(s) of assessment (i.e., individual foods, food groups, meals, and/or whole diets), and types of foods / food groups, meals, and/or dietary patterns analysed;
- Socio-economic externalities examined (both positive and negative);
- Monetisation methods and data sources used for quantifying and economically valuing socio-economic impacts;
- Methodological strengths and limitations and recommendations for future research, as stated by the original authors.

Data analysis and evidence synthesis

Evidence synthesis combined quantitative descriptive statistics with qualitative analysis. First, we used counts and frequencies to map the evidence distribution by key variables of interest (e.g., country income groups, externalities considered, assessment levels).

Second, we employed content analysis to classify each included study according to a three-tiered analytical hierarchy (Figure 1, Table 2):

- **Framework (Tier 1):** The overarching theoretical foundations and conceptual orientation (i.e., market-oriented, rights-based, or mixed);
- **Approach (Tier 2):** The general strategy adopted for impact assessment (i.e., bottom-up, top-down, or comparative);
- **Method (Tier 3):** The specific analytical technique chosen (i.e., cost of socio-economic externalities, cost-benefit analysis, restorative or preventive cost valuation).

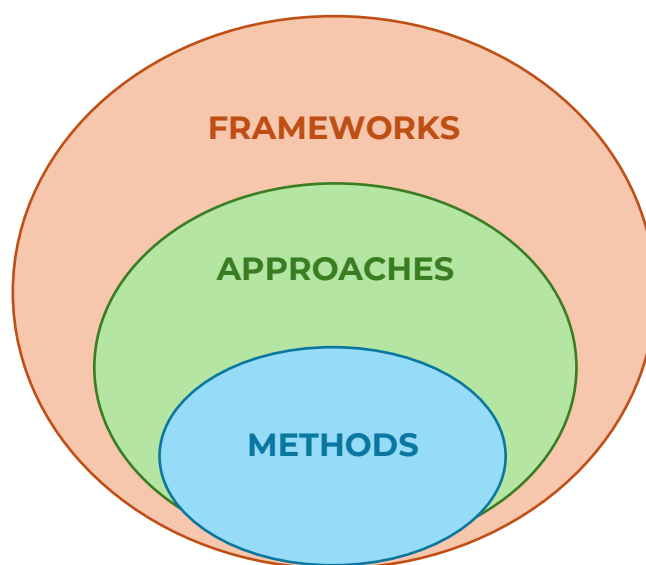


Figure 1: Hierarchy of analytical levels used for categorising each record based on frameworks (Tier 1), approaches (Tier 2), and methods (Tier 3) employed.

Finally, we thematically categorised all data sources used in the reviewed literature to quantify and monetise food system-related socio-economic impacts. We also synthesised overarching patterns, methodological strengths, and limitations across records, highlighting emerging knowledge gaps and priority areas for future TCA research and applications.

Table 2. Classification and definitions of frameworks, approaches, and methods to measure and value socio-economic impacts. Typology definitions were developed by our research team for the purpose of this review and may diverge from those used in other studies.

Hierarchy of analytical levels	Typologies and definitions
Framework (Tier 1): The broad conceptual structure that provides an overall theoretical foundation and boundaries for understanding a field of study. It establishes underlying assumptions, key concepts, and relationships between elements.	Market-oriented: Rooted in neoclassical and welfare economics, this framework considers externalities as market failures due to missing or distorted price signals. The primary objective is to 'internalise' external costs, so that market prices reflect the full socio-economic implications of a given good or service. Impacts are monetised and integrated into decision-making to improve resource allocation and economic efficiency. The proposed solutions work within existing market structures, without challenging current growth-centred economic models.
	Rights-based: Grounded in international human rights law and social justice theory, this framework considers externalities as violations of fundamental, non-negotiable rights, which are non-substitutable and cannot be traded for economic gains (32–38). The focus is on addressing structural inequalities, power imbalances, and governance failures, and ensuring public and corporate entities comply with their obligations to respect, protect, and fulfil human rights. The proposed solutions require fundamental systemic changes to eradicate the root causes of rights violations. While monetisation of impacts may be used, it serves mainly as an advocacy tool rather than directly informing policy and industry decisions.
	Mixed: This framework combines market-oriented and rights-based perspectives, by applying different treatments to various externalities within the same model (39–41). Violations of fundamental human rights, such as child labour, cannot be tolerated and must be eradicated at the source rather than compensated economically. Other socio-economic impacts (e.g., inadequate working conditions, wage gaps) are subject to monetisation and cost-benefit analysis. This dual framework leverages economic valuation to internalise certain externalities into market prices, while concurrently pursuing systemic transformation via policy and preventive measures.
Approach (Tier 2): The general strategy employed for tackling a problem. It operates within a given framework, representing a specific line of action for addressing an issue. Being more concrete than a framework, it is still broader than individual methods.	Bottom-up: This approach quantifies socio-economic outcomes using locally gathered, granular data (e.g., from household surveys, workplace / administrative records, health facility information systems), sometimes complemented with secondary data. Impacts are then monetised by applying valuation parameters – either published monetisation factors or case-specific estimates. Bottom-up studies are typically conducted at regional to (sub)national scales. However, most reviewed records using this approach did not make their primary datasets publicly available – often due to confidentiality agreements or the use of proprietary data collection instruments.
	Top-down: This approach entirely relies on secondary data sources for quantifying socio-economic externalities, such as national accounts, labour statistics, health expenditure databases, and burden of disease estimates. Top-down studies are generally conducted at national to global scales. Impacts are usually monetised by employing published, pre-defined valuation

	coefficients (e.g., Value of a Statistical Life, social cost factors), which can be adjusted to the study country and year of analysis (e.g., inflation corrections, income scaling). When no damage-cost factors exist, preventive / restorative costs can be used as proxies.
	Comparative: This approach often combines primary and secondary data sources. Comparative studies model different production, consumption, and/or policy scenarios to assess the magnitude of socio-economic impacts and costs under various conditions and assumptions.
Method (Tier 3): The specific technique used to implement an approach, and to collect and analyse data. Methods represent the most detailed and operational level of the three-tiered analytical hierarchy.	Cost of socio-economic impacts: A valuation method that monetises socio-economic externalities by estimating the economic costs and/or benefits from their actual occurrence. While most applications focus on damage or social costs emerging from negative impacts, this method is also suitable for capturing improvements in socio-economic conditions from positive externalities. It an impact-based technique, meaning it can only be used to value realised effects on individuals, communities, or society.
	Cost-benefit analysis: An economic evaluation method that systematically compares the total costs of a product, intervention, or policy against its benefits, both expressed in monetary terms. This includes quantifying (positive and negative) socio-economic externalities to determine whether a decision or action is economically justified.
	Restorative cost valuation: An analytical technique that estimates the monetary value of a negative socio-economic impact by calculating the cost of interventions needed to bring conditions back to acceptable standards (e.g., respect of human rights, decent work).
	Preventive cost valuation: An analytical technique that estimates the monetary value of avoiding or mitigating a negative socio-economic externality by calculating the cost of measures taken in advance to prevent it from occurring or minimise its known impacts. This is a prospective method, meaning it focuses on the resources required for prevention rather than compensating damage once it has occurred.

RESULTS

Evidence distribution by key variables of interest

The PRISMA flow diagram (Figure 2) illustrates the outputs of the evidence search and selection processes. Our review identified a diverse but relatively small body of literature on the quantification and monetisation of food system-related socio-economic impacts. Of the 24 records included, most were peer-reviewed primary research articles (58%, n=14), followed by technical reports (29%, n=7), and methodological guidelines (13%, n=3).

Most studies (79%, n=19) reported socio-economic externalities as their primary research focus rather than as a secondary outcome within broader analyses. Fifty percent (n=12) relied on data from 2000–2015. Only two records used data from 2020 onwards, while five studies did not specify reference years. Overall, half of the records used data collected within 10 years from the publication date, 29% (n=7) combined more recent data with inputs older than 10 years, and 21% (n=5) either did not use empirical data (i.e., methodological guides) or did not report the reference period.

