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The role of true cost accounting in guiding agrifood businesses and investments towards sustainability

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Abstract

Current practices in business accounting and reporting are hindering the transition to sustainability in the agrifood sector. To address this problem, a paradigm shift is needed, one that redefines core business concepts and ultimately revises international and national accounting and reporting standards.

True cost accounting (TCA) is a potential game-changer because it can be used to promote investment in those businesses that prioritize social benefits and operate within planetary boundaries. If agrifood systems become pioneers in TCA, they will inform the development of integrated, multi-capital accounting and reporting in all sectors of the global economy.

However, numerous gaps need to be filled to ensure the mainstreaming of TCA. These include gaps in the standardization of methods, including indicators, impact pathways and valuation factors. Research and guidance are needed to help businesses integrate capital accounting into corporate governance, strategy and performance models. Furthermore, there is a need to address the lack of data and to standardize reporting guidelines to ensure clear and consistent communication with all stakeholders. Overcoming these barriers will require coordinated efforts by different actors in agrifood systems.

The great challenges of our time call for a new economic foundation for sustainability. The momentum at international level to reform business accounting and reporting standards can support a transformation towards sustainable agrifood systems. So far, the initial success of agrifood businesses in applying and integrating TCA into decision-making shows that, given the right enabling environment, business can contribute to building socially, environmentally and economically sustainable agrifood systems.

Keywords: true cost accounting, business accounting and reporting, sustainable investments, agrifood systems transformation

JEL codes: D47, D61, D62, G32, M21, M41, O16, Q13, Q14, Q56

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1 Introduction

The agrifood sector faces unprecedented challenges. A growing global population with rising expectations of better nutrition and lifestyle, coupled with the finite availability of natural resources, is creating significant disturbances that create challenges, but also opportunities. While there is a growing consensus that agrifood systems need to be transformed, few have asked what this transformation means for private enterprise (Gliessman, 2021; McGreevy *et al.*, 2022; Riemer, Shah and Zitterbarth, 2023; Webb *et al.*, 2020). The expectations of customers, employees, suppliers, governments and society at large are evolving, requiring businesses to measure their success and value in more holistic ways (Michalke *et al.*, 2022; Walkiewicz, Lay-Kumar and Herzig, 2021). The current agrifood business models are not well equipped to deal with this transition, nor are current accounting and reporting standards capable of informing and supporting the transformation, as they omit crucial information about the business's impacts, risks and value beyond produced and financial capital. The key message of this background paper, therefore, is that a transformation is needed in the way business operates (McGreevy *et al.*, 2022). This necessitates the reform of international and national accounting and reporting standards.

TCA provides a framework that can help businesses develop a better understanding of the social, environmental and health impacts of their activities (True Cost Initiative, 2022; Gemmill-Herren, Baker and Daniels, 2021). This, in turn, leads to more informed decision-making processes and helps to ensure a business's social licence to operate and regulatory compliance in the long run.¹ By measuring, understanding and comparing the trade-offs between different options, TCA gives businesses more complete knowledge of the impact of decisions (Baker *et al.*, 2020; Impact Institute, 2023). The valuation and monetization that TCA provides are a vital step in integrating sustainability into management and reporting processes, thereby influencing the decisions of investors and mobilizing financial resources to fund the urgently needed transformation of agrifood systems.

In this regard, different actors, including the Global Alliance for the Future of Food, the United Nations Environment Programme "The Economics of Ecosystems and Biodiversity for Agriculture and Food" initiative (UNEP TEEB) and the Capitals Coalition, agreed to define TCA as:

True Cost Accounting (TCA) is an evolving holistic and systemic approach to measure and value the positive and negative environmental, social, health and economic costs and benefits to facilitate policy, business, farmer, investor and consumer decisions. This term True Cost Accounting is not exclusive – other actors use 'impact assessment/management' and 'a capitals approach' to mean the same. Indeed, the capitals – natural capital, social capital, human capital and produced capital – form the foundation of food systems. By understanding how food systems impact and depend on the capitals, policy-makers, civil society, consumers and businesses can make holistic decisions that redefine the value provided by nature, people and society (UNEP, Capitals Coalition and Global Alliance for the Future of Food, 2021, p. 5).

¹ "Social licence to operate" is the acceptance or approval a company or organization enjoys from the public to carry out its activities or operations. It is not a legal requirement but rather a social expectation that a company or organization must meet to be accepted and trusted by the community and stakeholders.

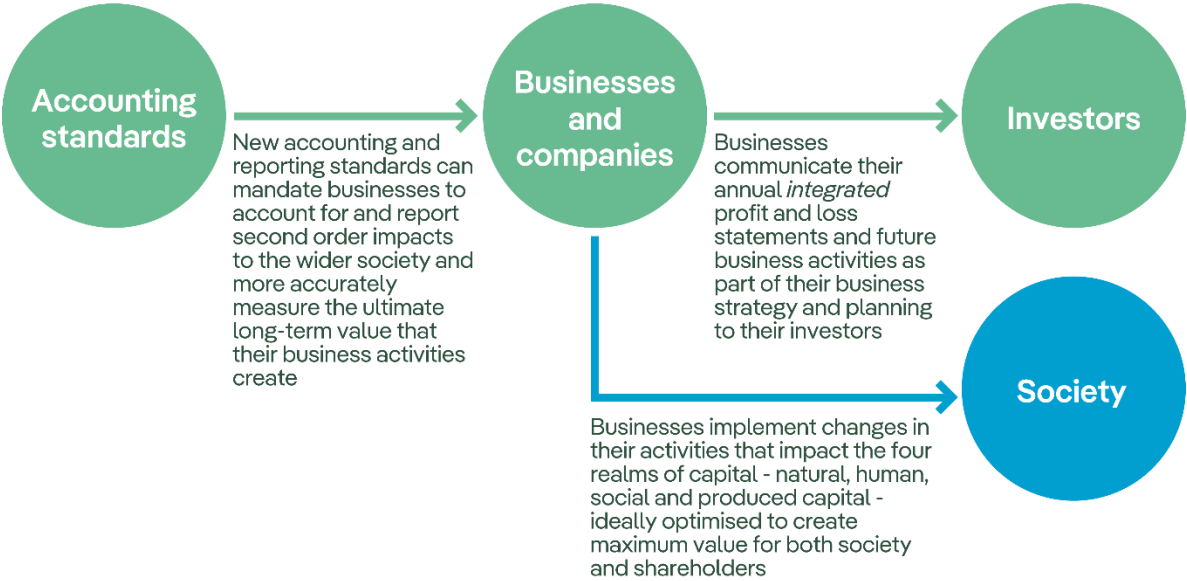
The language of value creation in business has barely changed since the Industrial Revolution. The focus remains on inputs and outputs, revenues and costs, and risk is defined solely in terms of factors that can throw the financial model off course (PwC, 2013). This language is deeply embedded in how businesses are structured and governed. Financial systems are hardwired into every step of every transaction in the world's leading businesses, with large teams dedicated to analysing the outputs of these systems. The financial accounting system was initially developed to create financial records to better manage businesses, but management accounts are not comparable, so need codification through accounting standards. This enables the preparation of comparable financial reports that can serve as a source of information for the capital markets (PwC, 2013). Current financial systems are dominated by an insider perspective, which ignore any external impacts and costs that do not directly affect the "bottom line".

Business managers often complain that investors are not interested in broader measures of performance, yet they are hungry for information that gives them more confidence in the long-term value-creation story of a business. This apparent disconnect is directly attributable to the language of investment communication. Until managers can articulate the value they are creating through their activities, investors will struggle to factor their initiatives into assessments of performance. Governments and non-governmental organizations (NGOs) also express frustration at the lack of consistency in disclosures by business managers and suspect that data may have been carefully curated to present just one side of the story. They seek a consistent and balanced language for communication, both to add credibility to management reports and to build trust between different stakeholder communities (PwC, 2013).

A new definition of success in business is needed, one that takes into account impacts and dependencies beyond financial capital and including natural, social and human capital (True Cost Initiative, 2022). The progress made on the development of impact assessment and integrated reporting allows for a more holistic view of business impacts and externalities. Demand for the internalization of externalities comes from outside the business, hence the need for an equivalent bookkeeping and management accounting mechanism for externalities to support the mainstreaming of impact assessment and integrated reporting in businesses. A prerequisite to such accounting is a methodology for quantifying and evaluating various externalities.

Initiatives relevant to TCA have made substantial progress in understanding and communicating value creation in today's world (see Figure 1). These include initiatives that aim to integrate factors relevant to different national, supranational and international targets (for example, the United Nations Sustainable Development Goals [SDGs], the European Union [EU] Taxonomy and the EU Corporate Sustainability Reporting Directive [CSRD]) into performance assessment and accounting (Lay-Kumar *et al.*, 2023). In the climate action area, for example, the Science Based Targets initiative (SBTi) is one such initiative that provides companies with customized and clearly defined pathways for meeting the goals of the Paris Agreement. However, there are still significant challenges involved in bringing impact measurement, valuation, management and reporting into the mainstream (Impact Institute, 2023). Developing a clear vision and understanding of how TCA can realize its full potential will mean overcoming the barriers that have impeded its uptake in the private sector to date.

Figure 1. How true cost-based accounting standards will lead to better business and investment decisions



Source: Authors' own elaboration.

It is encouraging to see growing global multistakeholder acknowledgement of the need for holistic integrated reporting. Major standard setters have begun to collaborate to develop prototypes of new accounting and reporting standards. Prominent collaborative attempts to set and revise standards include those by the International Financial Reporting Standards (IFRS) Foundation and the International Sustainability Standards Board (ISSB), as well those at the regulatory level, the EU CSRD and the EU Taxonomy framework (Kadija, 2022; European Commission, 2022b).²

The ISSB announced in 2021 at the United Nations Climate Change Conference in Glasgow (COP26) that it would build on existing sustainability reporting initiatives, including the Task Force on Climate-related Financial Disclosures (TCFD). It develops standards for corporate sustainability reporting that are globally uniform and can serve as the basis for national legislation. The ISSB standards are being developed from a financial perspective and primarily cater to investors and focus on climate-related disclosure (European Commission, 2022b).

This contrasts with the EU standards for sustainability information, known as European Sustainability Reporting Standards (ESRS), currently being developed under the new CSRD. They are designed to inform all stakeholders, including NGOs and the general public, and follow the principle of double materiality, taking into account environmental as well as social issues. The ESRS align sustainability reporting with financial reporting, gradually elevating sustainability data to parity with financial data (European Commission, 2022b).

In this background paper to FAO report *The State of Food and Agriculture 2023*, we describe how TCA and the lessons learned from its application in the agrifood sector can inform efforts to develop a sound economic foundation for sustainability. We begin with a literature review, analysing how TCA can be used to make the agrifood sector more sustainable. We explore

² The EU taxonomy regulation describes a framework to classify “green” or “sustainable” economic activities in the European Union (see the EU Taxonomy Info Portal at <https://eu-taxonomy.info>).

the challenges and opportunities of applying TCA in this context and provide recommendations for bringing full impact measurement, valuation, management and reporting into mainstream business accounting and reporting. We aim to show how TCA can realize its full potential and help prepare the agrifood sector to meet the challenges of the twenty-first century.

2 Current challenges in business and finance and how true cost accounting can help overcome them

The urgent need to integrate the impacts of agrifood business on natural, human and social capital is illustrated by the following statement in the 2022 annual report of Olam Group (one of the “beacons” of TCA in the agrifood sector discussed in this paper), entitled *Forging A Bold Future*. Chief Executive Officer Sunny Verghese describes the importance of TCA as follows: “We recognize [that] the management of our non-financial capitals – Manufactured, Intellectual, Intangible, Natural, Human and Social – plays an intersectional and integral role in our ongoing profitability and performance” (Olam Group, 2022). Coming from a major international agrifood company with operations in 60 countries, this statement sets a benchmark for the wider agrifood business sector.

Because of the tendency of agrifood businesses to ignore non-financial impacts, the agrifood sector is widely perceived as dysfunctional and unfit for purpose (McGreevy *et al.*, 2022; Riemer, Shah and Zitterbarth, 2023; Webb *et al.*, 2020). An indication of its failure is the uneven distribution of costs and benefits of the agrifood systems between those actors causing and those bearing the costs and reaping the benefits across social, economic and environmental dimensions (Degieter *et al.*, 2022). Social and ecological damage also disproportionately affects weaker socioeconomic groups, exacerbating social injustice.

The problem is that not all actual costs and benefits are included in the calculation of economic success. The conventional economic system and its associated performance accounting and reporting provide a distorted assessment of the success of businesses and economies (Tarulli *et al.*, 2022; Vitale, Cupertino and Riccaboni, 2022).

Conventional definitions of success and growth, such as GDP, and key performance indicators (KPIs), such as turnover, profit and return, only take into account the financial performance of economies and businesses. They ignore the positive or negative contributions a business may have on nature (natural capital), people (human capital) and society (social capital) and pass on associated costs (externalities) to others or to future generations (Poponi *et al.*, 2022).

However, growing awareness of the dependencies, risks and future costs associated with externalities are driving investor groups to demand more transparency from businesses. This is especially true for the agrifood sector, as it is one of the major contributors to environmental and social externalities, including GHG emissions, land-use change, water pollution and labour exploitation (Acampora *et al.*, 2023; Batini, 2019; Oxfam, 2021). The agrifood sector also relies heavily on functioning ecosystems and labour while being highly vulnerable to climate change and biodiversity loss.

Investors are increasingly recognizing that externalities can have a significant impact on a business’s financial performance and long-term sustainability (Baumüller and Sopp, 2022; Negash, 2012; Shabbir and Wisdom, 2020; Tarulli *et al.*, 2022; UNEP, 2023; Vitale, Cupertino and Riccaboni, 2022). For example, a business that pollutes the environment may face fines, reputational damage and increased costs of compliance, all of which can impact its financial performance (RegASK, 2023). Conversely, a business that invests in sustainable practices may benefit from increased customer loyalty, reduced regulatory risks and cost savings in the long run (Henisz, Koller and Nuttall, 2019; Whelan and Fink, 2016).