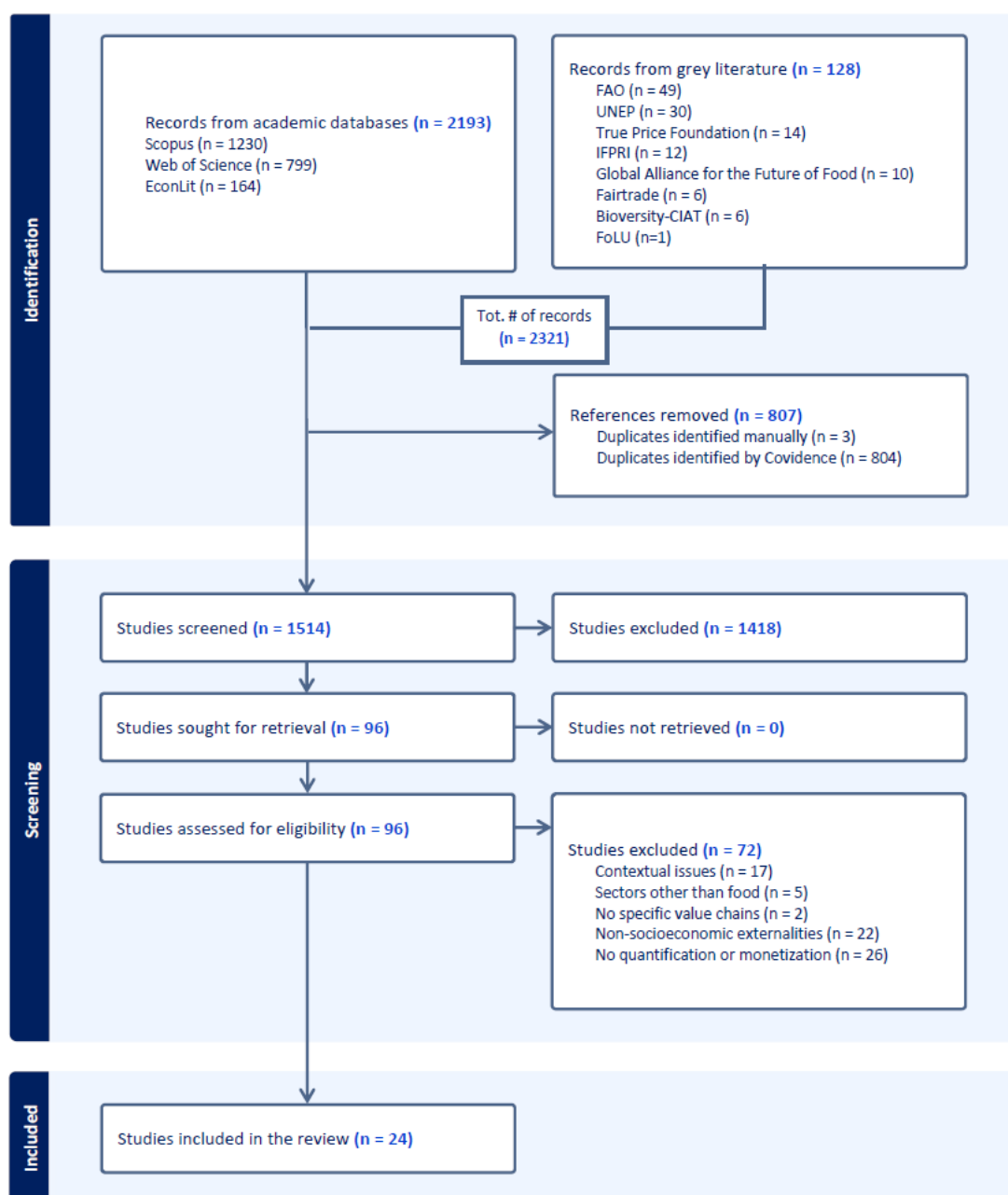


Figure 2: PRISMA flow diagram with outputs of the evidence search and selection processes

Geographic focus and income level classification

Europe was the most frequently assessed geographic region (n=9), followed by Asia (n=6) and Africa (n=6). Only two studies focused on North America, Central and South America, and Oceania each. One publication adopted a global perspective, while in two cases, no specific geographic focus was reported.

When classified by country income level (Figure 2), the distribution of records was relatively balanced between high-income (n=11) and lower-middle-income (n=10) countries. Upper-middle-income (n=2) and low-income (n=1) settings accounted for a much smaller share of the evidence. One global-scale study included countries from all income groups.

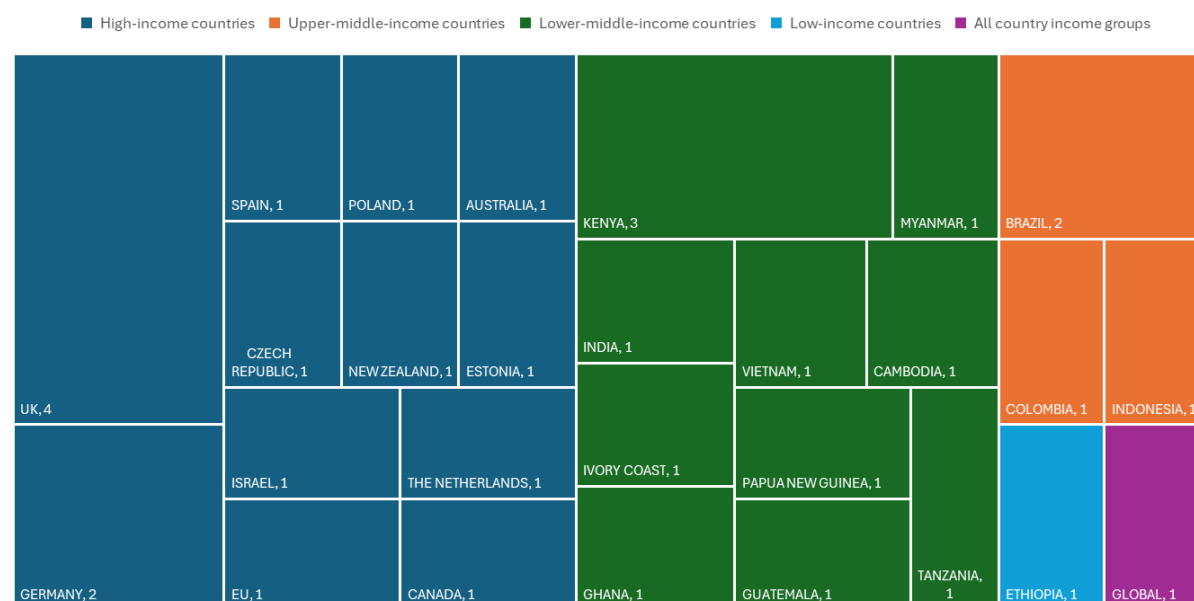


Figure 3: Overview of countries represented in the included records, classified by income level as per the World Bank's rankings (fiscal year 2026) (42). The size of boxes reflects the frequency with which each country was assessed. Numbers after country names (e.g., UK, 4) indicate how many records focused on each country. Multi-country studies were counted more than once, so the total exceeds 24. EU = European Union setting (no specific countries mentioned).

Value chain stages assessed

As shown in Table 3, most records measured socio-economic impacts arising during primary production (63%, n=15), while other supply chain stages were less frequently examined: home preparation and/or consumption (38%, n=9), processing (33%, n=8), wholesale and/or retail (29%, n=7), transport and distribution (25%, n=6), packaging (17%, n=4), and pre-farm activities (8%, n=2). Only one study assessed externalities across the full life cycle (43), suggesting a fragmented understanding of food systems' impacts.

Table 3. Value chain stages considered in the reviewed literature

Value chain stage	n	%**
Pre-farm activities*	2	8
Primary production	15	63
Primary and/or secondary processing	8	33
Packaging	4	17
Transport and distribution	6	25
Wholesale and/or retail	7	29
Home preparation and/or consumption	9	38
Waste management	1	4
All value chain stages covered	1	4
N/A	3	13

*Pre-farm activities refer to all activities that occur before primary production, such as the extraction and transformation of raw materials and the manufacturing and transport of agricultural inputs like fertilisers and pesticides. **As many studies focused on multiple supply chain stages, the percentages add up to over 100%.

Assessment level and types of foods analysed

Almost all records assessed externalities at the individual food (71%, n=17) or food group (13%, n=3) levels; only one evaluated whole diets and one focused on food waste. Among studies examining single foods / food groups, cereals and cereal-based products (29%, n=6) and milk and dairy products (29%, n=6) were the most frequently assessed categories, followed by meat and meat products (24%, n=5), and coffee, cocoa, tea, and infusions (24%, n=5). Other food groups received more limited attention, such as fish and seafood (14%, n=3), legumes, nuts, and oil seeds (14%, n=3), and vegetables (10%, n=2). Fruit, eggs, and fats and oils were only considered in one record each (Table 4).

Table 4. List of individual foods and food groups analysed in the reviewed literature, classified following the FoodEx2 system developed by the European Food Safety Authority (44).

Food groups	n*	%**
Cereals and cereal-based products	6	29
Milk and dairy products	6	29
Meat and meat products	5	24
Coffee, cocoa, tea and infusions	5	24
Alcoholic beverages	4	19
Legumes, nuts, oil seeds and spices	3	14
Fish, seafood, amphibians, reptiles and invertebrates	3	14
Vegetables and vegetable products	2	10
Animal and vegetable fats and oils and primary derivatives thereof	1	5
Fruit and fruit products	1	5
Eggs and egg products	1	5
Starchy roots and tubers and products thereof, sugar plants	0	0
Fruit and vegetable juices and nectars (including concentrate)	0	0
Sugar and similar, confectionary and water-based sweet desserts	0	0
Water and water-based beverages	0	0
Food products for young population	0	0
Products for non-standard diets, food imitates and food supplements	0	0
Composite dishes	0	0
Seasoning, sauces and condiments	0	0
Major isolated ingredients, additives, flavours, baking and processing aids	0	0
Other ingredients	0	0
*Counts include records focusing on specific food categories (e.g., fruit and fruit products) and/or individual items within those (e.g., apple, watermelon). **Frequencies were calculated using the total number of studies that assessed socio-economic externalities at the single food or food group level as the denominator (n=20). As some records examined multiple food groups, the sum of frequencies across categories exceeds 100%.		

Socio-economic externalities assessed

Most studies exclusively focused on negative socio-economic impacts, with inadequate working conditions (42%, n=10) as the most frequently assessed main category (Table 5) – especially unfair compensation practices (33%, n=8) (41,45,46) and lack of worker protection and/or occupational health and safety risks (21%, n=5) (41,45,47). Seven out of eight records defined ‘unfair compensation’ as pay below the living wage (for employees) or revenues below the living income (for farmers), often alongside unpaid overtime and

absence of social security schemes (40,47). One study employed an *emergy* method¹ and found that labour (including relevant know-how and skills) was undervalued relative to an estimated fair price (48). Other commonly assessed main categories included poverty and income-related impacts (21%, n=5) (43,49) and rights violations and systemic abuses (21%, n=5) (40,47). The latter comprised forced or child labour, various forms of discrimination, and lack of union rights.

Fewer records considered positive externalities (Table 5), with the most frequently assessed main categories being local economic and community development (17%, n=4) (46,50) and income-related benefits (17%, n=4) (49,50), followed by job creation, food security and reduced poverty, and adequate animal welfare levels (each at 8%, n=2) (51–53). Only isolated mentions were made of social inclusion or preservation of cultural heritage (46,48).

Table 5. Negative and positive externalities assessed in the included records, organised into main and sub-categories. Numbers indicate the frequency with which each (sub)category was considered in the reviewed literature. As many studies evaluated more than one (sub)category, numbers add up to more than 24 (i.e., the total number of included records). Main and sub-category definitions were developed by our research team and may diverge from those used in other studies.

Negative socio-economic externalities			
Main categories	No.	Sub-categories	No.
Inadequate working conditions: Labour arrangements (comprising both employment and independent work) failing to meet legal / contractual or other acceptable standards (e.g., pay below the living wage, unpaid overtime, unlawful deductions, lack of mandated benefits, unsafe environments, excessive working hours), often leading to sub-optimal productivity.	10	Unfair compensation practices	8
		Lack of worker protection and/or occupational health and safety risks	5
		Work overload	4
		Productivity losses	2
Rights violations and systemic abuses: Violations of fundamental human / labour rights, such as forced or child labour, all forms of discrimination, suppression of freedom of association or collective bargaining power.	5	Forced or child labour	4
		Discrimination	4
		Lack of union rights	4
Poverty and income-related impacts: Insufficient and/or unstable household / individual earnings and/or income-related inequalities, including living wage / income gaps (regardless of whether minimum legal standards are met), seasonal volatility in earnings, indebtedness, and households living below the poverty line.	5	-	-
Inadequate animal welfare levels: Treatment of farm animals falling short of legal / acceptable welfare standards, encompassing health, housing, handling practices, and behavioural needs.	3	-	-
Economic impacts of food waste: Macro- and microeconomic losses due to avoidable waste across food supply chains (e.g., reduced	2	-	-

¹ *Emergy* is a methodology to measure the total energy required to produce a good or service, including environmental, economic, and socio-cultural inputs. This means that environmental resources (such as sunlight, rainfall, or soil), economic contributions (e.g., machinery, fuel, infrastructure), and sociocultural capital (like human labour, relevant knowledge, skills, and practices) are all translated into an equivalent amount of solar energy that would hypothetically be required to produce them. By converting all inputs to a common measurement unit (i.e., solar-equivalent joules), *emergy* enables the direct comparison of widely diverse resources.

Negative socio-economic externalities			
agricultural outputs, GDP losses, decreased employment opportunities).			
Reduced health and well-being: Non-fatal health – including psychosocial – damage, such as stress, fatigue, or mental health strain, linked to working conditions or food environments.	2	-	-
Costs to employers and/or public institutions: Direct financial burdens on businesses or public entities (e.g., absenteeism, disciplinary / legal time, policing, courts, prisons).	2	-	-
Crime and legal infractions: Criminal activity associated with food production and/or consumption (e.g., alcohol-attributable crime) and any associated economic consequences.	2	-	-
Positive socio-economic externalities			
Main categories	No.	Sub-categories	No.
Local economic and community development: Enhancement of local economic conditions, improved market access and infrastructure, investments in community assets and services, and/or strengthened collective capacities.	4	Local economic development	2
		Local community development	2
Income-related benefits: Improved household / individual earnings and/or fairer income / revenue distribution along the value chain (e.g., better prices of agricultural commodities, improved market access, lower transaction costs).	4	Income generation	2
		Improved income distribution	2
Job creation and employment: Net job gains, employment formalisation, and/or improved stability and quality of employment in supply chains.	2	-	-
Food security and reduced poverty: Improvements in the availability, physical accessibility, and/or affordability of food, along with reduced household / individual poverty. This can be achieved through higher incomes / revenues, lower retail prices, and/or improved reliability and stability of supply chains (e.g., reduced vulnerability to seasonal and/or crisis-related disruptions).	2	-	-
Adequate animal welfare levels: Treatment of farm animals meeting or exceeding legal / acceptable welfare standards (e.g., adequate housing, handling practices, and healthcare provision).	2	-	-
Social inclusion: Increased participation, benefits, and/or decision-making power for vulnerable and/or marginalised groups (e.g., women, youth, migrants, refugees, smallholders).	1	-	-
Cultural heritage preservation: Preservation of culinary practices, indigenous / traditional foods, artisanal skills, and production systems that foster cultural identity and heritage (including by leveraging tourism / market spillovers).	1	-	-

As shown in Figure 4, most main categories of negative externalities were exclusively assessed in high-income country contexts, including costs to employers and/or public institutions, reduced health and well-being, economic impacts of food waste, inadequate animal welfare levels, and crime and legal infractions. In contrast, rights violations and systemic abuses were only measured in lower-middle-income countries. As for the two remaining categories – inadequate working conditions and poverty and income-related impacts – these were examined across (almost) all income groups. The single record focusing on a low-income setting solely assessed poverty and income-related impacts.

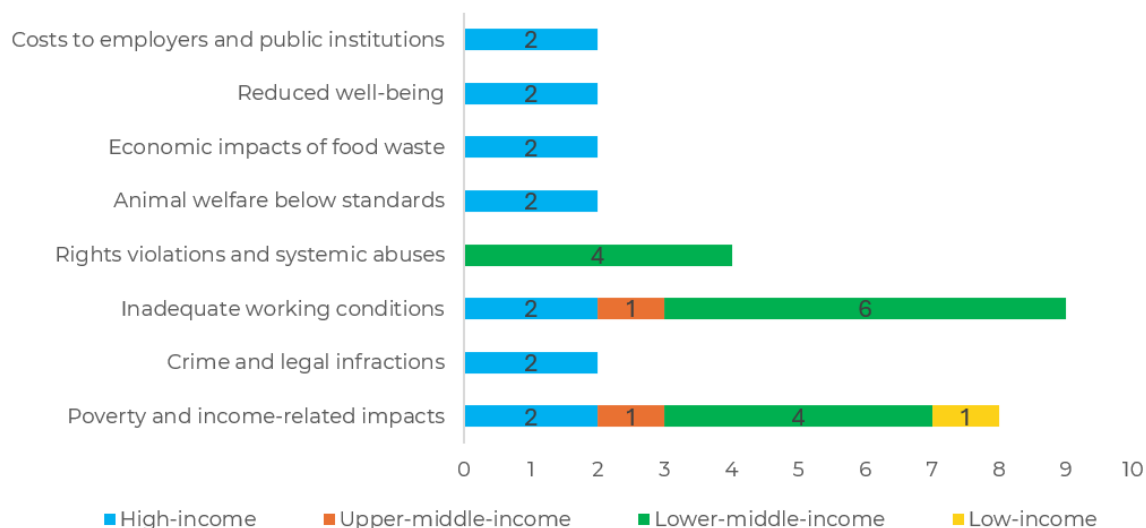


Figure 4: Relationship between the main categories of negative socio-economic externalities and income level classification (as per the World Bank's rankings) (42). Each bar on the graph corresponds to a main category. Colours represent different income levels. Labels on the stacked bar segments indicate the number of records per country income group assessing a given category. Monochrome bars indicate that a certain category was only considered by publications focusing on high-income (e.g., reduced well-being) or lower-middle-income (i.e., rights violations and systemic abuses) countries. Since many studies covered more than one category while few did not assess negative externalities, counts may exceed the total number of records belonging to each country income group.

Classification of frameworks, approaches, and methods

As mentioned under the Methodology section, each record was classified against three analytical levels: (Tier 1) Framework; (Tier 2) Approach; and (Tier 3) Method. For a detailed categorisation of the 24 included records please refer to Annex Table 4.

Tier 1: Frameworks

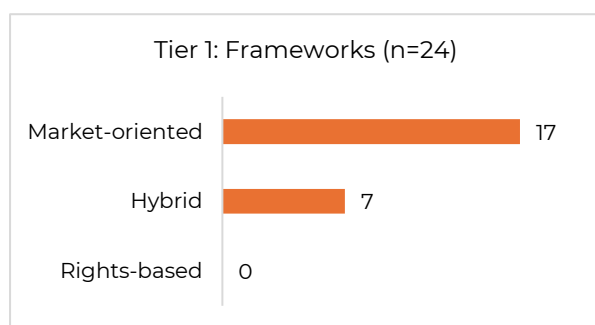


Figure 5: Distribution of records across frameworks

Most studies adopted a market-oriented framework (71%, n=17) (Figure 5): socio-economic impacts were considered as priceable externalities to be internalised into existing markets, toward making food systems' hidden costs and benefits visible to decision-makers at all levels (from government agencies to value chain actors and consumers) (43,46,51,52,54–56). Examples include country- or sector-specific social cost studies (e.g., the

financial burden of alcohol-attributable crime and unemployment), as well as macro-scale models valuing the impacts of food supply chains on national GDP and employment rates.