As a result, investor groups are demanding more transparency from businesses in relation to externalities. They want to understand the risks and opportunities associated with a business's operations and how the business manages them. For example, the TCFD was established in 2015 by the Financial Stability Board (FSB) to develop recommendations for companies on disclosing climate-related risks and opportunities. The TCFD's recommendations have been widely adopted by businesses and investors, with over 1 700 organizations endorsing them as of 2021. This growing demand for transparency is starting to drive businesses to adopt more comprehensive reporting frameworks that include metrics on natural, social and human capital (Capitals Coalition, 2021; Tarulli *et al.*, 2022; TCFD, 2017; Vitale, Cupertino and Riccaboni, 2022).

The agrifood sector is also subject to increasing scrutiny from consumers and civil-society organizations, which are demanding more sustainable and ethical food production. This puts pressure on food companies to adopt more sustainable practices and to report on their ESG performance in order to maintain their reputations and consumer trust (Acampora *et al.*, 2023; Shabbir and Wisdom, 2020). However, such performance reporting needs to go beyond ranking and scores and move towards an assessment of impacts and the integration of those impacts into financial statements and balance sheets (Sandhu, 2022).

In this chapter, we investigate the issue of externalized costs in the agrifood sector and discuss the shortcomings of the current economic system in terms of finance, business management, accounting and reporting. Conventional practices and mechanisms are shown to support the growth and success of unsustainable agrifood businesses by facilitating the externalization of costs. The externalization of costs, and the associated but hidden impacts, dependencies and risks, renders the accounting system opaque and serves to maintain unsustainable business pathways.

In this context, TCA is essential for the transformation of agrifood systems to environmental, economic and social sustainability. TCA allows the private sector to manage and account for the externalities of business operations and investments and enables businesses to identify, assess, value and report impacts on nature, people, economy and society (an “inside-out” perspective), as well as their dependencies on same (an “outside-in” perspective) (de Adelhart Toorop *et al.*, 2021).

TCA helps raise awareness that “business as usual”, “accounting as usual”, “reporting as usual” and “investing as usual” will not undergird the right to nutritious food for all. TCA can help businesses in the food and agricultural sector identify the hidden costs of their operations and make informed decisions that consider the long-term sustainability of their business. By incorporating the costs of externalities into decision-making processes, businesses can develop more sustainable practices that reduce negative impacts on the environment and society (Baker *et al.*, 2020; Impact Institute, 2023; Gemmill-Herren, Baker and Daniels, 2021). Unlike current corporate sustainability initiatives such as ESG reporting, TCA aims to transform businesses by becoming part of their core management strategy rather than existing merely as a standalone initiative at the margins (Sandhu, 2022). A closely related initiative in this context is sustainable performance accounting (SPA), which offers methods of folding ESG factors into the core business “DNA”, integrating sustainability performance into the profit and loss statements (Henkel and Lay-Kumar, 2022; Walkiewicz, Lay-Kumar and Herzig, 2021).

Furthermore, TCA can help investors better understand the risks and opportunities associated with a business's operations in the agrifood sector. By accounting for externalities,

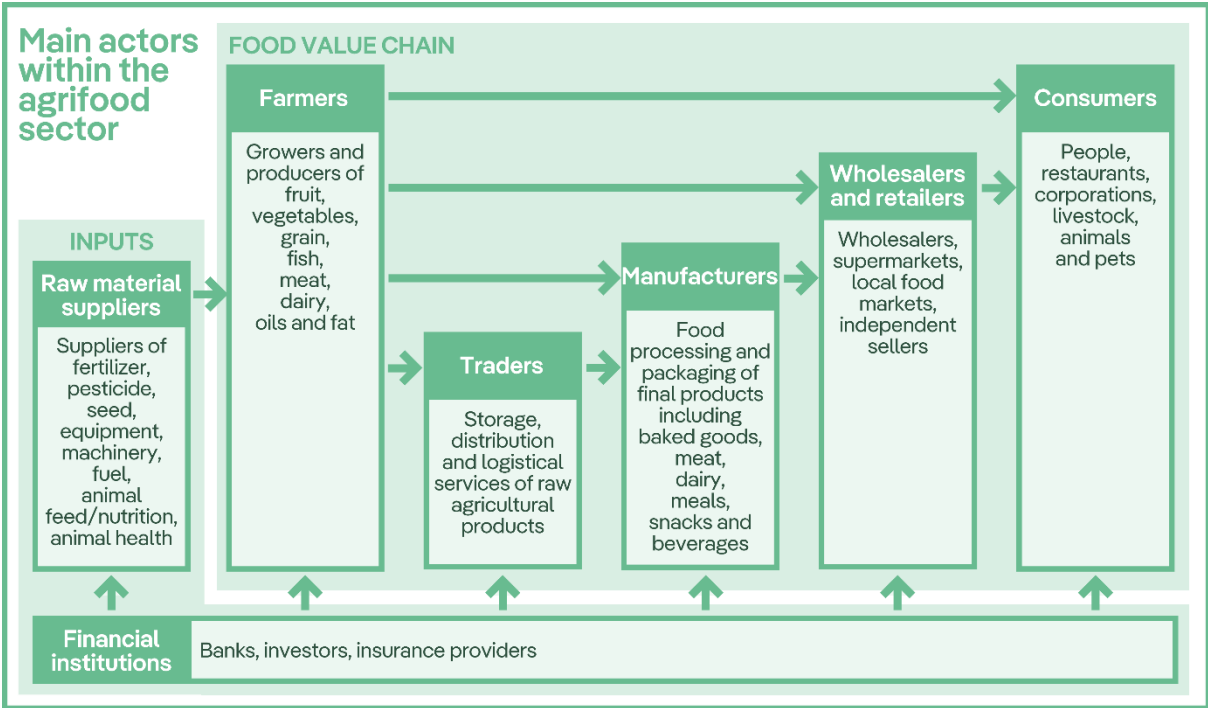
TCA provides a more accurate picture of financial performance and long-term sustainability, which can help investors to make more informed decisions. In this regard, TCA has been pitched as an approach that can inform and broaden the scope of conventional ESG investment criteria (Baker *et al.*, 2020).

In addition, TCA can support policies that address the externalities of the food and agricultural sector. By providing a more comprehensive understanding of the true cost of food production, TCA can help policymakers design policies that incentivize more sustainable practices and discourage practices that have a negative impact on the environment and society (de Adelhart Toorop *et al.*, 2021).

2.1 How current accounting methods prevent the transformation of agrifood systems

Private businesses play a huge role at different stages of the food supply chain worldwide. They include input suppliers, farmers, traders, manufacturers, processors, retailers and businesses offering supporting services such as finance, certification, advice and insurance. They range in size from small-scale farms to giant global companies (Capitals Coalition, 2020). Therefore, agrifood businesses are essential to the transformation of agrifood systems (Global Nutrition Report, 2022; World Economic Forum, 2022). Figure 2 summarizes the main actors in the agrifood sector.

Figure 2. Main actors within agrifood systems and how they interact



Source: Adapted from Capitals Coalition. 2022. *TEEBAgriFood Draft Operational Guidelines for Business*. The Hague, Kingdom of the Netherlands. <https://capitalscoalition.org/publication/teebagrifood-draft-operational-guidelines-for-business>

Like all businesses operating in the global economic system, agrifood businesses follow conventional accounting and reporting guidelines (von Wolfersdorff, 2022). These accounting systems have three key shortcomings that hinder the transition to sustainable food systems:

i) insufficient disclosure of sustainability-related risks and opportunities; ii) a focus on financial flows only, neglecting social, human and natural capital; and iii) the depiction of investments in sustainability as a destruction of value and not as a restructuring of assets. These shortcomings affect all three vital business aspects: risks, costs and value/profits (Gemmill-Herren, Baker and Daniels, 2021). The three weaknesses of current accounting systems are outlined briefly below (True Cost Initiative, 2020; 2021).

(1) Risk: No transparency in relation to sustainability-related risks and opportunities, including alignment with international policy goals

Compliance with national, supranational and international sustainability strategies, regulations and targets, such as the German Organic Farming Law, the National Organic Agriculture Program of the Philippines, the National Mission on Natural Farming in India, the EU Farm-to-Fork Strategy, the SDGs or the Paris Agreement on Climate Change, requires clear commitments and contributions by agrifood businesses. In this regard, current practices in the agrifood industry present a source of risk for both businesses themselves and society. The assessment, accounting and reporting of these risks is essential to meeting international sustainability targets and goals.

However, current accounting and business management practices do not offer transparency about the core business and sustainability strategy of agrifood companies. It is not clear which scenario a company has used as a basis for assessing its disclosures in the financial statements. Take, for example, a company that manufactures internal combustion engines for tractors, which bases its long-term business model on the assumption that the Paris targets will not be met due to a lack of political will and insufficient social pressure. This company is not contributing to the international agreement and the transformation of agrifood systems (True Cost Initiative, 2020; 2021).

However, the underlying assumption of the core business and sustainability strategy is also crucial to the assessment of financial risks. In the above example, if the premise of the Paris Climate Agreement applies, this means that the company – and its investors – accept long-term business risks and possibly high risks of overvaluation. These are not recognizable in current business reporting. In our example, the overvaluation of the business could contribute to a “carbon bubble”.³ The lack of information on the core business and sustainability strategy leads to the misdirection of managers, shareholders and banks and, thus, to misdirected capital.

Consequently, for informed sustainable development, it is necessary for boards and auditors to present and audit accounts in alignment with international goals. This includes a risk assessment of assets, liabilities, profits and losses under the assumption that international policy goals hold true. Only then will management, investors and creditors have the information they need to deploy capital in a way that supports the sustainable transformation of agrifood systems. The Institutional Investors Group on Climate Change (IIGCC)⁴ is an example of an investor group already explicitly demanding that businesses report on their alignment with the Paris Agreement and the European Union’s 2050 net-zero targets (True Cost Initiative, 2020, 2021).

³ The concept of a carbon bubble refers to a situation in which the valuation of companies that rely on fossil fuel-based energy production is overinflated due to projected decreases in the value of fossil-fuel reserves as they become unusable due to restrictions imposed by carbon budgets and because the negative externalities of carbon fuels are not reflected in a company’s stock-market value.

⁴ The IIGCC is the European membership body for investor collaboration on climate change and the voice of investors taking action for a prosperous, low-carbon future (see <https://www.iigcc.org> for more information).

(2) Costs: No transparency in relation to externalized costs

Current corporate accounting and reporting mechanisms largely ignore environmental, social and human impacts and the associated externalized costs. They do not require businesses to declare non-financial impacts, resulting in cost estimations and management decisions that ignore non-financial costs. As most externalities are not subject to the “polluter pays” principle, the costs associated with environmental, social and human impacts are borne elsewhere (True Cost Initiative, 2020, 2021).

For example, monocultural soybean production can lead to soil erosion, which, in the event of extreme rainfall caused by climate change, can cause soil to end up in water bodies. This causes flooding and requires costly protective measures for the general public, as well as spending to remove silt from water bodies. The loss of fertile soil causes soil degradation, putting farming activities and yields at risk, resulting in additional costs for the farmer and neighbouring farmers.

This example shows that externalities not only involve costs to society, but to businesses themselves. Businesses must take an inside-out perspective – disclosing their impact and associated cost to the environment and society – as well as an outside-in perspective that considers the dependencies and risks to the business that can be attributed these impacts. These need to be complemented by a decision-making mechanism that is focused on more than just profits (Schramade, Schoenmaker and De Adelhart Toorop, 2022).

Failure to include externalized costs in current accounting and reporting conventions reinforces unsustainable business models. Businesses can exclude certain costs when pricing their products for the market, allowing them to sell these products cheaply, irrespective of the social or environmental damage caused by production. This puts businesses that internalize those costs through activities such as carbon sequestration, improvement of soil health and capacity-building of employees at a disadvantage. The expenses for activities that yield positive external impacts are posted as costs for the company. Therefore, there is no level playing field with regard to the representation of economic performance; companies that operate with a high ecological and social footprint are “rewarded” on the balance sheet, while responsible management is “penalized” (True Cost Initiative, 2020, 2021).

It is clear, therefore, that a short-term, profit-focused, externalizing approach to business is not sustainable in the long run. Companies must consider the wider impacts of their actions and work to minimize their negative effects on the environment and society. Doing so will not only benefit the world at large, but also make good business sense by reducing follow-on costs and creating a more resilient business. However, this requires an accounting system that follows the “polluter pays” principle (or at least a “polluter discloses” principle).

(3) Assets: No transparency on transformation assets

The transformation phase of a company is an investment phase. In accounting terms, however, it is typically depicted as a destruction of value and not as a restructuring of assets that does not affect profit or loss. The reason for this is that the achievement of sustainability goals by a company typically requires complex reorganization, which can often be consultancy and training intensive. These expenses can often not be allocated to individual, tangible assets, especially at the beginning of the transformation process. Therefore, they are currently depicted as expenses on the balance sheet, without a corresponding improvement in assets.

As a result, rating-relevant ratios, such as earnings before income and tax and return on investment, deteriorate. Bank loans typically become more expensive as a result or are not granted at all, because the bank itself has to deposit higher equity capital for these loans. Even if these economic activities are recognized as sustainable, the external financing of sustainable business transformation, especially via debt capital, becomes difficult. This causes a dilemma for the private sector: while trying to comply with new sustainability requirements based on international goals, companies are punished financially as the higher costs of sustainable transition measures reduce their profits. Current accounting rules need to be adjusted in order to promote investment in sustainability transitions (True Cost Initiative, 2020, 2021).

In the context of agrifood businesses, this translates into sustainable farming and business practices being accounted for as a risk mitigation strategy. Thus, information on farming and sustainability practices becomes relevant for investors as an indicator of a business’s future prospects.

Table 1 summarizes the shortcomings of current accounting practices. They create barriers to informed decision-making by private and public investors, thus giving unsustainable business models an unfair advantage. The bulk of investments, therefore, flow to those businesses that fare better from the point of view of cost, profit and risk by conventional standards. The unfair advantage enjoyed by businesses that do not strive to reduce their externalities impedes the achievement of sustainable development, conservation and mitigation agendas (True Cost Initiative, 2020, 2021).

Table 1. Shortcomings of current business accounting and reporting that are addressed by true cost accounting

Metric	Direct financial costs and benefits	Financial risks	System risks from dependencies on natural, human and social capitals	Externalized costs from negative impacts on natural, human and social capitals	Value to society from positive impacts on natural, human and social capitals	Resilience
Current accounting and reporting methods	✓	✓	✗	✗	✗	✗
TCA-based accounting and reporting methods	✓	✓	✓	✓	✓	✓

Source: Authors’ own elaboration.