The remaining seven records (28%) employed a mixed framework – specifically, six publications authored by the True Price Foundation and one academic manuscript (39–41,45,47,48,57). The case studies and methodological guides by the True Price Foundation were based on the assumption that respect for human rights is essential to societal well-being, and monetised socio-economic externalities by calculating remediation costs (i.e., retribution costs and costs to restore, compensate, and prevent re-occurrence of harm caused by a rights violation) (58). As for the single peer-reviewed article adopting a mixed framework, it applied *emergy* theory and methods to integrate environmental, economic, and sociocultural impacts – including knowledge, information, and other intangible costs – into a common solar energy accounting system. It then converted impacts into monetary terms to highlight social inequities (e.g., inadequate farmer remuneration) (48).

Tier 2: Approaches

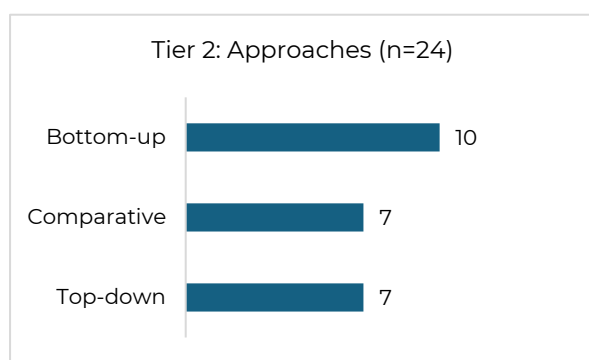


Figure 6: Distribution of records across approaches

Most records employed a bottom-up approach (42%, n=10) (Figure 6), by collecting primary data (e.g., through household or farm surveys, administrative records) and then either applying published monetisation factors (sourced from the available literature) or relying on study-specific cost estimates. However, only one of ten bottom-up studies made the primary data collected publicly available (48). Six records did not publish the datasets used in their analyses (40,41,45,47,49,59) – mostly

due to confidentiality issues or proprietary research instruments. Three studies did not generate any primary data as they consisted of methodological guides or review articles (43,54,60).

Top-down approaches accounted for nearly one-third of records (29%, n=7), building upon official statistics (e.g., national accounts, labour and health system records) combined with published valuation factors from the TCA literature. Comparative approaches also represented about one-third of records (29%, n=7), modelling alternative scenarios to assess the impacts of different policies, interventions, technological advancements, and/or dietary patterns (e.g., strategies to reduce alcohol consumption, reductions in household food waste, healthy and sustainable diet shifts). Comparative studies often relied on both primary and secondary data inputs (46,51,52).

Tier 3: Methods

Cost of socio-economic impacts (67%, n=16) was the most commonly used method, quantifying and monetising socio-economic harms and/or benefits that have already occurred (e.g., productivity losses, poverty gaps, below-standards animal welfare, improved food security, income generation) (41,47,53,54,61,62). Three records (13%) employed *cost-benefit analysis* – a methodology to compare the total costs of a product,

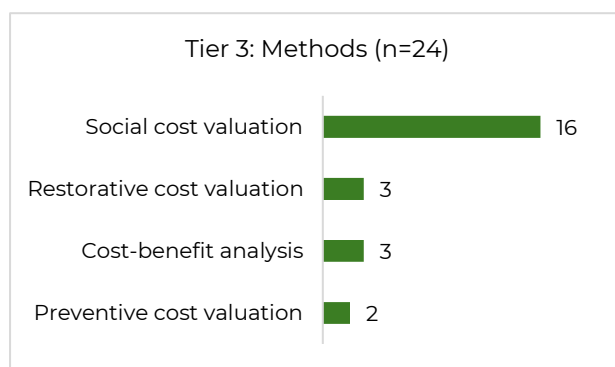


Figure 7: Distribution of records across methods

methodological guides by the True Price Foundation (not including implementation examples) (39,57). *Preventive cost valuation* was the least-represented method in the reviewed literature (8%, n=2) (55,63). Although the True Price Assessment Method is remediation-based, most case studies authored by the True Price Foundation only discussed prevention as a desirable strategy, rather than using it as the basis for monetising impacts (40,45,47).

Intended audience and use of the reviewed literature

The primary intended use of the included records is to provide decision support for the public sector (58%, n=14), comprising country- or sector-specific studies designed to inform governmental agencies and financial / investment institutions (43,49,51,55,62–66). About one-fourth (25%, n=6) of records – primarily case studies by the True Price Foundation – aimed to guide corporate strategies and actions. Companies employ TCA methodologies to estimate socio-economic costs per unit of product (e.g., USD/kg of food), and are encouraged to leverage these insights to prioritise suppliers, establish price premiums and/or remediation plans, report on Environmental, Social, and Governance (ESG) performance, and make product claims (39–41,45,47,56,60). Research / methodological development was the intended purpose of 17% (n=4) of the reviewed studies. Many records were directed to multiple audiences (39,48,60,61). For instance, while case studies authored by the True Price Foundation mostly targeted private-sector actors, the Foundation's methodological guides have broader scope of application – including beyond corporate settings.

Data sources for impact quantification and monetisation

Impact quantification

The most common data sources for assessing socio-economic externalities were national and/or regional public databases (75%, n=18) and data generated by academia or research institutes (75%, n=18) (Annex Table 5), often used in combination (e.g., CAPRI, AgroSAMs). Primary data collection was also frequent (38%, n=9), typically through farm or household (or online) surveys. TCA or True Pricing databases and market or consumer insights were more rarely used (each at 8%, n=2). In some cases, proprietary datasets were integral to impact assessment models, making study replication dependent on access to both the detailed methodology employed and underlying data (39,53).

policy, or practice / intervention against its total benefits, both expressed in monetary terms. *Restorative cost valuation* was also used in three studies (13%). This analytical technique – sometimes found in corporate applications – allows to estimate the minimum expenditure required to bring conditions back to an acceptable benchmark after damage has occurred. Two of the three records employing restorative cost valuation were

Monetisation factors

Monetisation factors were often derived from published scientific and grey literature (46%, n=11) and national and/or regional institutional databases (33%, n=8) (Annex Table 6). TCA / True Pricing databases and inventories were employed in 25% (n=6) of records. Specifically, the Monetisation Factors for True Pricing (60) were referenced in methodological guidance documents and case studies by the True Price Foundation. Primary data, databases curated by international organisations (e.g., United Nations agencies, the World Bank), and datasets for foresight modelling were each used in 21% (n=5) of the included studies. Notably, Social Life Cycle Assessment (SLCA) inventories were never reported as data sources for impact quantification and/or monetisation.

Author-stated strengths, limitations, and research recommendations

Strengths

The most frequently cited strength was the ability to evaluate different conditions or scenarios (46%, n=11) (43,48,64), thanks to converting socio-economic impacts into monetary units, which makes widely diverse externalities directly comparable and more visible (as highlighted in 38% of records, n=9). Another commonly reported strength was the disaggregation of costs across supply chain stages (29%, n=7) (40,55), even where assessments did not cover the entire life cycle. Less frequently mentioned strengths included the ability to show system-wide connections (13%, n=3) (50,66) and ground analyses in real-world data and settings (13%, n=3) (45,59). Nine studies (38%) did not explicitly report any strengths.

Limitations

Most records (71%, n=17) mentioned data availability and quality issues as key limitations (46,51,65). Narrow application scope or breadth of coverage were cited by 63% (n=15) of the studies (43,48,49), particularly the small range of externalities measured (47%, n=11), restricted geographic boundaries (33%, n=8), limited number of value chain stages considered (27%, n=6), temporal constraints (20%, n=5), and low diversity of foods and diets assessed (13%, n=3). Significant reliance on methodological assumptions and/or oversimplifications was reported in 58% (n=14) of records (64,66). Other author-stated limitations included the absence of uncertainty and/or sensitivity analyses (38%, n=9), sample representativeness issues (29%, n=7) (50,66), and challenges with converting non-market impacts into monetary terms (21%, n=5) (51,61).

Research recommendations

Over half of the reviewed studies (56%, n=13) recommended improving the quality of and/or expanding upon existing databases, models, and overall research infrastructure, stressing the importance of reliable, context-specific, and disaggregated data to improve quantification and monetisation estimates (43,47,49,61). Nearly half (44%, n=11) highlighted the need to conduct comprehensive uncertainty and sensitivity analyses, including to assess the impacts of using alternative monetisation methods (52,59,64,65). The importance of broadening the scope of application was also commonly mentioned, either by covering a wider range of value chains, food products, and dietary patterns (24%, n=6) (46,54,56), or including often-neglected life-cycle stages and externalities (28%, n=7) (43,45,49). A smaller share of records (16%, n=4) called for methodological standardisation to improve cross-study comparability (39,43,51,54).

DISCUSSION

Our review revealed a research field in its early stages of development, characterised by a small evidence base (n=24). The limited number of relevant records identified indicates that socio-economic externalities remain underrepresented in the food system-related TCA literature compared to environmental and health impacts – as documented in previous studies (5,15) and highlighted by two complementary reviews conducted by our research team (18,19). The reviewed literature presented considerable heterogeneity in methods for assessing and economically valuing socio-economic externalities (67,68), reflecting case-by-case adaptation rather than progression toward standardised protocols. The included records varied greatly in their theoretical foundations, analytical approaches, and monetisation methods, suggesting the field remains in an exploratory research and development phase, rather than converging on best practices. This makes it difficult to draw conclusions around current valuation strategies applied to socio-economic impacts.