2.2 Shortcomings of business management and operational decision-making hinder a holistic approach to sustainable food systems

Unsustainable business practices not only harm the public, but also increasingly entail operational and financial risks for the businesses themselves. This is due to growing public awareness of the damage the global economy causes to natural ecosystems through the extraction of biomass and mineral resources, the limited availability of natural resources and the limits to the carrying capacity of planet Earth. The agrifood sector is particularly vulnerable to the effects of the climate and biodiversity crises, with new and extreme weather patterns leading to failed harvests worldwide. Sustainable farming and food production systems have shown themselves to be more resilient and adaptable to climate change. Though they may have higher production costs (if calculated in the current way) in the short term, they optimize

resource use, leading to lower operating costs in the long run and greater stability of production. In addition, as consumers demand more sustainable practices and regulations become stricter, businesses that disregard social and planetary limits are exposed to operational and financial consequences (Capitals Coalition, 2020).

Increasing challenges in the operation of agrifood businesses are causing a rethink of operational and strategic business models. These challenges are diverse – from decreasing farm yields due to soil degradation to declining availability of resources, such as coffee beans, due to climate change. Retailers also face new consumer demands, for example, to pay fair prices to farmers and stock environmentally friendly products. Together, these challenges are driving a shift in planning horizons from short-term profit maximization to long-term sustainability strategies.

2.3 Lack of (trusted) information at the point of sale hinders sustainable purchasing decisions

Alongside sustainable production, more progress is needed on sustainable consumption. However, a range of barriers prevents consumers from making more sustainable and healthy eating choices. One of these barriers is a lack of information on food sustainability at the point of sale. For example, a survey by the European Consumer Organization (2020), found that EU consumers were influenced by environmental concerns and were willing to change their eating habits accordingly, but high prices, a lack of information and difficulties accessing or identifying sustainable food options were perceived as barriers to sustainable eating (Foote, 2020).

Studies have shown that food choices are strongly determined by price. However, prices do not tell the full story. The external costs to the environment and human health of producing and consuming food are not reflected in the market prices of food (von Wolfersdorff, 2022). It is estimated that food would be more than twice as expensive, on average (in the case of conventionally produced meat, even more than three times more expensive), if the main externalities of food systems were incorporated into market prices (Hendriks *et al.*, 2023).

By excluding the environmental, social and health costs associated with production and consumption, unsustainable food producers can offer their products at low prices. Lower prices lead to higher turnover, resulting in even more environmental, social and health impacts, leading to even higher external costs. These external costs worsen the climate emergency, for example, causing drought and floods. This leads to crop failures, which drive higher food prices worldwide. For low-income households that already spend a larger share of their household budget on food, the impact of further increases in food prices can be catastrophic, and rising prices push these households further into consuming unhealthy and unsustainable food (as they are cheaper). This creates a fatal cycle that works against the transition to sustainable food systems (Caferra *et al.*, 2023).

In addition to price, information on the sustainability characteristic of a food product influences consumer behaviour (Bishop *et al.*, 2022). According to a European study conducted by Vittersø *et al.* (2019), information on the product, such as ingredients, nutrition information or best-before date, is consulted by consumers ahead of labels and logos. However, to our knowledge, nowhere has standardized information about the external costs of foods and their associated environmental, social and health impacts been added to food packaging to date. As a result, the consumer cannot take the environmental, social and health impacts of the food

product into consideration when shopping (Vittersø *et al.*, 2019; Schifferstein, de Boer and Lemke, 2021).

2.4 How true cost accounting can support sustainable business models and investments in the agrifood sector

To create an enabling environment for the transformation of the agrifood sector, it is important to address the challenges created by current standards of business and product performance evaluation. In the following section, we argue that TCA points in the right direction by taking a systems view of the four types of capital, thereby helping to redefine the concepts of cost, value, profit and risk that are essential for business, investment and consumer decision-making. TCA can lead to a slew of measures that bring greater clarity to different agrifood business actors and enable them to make better-informed decisions that support the transformation of agrifood systems.

The role of TCA in this context is summarized as follows (also see Figure 3):

- TCA has been described as a method for changing mindsets, in that it helps us to understand the importance of considering all four types of capital needed for business and investment success.
- TCA can help businesses identify material risks as well as opportunities other than explicitly financial ones. This helps them to develop resilient strategies that attract investment.
- TCA can be integrated into everyday management, supporting holistic strategic and operational decision-making. It can also help agrifood businesses monitor and unlock opportunities at different stages of their supply chain, which can help them manage sustainable production, attract private investment and avail of government incentives.
- TCA redefines financial KPIs and presents alternative indicators, changing the bottom line of businesses by including human, social and natural capital. In this way, TCA can demonstrate the economic advantages of resilient agrifood systems.
- TCA can enable disclosures that improve the reputational standing of a business, which can then support its marketing strategy.

Figure 3. Leveraging true cost accounting to support sustainable agrifood businesses



Source: Authors' own elaboration.

2.4.1 Changing the mindset by raising awareness of holistic assessments and redefining business costs and success

With its holistic systems approach, TCA widens the scope for comprehensive assessment of business performance. By taking into account the impacts and dependencies on social, human, natural and produced capital, TCA changes the mindset of businesses and investors by promoting a more holistic approach to decision-making. Rather than solely focusing on short-term financial gains, TCA encourages businesses to consider the long-term sustainability of their operations and to take responsibility for their social and environmental impacts. TCA can thus be used to improve corporate governance and guide more informed decision-making and management.

By highlighting the hidden costs and impacts associated with unsustainable practices and by quantifying externalities, TCA leads to a more accurate perception of the costs and risks of production (Galgani *et al.*, 2023; Hendriks *et al.*, 2021). It also helps in quantifying intangible benefits, such as improved biodiversity, soil health and water quality, which are often ignored in traditional accounting methods.

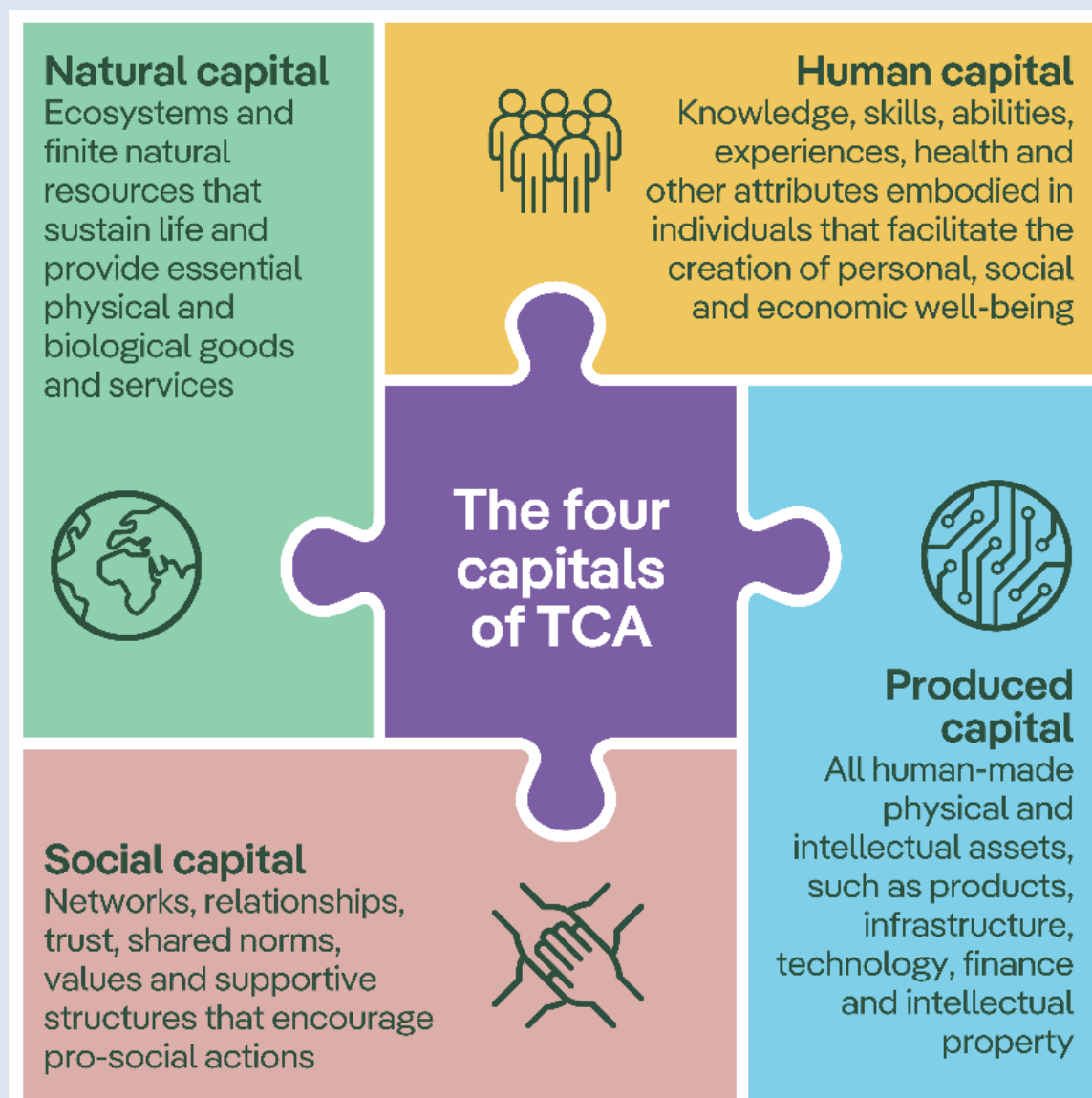
Increasing awareness of the impacts and externalities of business activities also improves knowledge among an organization's employees, resulting in increased participation and better decision-making. Thus, awareness-raising is a vital initial benefit of TCA, which facilitates change and plays a critical role in bringing about transformative shifts. TCA provides a common language that facilitates communication between departments and functions within a company, such as sustainability, finance, human resources, research and development (R&D) and operations.

The concept and methodology of TCA has initiated a rethink of how we define profits and costs (Gemmill-Herren, Baker and Daniels, 2021). It offers a way to present the non-financial gains and impacts of a business in financial terms, rather than in unquantifiable "sustainability terms". This can lead to a change in the way costs and profits are defined and in how investors evaluate investment opportunities. TCA provides a standard language for communicating non-financial performance that is transparent and tangible, with much less scope for greenwashing and deception.

Box 1. The four-capital concept of true cost accounting

This background paper follows the concept of capital contained in the TEEBAgriFood Evaluation Framework and includes both the negative and positive impacts of agrifood systems on natural, social and human resources, which are externalized under the current system.¹ The costs and benefits of agrifood businesses are, therefore, classified in terms of the four types of capital: natural, human, social and produced (see Figure 4).

Figure 4. The four-capital concept of true cost accounting



Source: Adapted from True Cost Initiative. 2022. *TCA Handbook – Practical True Cost Accounting guidelines for the food and farming sector on impact measurement, valuation and reporting*. Hamburg, Germany. https://tca2f.org/wp-content/uploads/2022/03/TCA_Agrifood_Handbook.pdf

TCA is a powerful approach for businesses seeking to operate in a more sustainable manner. By considering impacts and dependencies in terms of the four capitals, businesses can understand the true costs and risks associated with current operations and adjust their strategies and activities to operate more sustainably. For example, the four capitals come into play in the following ways:

- **Natural capital:** What environmental damage is caused by the business's activity and products? How much do the different processes and activities along the agrifood supply chain contribute to GHG emissions, environmental pollution and water scarcity? What environmental conservation and restoration activities does the business undertake? How much carbon should be sequestered and what is the value of the biodiversity conserved?
- **Human capital:** What are the working conditions under which the agrifood supply chain is operating? What is the nutritional value of the food products sold? What effects do they have on human health? Do farmers receive a fair price and is work along the supply chain paid at or above the living wage?
- **Social capital:** What social values and norms are adhered to along the agrifood supply chain? Are human rights respected? What kind of mechanisms are being employed to prevent discrimination?
- **Produced capital:** What kind of processes, tools and infrastructure are used at the different stages of the agrifood supply chain? What taxes are paid?

Note: ¹ True Cost Initiative. 2022. *TCA Handbook – Practical True Cost Accounting guidelines for the food and farming sector on impact measurement, valuation and reporting*. Hamburg, Germany. https://tca2f.org/wp-content/uploads/2022/03/TCA_Agrifood_Handbook.pdf

2.4.2 A systems approach to risk assessment and management

The challenges posed by transitory and physical risks associated with climate change, biodiversity loss, resource depletion and zoonotic diseases, such as COVID-19, highlight the need for agrifood business to take a more holistic approach to risk assessment, management and disclosure. Transitory risks, such as regulatory and policy changes, shifts in consumer preference, reputational risks and physical risks, such as extreme weather events, water scarcity and soil degradation, can have short- to long-term impacts on supply chains, production and profitability. Sustainable agrifood systems require the monitoring and protection of all four types of capital (produced, natural, social and human) for a future-proof food supply. One of the key messages of TCA is that today's costs in terms of social, human and environmental capital can become tomorrow's risks. Most externalities from business value chains are eventually internalized, either by design, decree or disaster. "Future-ready" corporations design their responses to externalities: they measure, value and manage their externalities.

To effectively identify and manage these risks and ensure the sustainability of their operations, businesses need to adopt an approach that considers social, human, natural and produced capital dependencies and risks. TCA can inform a systems approach to risk assessment and management that is not restricted to financial risks in the narrow sense. TCA can play a crucial role in this by providing a framework for businesses to assess and manage their impacts and dependencies more accurately (Gemmill-Herren, Baker and Daniels, 2021).

Integrating TCA into reporting frameworks allows investors and businesses to take a holistic view of the different business risks in addition to the financial ones put forward by conventional assessments. TCA supports the principle of "double materiality", which is likely to become a central element of future corporate sustainability reporting (European Commission, 2022b; KPMG Deutschland, 2023). Materiality defines why and how certain issues or information are important for a company or a business sector. With double materiality, a company must report

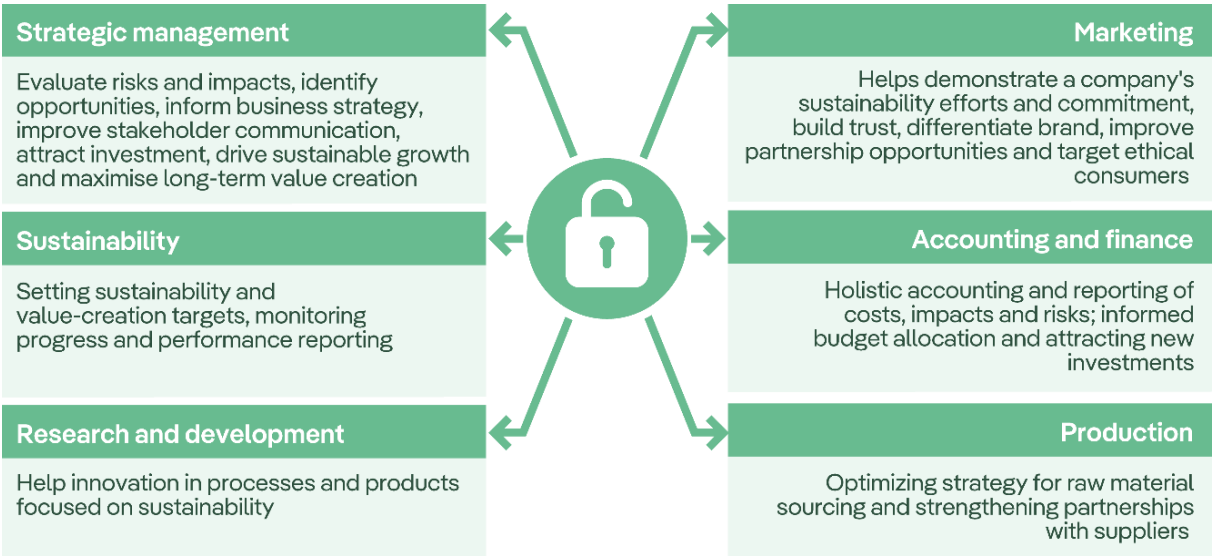
both on how its business is affected by sustainability issues, such as climate change (outside-in), and how its activities impact society and the environment (inside-out). The conversation around materiality is evolving and the concept of dynamic materiality is becoming more popular. If we consider materiality as a process that unfolds over time – often very rapidly – it is clear that what appears to be financially immaterial today can be business-critical tomorrow (Calace, 2020).

With transparent disclosure of impacts, opportunities and risks by businesses, investors will not only be able to estimate the true value of a business, but also test it for stresses related to the applicability and scalability of the business model. Full disclosure of a business’s risk mitigation strategy and alignment with international agreements (for example, Paris alignment) allows investors to make more informed decisions and incentivizes companies to adopt more sustainable practices. Financial institutions such as banks and insurance companies can use TCA to determine credit and insurance conditions based on better risk assessments, resulting in better credit and insurance conditions for sustainable businesses. This results from a quantification in monetary terms of otherwise intangible or invisible risks and returns, which can be significant in determining the creditworthiness of a company (TCFD, 2017; UNEP, 2023).

2.4.3 Improved strategic and operational management and supply-chain transparency

TCA helps businesses improve management and strategic decision-making both within their own operation and along their product value chains (Global Alliance for the Future of Food, 2019). The various TCA methods that have been developed so far work at different functional levels: product, organization, system, investment and so on. Hence, TCA can be employed in different decision-making contexts within various departments of a company (for example, R&D, finance, procurement, sustainability or communications) (see Figure 5).

Figure 5. Examples of how true cost accounting can inform decision-making across an agrifood company



Source: Authors' own elaboration.

A single organization-level TCA analysis or various product-level analyses can directly inform an organization's plans to reduce externalities. Its sustainability department can also use TCA to set targets and to track and evaluate progress. TCA also provides important information for the R&D department, supporting its efforts to develop more sustainable products. At a strategic level, TCA can inform management about potential risks and the need for adjustments, for example, with regard to sourcing products and services. TCA can also help to communicate the benefits of changes and decisions to investors by translating these into financial terms (Soil & More Impacts and TMG –Think Tank for Sustainability, 2022).

The potential of TCA is particularly pronounced in relation to supply-chain management. Global food supply chains are facing significant challenges, including bottlenecks and disorderly developments, which underscore the need for product tracking from start to finish. Although this is not a new idea, recent developments, such as the COVID-19 pandemic, material shortages and rising energy costs due to the Ukraine war, have exacerbated the situation. Moreover, many agrifood companies have been struggling with a shortage of skilled workers, which affects agricultural cultivation both directly and indirectly. The recent spike in energy prices has also led to higher transportation costs.

Climate change is making agricultural sourcing more challenging, influencing consumer behaviour and driving stricter regulation. At the same time, sourcing practices have come under greater scrutiny following scandals about food safety, poor working conditions, human rights violations and even modern slavery. These challenges pose great risks to the operation, reputation and financing of organizations and reveal an urgent need for new approaches to corporate supply-chain management (Rosendahl, 2022).

With growing interest in ethical and sustainable food consumption, there is a need for more transparency about the origin of food. An increasing number of consumers are conscious of the different aspects of production, including working conditions and environmental impacts. According to a survey conducted by FMI, the US Food Industry Association, in 2022, 65 percent of respondents were willing to switch from their preferred brands to ones that were more transparent about supply-chain conditions and embraced values like fair trade and animal welfare. This finding reflects a growing demand for supply-chain transparency, whereby companies know where and how their goods are produced, based on reliable data, and then communicate that knowledge both to internal and external stakeholders, including consumers (FMI and NielsenIQ, 2022).

Through TCA, businesses can identify and quantify potential and actual issues in their operations and supply chains. By integrating TCA analysis into their due diligence processes, organizations can identify, assess, mitigate, prevent and account for how they address the actual and potential adverse impacts of their own activities and those of their direct and indirect suppliers (Soil & More Impacts and TMG – Think Tank for Sustainability, 2022).

Some environmentally conscious food-processing companies send out questionnaires or pay regular visits to their suppliers to enquire about their yields and product quality and to assess their farming techniques, pesticide management and other sustainability concerns, to ensure that the activities are in line with the processor's own requirements. TCA could be integrated into such questionnaires, forming part of a more holistic assessment of the supplier's performance. Case studies by the True Cost Initiative have shown that this approach can also be used to address issues of social justice, such as gender equality, diversity and inclusion (Capitals Coalition, 2023a).

A comprehensive assessment of costs and benefits with TCA can help businesses uncover possibilities in the supply chain where the company can introduce changes to improve sustainability (and hence production performance) and qualify for voluntary certifications and government incentives. For example, the results of a TCA analysis can be used to discuss with the supplying farmer how sustainability practices can be improved.

In addition to serving as a sustainability performance assessment, TCA can also be used to justify and mobilize the financial resources for the transition to sustainability, opening opportunities for new investment and upscaling. For example, there is typically a need for initial financing to cover services, reorganization, machinery and other expenses, which only pay off in the medium to long term through more stable production, lower costs and higher profits. A supplier partnership between a food producer and its client (for example, a food-processing company) allows the client to finance the farm's conversion to sustainable agricultural practices through an advance payment on the expected purchase. This arrangement frees the producer of the need to take out an external loan from a bank, which may be expensive or difficult due to accounting rules that treat business transformation as an expense rather than asset generation (see section 2.1 for details on this issue with current accounting rules). By using TCA, which allows for supply-chain control and risk management, the producer can monitor and minimize the risk of transformation, including default risk. The financial information, true cost and value of the transformation process can be recorded and represented as balance-sheet and cash-flow data, providing transparency and control over progress. This also strengthens the producer's position when communicating with banks, rating agencies and investors (von Wolfersdorff, 2022; True Cost Initiative, 2020, 2021).

To effectively measure the environmental impacts and risks associated with their operations and supply chains, agrifood companies need to gather significant amounts of data. These data are necessary to accurately identify, quantify and ultimately mitigate impacts and risks. TCA can provide the necessary information on what data to collect and how to collect them. The True Cost Accounting AgriFood Handbook outlines the method and steps required for agrifood businesses to perform TCA along their supply chains (Soil & More Impacts and TMG – Think Tank for Sustainability, 2022). It is crucial that the data collected are reliable, as the TCA results inform strategic decision-making and may be used for public disclosure. Obtaining assurance can help to increase the credibility and reliability of TCA information, similar to conventional financial information.

2.4.4 Changing the bottom line – what is a profitable business?

There are factors beyond financial capital that determine the short- to long-term value creation of an economic activity or organization. Value is created, prolonged and strengthened by sustaining multiple capitals, such as produced, human, social and natural capital. An organization's value creation depends on the increase or decrease of those capitals within an organization. Hence, their interactions dictate an organization's overall value and future viability (Gemmill-Herren, Baker and Daniels, 2021).

The long-term relevance of multiple capitals for business performance and issues related to their development, use and degradation need to be a core focus of investment decisions. To understand, implement and manage sustainability-related risks and opportunities, economic actors, in general, and financial institutions, in particular, need to redefine the parameters that influence economic value. Through its "four capitals" approach, TCA can help economic actors

to understand the interplay between produced, human, social and natural capital and their importance for value generation in an organization (True Cost Initiative, 2022).

Based on this enhanced understanding of value, it becomes clear that we need to adapt more holistic and accurate accounting practices. We need to broaden the scope for disclosure of information in financial statements on an organization's impacts on natural, social and human capital. Failing to incorporate relevant information into financial statements could jeopardize the efficacy of management and hinder its ability to make informed decisions on resource allocation. Reforming the manner in which we account for value is a cornerstone of sustainable development (Capitals Coalition, 2021).

One way to redefine value is to provide details in annual reports on how a company affects natural, social and human capital (Capitals Coalition, 2021). TCA can contribute to this enhanced reporting by making what are still erroneously termed "non-financial indicators" easy to understand. TCA brings together the different environmental, social and human impacts into a single monetary unit, permitting full integration into annual reports and enabling companies and investors to make strategic decisions that balance financial and non-financial performance. This can initiate a transition from purely financial reporting to integrated reporting, which will benefit businesses by creating trust among investors, business partners and other stakeholders.

If the private sector is to operate in a world defined by human rights, planetary boundaries, the SDGs and the Paris Climate Agreement, a re-alignment of financial accounting is needed. There are several entry points in an annual report where TCA can enhance the scope of information disclosure contained in the IFRS (Negash, 2012).

- Management report: The double materiality of TCA indicators makes them core elements for enterprise value, as well as sustainability disclosure. These indicators highlight sustainability issues that are financially significant and likely to impact the balance sheet and profit and loss account in the future, for example, due to higher purchase prices, provisions for probable losses, impairments or necessary investments. Therefore, TCA indicators should – or, depending on the regulation, must – be reported in a company's annual report (Capitals Coalition, 2021).
- Profits and loss statement: TCA can also be used to develop an integrated profit and loss statement (IP&L) (Natura and Valuing Impact, 2022). The IP&L provides a comprehensive view of the value created by a company across all types of capital (produced, human, social and natural) and allows for greater comparability with financial or economic data through monetization. By reflecting both value generation and degradation, the IP&L becomes a genuine measure of a company's sustainability.
- Balance sheet: A financial balance sheet provides stakeholders with an understanding of what the company owns (assets) and owes (liabilities) and whether it is solvent and can meet short-term debts. For decades, accountants have categorized employees as a liability and not as an asset due to their salaries and future pensions. The same goes for sustainable land management practices: costs are recognized, but not the increase in value of the land assets resulting from such practices. However, in an era of skills shortages and the rapid decline of natural capital, agribusinesses executives often talk about employees and nature as their greatest assets. It is time for the twenty-first-century ledger to match current rhetoric.

2.4.5 Marketing and co-benefits for businesses

TCA can benefit agrifood businesses in terms of marketing their products and accessing new markets by communicating their sustainability efforts and performance in quantifiable and understandable terms. Pertinently, the SPA approach also uses accounting methods to integrate the sustainability efforts of businesses into their profit and loss statements (Henkel and Lay-Kumar, 2022). Due to awareness of the environmental and social impacts of food production, consumers are showing greater interest in sustainable food products. A business's efforts to reduce and compensate for negative externalities and to contribute to positive co-benefits can be communicated through TCA. TCA can also be used to create awareness of sustainability issues in the agrifood sector by exposing "hidden costs" and "false prices" (True Price, 2019).

Through TCA, businesses can increase transparency about the sustainability performance of the product at the point of sale. Businesses can depict the reduced negative impacts of the product (for example, by placing a QR code that links to more detailed information on the impact assessment of the products) or by communicating the true costs (through a second price tag, for instance) (REWE Group, 2020). TCA answers one of the questions most frequently asked by consumers: "why is good food so expensive?"

Certain companies have followed the true pricing initiative, which involves marketing a food product at its "true price". True prices are the market price plus the hidden costs (due to social and environmental impacts) of a product. The objective of true pricing is not to make products more expensive, but to make them more sustainable by reducing social and environmental damage in the value chain.

3 The current state of true cost accounting in the business and financial sectors

TCA is part of a movement to challenge the dominant global conventions of economics, business management and accounting by which the strategies and success of business enterprises are evaluated. Most recent impact assessment initiatives related to TCA application in the private sector have been led by private-sector alliances, NGOs and research institutions. They promote a more holistic approach to assessing business practices, conveying the underlying concepts of natural, social and human capital, as well as the impacts, dependencies and associated externalized costs and benefits. These initiatives may not necessarily be termed TCA and may not always adhere to the strictest definition of TCA (for example, they may not include all four types of capital), but have in common the goal of going beyond conventional methods of assessment and disclosure. Thus, these initiatives have contributed to the process of developing TCA and are contributing towards the harmonization of TCA assessments (Impact Institute, 2023).

In the context of agrifood systems, TCA has been employed in a variety of ways to shed light on the negative impacts and positive co-benefits of different agrifood practices. Although the proliferation of such initiatives is evidence that TCA is growing in popularity, their varying approaches create barriers to the widespread mainstreaming of TCA.