Most studies predominantly focused on negative externalities, especially inadequate working conditions (42%, n=10), poverty and income-related impacts (21%, n=5), and rights violations and systemic abuses (21%, n=5), as found in a previous review (69). In contrast, positive impacts received significantly less attention. The emphasis on negative externalities results in clearer documentation of harms than benefits and may present an incomplete picture of food systems' socio-economic implications (70). Most impact assessments were narrow in scope, focusing on individual foods (71%, n=17) or food groups (13%, n=3) rather than whole diets, and examining select supply chain stages instead of the full life cycle. Primary production emerged as the most frequently analysed stage (63%, n=15), while downstream (e.g., retail, home consumption, waste treatment) and upstream (e.g., manufacturing and transportation of agricultural inputs) processes received little-to-no attention. Even records disaggregating impacts by supply chain stage – which was explicitly reported as a strength in 29% (n=7) of the studies – seldom did so comprehensively, leading to a fragmented understanding of food systems' dynamics (69,71).

The *cost of socio-economic impacts* method dominated the available literature (67% of records, n=16), focusing on monetising externalities after their occurrence (59,61,62). This reactive technique contrasted with the limited number of studies adopting proactive methodologies: *preventive cost valuation* was only used in 8% (n=2) of records, while *cost-benefit analysis* and *restorative cost valuation* each accounted for 13% (n=3). The preference for reactive over proactive techniques likely reflects practical constraints (e.g., data availability) rather than deliberate methodological choices. Yet, overreliance on reactive methods limits TCA's potential to inform structural, systemic change, while shifting focus towards preventive and/or transformative action could help address underlying causes of harm before damage materialises. Nevertheless, proactive techniques are substantially harder to operationalise than reactive ones, as the latter can draw on observable outcomes (40,41,47). Indeed, authors often failed to provide clear rationales for their methodological choices, suggesting that these may be driven by convenience (e.g., technical feasibility) rather than strategic considerations or policy / industry relevance.

Pervasive methodological limitations represent the primary challenge to accurately assessing socio-economic externalities in food systems, with data constraints reported by

most records (71%, n=17). Such limitations emerged across multiple dimensions: (i) data availability and quality issues resulting in high uncertainty levels and frequent reliance on proxy inputs to fill in gaps; (ii) methodological complexity leading to assumption-heavy models incapable of distinguishing individual effects from system interactions; and (iii) transparency challenges, with studies often omitting critical information on data sources, analytical techniques, and uncertainty quantification. As scope and quality of assessments vary greatly across the reviewed literature, translation of impacts into monetary units risks making widely different estimates seem comparable when, methodologically, they are not. Addressing the above-mentioned limitations would contribute to enabling study replication and validation, as well as strengthening confidence in valuation estimates (60,72–74).

Most records (58%, n=14) aimed to provide policy decision support; however, an equivalent number of studies (n=14) reported relying on assumptions and oversimplifications, suggesting that current methods may not yet be able to generate sufficiently robust evidence for informing high-stakes policies. The focus on private-sector audiences in methodological guides and case studies by the True Price Foundation (33%, n=8) indicates growing corporate interest in TCA assessments – partly driven by emerging business responsibility and sustainability regulations and reporting requirements (45,75). Yet, this trend raises questions about potential conflicts of interest and whether isolated firm-level interventions may meaningfully contribute to addressing systemic socio-economic challenges that require structural changes (beyond individual company initiatives). While private-sector actors must be part of the solution, they cannot achieve transformational impact alone. Moreover, firm-level cost estimates may create an illusion of progress despite underlying systemic issues remaining unaddressed – due to solely focusing on short-term, measurable impacts rather than tackling complex, interdependent socio-economic externalities (76,77).

The monetisation of socio-economic costs and benefits carries significant ethical concerns (78–81). Converting non-market impacts into monetary units – which 21% (n=5) of the included studies explicitly reported as being challenging – may distort the nature of externalities and shift responsibility for addressing system-wide failures away from policymakers and regulators, placing it on individual consumers through pricing signals, or calling for general government intervention without specifying concrete action mechanisms (82). Thus, economic valuation may result in the legitimisation and continuation of harmful practices by suggesting these can simply be ‘offset’ via monetary compensation rather than requiring structural reform (83). The predominance of market-oriented frameworks (71%, n=17) reflects the current emphasis on internalising impacts through existing economic mechanisms but raises questions about whether market-based solutions alone can adequately address complex social challenges involving fundamental human rights. On the other hand, the recent emergence of mixed frameworks (28%, n=7) suggests growing recognition that some externalities cannot be priced and require sustainable, systemic change. Future research and applications should increasingly aim to embed TCA assessments within a rights-based framework (84) and avoid the direct summation of incomparable socio-economic impacts (85,86).

In addition to methodological and ethical issues, important questions remain about the practical applicability of food system-related TCA of socio-economic externalities in real-world settings (26,70). Existing methods fail to capture the ever-evolving nature of socio-economic externalities within large (often multinational or global), interconnected value

chains. In such contexts, labour market shifts, policy changes, and emerging crises (such as conflicts or epidemics) can lead to supply disruptions and generate dynamic effects on workers, communities, and society. Leakages due to corruption and intermediary capture in value chains can also widen the gap between prices paid by consumers and farmer or worker incomes. Even when businesses commit to living-wage or 'fair-payment' pricing, revenues may dissipate at local trading or certification nodes, undermining intended benefits (87). The challenge of ensuring continuous monitoring and updating of socio-economic impact estimates becomes especially evident when effects manifest with significant time lags and vary greatly across geographic, cultural, and regulatory contexts (6,10,72).

Questions also persist on whether incorporating socio-economic costs and benefits into market prices could drive more equitable practices. A narrow focus on economic efficiency risks shifting burdens toward lower-income countries and vulnerable populations, worsening pre-existing inequalities and food insecurity (88). Moreover, the available literature neglects informally produced and/or traded foods (e.g., subsistence farming), limiting applicability to many world regions where informal food systems play an essential role (89,90). Therefore, current TCA assessments likely underestimate global and local power imbalances and the complex challenges to effective market correction.

Recommendations for future efforts consistently emphasise research and data infrastructure development needs (56%, n=13), supporting our conclusion that quantification and monetisation methods for socio-economic externalities are still in the early stages of conceptualisation. The limited evidence base also suggests that existing approaches represent preliminary attempts that may require fundamental reshaping. Thus, future research should prioritise methodological advancement and validation across diverse value chains, impact categories, and geographic settings. Once scientifically sound approaches have been established, large-scale data collection and methodological standardisation efforts should be undertaken. Future studies should also analyse interlinkages among different socio-economic externalities (e.g., the effects of living-wage interventions on child labour reductions), using combined indicators and integrated models to identify trade-offs and synergies and avoid double-counting. Finally, it is imperative for TCA assessments to engage with ethical questions about whether and how to monetise certain social impact categories, particularly those involving fundamental human rights and dignity.

CONCLUSION

Our review revealed that food system-related TCA of socio-economic externalities remains a nascent, highly heterogeneous field. Caution should be used when interpreting current estimates and using them for decision support; they should not be treated as indicative (i.e., not absolute or definitive) values. The immediate priority is methodological development and testing before scaling up data collection and standardisation efforts. Decision-makers may be able to leverage TCA-derived insights to inform priority-setting, but such estimates must come with strong rights-based safeguards, especially for non-negotiable harms such as human rights violations. If used appropriately, strengthened methodologies can generate more credible and comparable estimates to guide policy interventions, investment strategies, and business practices toward achieving sustainable and equitable food systems transformation.

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ANNEX

Annex Table 1. List of all evidence sources searched, including both academic and grey literature databases

Database	No. of hits	Last searched	Platform
EconLit	164	30-April-25	EBSCO
Scopus	1,230	30-April-25	Elsevier
Web of Science Core Collection	799	30-April-25	Clarivate
UNEP	30	06-March-25	https://wedocs.unep.org/discover
Global Alliance for the Future of Food	10	06-March-25	https://futureoffood.org/insights/
IFPRI	12	06-March-25	https://garden.cgir.org/home
Biodiversity-CIAT	6	06-March-25	https://garden.cgir.org/home
FoLU	1	06-March-25	https://www.foodandlandusecoalition.org/knowledge-hub/
FAO Knowledge Repository	49	10-March-25	https://openknowledge.fao.org/
Fairtrade (hand-searched)	6	30-April-25	https://www.fairtrade.net/
True Price Foundation (hand-searched)	14	30-April-25	https://trueprice.org/true-price-resources/
Total	2,321		

Annex Table 2. Full search strategy for Scopus, as executed on April 30, 2025. Designed to identify English-language records published during the period 2008–2025, the search strategy for Scopus yielded 1,230 citations. Our comprehensive search strategy, across all included academic and grey literature databases, retrieved a total of 2,321 records. Annex Table 1 provides a list of all evidence sources searched.