This chapter provides an overview of the current state of research on and adoption of TCA in the private sector. It describes the current state of TCA in business and finance, looking in more detail at the main initiatives so far. The findings of different TCA efforts in the agribusiness sector are collated and insights are drawn on how to accelerate the mainstreaming of TCA in the private sector.

3.1 True cost accounting initiatives and resources in the private agrifood and financial sectors

As discussed in Chapter 2, TCA can be applied in different private-sector contexts, ranging from sustainability assessments for improved decision-making in management to advanced risk assessment for investment, holistic reporting and true pricing. While the principle and concepts of TEEBAgriFood and the general approach of TCA remains the same throughout these different applications, each application has methodological specificities. An analysis and comparison of different TCA initiatives performed by the Impact Institute from 2021 to 2023 provides a detailed overview of the methodological similarities and differences (Impact Institute, 2023), while the Capitals Coalition has carried out a landscape analysis on natural capital accounting (Capitals Coalition, Value Balancing Alliance and WBCSD, 2021). Furthermore, the TCA Inventory provides an overview of available resources (as of 2019) (True Cost Accounting – Inventory Project, 2020).

In the absence of a “one-size-fits-all” TCA methodology, businesses and organizations are in the process of refining the assessment, accounting and communication of different externalized costs and benefits in various private-sector contexts. The various TCA initiatives differ in terms of the primary stakeholder (for example, farmers, agrifood businesses and investors), the scope of analysis (for example, focus on own operations, supply chains and portfolios), the extent to which the different types of capital are included (for instance, all four capitals, just natural capital or just GHG emissions), whether the main focus is on impacts (that

is, impact assessments) or dependencies (namely, risk assessments), and the purpose of the TCA analysis (for example, improved operational and risk management, external reporting, investment decisions or true pricing). Efforts are under way that focus on the further development of methodological aspects, such as impact assessment, valuation and monetization, reporting and communication, and harmonization and standardization.

The ecosystem of TCA initiatives and their resources can be broadly classified as follows:

- **Framework:** The TEEBAgriFood Evaluation Framework provides the key definitions and concepts associated with TCA in the agrifood context;
- **Guidelines:** Principles, structure and procedures of TCA, issued by public and/or private bodies;
- **Standards:** Rules for the performance of a full or partial TCA assessment;
- **Methods and tools:** A practical application of a framework and standard, setting out how TCA assessments should be undertaken, to support the translation of output into impact with an explicit list of indicators and valuation factors;
- **Valuation factors:** Specific quantitative indicators that allow for the translation of an impact driver into a monetized impact;
- **Financing instruments:** Initiatives or institutions that direct funding towards transformative (agrifood) businesses on the basis of TCA assessments;
- **Beacons:** Companies that pioneer the implementation of TCA and have, for example, adopted and incorporated TCA assessments into their accounting and reporting mechanisms.

3.1.1 Overview of the initiatives and resources available

The following section contains a non-exhaustive overview of notable TCA initiatives that have contributed significantly to the development of knowledge and guidance for TCA application in the agrifood sector. While the development of TCA is significantly influenced by the knowledge and experience generated in related fields, the overview presented here specifically highlights initiatives that target TCA within the private and financial sectors of agrifood systems.

The TEEBAgriFood framework provides the basis for a systemic economic evaluation of “eco-agrifood systems”. It was developed by the TEEBAgriFood Initiative, which was launched in 2015 by UNEP in collaboration with FAO, the European Union and others. Its flagship publication is the *TEEBAgriFood Scientific and Economic Foundations* report, which sets out the TEEBAgriFood Evaluation Framework (TEEB, 2018). It makes a strong case for applying systems thinking to the evaluation of agrifood systems by articulating the interrelationships and interdependencies between the different constituents of agrifood systems. The framework informs decision-making in agrifood systems by clearly representing all material interactions between the environment, economy, society and health at all stages of the supply chain, from farm to retail. The framework describes the capacity of the four capitals in terms of four factors: stocks, flows, outcomes and impacts. Developed as an overarching framework for policymakers, businesses, civil society and farmers, it provides the rationale for a holistic evaluation of agrifood businesses.

Since the publication of the *TEEBAgriFood Scientific and Economics Foundations* report, the TEEBAgriFood framework has been widely embraced as a point of reference within agrifood

systems. Several applications have been carried out to provide evidence of its effectiveness and there is a rapidly growing and varied community of industry leaders, policymakers, researchers, farmers and members of civil society eager to further improve and integrate the use of the TEEBAgriFood framework. It soon became evident that for the holistic food systems approach to be applied widely, further guidance was required. This has resulted in the emergence of multiple initiatives offering advice and guidance on TCA specifically targeted towards companies in the agrifood sector (TEEB, 2018).

One of those efforts is the TEEBAgriFood Operational Guidelines for Business currently being compiled by the Capitals Coalition (2022). These guidelines present an iterative four-stage process consisting of nine steps that need to be followed during assessment of the capitals in a business context. The guidelines highlight the importance and benefits of the four types of capital for agrifood businesses. The operational guidelines also make the business case for a multicapital assessment in the agrifood sector by identifying materiality and double materiality through impacts and dependencies across the agrifood value chain. The initiative describes practical case examples from the sector to illustrate the successful implementation of TCA. The TEEBAgriFood for Business project works with businesses in seven countries (Brazil, China, India, Indonesia, Malaysia, Mexico and Thailand) to build the capacity of agrifood businesses to apply the TEEBAgriFood framework (Capitals Coalition, 2020).

The TEEBAgriFood Operational Guidelines for Business can also be seen as a sector-specific adaptation of the Natural Capital Protocol and the Social & Human Capital Protocol. These two protocols by the Capitals Coalition can be considered decision-making frameworks to support TCA (Capitals Coalition, 2020). They enable organizations to identify, measure and value impacts and dependencies in relation to the different capitals. This is achieved by informing decision-makers about significant risks and opportunities that become visible through a four capitals approach. Armed with a comprehensive understanding of how different activities interact with natural, social and human capital, managers can take decisions to transform the way their business is conducted. In this context, the ACT-D high level business actions on nature guide businesses to assess their relationships with nature, commit to action and set targets, transform their practices and to disclose nature-related information (Capitals Coalition, n.d.).

Another attempt to adapt TCA specifically to the requirements of the private sector was the True Cost – From Costs to Benefits in Food and Farming initiative (True Cost, n.d.), a private-sector initiative of agrifood businesses, consultancy firms, banks and NGOs that ran from 2019 to 2022. The goal of the initiative was to provide guidance on transparent and the holistic assessment and reporting of environmental, social and health impacts along companies' supply chains. The aim was to provide clear and detailed instructions for TCA application that would leave little room for greenwashing. The outcome of the initiative, led by consultants TMG – Think Tank for Sustainability and Soil & More Impacts, was the *TCA AgriFood Handbook* (Soil & More Impacts and TMG – Think Tank for Sustainability, 2022).

The handbook builds on the premise that companies will, sooner rather than later, be expected to report on sustainability impacts and risks in the same way they currently report on financial impacts and risks. It outlines a concrete methodology of TCA for the agrifood sector, describing how the measurement, valuation and reporting of the environmental, social and health externalities can be carried out. This includes a description of indicators, monetization factors, data-collection procedures and a reporting mechanism for social, environmental and health

impacts. The methodology was tested on 20 supply chains in 14 countries on five continents and has the potential to evolve into a standard approach for TCA in agrifood supply chains (Soil & More Impacts and TMG – Think Tank for Sustainability, 2022).

The Global Farm Metric coalition is another initiative in this context (Global Farm Metric, n.d.). It is supported by more than 80 organizations, including farmers, consultants, researchers, educators, environmental groups, certifiers, food companies, financial services providers and government agencies. The coalition has launched and is in the process of further refining a framework that defines on-farm sustainability and measures whole-farm impacts. The framework sets out indicators as a benchmark for measuring future performance against sustainability goals at local, national and international level.

The Transparent Project is a consortium formed by the Value Balancing Alliance with the Capitals Coalition and the World Business Council For Sustainable Development to address the lack of standardization in corporate environmental assessment methods (Capitals Coalition, n.d.). It aims to develop the first set of natural capital accounting principles and corporate implementation guidelines tested by industry practitioners. In 2021, the Transparent Project issued a report entitled *Corporate Natural Capital Accounting — from building blocks to a path for standardization* (Capitals Coalition, Value Balancing Alliance and WBCSD, 2021).

To advance TCA while calling for greater consistency in the dynamically evolving field of TCA methods, the Global Alliance for the Future of Food commissioned in 2020 a guide entitled *Applying the TEEBAgriFood Evaluation Framework – Overarching Implementation Guidance*, which aims to ensure that TEEBAgriFood applications are coherent and consistent (Eigenraam *et al.*, 2020). The following year, it commissioned the Impact Institute, as a member of the working group on the “harmonization” of the TCA Accelerator, to conduct an analysis of TCA in the agrifood sector to better understand the opportunities and barriers to harmonizing the TCA space (Impact Institute, 2023).

Other projects and initiatives choose to focus on the accounting aspect of TCA to expand the limits of current accounting. For example, the “Richtig Rechnen” (German for “calculate correctly”) project (2019), accompanied by the “Regionalwert Leistungsrechner” (Regionalwert performance calculator) tool, took a farm-level approach, but with a focus on positive sustainability services as opposed to impacts or externalized costs.⁵ The aim of the project was to show ways in which the sustainability performance of farms can be recorded, evaluated and monetized and can be accounted for not only as expenses, but as values in an extended financial accounting system. This system would allocate expenses and income based on accounting documents using a causation-based approach (Regionalwert Leistungen, 2023).

Another attempt to enhance current accounting was undertaken by the Impact Institute. Its Integrated Profit & Loss Assessment Methodology replaced the traditional economic model of maximizing profit for shareholders with an alternative model that creates value for all stakeholders of a business (Impact Institute, 2020). Rather than creating simple profit and loss statements, this methodology creates “impact statements” that have the potential to steer the transformation of businesses towards greater sustainability and more inclusive practices. The Impact Economy Foundation has built on the IP&L idea and published the Impact Weighted

⁵ This project does not follow the basic principles of TCA. However, we decided to include it, as it provides valuable ideas about extended or integrated accounting that can also contribute to the development of TCA.

Accounts Framework in collaboration with, among others, Harvard Business School and Singapore Management University (Impact Economy Foundation, n.d.).

Other initiatives try to advance TCA in the field of true pricing. For example, the True Price Foundation, linked to the Impact Institute, incorporates the environmental and social costs of agrifood products into the prices at which they are sold (True Price Foundation, n.d.). The methodology follows a three-step process: tracing impact pathways and building databases, using the data to provide quantitative impact measurement, and monetizing the impact using standardized valuation models.

At the same time, efforts are being made to further improve the underlying methods of TCA. Initiatives and projects in the field of agriculture and food include the Food System Impact Valuation Initiative (FoodSIVI, 2023), the “HoMaBiLe – How Much Is The Dish?” project (Universität Greifswald, n.d) and the FOODCoST project (National Institute for Public Health and the Environment. n.d).

Several networks with a focus on joint communication have been formed to increase visibility and outreach for TCA. The TCA Accelerator was launched in 2019 by the TCA Community of Practice and is a global network advocating for the transition to a just, sustainable and healthy world through the widespread adoption of TCA (TCA Accelerator, n.d.). Through strategic communications, stakeholder engagement and innovative analysis, the TCA Accelerator raises awareness of food system externalities to inform private- and public-sector policy and practice and improve accountability.

Business for Nature is a global coalition of more than 80 influential organizations and forward-thinking companies (Business for Nature, n.d.). It calls on governments to take action to reverse ecosystem destruction this decade and work to accelerate business action to protect nature and support the implementation of the post-2020 Global Biodiversity Framework by organizing dialogues between business and national governments (Convention on Biological Diversity, n.d.). We Value Nature was a three-year campaign that aimed to make valuing nature the new normal for businesses across Europe by offering online training and resources, as well as organizing events and partnerships on valuing nature (We Value Nature, n.d.). The True Value of Food Initiative (TVFI) was launched at the United Nations Food Systems Summit (UNFSS) in 2021 to advocate for TCA (True Value Food, n.d.). It is a multistakeholder collaborative initiative including, among others, the UNFSS Scientific Group, FAO, the Global Alliance for the Future of Food, UNEP, the World Business Council for Sustainable Development, and Rabobank. The stated aims of the initiative include raising awareness on the hidden costs of agrifood systems, amplifying TCA tools and resources, and connecting interested governments with implementation partners.

There are also efforts to set up ready-reference tools that can provide impact assessments for the agrifood sector. One such example is the How initiative, which offers a software-as-a-service platform designed to analyse the environmental and social impact of agrifood products (How Good, n.d.). The initiative uses eight core metrics (GHG emissions, biodiversity, processing, blue water usage, labour risk, land use, soil health and animal welfare) spread across the four capitals to generate a holistic sustainability profile for a business. The analysis and evaluation conducted by HowGood is backed by a range of data sources from peer-reviewed research to databases of government agencies.

3.1.2 Insights into the state of true cost accounting initiatives and resources

A review of the existing TCA landscape shows that the existing resources cover a significant amount of ground for applicability in the field of agrifood business. However, in the absence of a ready-reference database and tool, applying TCA in agrifood businesses is bound to be a tailored exercise rather than an algorithmic one. This also follows from the inherent complexity of the agrifood sector, where a one-size-fits-all solution cannot cater to the wide range of businesses involved. Nevertheless, an assessment of the impacts, costs and benefits of agrifood businesses can draw on the extensive groundwork that has been conducted under various TCA initiatives.

The areas in which TCA is already well developed and has numerous resources available for agrifood businesses can be broadly summarized as follows (also see Figure 6):

- **Framework/principles.** The TEEBAgriFood Evaluation Framework is the foundational overarching framework that guides individual developments in TCA. It sets out the fundamental principles of TCA, aiming at a quantifiable evaluation of agrifood systems. The core principle here is the systems-thinking approach to eco-agrifood systems. The framework establishes a link between how agrifood systems work at different levels in the economic environment and their dependency on natural, human and social capital.
- **Guidance.** There are resources that offer guidance on procedure and set out the four phases of TCA implementation: i) framing the purpose, ii) describing the relevant eco-agrifood system and setting the scope of the assessment, iii) measuring impacts and assigning a value and iv) taking action based on the results of the TCA assessment. The guidance outlines the differences between stocks, flows, outcomes and impacts. It also includes parameters that characterize a business as sustainable or non-sustainable, such as GHG emissions, natural resource use, water use, land use and effects on biodiversity (Capitals Coalition, 2020; Eigenraam *et al.*, 2020; Soil & More Impacts and TMG – Think Tank for Sustainability, 2022).

While existing resources have made significant progress in this field, there are still areas where further development is needed to fully realize the potential of TCA in the private sector. These can be summarized as follows:

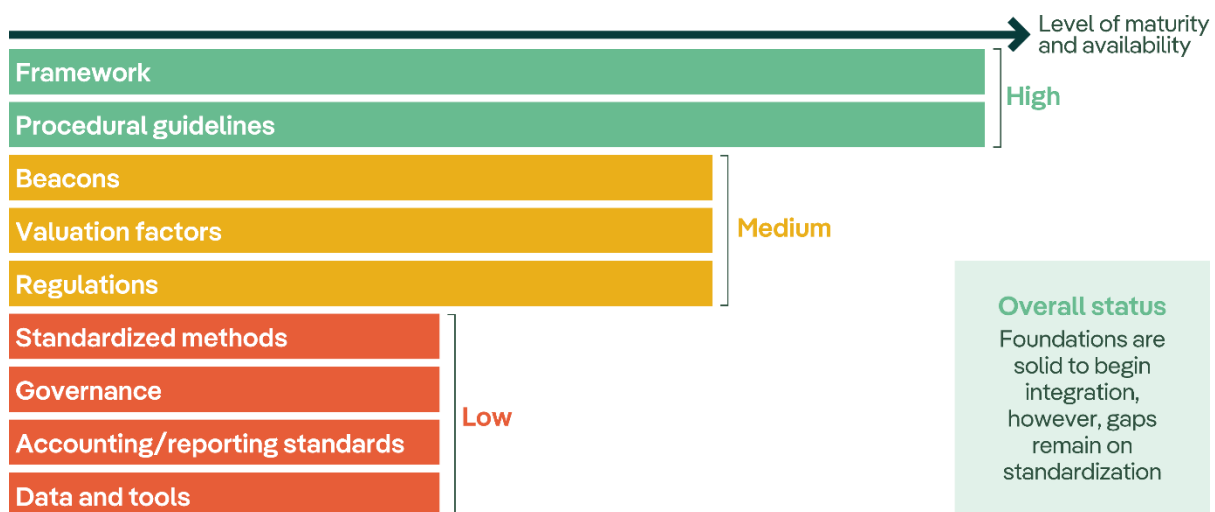
- **Methods.** While some methods⁶ for applying TCA have been developed, they are mostly used by consultancies and not readily applicable to businesses. This is especially true for social and human capital analyses. There is a similar lack of development in terms of evaluation factors, although there has been some progress in this area with recent publications of evaluation factors (see, for example, CE Delft [2018], True Price [2023] and Sustainability Impacts Metrics [n.d.]). The development of TCA methods by different initiatives has, indeed, led to the incomparability of TCA results across different initiatives. This makes it difficult for stakeholders to compare and evaluate different TCA assessments

⁶ The term “methods” refers to a collection of methodological elements that define how impacts and dependencies are measured, evaluated and reported. Methods include sets of indicators (such as emissions to air, water eutrophication, resource use), the pathways defined for each indicator (such as GHG emissions affecting the agriculture sector) and the evaluation technique to be used (such as damage cost approach or mitigation cost approach). The methods should also establish other principles and rules for calculation, such as the baseline, the rules of additivity across pathways and indicators, and the rationale for exclusions.

and can undermine confidence in the usefulness and reliability of TCA as a decision-making tool.

- **Corporate governance and strategy.** Another significant gap in the existing resources pertains to the absence of research and guidance on corporate governance, strategy and performance models that include natural, social and human capital accounting and impact valuation in general. This creates a challenge for businesses that seek to incorporate the measurement and valuation of all types of capital in resource allocation, costing, risk assessment, project appraisal and product development processes. The same is true for the financial sector, where few resources are available showing businesses how to use TCA in decision-making.
- **Reporting guidelines.** Guidelines are currently lacking for reporting on the implications of impacts. As a result, leading companies use different formats, including added-value or integrated impact statements, IP&L and separate natural capital accounting and impact valuation results. While a variety of formats can be beneficial, there is a need for standardized reporting guidelines to ensure that companies offer clear and consistent messaging to stakeholders.
- **Data and tools.** From the review of TCA initiative and resources, it is apparent that TCA efforts have so far neglected to develop consolidated data, open-source databases and other tools. These will be critical for the mainstreaming of TCA.

Figure 6. Level of maturity and availability of different elements required for true cost accounting



Source: Authors' own elaboration.

3.2 Early efforts at integrating true cost accounting into business management and finance

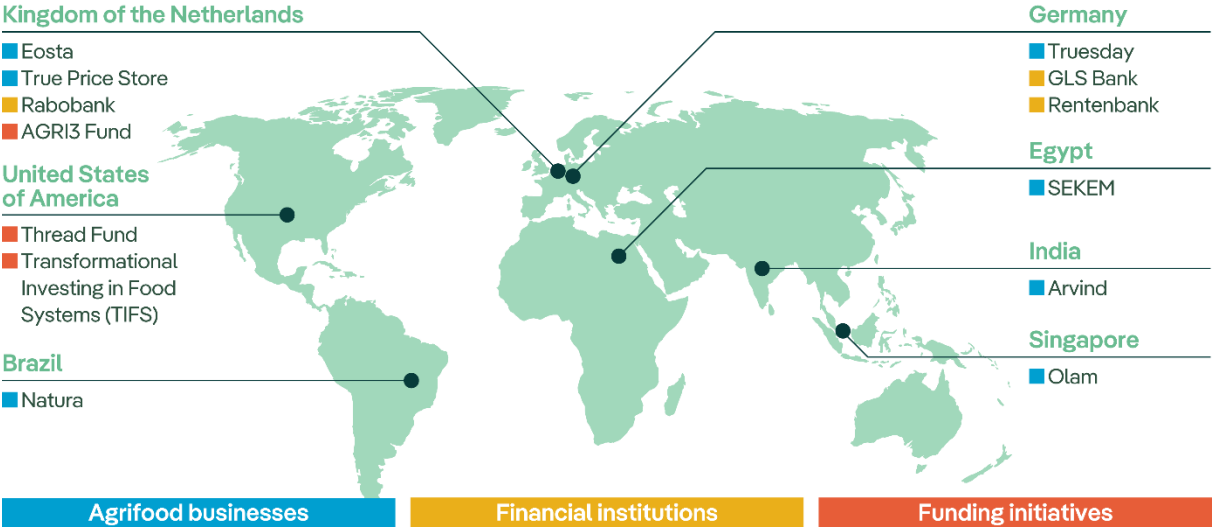
In this age of multiple crises (climate, biodiversity, food crisis, public health and so on), given the increasing urgency of quantifying the externalized costs of businesses, particularly those in the agrifood sector, some have started taking first steps towards accounting for the true costs and value of their supply chains. This can include the integration of TCA into management practices and decisions, but can also go further to externally communicate true

costs and values. Some businesses have gone as far as making TCA a primary component of their business model and communication strategy. Cases from the financial sector show that the concept of TCA can inform investment criteria and loan conditions and be used to assess the impacts and holistic value of investments.

3.2.1 Beacons of true cost accounting in the agrifood business sector

The following section lists examples of the application of TCA or elements of TCA to exemplify the current scale and status quo of TCA in the private and financial sectors. An overview can be found in Figure 7. This section highlights these early efforts showcasing how TCA or similar frameworks have been used by businesses and investors on different scales (public, private, regional and global businesses and investors on a start-up, growth and institutional scale).

Figure 7. Examples of true cost accounting pioneers from different parts of the world



Source: Authors' own elaboration.

Business sector

The following examples describe different ways in which businesses make use of TCA. What connects the different efforts is the motivation to increase transparency and reduce the business's negative impacts on society and the environment.

- **Eosta**

Eosta is an agrifood business based in the Kingdom of the Netherlands (Eosta, n.d.). It is a distributor of fresh organic fruits and vegetables operating under fairtrade conditions. It has its own cost/benefit accounting system called Nature & More, with which it keeps a track of the different costs the business incurs and the benefits it delivers in terms of the four capitals. Customers can access the website and enter the three-digit code of the producer to learn about the quality of certain products and access background information about the growers and their ecological and social commitments. Eosta describes the impacts of its business using the Sustainability Flower framework, which was developed by the International Association & Partnership of Ecology and Trade in 2009 to monitor, manage, market and monetize the sustainability impacts of an organization or production process (Nature & more, n.d.). This includes information on metrics such as soil saved from degradation, reduction in carbon dioxide emissions and water conserved.

In 2017, Eosta, together with the consultancy firms EY and Soil & More, performed an assessment of nine fruits and vegetables, concluding that based on true costs, conventional, non-organic products are more expensive than organic produce (Eosta, Soil & More, EY, Triodos Bank & Hivos, 2017). Based on their accounting system, the positive impact of Eosta can be described in terms of the following three metrics: more than 100 000 tonnes of soil saved, more than 10 000 tonnes of carbon dioxide emissions reduced and more than 2 billion litres of water saved compared with conventional production systems.

- **Olam**

Olam International is an agrifood business that supplies food ingredients, feed and fibre to over 20 000 customers worldwide (Olam, n.d.). It has operations in more than 60 countries, including farming, processing and distribution, and a sourcing network of 5 million farmers. Olam was founded in Nigeria, but is currently headquartered in Singapore. Olam's Finance for Sustainability Function (F4S) has developed the Olam integrated impact statement (IIS), a tool for multicapital accounting that allows Olam to disclose its impact on financial, natural, human, social, manufactured and intellectual capitals in the strategy section of its annual report. The IIS includes a multicapital P&L statement, a balance sheet and a risk and opportunity statement. Olam uses it to measure and value its annual multicapital flows and accumulated multicapital stocks based on three capitals – natural, human and social. Olam's 2021 Annual Report depicts its framework for natural capital accounting, consisting of the three steps of scoping, impact valuation, and risk and opportunity statement (Olam Group, 2021).

The natural capital P&L statement reports on performance, including the positive and negative impacts of Olam's operations. Like a conventional P&L, it shows i) enhancements (revenue) and ii) deteriorations (expenses). The enhancements section focuses on the key activities undertaken by Olam that led to a positive impact on natural capital or natural capital contributions to business, while the deteriorations section focuses on the negative externalities arising from its operations.

The integrated balance sheet accounts for the natural capital dependencies of the organization and its value chain on the stock of assets. Like a conventional balance sheet, it includes assets and liabilities. However, unlike a traditional balance sheet, it is a forward-looking statement and involves looking at asset values in the future. The assets section focuses on assessing and quantifying potential future natural capital assets on which Olam's operations depend, while the liabilities section addresses ongoing spending or investments aimed at avoiding negative externalities. Olam's 2021 Annual Report contains an illustration of Olam's natural capital balance sheet (Olam Group, 2021).

The IIS enables Olam to better account for the long-term sustainability of these types of capital, which is crucial to future financial returns. As companies are increasingly required to disclose the externalities of non-financial capital, Olam sees its IIS tool as an essential step in preparing for the future reporting of non-financial capital. By monetizing, consolidating and reporting externalities alongside conventional financial figures, Olam can account for these costs, better understand future risks and manage them promptly.

- **Natura**

Natura is a publicly traded agrifood business company based in Brazil that is focused on plant-based vegan cosmetic products (Natura & Co, n.d.). It is part of the Natura &Co Group, which

is the world's largest company with a B-Corp certification.⁷ The company has adopted annual IP&L accounting, comprising a comprehensive materiality assessment with a view to prioritizing the issues that are most relevant in terms of their impact on the business, communities and the environment. Based on the IP&L methodology, Natura contributed a net positive societal value of BRL 18 billion (USD 3.2 billion) in 2021. This figure was mostly based on social and human capital and a sales volume of BRL 12 billion (USD 2.2 billion). While generating a societal return of BRL 1.5 billion (USD 269.2 million), Natura still generated a net negative natural capital impact value of BRL 400 million (USD 71.8 million). Natura is committed to addressing this deficit by increasing its preservation area in the Amazon region to 2 million hectares and by sourcing ingredients from 40 traditional communities (Natura and Valuing Impact, 2022). The numbers related to natural capital go on to show how much more work still needs to be done.

- **Tuesday**

Tuesday is a German coffee brand that has been a pioneer in putting true cost theory into practice. In addition to providing a coffee with positive impact, the company aims to raise awareness about this alternative economic model that takes externalized costs into account. The company avoids, reduces or remedies the usual ecological and social damage of coffee cultivation in terms of low wages, climate change and soil pollution through an additional price paid by customers. Tuesday collaborates with Netherlands business consultancy True Price to determine the true price of its products. Tuesday is also part of a larger association of coffee businesses called the Futureproof Coffee Collective, which aims to pioneer true pricing in the coffee industry.

- **True Price Store and supermarket with true prices**

The year 2020 marked the opening of the world's first True Price Store and a supermarket where consumers can see and pay the true price for a wide range of goods. For over a month, customers of De Aanzet, a supermarket located in the heart of Amsterdam, paid the true price for fruits, vegetables and bread. In the same year, the popular German discount supermarket chain PENNY started an initiative in cooperation with the University of Augsburg to raise awareness about the true cost of food products at one of its stores in Berlin. It calculated the true prices of a set of own-branded food products (apples, bananas, potatoes, tomatoes, mozzarella, gouda, milk and mixed meat) and listed these alongside the market prices of the products on the labels. It found, on average, a gap of 62 percent between the true costs of conventionally produced foods and their retail prices. In the case of organic foods, the gap is 35 percent.