Row #	Search string
1	TITLE-ABS("indirect cost*" OR "hidden cost*" OR "shadow cost*" OR "external cost*" OR "external benefit*" OR "indirect benefit*" OR "hidden benefit*" OR "shadow benefit*" OR "abatement cost*" OR "true price*" OR "true pricing" OR "true cost*" OR "full cost*" OR monetization OR "monetary unit*" OR "monetary valuation*" OR ("holistic assessment" AND agrifood) OR "adjusted price*" OR ((cost* OR risk*) W/1 internalization) OR "food impact cost*" OR ((measur* OR assess* OR calculat* OR evaluat* OR monetiz* OR valuat* OR "cost benefit" OR "risk benefit" OR quantif*) W/4 externalit*) OR "impact weighted accounting" OR (("impact assessment" OR "impact measurement" OR "impact evaluation" OR "impact valuation") W/10 (cost* OR econom* OR quantit* OR monet*))) OR AUTHKEY("indirect cost*" OR "hidden cost*" OR "shadow cost*" OR "external cost*" OR "external benefit*" OR "indirect benefit*" OR "hidden benefit*" OR "shadow benefit*" OR "abatement cost*" OR "true price*" OR "true pricing" OR "true cost*" OR "full cost*" OR monetization OR "monetary unit*" OR "monetary valuation*" OR ("holistic assessment" AND agrifood) OR "adjusted price*" OR ((cost* OR risk*) W/1 internalization) OR "food impact cost*" OR ((measur* OR assess* OR calculat* OR evaluat* OR monetiz* OR valuat* OR "cost benefit" OR "risk benefit" OR quantif*) W/4 externalit*) OR "impact weighted accounting" OR (("impact assessment" OR "impact measurement" OR "impact evaluation" OR "impact valuation") W/10 (cost* OR econom* OR quantit* OR monet*)))
2	TITLE-ABS((rights W/3 (animal* OR human* OR indigenous OR social OR labor OR land OR water)) OR ethic* OR unethic* OR justice OR injustice OR unjust OR inequit* OR equitable OR inequalit* OR equalit* OR ((social OR "food system*") W/3 equity) OR (access W/3 (water OR food OR land OR health OR healthcare OR market* OR "natural resource*" OR capital OR financ* OR credit)) OR ((animal OR livestock) W/3 (welfare OR wellbeing OR exploit*)) OR "seed* patent*" OR "land tenure" OR "land grab*" OR (food W/2 (price* OR cost* OR afford* OR unafford* OR right*))) OR AUTHKEY((rights W/3 (animal* OR human* OR indigenous OR social OR labour OR labor OR land OR water)) OR ethic* OR unethic* OR justice OR injustice OR unjust OR inequit* OR equitable OR inequalit* OR equalit* OR ((social OR "food system*") W/3 equity) OR (access W/3 (water OR food OR land OR health OR healthcare OR market* OR "natural resource*" OR financ* OR credit)) OR ((animal OR livestock) W/3 (welfare OR wellbeing OR exploit*)) OR "seed* patent*" OR "land tenure" OR "land grab*" OR (food W/2 (price* OR cost* OR afford* OR unafford* OR right*)))
3	TITLE-ABS(((job OR employment) W/2 (creation OR growth OR loss* OR security OR insecurity)) OR unemployment OR "labor law*" OR "labor violat*" OR "right* violat*" OR "labor practice*" OR worker* OR ((traffick* OR child OR force* OR exploit* OR migrant OR contract OR farm OR precarious OR seasonal OR field OR prison OR incarcerated OR informal) W/2 (labor* OR work)) OR ((racial OR ethnic OR religio* OR disab* OR gender OR wom?n) W/2 (discriminat* OR equit* OR right*)) OR "equal opportunit*" OR workplace OR ((work* OR employ*) W/3 (condition* OR protection* OR benefit* OR insurance OR pension))) OR AUTHKEY(((job OR employment) W/2 (creation OR growth OR loss* OR security OR insecurity)) OR unemployment OR "labor law*" OR "labor violat*" OR "right* violat*" OR "labor practice*" OR worker* OR ((traffick* OR child OR force* OR exploit* OR migrant OR contract OR farm OR precarious OR seasonal OR field OR prison OR incarcerated OR informal) W/2 (labor* OR work)) OR ((racial OR ethnic OR religio* OR disab* OR gender OR wom?n) W/2 (discriminat* OR equit* OR right*)) OR "equal opportunit*" OR workplace OR ((work* OR employ*) W/3 (condition* OR protection* OR benefit* OR insurance OR pension)))

4	TITLE-ABS(wages OR "wage level*" OR salary OR salaries OR earning* OR ((pay OR wage OR income OR wealth OR subsistence) W/3 (equit* OR gap OR lost OR loss* OR raise* OR rise OR increase*)) OR poverty OR impoverish* OR marginalization OR (food W/2 (inaccess* OR access* OR secur* OR insecur* OR stability OR instability OR stable OR unstable)) OR livelihood* OR "social protection*" OR "cash transfer*" OR (nutrition W/3 (access OR secur* OR insecur*))) OR AUTHKEY(wages OR "wage level*" OR salary OR salaries OR earning* OR ((pay OR wage OR income OR wealth OR subsistence) W/3 (equit* OR gap OR lost OR loss* OR raise* OR rise OR increase*)) OR poverty OR impoverish* OR marginalization OR (food W/2 (inaccess* OR access* OR secur* OR insecur* OR stability OR instability OR stable OR unstable)) OR livelihood* OR "social protection*" OR "cash transfer*" OR (nutrition W/3 (access OR secur* OR insecur*)))
5	TITLE-ABS(monopolies OR monopoly OR "indigenous knowledge" OR "traditional knowledge" OR "indigenous practice*" OR "traditional practice*" OR "cultural heritage" OR monoculture OR plantation* OR smallholder OR "rural development" OR agrobiodiversity OR "agro ecology" OR agroforestry OR "climate smart" OR subsidi* OR ownership OR "small farm*" OR "small-scale farm*" OR "large farm*" OR "large-scale farm*" OR "commercial farm*" OR "farm size*" OR (food W/2 (resilien* OR sovereign* OR loss* OR waste*)) OR "extension service*" OR "capacity building" OR "fair trade" OR "responsible buy*" OR "fair pric*" OR certification* OR "agricultur* co-op*" OR "agricultur* coop*" OR "farmer co-op*" OR "farmer coop*") OR AUTHKEY(monopolies OR monopoly OR "indigenous knowledge" OR "traditional knowledge" OR "indigenous practice*" OR "traditional practice*" OR "cultural heritage" OR monoculture OR plantation* OR smallholder OR "rural development" OR agrobiodiversity OR "agro ecology" OR agroforestry OR "climate smart" OR subsidi* OR ownership OR "small farm*" OR "small-scale farm*" OR "large farm*" OR "large-scale farm*" OR "commercial farm*" OR "farm size*" OR (food W/2 (resilien* OR sovereign* OR loss* OR waste*)) OR "extension service*" OR "capacity building" OR "fair trade" OR "responsible buy*" OR "fair pric*" OR certification* OR "agricultur* co-op*" OR "agricultur* coop*" OR "farmer co-op*" OR "farmer coop*")
6	#2 OR #3 OR #4 OR #5
7	TITLE-ABS(vegan* OR vegetarian* OR pescatarian* OR "lacto ovo" OR whole30 OR "intermittent fasting" OR flexitarian* OR "dietary choice*" OR "dietary pattern*" OR "dietary practice*" OR "dietary habit*" OR "dietary behavio*" OR "consumption behavio*" OR "consumption pattern*" OR ((paleo OR keto OR carnivore OR omnivore OR mediterranean OR "low carb" OR "sugar free" OR "gluten free" OR "plant based" OR "animal based") W/2 diet*)) OR AUTHKEY(vegan* OR vegetarian* OR pescatarian* OR "lacto ovo" OR whole30 OR "intermittent fasting" OR flexitarian* OR "dietary choice*" OR "dietary pattern*" OR "dietary practice*" OR "dietary habit*" OR "dietary behavio*" OR "consumption behavio*" OR "consumption pattern*" OR ((paleo OR keto OR carnivore OR omnivore OR mediterranean OR "low carb" OR "sugar free" OR "gluten free" OR "plant based" OR "animal based") W/2 diet*))
8	TITLE-ABS(agricultur* OR agrobiodivers* OR farm* OR crop OR cropping OR livestock* OR "animal husbandry" OR ranching OR rancher OR pastoralis* OR apiculture OR apiary OR permaculture OR aquacultur* OR aquaponic* OR hydroponic* OR agroforestry OR orchard* OR garden* OR vineyard* OR viticulture OR forag* OR hunting OR hunter* OR fishing OR fisher* OR fairtrade) OR AUTHKEY(agricultur* OR agrobiodivers* OR farm* OR crop OR cropping OR livestock* OR "animal husbandry" OR ranching OR rancher OR pastoralis* OR apiculture OR apiary OR permaculture OR aquacultur* OR aquaponic* OR hydroponic* OR agroforestry OR orchard* OR garden* OR vineyard* OR viticulture OR forag* OR hunting OR hunter* OR fishing OR fisher* OR fairtrade)