- **SEKEM**

SEKEM is an international community initiative focused on holistic sustainable development. It is located near Cairo, Egypt. It produces, processes and markets organic and biodynamic agrifood products. SEKEM assesses its sustainability performance by evaluating 64 ecological indicators and publishes the results in an annual report. It has created its own Vision 2057 framework for sustainable development and aligns its KPIs with the SDGs. SEKEM has converted more than 2 100 hectares of land to organic or biodynamic agriculture, planted

⁷ B Corp certification attests to the fact that a business meets high standards of verified performance, accountability and transparency on factors ranging from employee benefits and charitable giving to supply - chain practices and input materials (see <https://www.bcorporation.net/en-us/certification> for more information).

around 600 000 trees and sequestered 551 million tonnes of carbon dioxide. All of this did not prevent its herbal tea brand achieving a 77 percent market share in Egypt as of 2021, far overtaking major multinational brands. As part of its Vision 2057, SEKEM aims to generate EUR 19 million (USD 20 million) worth of accumulated net present value from carbon sequestration alone (Capitals Coalition, 2023b).

- **Arvind Ltd.**

Arvind Limited is an agrifood business involved in cotton production and processing and is one of the largest textiles manufacturers and exporters in India. Cotton is the raw material for 80 percent of its products. A capitals assessment with the aim of improving the sourcing and transformation of the carbon production sector revealed that cotton produced under the Better Cotton Initiative⁸ yielded numerous benefits. The assessment found that the human health costs associated with Better Cotton Initiative (BCI) cotton farming were USD 0.009 per kg lower than with conventional farming. In terms of ecosystem damages, the intensity of BCI practices was found to be USD 0.31 per kg lower than conventional cotton farming. This translates into a 49 percent reduction in damage to human and ecosystem health due to BCI practices (Capitals Coalition, 2023a).

Financial sector

The few examples from the financial sector that support sustainable agrifood businesses that work to reducing their externalized costs are summarized below. Businesses can use TCA to fulfil the criteria set by these financial institutions for financial incentives and investments.

- **GLS Bank**

GLS Bank, a German bank, is a first-of-its-kind sustainable bank that invests its customers' deposits exclusively in sustainability-related projects. The bank follows strict criteria and principles to select projects and initiatives that it can finance and deposits it can accept. Among its affirmative criteria is the use of renewable energy, while exclusion criteria include pesticide use and industrial livestock production. GLS Bank publishes yearly reports detailing its progress on 50 sustainability goals based on specified indicators. It considers the use of synthetic chemical fertilizers to be the main cause of soil degradation and biodiversity loss in rural areas. Through the strict exclusion of conventional agrifood systems from its investment and financing mechanisms, the bank contributes to the transformation of agrifood systems as whole. A statement by GLS Bank in 2020 said that it saw the internalization of external costs as the biggest lever for a successful transformation to a sustainable economy (GLS Bank, 2020a, 2020b). In 2017, Soil & More carried out a TCA analysis for three organic farms that are partners of GLS Bank, taking into account factors such as CO₂ emissions, CO₂ sequestration, water consumption and pollution, erosion, soil structure, biodiversity, energy consumption, transport of goods to consumers, educational work and health (Bandel, 2018). The results were compared with those generated for a conventional farm, based on a low-input/high-output modelling scenario. The analysis showed that the organic farms generated on average a positive net benefit of around EUR 720 (USD 770) per hectare, whereas the conventional comparative farms had net costs of EUR 3 670 (USD 3 920) per hectare, on average. The assessed difference is thus almost EUR 4 400 (USD 4 700) per hectare. From

⁸ The Better Cotton Initiative is the world's leading sustainability initiative for cotton, covering the sustainable growing of cotton, sustainable working and living conditions for farmers, and empowering women and communities. It claims to cover 20 percent of the world's total cotton production.

an overall societal cost perspective, a conventional farm would therefore be unprofitable (Bandel, 2018).

- **Rentenbank**

Rentenbank is the German funding agency for agriculture and rural development. It operates under the supervision of the German Ministry of Food and Agriculture, in consultation with the German Ministry of Finance. The bank says it promotes innovation and sustainable investments through its financing decisions. Furthermore, since 2021, Rentenbank has provided grants under the German Ministry of Food and Agriculture's "Investment Programme for Agriculture" for environmentally and climate-friendly farming practices. Organic farming businesses receive loans at an interest rate up to 1 percent lower than that offered to conventional farms. Similar conditions apply to the acquisition of farm machinery, depending on their intended use. Some of the agrifood businesses supported by Rentenbank include a carbon-neutral greenhouse vegetable farm, an organic milk farm and a solar-powered free-range henry.

- **Rabobank**

Rabobank is a financial institution that grew out of the agrifood sector. It started as cooperative bank movement founded by Netherlands farmers. Its business model follows the core company strategy, known as the Banking for Food strategy. Rabobank supports food production that uses fewer resources, reduces GHG emissions and pays fair prices to farmers. It offers many sustainable finance products aimed at helping transform the current agrifood systems in the Kingdom of the Netherlands, with plans in the pipeline to expand into countries such as Mexico, Uganda, Kenya, Honduras, Colombia, Peru, Indonesia, India and Viet Nam. Mechanisms include sustainability-linked loans, blended finance solutions (in cooperation with the AGRI3 Fund), the Rabobank Impact Loan and special financing programmes for smallholder farmers. The Impact Loan offers discounts on interest rates for businesses that can demonstrate sustainable or social impact. The bank tracks the efforts of the businesses based on the Science Based Targets initiative – Forests, Land and Agriculture (SBTi FLAG) benchmark. Furthermore, Rabobank uses different tools and indicators to assess and incentivize the compliance of the borrowing agrifood businesses. These include Biodiversity Monitor, the Open Bodem Index, Rabo Trace and carbon foot printing tools, together with the Rabo Carbon Bank.

Investment networks and funding initiatives

- **Transformational Investing in Food Systems (TIFS)**

TIFS is an impact network and allied initiative of the Global Alliance for the Future of Food. The TIFS network seeks investments that contribute to just and sustainable food systems. To help investors and entrepreneurs interested in holistic approaches to investment screening, TIFS and its partners have prototyped and tested investment screening tools. These help investors ensure that their investments are doing good in the world and not causing harm. One of the tools is the Systems Investment Assessment, which applies the TEEBAgriFood framework and the Global Impact Investing Network's Core Characteristics of Impact Investing to assess the intended systemic impacts of funds and their capacity to deliver.

- **AGRI3 Fund**

The AGRI3 Fund is an investment facilitator for deforestation-free sustainable agriculture and land use. It is a public-private partnership involving UNEP, Rabobank, the Dutch Entrepreneurial Development Bank (FMO) and IDH, the Sustainable Trade Initiative, which aims to “unlock” USD 1 billion to fund sustainable land-use practices at scale. The fund aims to mobilize public and private capital, including from commercial banks, development finance institutions, impact investors and institutional investors. It pursues multiple objectives, including providing credit-enhancement tools to catalyse private funding for qualifying initiatives, stimulating those that propagate best practices to lower the footprint of agriculture, generating substantial, measurable environmental and social impact, and improving rural livelihoods by treating farmers as priority beneficiaries.

- **Thread Fund**

The Thread Fund is an initiative working on systemic transformation at the nexus of food, finance and philanthropy. Its primary focus is to improve market conditions for agrifood businesses involved in sustainable, agroecological food production by investing multiple forms of capital to generate social and environmental returns in addition to financial returns.

3.2.2 Insights gained from early efforts to account for externalities

In this section, we summarize findings and insights from our own search for TCA application by businesses and investors in the agrifood sector, as well as previous landscape analysis on TCA and related fields.

The current application of TCA in the agrifood sector can be broadly grouped under the following categories:

- assessing the impact of conventional agricultural and associated practices and comparing these with alternative practices;
- evaluating the costs of transforming agrifood systems and comparing these with the costs incurred due to inaction;
- identifying solutions that systemically address the underlying issues of the current dysfunctional agrifood systems;
- monitoring progress on initiatives aimed at reducing negative impacts and improving the value created for nature and society; and
- encouraging the implementation of alternative solutions to existing problems by quantifying their benefits.

Businesses are increasingly engaging in the measurement of sustainability issues. In very few cases is this a TCA assessment in the strictest sense, however. Most companies use input and/or output indicators based on standards like the Global Reporting Initiative (GRI)⁹ to report on their sustainability performance. For example, the success of a capacity-building programme for farmers is often assessed based on the amount of money and resources

⁹ The GRI is an independent international organization that helps businesses and other organizations take responsibility for their impacts, by helping them communicate those impacts in commonly understood terms.

invested in it and the number of training hours provided, rather than the effects it has on the community and nature. Only a small number of agrifood businesses analyse the outcomes and effects of their actions, while even fewer assign a value. This trend is likely the result of an incomplete understanding of their significance, as well as the difficulties and obstacles related to data and methodology, particularly when it comes to assessing impacts. TCA goes a step further by assigning value to reported impacts in clear financial terms, which can be integrated into balance sheets.

Although input and output data are necessary to facilitate TCA, most companies lack a comprehensive database for evaluating their performance in terms of natural, social and human capital. The accuracy of TCA assessments relies greatly on the accessibility of sustainability data. However, data availability can pose a significant challenge. Throughout history, accountants have refined their techniques for recording, compiling and interpreting financial data, with companies investing considerable resources in staff and systems to support these efforts. In contrast, sustainability data are often gathered under tight budgets, using spreadsheets rather than dedicated tools and only a limited number of personnel. Hence, developing robust methods to estimate corporate TCA data is just as vital as collecting data directly from the source.

It is also worth noting that businesses often start their impact valuation journey by assessing their impacts and risks in relation to natural capital, especially Scope 1 and Scope 2 GHG emissions. This is likely due to the fact that resources, especially services and tools, are widely available and consumers are aware of the urgency of the climate crisis. The main criteria commonly used by businesses and financial institutions in this regard are GHG emissions, biodiversity, water use, payments to farmers and labourers, and health impacts. Other criteria or indicators, such as carbon sequestration in soil, are also being used more and more. Here, the main comparisons presented by agrifood businesses in their true cost assessments are between organic and biodynamic or conventional agriculture.

The above examples of agrifood businesses and financial institutions that have informed their decision-making on sustainability and social impact with data provide a favourable entry point for TCA in the agrifood sector. Broadly speaking, when considering two crucial factors that influence decision-making, namely transparency and integration with business operations, the majority of business applications are still in the early stages of development and effectiveness. See Figure 8 for a classification of the different progress levels of integrating TCA into a business.

Figure 8. The five stages of integrating true cost accounting into business and finance decision-making

	STAGE 1 Awareness	STAGE 2 Piloting	STAGE 3 Commitment	STAGE 4 Decision making	STAGE 5 Transformation
Definition	Raising awareness in the company and along the value chain	An implementation effort at small scale	Committing to inform business strategy with the pilot results	Informing decision-making of different business units with TCA	Full integration of TCA into the whole business, value chains and communication with stakeholders
Aims	Creating an enabling environment	Establishing the proof of concept	Impact valuation of individual units or for different capitals	Aligning management decisions with TCA results	A functioning sustainable business model and value chain
Mandate	Familiarising with TCA, participating in awareness training and events	Conducting studies, publication, consultation	Identifying business units, assessment and valuation, internal report	Financial and non-financial reporting in annual report, assessment and evaluation	Integrated reporting, annual report with integrated profit and loss statements
Examples	<ul style="list-style-type: none"> ▪ Lammsbräu ▪ Community Markets for Conservation ▪ The Common Market 	<ul style="list-style-type: none"> ▪ True Cost Initiative (HiPP, Lebensbaum, Martin Bauer, GEPA) ▪ Penny Study 	<ul style="list-style-type: none"> ▪ Arvind Ltd. ▪ SEKEM 	<ul style="list-style-type: none"> ▪ GLS Bank ▪ Eosta 	<ul style="list-style-type: none"> ▪ Natura ▪ Olam ▪ Truesday

Source: Authors' own elaboration.

A common thread in the cases featured above is that they demonstrate the feasibility of business success, despite not following the conventional financial and business blueprints. It is evident from the wide range of businesses and financial institutions that are working on measuring, reporting and verifying sustainability and social impact that an accounting of externalities is increasingly popular as well as urgent. With an increasing number of banks formulating criteria for investments that favour sustainable agrifood businesses, it is clear that the scope is widening for a transformation of agrifood systems.

However, in the absence of a standardized methodology for accounting for the impacts and co-benefits and their quantification in tangible terms, there is a risk that some businesses may not receive appropriate recognition for genuine sustainability efforts, while others may engage in greenwashing by dedicating a small portion of their budgets and resources to sustainable activities while presenting these as indicative of the sustainable nature of the entire business. This can result in confusion for consumers and stakeholders, who may be unable to distinguish between genuine and false claims.

In some cases, where the business has, in fact, presented the cost of products by incorporating the externalities into the dollar price, the resulting high price of the products hints at the role of government support in bringing down prices for consumers. This is not possible as long as TCA remains niche and as long as a standardized TCA methodology has yet to be developed. This further strengthens the case for mainstreaming and formalizing TCA.

4 Mainstreaming true cost accounting for business and finance: barriers to and enabling mechanisms

Our overview of the efforts of various actors in the agrifood sector to improve traditional accounting by including other types of capital in their internal or external reporting provides a clear insight: actors in agrifood systems are increasingly aware of the limitations of current accounting methods. Businesses, financial institutions, policymakers and intergovernmental agencies are experimenting with innovative accounting efforts to underpin and guide steps towards sustainability. All these attempts are steps in the right direction in view of the growing urgency of transforming agrifood systems. Although these efforts are driven by positive intent and spur a positive change in agrifood businesses, they beg the question of what steps are necessary to change the regulatory framework of accounting. This chapter discusses potential barriers to and enablers of mainstreaming TCA in the private sector, as well as the potential roles of different actors in creating an enabling environment for TCA.