9	TITLE-ABS(meatpack* OR canning OR canner OR canned OR "processing plant*" OR Milling OR mills OR Pasteuri* OR slaughterhouse* OR "nutrition label*" OR "ready to eat" OR "ready to drink" OR "ready to heat" OR "atmosphere packaging" OR "vacuum packaging" OR "vacuum packing" OR silage OR ferment* OR pickl* OR "shelf stable") OR AUTHKEY(meatpack* OR canning OR canner OR canned OR "processing plant*" OR Milling OR mills OR Pasteuri* OR slaughterhouse* OR "nutrition label*" OR "ready to eat" OR "ready to drink" OR "ready to heat" OR "atmosphere packaging" OR "vacuum packaging" OR "vacuum packing" OR silage OR ferment* OR pickl* OR "shelf stable")
10	TITLE-ABS(supermarket* OR "farmers market*" OR "open air market*" OR restaurant* OR diner OR cafe OR canteen* OR grocer* OR superstore* OR "super store*" OR "coop" OR "co op" OR delicatessen OR bodega* OR ((corner OR convenience) W/3 (shop OR shops OR store*)) OR "terminal market*" OR barbequ* OR cooktop* OR stove* OR oven* OR "open burning" OR broil* OR bake OR baking OR grill* OR frying OR fry OR fried OR "brine cur*" OR din* OR cook* OR "agricultural waste" OR "food waste" OR compost*) OR AUTHKEY(supermarket* OR "farmers market*" OR "open air market*" OR restaurant* OR diner OR cafe OR canteen* OR grocer* OR superstore* OR "super store*" OR "coop" OR "co op" OR delicatessen OR bodega* OR ((corner OR convenience) W/3 (shop OR shops OR store*)) OR "terminal market*" OR barbequ* OR cooktop* OR stove* OR oven* OR "open burning" OR broil* OR bake OR baking OR grill* OR frying OR fry OR fried OR "brine cur*" OR din* OR cook* OR "agricultural waste" OR "food waste" OR compost*)
11	TITLE-ABS(food* OR agrifood* OR "agri food*" fruit* OR vegetable* OR grain* OR legume* OR nut* OR seed* OR dairy* OR meat* OR pork OR poultry OR fish* OR shellfish* OR seafood* OR beef OR chicken* OR goat* OR lamb* OR veal OR venison OR koumiss OR "alternative protein" OR "plant source" OR "plant based" OR "animal source" OR "animal based" OR egg OR eggs OR "leafy green*" OR cheese OR yog?urt OR milk* OR cereal* OR bean* OR "ultra-processed" OR candy OR dessert* OR sugar* OR "fast food" OR "snack*" OR "meal*" OR lunch* OR brunch* OR dinner* OR breakfast* OR "beverage*" OR drink* OR alcohol OR beer* OR wine* OR sake* OR liquor* OR kefir OR cream OR juice* OR soda* OR coffee OR tea OR soy OR tofu OR tempeh OR sausage* OR "hot dog*" OR bacon OR hamburger OR cookie* OR cake* OR pastry OR pastries OR chips OR chocolate* OR pasta* OR pizza* OR bread* OR condiment* OR "sodium nitrite*" OR "artificial color*" OR "artificial flavor*" OR "artificial sweetener*" OR "flavor enhancer*" OR "trans fat*" OR "hydrolyzed protein*" OR lard OR vinegar* OR flour* OR "corn syrup" OR "monosodium glutamate" OR MSG OR "hydrogenated oil*" OR "hydrogenated fat*") OR AUTHKEY(food* OR agrifood* OR "agri food*" fruit* OR vegetable* OR grain* OR legume* OR nut* OR seed* OR dairy* OR meat* OR pork OR poultry OR fish* OR shellfish* OR seafood* OR beef OR chicken* OR goat* OR lamb* OR veal OR venison OR koumiss OR "alternative protein" OR "plant source" OR "plant based" OR "animal source" OR "animal based" OR egg OR eggs OR "leafy green*" OR cheese OR yog?urt OR milk* OR cereal* OR bean* OR "ultra-processed" OR candy OR dessert* OR sugar* OR "fast food" OR "snack*" OR "meal*" OR lunch* OR brunch* OR dinner* OR breakfast* OR "beverage*" OR drink* OR alcohol OR beer* OR wine* OR sake* OR liquor* OR kefir OR cream OR juice OR soda OR coffee OR tea OR soy OR tofu OR tempeh OR sausage* OR "hot dog*" OR bacon OR hamburger OR cookie* OR cake OR pastry OR pastries OR chips OR chocolate* OR pasta* OR pizza* OR bread* OR condiment* OR "sodium nitrite*" OR "artificial color*" OR "artificial flavor*" OR "artificial sweetener*" OR "flavor enhancer*" OR "trans fat*" OR "hydrolyzed protein*" OR lard OR vinegar* OR flour* OR "corn syrup" OR "monosodium glutamate" OR MSG OR "hydrogenated oil*" OR "hydrogenated fat*")
12	#7 OR #8 OR #9 OR #10 OR #11
13	#1 AND #6 AND #12
14	Date filter: 2008-present

Annex Table 3. Standardised data charting form used for extracting information from all included studies. The form was developed following the JBI template (31).

Section 1: Record details										
Record #	Full record citation in Harvard referencing style	Publication type*	Geographic focus: country(ies), region(s), or global	Country income group(s)*	Life cycle stage(s)*	Reference year(s) / period(s) of input data	Primary research question(s)	Secondary research question(s)		
1.										
2.										
3.										
4.										
...										
Section 2: Key variables of interest to this review										
Record #	Socio-economic externalities - positive	Socio-economic externalities - negative	Assessment level(s)*	Food(s) / meal(s) / diet type(s)	Monetisation methods	Data sources (impact assessment)	Data sources (valuation factors)	Author-stated strengths	Author-stated limitations	Author-stated research recommendations
1.										
2.										
3.										
4.										
...										
* Closed-ended variable										

Annex Table 4. Classification of the 24 included records based on frameworks, approaches, and methods (i.e., three-tiered analytical hierarchy)

Record citation	Framework	Approach	Method
Bergman, E., de Groot Ruiz, A. and Fobelets, V. (2016). The true price of tea from Kenya. IDH and True Price. Available at: https://trueprice.org/wp-content/uploads/2022/07/TP-Tea.pdf	Mixed	Bottom-up	Cost of socio-economic impacts
Brennan, A., Meier, P., Purshouse, R., Rafia, R., Meng, Y. and Hill-Macmanus, D. (2016) 'Developing policy analytics for public health strategy and decisions—the Sheffield alcohol policy model framework', <i>Annals of operations research</i> , 236, pp.149-176.	Market-oriented	Comparative	Cost of socio-economic impacts
Campoy-Muñoz, P., Cardenete, M.A. and Delgado, M.C. (2017) 'Economic impact assessment of food waste reduction on European countries through social accounting matrices', <i>Resources, Conservation and Recycling</i> , 122, pp.202-209.	Market-oriented	Top-down	Cost of socio-economic impacts
FABLE Consortium. (2024) How to reduce agrifood systems' future hidden costs? A multi-country case study – Background report for the State of Food and Agriculture 2024. Paris: Sustainable Development Solutions Network (SDSN).	Market-oriented	Bottom-up	Cost of socio-economic impacts
Filipski, M. and Belton, B. (2018) 'Give a man a fishpond: modeling the impacts of aquaculture in the rural economy', <i>World Development</i> , 110, pp.205-223.	Market-oriented	Comparative	Cost of socio-economic impacts
Flammini, A., Bracco, S., Sims, R., Cooke, J. and Elia, A., 2018. Costs and benefits of clean energy technologies in the milk, vegetable and rice value chains. Available at: https://openknowledge.fao.org/handle/20.500.14283/i8017en [Accessed 2 Jul. 2025].	Market-oriented	Comparative	Cost-benefit analysis
Fobelets, V. and de Groot Ruiz, A., (2016). The True Price of Cocoa from Ivory Coast. IDH and True Price. Available at: https://trueprice.org/wp-content/uploads/2022/07/TP-Cocoa.pdf	Mixed	Bottom-up	Cost of socio-economic impacts
Greenfeld A, Angel D, and Farja Y. (2024) 'Valuing Sustainability Impacts and Food Security Effects of Local Mariculture,' <i>Sustainability</i> , 16(22), pp.9625. Available at: https://doi.org/10.3390/su16229625	Market-oriented	Comparative	Cost-benefit analysis
Kuruc, K. and McFadden, J. (2023) 'Monetizing the externalities of animal agriculture: insights from an inclusive welfare function', <i>Social Choice and Welfare</i> , pp.1-24.	Market-oriented	Top-down	Cost of socio-economic impacts
Mulwa, R., Rao, K.P., Gummadi, S. and Kilavi, M. (2016) 'Impacts of climate change on agricultural household welfare in Kenya', <i>Climate Research</i> , 67(2), pp.87-97.	Market-oriented	Bottom-up	Cost of socio-economic impacts
Nascimento, R.A., Canever, M.D., Almeida, C., Agostinho, F., Gameiro, A.H. and Giannetti, B.F. (2023) 'Hidden Costs Associated with Smallholder Family-Based Broiler Production: Accounting for the Intangibles', <i>Sustainability</i> , 15(22), pp.15780.	Mixed	Bottom-up	Restorative cost valuation
Pechrová, M. (2017) 'Monetary valuation of odour from agricultural production', <i>Proceedings of the 20th International Conference: Current Trends of Public Sector Research</i> , 2017, pp. 340–346.	Market-oriented	Top-down	Preventive cost valuation

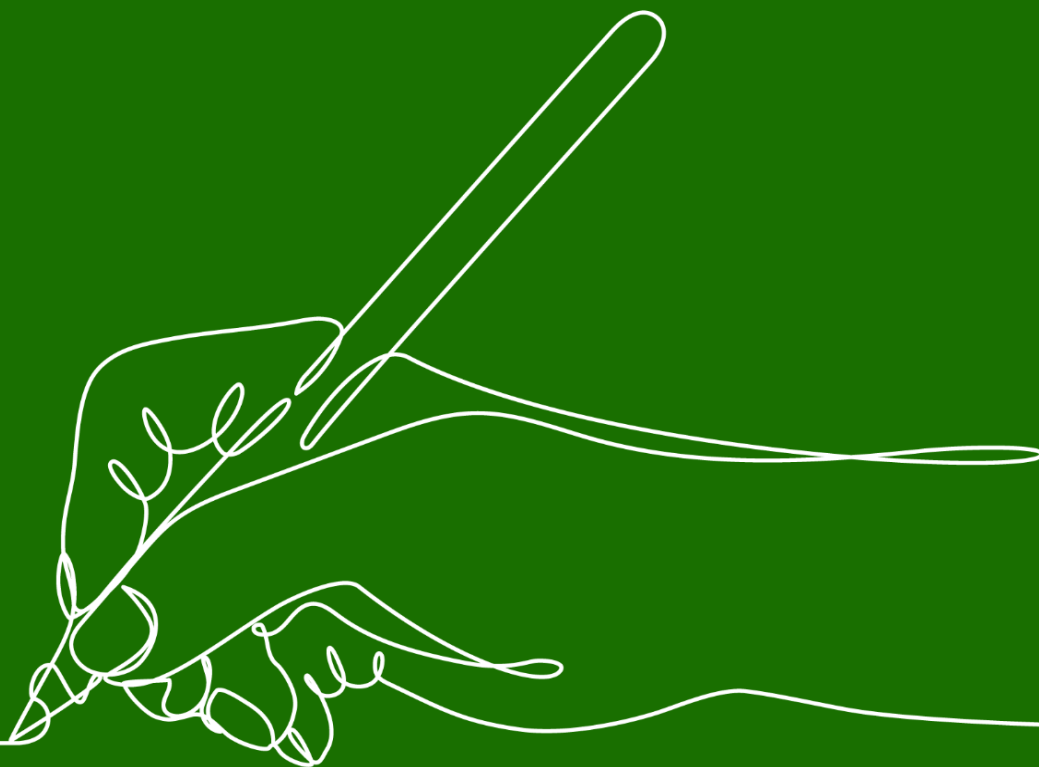
Philippidis, G., Sartori, M., Ferrari, E. and M'Barek, R. (2019) 'Waste not, want not: A bio-economic impact assessment of household food waste reductions in the EU,' <i>Resources, Conservation and Recycling</i> , 146, pp.514–522. https://doi.org/10.1016/j.resconrec.2019.04.016	Market-oriented	Comparative	Preventive cost valuation
Popova, S., Patra, J., SARNOCINSKA-HART, A.N.N.A., Gnam, W.H., Giesbrecht, N. and Rehm, J. (2012) 'Cost of privatisation versus government alcohol retailing systems: Canadian example', <i>Drug and alcohol review</i> , 31(1), pp.4–12. https://doi.org/10.1111/j.1465-3362.2010.00276.x	Market-oriented	Top-down	Cost of socio-economic impacts
Raynaud, J., Fobelets, V., Georgieva, A., Joshi, S., Kristanto, L., de Groot Ruiz, A., Bullock, S. and Hardwicke, R. (2016) Improving business decision making: Valuing the hidden costs of production in the palm oil sector. A study for The Economics of Ecosystems and Biodiversity for Agriculture and Food (TEEBAgriFood) Program [online].	Market-oriented	Top-down	Cost of socio-economic impacts
Saar, I. (2009) 'The social costs of alcohol misuse in Estonia', <i>European Addiction Research</i> , 15(1), pp.56–62. https://doi.org/10.1159/000173010	Market-oriented	Top-down	Cost of socio-economic impacts
Sain, G., Loboguerrero, A.M., Corner-Dolloff, C., Lizarazo, M., Nowak, A., Martínez-Barón, D., and Andrieu, N. (2027), 'Costs and benefits of climate-smart agriculture: The case of the Dry Corridor in Guatemala', <i>Agric Syst</i> , pp. 151:163–73.	Market-oriented	Comparative	Cost-benefit analysis
Sullivan, T., Edgar, F., and McAndrew, I. (2019) 'The hidden costs of employee drinking: A quantitative analysis', <i>Drug and Alcohol Review</i> , 38(5), pp.543–553. https://doi.org/10.1111/dar.12935	Market-oriented	Bottom-up	Cost of socio-economic impacts
True Price Foundation. (2023) Monetisation factors for true pricing, Version 3.0.0. Amsterdam: True Price Foundation. Available at: https://www.trueprice.org/ [Accessed 1 Jul. 2025].	Mixed	Bottom-up	Restorative cost valuation
True Price, 2018. The True Cost of Cocoa: Tony's Chocolonely 2018 progress report. Amsterdam, The Netherlands: True Price. Available at: https://trueprice.org/wp-content/uploads/2022/07/The-True-Price-of-Cocoa.-Progress-Tonys-Chocolonely-2018.pdf	Mixed	Bottom-up	Cost of socio-economic impacts
van Veen, B. and Galgani, P. (2022) Living income: True pricing method for agri-food products. Amsterdam: True Price. Available at: https://www.trueprice.org [Accessed 1 July 2025].	Mixed	Top-down	Restorative cost valuation
Verkooijen, L., De Groot Ruiz, A. and Fobelets, V. (2016). The true price of coffee from Vietnam. IDH and True Price. Available at: https://trueprice.org/wp-content/uploads/2022/07/TP-Coffee.pdf	Mixed	Bottom-up	Cost of socio-economic impacts
Visser, L.S., Van Wagenberg, C.P. and Baltussen, W.H. (2023) 'A method for calculating the external costs of farm animal welfare based on the Welfare Quality® Protocol', <i>Frontiers in Animal Science</i> , 4, p.1195221. https://doi.org/10.3389/fanim.2023.1195221	Market-oriented	Comparative	Cost of socio-economic impacts
Whatford, L., van Winden, S. and Häslar, B. (2022) 'A systematic literature review on the economic impact of endemic disease in UK sheep and cattle using a One Health conceptualisation', <i>Preventive Veterinary Medicine</i> , 209, p.105756. https://doi.org/10.1016/j.prevetmed.2022.105756	Market-oriented	Bottom-up	Cost of socio-economic impacts

Annex Table 5. Categorisation and frequency of use of data sources for quantifying socio-economic impacts surfaced across the 24 included records

Category of data sources	Main purpose and use case	# (%) of records using this category
National / regional institutional databases and resources	To obtain official (sub)national and/or regional statistics on demographics, dietary patterns, socioeconomic indicators, and food systems' performance.	18 (75%)
Academia and research institutes	To source parameters like relative risks, dose-response functions, burden estimates, and economic values from scientific literature, published studies, and datasets.	18 (75%)
Primary data	To collect original, context-specific information directly from target populations or entities through surveys, interviews, and/or direct measurement (e.g., observation).	9 (38%)
Resources by UN agencies	To obtain methodological guidance and internationally comparable data across sectors from technical reports, guidelines, conceptual frameworks, and standardised databases produced by UN agencies.	8 (33%)
(Non-LCA) Social impact databases	To source data on socio-economic impacts from specialised databases.	8 (33%)
Datasets for foresight modelling	To obtain specific input data and parameters for running future-oriented simulation models.	8 (33%)
Non-governmental (NGOs) and civil society (CSOs) organizations	To use methodological guidelines, conceptual frameworks, technical reports, datasets, and other resources published by NGOs and CSOs, including on specific local contexts and target population groups.	7 (29%)
Market data and consumer insights	To obtain data on market prices, consumer behaviour, and industry trends from market research firms and commercial data providers.	2 (8%)
TCA and True Pricing databases and inventories	To use pre-existing socio-economic impact data and monetisation factors from established TCA and True Pricing frameworks and initiatives.	2 (8%)

Annex Table 6. Categorisation and frequency of use of data sources for obtaining monetisation factors surfaced across the 24 reviewed records

Category of data sources	Main purpose and use case	# (%) of records using this category
Academia and research institutes	To source parameters like relative risks, dose-response functions, burden estimates, and economic values from scientific literature, published studies, and datasets.	11 (46%)
National / regional institutional databases and resources	To obtain official (sub)national and/or regional statistics on demographics, dietary patterns, socioeconomic indicators, and food systems' performance.	8 (33%)
TCA and True Pricing databases and inventories	To use pre-existing socio-economic impact data and monetisation factors from established TCA and True Pricing frameworks and initiatives.	6 (25%)
Resources by UN agencies	To obtain methodological guidance and internationally comparable data across sectors from technical reports, guidelines, conceptual frameworks, and standardised databases produced by UN agencies.	5 (21%)
Primary data	To collect original, context-specific information directly from target populations or entities through surveys, interviews, or direct measurement (e.g., observation).	5 (21%)
Datasets for foresight modelling	To obtain specific input data and parameters for running future-oriented simulation models.	5 (21%)
Market data and consumer insights	To obtain data on market prices, consumer behaviour, and industry trends from market research firms and commercial data providers.	1 (4%)



ABOUT GAIN

The Global Alliance for Improved Nutrition (GAIN) is a Swiss-based foundation launched at the UN in 2002 to tackle the human suffering caused by malnutrition. Working with governments, businesses and civil society, we aim to transform food systems so that they deliver more nutritious food for all people, especially the most vulnerable.

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