4.1 Barriers to the adoption of true cost accounting at scale

Based on the lessons and insights that can be drawn from the different methodologies around TCA and the early efforts of the private sector to use TCA for decision-making, the following barriers to mainstreaming the adoption of TCA can be observed:

- **Inadequate data.** As shown by the examples in previous sections, a variety of approaches and methodologies are being used to account for externalities in agrifood businesses. However, the data required to perform the accounting are not always available or, if available, not always consolidated. This has to do with the hitherto voluntary and decentralized development of TCA.
- **Lack of standards.** Currently, there is no agreed and standardized way of performing TCA and calculating the true cost of a product. At present, it is up to each business to develop and apply its own methods for assessment, valuation and reporting, leading to a high degree of complexity, resource requirements and expense and a low degree of comparability. This raises the risk of greenwashing due to a lack of clarity around the methods used and the selection of which TCA outcomes to reveal and which to conceal.
- **Lack of easy-to-use tools.** The absence of a ready-reference tool that can be used to quickly determine true costs also hampers the mainstream adoption of TCA. The significant expenses that companies face in establishing TCA, either by acquiring in-house expertise or outsourcing to a third-party service provider create a barrier, especially for newcomers. This also arises from the previous two barriers – the lack of data and standardized methodology.
- **Lack of obligation.** Even if adequate data are collected, collated and consolidated and an easy-to-use tool is developed that follows an agreed standard of TCA, we are unlikely to see the mainstreaming of TCA beyond individual companies as long as it remains voluntary to disclose TCA results. This reduces the capacity of TCA to bring about change, as the TCA information is not available to external stakeholders. In the absence of mandatory reporting of impacts and dependencies on environmental, social and human capital, no business wants to be the first to disclose their impacts, thereby risking customer or investor

backlash. Obliging companies to account and report will introduce transparency about every business's impacts, dependencies and associated risks.

- **Lack of benchmarks.** In a world where the extent of externalities in the agrifood businesses is not yet common knowledge, data availability, standardization of methodology, a reference tool and mandating the accounting and reporting of externalities need to be accompanied by benchmarks. A benchmark can make it easier for investors, consumers and the general public to assess whether a company's external costs are high or low relative to its competitors. The benchmarks could be linked to global developmental or mitigation goals and targets.

4.2 Actors and enablers that can drive true cost accounting adoption at scale

The adoption of TCA at scale means more actors and stakeholders in the agrifood systems use TCA to evaluate, identify and implement solutions that can transform the agrifood systems. These decision-makers operate at different levels and different stages of the agrifood system. Hence, the application of TCA can have different manifestations for different enablers, as described in the scenarios below where TCA application is mainstreamed in the agrifood sector:

Farmers. Farmers are the primary decision-makers when it comes to how agrifood systems function. Notably, smallholder farmers provide up to 80 percent of the food supply in Asia and Africa. Knowledge of TCA and its methodologies empowers farmers to track the impacts of different farming activities and find solutions for existing challenges in the agrifood sector. With legislation in place under which farmers must pay penalties for pollution resulting from their activities, TCA gives farmers an overall picture of the negative as well the positive externalities of their activities. An example of a positive externality that farmers can use to gain incentives is the carbon sequestered in farm soils through diversified agroecological practices.

Businesses. Agrifood businesses employ TCA to assess all their major value chains at corporate level, thereby helping them understand how external impacts cause risks that require mitigation, as well as how businesses can create value across all types of capital. The information gained from TCA assessments is then used across different departments to inform, for example, sustainable sourcing, risk management, finance and human resources. Agrifood businesses account for and disclose their impacts, dependencies and true cost in a detailed and standardized manner in their annual reports. They follow International Reporting Standards and TCA frameworks, which outline how companies should disclose their impacts, dependencies and true cost across natural, social, human and produced capital. Annual reports provide information on how the company's strategy aligns with international agreements on climate, biodiversity, environment and sustainable development.

- **Policymakers.** Policymakers use the results of TCA assessments to understand and push for agrifood solutions that reduce impacts and increase benefits for the environment and society. This catalyses fundamental change in the way policymakers perceive business and growth, leading to innovative models of agrifood business ownership (for example, community-based business). Through subsidies and taxes informed by TCA, policies incentivize sustainable business models and agricultural production systems. Furthermore, governments employ TCA to assess progress in relation to national and international sustainability targets.

- **Retailers.** Retailers are closest to the consumers in the supply chain, so their decisions dictate how sustainable agribusinesses fare on the ground. TCA assessments and the resulting awareness of impacts are making retailers prioritize sourcing from suppliers that have low carbon footprints, use sustainable farming practices or treat their workers fairly.
- **Consumers.** Consumers are the decision-makers that directly influence the rise or fall in demand for sustainably produced agrifood products. Consumers increasingly base their purchasing decisions on an assessment of true costs and prefer more sustainably sourced products (demand-based).
- **Investors.** Investors are using TCA to make investment decisions and develop lending policies based on a systemic assessment of value and risks. TCA provides investors with information on business resilience that goes beyond conventional accounting methods that are inadequate for assessing non-financial risks.

To achieve a world in which TCA informs and contributes to sustainable agrifood systems, it will have to be mainstreamed in the private and financial sectors. This cannot be achieved in isolation by a single set of actors; it needs complementary contributions from all stakeholders in agrifood businesses. The following section (including Figure 9) provides an overview of the main actors and their role in mainstreaming TCA.

Figure 9. The role of the different actors in mainstreaming true cost accounting



Source: Authors' own elaboration.

4.2.1 The role of policy

One of the main issues around the acceptance and mainstream adoption of TCA is that of consumer prices. Does the quantification of high *true* costs of agrifood products mean that consumers have to pay correspondingly high prices? The answer to this question partially depends on how policy measures support the accounting of true costs. The role of policy can be explained using the example of current agricultural subsidies. In the current policy scenario, worldwide, USD 540 billion is fed into agrifood systems as subsidies, which ultimately leads to relatively low prices for the consumer. However, when seen from a systems perspective, the overwhelming majority (90 percent) of these subsidies leads to impacts that are harmful to the

climate and the environment (Carrington, 2021; FAO, UNDP and UNEP, 2021). Repurposing such subsidies to help agrifood businesses transform their supply chains would lower the price of sustainably produced agrifood products.

By subsidizing sustainable production pathways, products can be made available to consumers at a lower price in the short term, while in the long term, the externalized costs can be avoided altogether. Furthermore, in addition to avoiding negative impacts, policy measures need to incentivize the co-benefits of sustainable agribusiness. To ensure smooth implementation of TCA across different sectors, policy support must facilitate its integration into existing and upcoming sustainability and impact reporting mechanisms, such as the EU Taxonomy and CSRD (Kadija, 2022; European Commission, 2022a). Such mechanisms and directives need to be properly supported by developing appropriate standards and indicators for their successful implementation.

The recent approval of the Kunming-Montreal Global Biodiversity Framework (GBF) by 196 countries represents a positive step towards enhancing reporting obligations on sustainability challenges resulting from business activities. Target 15 of the GBF commits governments to requiring all large business and financial institutions to assess and disclose their risks, impacts and dependencies on biodiversity, while Target 18 promises comprehensive reform of environmentally harmful subsidies.

Policies also play a crucial role in safeguarding consumers against deceptive practices and in supporting transparency and accurate consumer information on the impacts and true cost of food through regulation. Providing consumers with accurate and reliable information helps them make informed purchasing decisions and supports sustainable products and businesses. It is important to note here is that policy measures based on TCA must be implemented fairly across different sectors.

4.2.2 The role of accounting standards and other standard setters

The role of standard setters in mainstreaming TCA concerns the method, accounting and reporting. Whenever businesses claim to be sustainable or to conform to a particular standard, they always refer to an internationally agreed standard (for example, those of the ISO, the International Organization for Standardization). On the one hand, this makes communicating the way a business conducts itself more transparent and, on the other, it serves as a handy reference point for external stakeholders.

Standard setters must prioritize the rapid advancement of agreed methods and standards to ensure the credibility, comparability, transparency and robustness of TCA. Standardization is essential to establish a level playing field and foster a more balanced, transparent and objective approach to TCA. Standardization requires several conditions (Gemmill-Herren, Baker and Daniels, 2021). First, a clear definition of the pathways connecting drivers to the relevant impacts and their value is needed. Second, a clear definition of dependencies and business value pathways is required to understand how internalizing externalities will derive more added value for businesses. Third, sets of valuation factors in line with defined indicator lists of the standardized method are crucial. Fourth, an integrated multicapital accounting and reporting framework is essential. Lastly, standardization should support integration across business functions, units and applications (such as product development, strategic guidance, investment appraisal, resource management and risk assessment).

The implementation of TCA in the agrifood business sector would have to be supported by international standards. An example of such a standard is ISO 14097, published in 2021. This relates to the double materiality of climate change: how it affects the value of the company and how company activities contribute to climate change. The framework for this standard describes the principles and requirements for assessing and reporting investments and financing activities related to climate change and complements the analysis of climate risks conducted under the TCFD.

Another positive development is the recommendations of the Taskforce on Nature-related Financial Disclosure (TNFD), which are expected by September 2023. While not a standard, the TNFD will provide a global framework for nature risk management and disclosure that is designed to inform relevant standards, including those from the ISSB and the GRI.

How such standards and frameworks are implemented by businesses remains in the remit of the individual agrifood businesses and business alliances.

4.2.3 The role of businesses and business alliances

Agrifood businesses and business alliances are the most significant actors when it comes to how TCA is applied at business level. Businesses and business alliances can influence the mainstreaming of TCA in two ways: (1) by implementing internal or external voluntary guidelines on impact reporting in the absence of a mandatory reporting mechanism and (2) by directing private investments to support transformative practices and the application and further development of TCA.

The contribution of businesses and business alliances to TCA can also include the development of consumer information, such as a TCA labelling, advancing the concepts of the NutriScore and the PlanetScore. This would enable prospective consumers to understand the data better and make more informed purchasing and dietary decisions.

The mainstream operationalization of TCA would also require an easy-to-use tool that could be used to establish a standard operating procedure for accounting in this sector and possibly be extended to other sectors. This would help to reduce the financial and human resources required to collect data and perform true cost calculations.

Private capital flows represent the most significant lever of change in agrifood systems, amounting to as much as USD 1.5 trillion per year (Jacobs, 2022). Various studies have concluded that private-sector investments play a key role in influencing how agricultural systems function and whether innovations succeed. Hence, in order for the use of TCA to be adopted in mainstream agrifood businesses, an enabling financial support environment is required. Businesses investing in TCA implementation can do so with different motivations. Some may do it as part of carbon insetting, while others may do it with the intention of establishing better relations with producers and gaining favourable terms for acquiring sustainably produced agrifood products. Research also reveals numerous reasons from a purely financial perspective for addressing environmental impacts, climate change, land degradation, food insecurity and poor health outcomes, building a strong case for TCA. Furthermore, agrifood businesses can present themselves as beacons of change for businesses in other sectors by adopting TCA. Recognizing and incentivizing such efforts through financial and credit rating agencies could further promote the adoption of TCA.

4.2.4 The role of financial institutions and credit rating agencies

As discussed, so far, just a few banks have integrated non-financial impact measurement, reporting and verification into their business models. The broader spectrum of financial institutions and credit rating agencies needs to follow suit. This is essential to complement the efforts of other aforementioned drivers for the transformation of agrifood systems.

The role of financial institutions in mainstreaming TCA is primarily in the form of lending policies that favour sustainable agrifood businesses (GLS Bank, 2020b; 2020a; True Cost Initiative, 2020). The evaluation required for such lending decisions will be based on TCA, including the “true costs” of financial market requirements, expanding the purview of agrifood investments beyond inputs, machinery and infrastructure to include skills and knowledge, mobilizing resources beyond philanthropic activities, and recognizing the complementarity and mutualism between financial and non-financial performance (Tarulli *et al.*, 2022; Vitale, Cupertino and Riccaboni, 2022).

The way credit rating agencies categorize companies based on creditworthiness must also adapt to changing realities and include non-financial costs, benefits, risks and assets. An example of how this could work in practice is the AGRI3 Fund for sustainable agriculture and forest conservation. The Fund mobilizes public and private capital up to USD 1 billion by providing credit enhancement tools and technical assistance to enable a transition to more sustainable practices in agricultural value chains and to avert deforestation. However, this is only possible when the required tools and data, backed by robust research, are available for evaluation.

4.2.5 The role of research

The different tools, indicators and labels used in TCA application need to be backed by rigorously conducted research and accurate databases (TMG Think Tank for Sustainability, 2021; Tobias Bandel *et al.*, 2020). There is a lot of research to be done on TCA to narrow the yawning gaps in data availability.

Research organizations can support the mainstreaming of TCA by:

- developing indicators, especially at the social and human levels, and valuation factors that are currently lacking for a holistic analysis (for example, of animal welfare, biodiversity or antibiotic resistance);
- supporting the development of new accounting mechanisms and reporting formats that reflect the principles of TCA; and
- conducting case studies estimating the true costs of different production methods, value chains, products and diets, thereby informing businesses about sustainable practices and the necessary direction of the transformation.

These research tasks require interdisciplinary research teams that involve, for example, environmental and social science, as well as economic and business studies.

Recent tools and models developed by the FAO exemplify the role of research in facilitating the mainstreaming of TCA in the agrifood sector. For example, tools such as the Ex-Ante Carbon Balance Tool (EX-ACT), Tool for Agroecology Performance Evaluation and Global Livestock Environmental Assessment Model interactive (Gleam-i) serve multiple purposes. In addition to being valuable tools when accounting for different impacts, they also help to fill the

data gaps currently hindering TCA mainstreaming. Banks are already introducing these tools for assessment and evaluation. The role of research also extends to making scientific findings and data available, accessible and comprehensible to policymakers and consumers alike.

4.2.6 The role of accounting firms and business consultancies

Accounting firms and business consultancies are important advisers to companies in their transition to sustainable business models. In their role as advisers, they can support companies on their TCA journey. Accounting firms and business consultancies can engage with research institutions and take an active role in developing tools for data collection and management, impact and risk assessment, as well as true cost calculations. They can also support the development of accounting rules for TCA and quality assurance processes for TCA data. Accounting firms and business consultancies can identify relevant hurdles in the application of TCA and help other businesses to overcome them.

5 Conclusions and recommendations

The evidence suggests that TCA has moved from being an academic theory to a crucial means for private-sector organizations to analyse and value interactions with natural, social and human capital. While many of these initiatives are still in their infancy, they reflect a genuine interest in improving the information provided by traditional economic accounting and moving towards a more holistic and sustainable system of accounting and reporting. Some companies and organizations are investing time and money in not only improving their management and accounting, but also facilitating a structured debate on how to establish new systems for standard accounting in support of sustainable business models. Based on the insights gained from our review, we propose a set of recommendations for charting the way forward. These are geared towards steering the transformation of agrifood businesses and private investments to promote sustainable agrifood systems.

Conventional business accounting and reporting frameworks are not fit for purpose when it comes to transforming agrifood systems, as they represent an enabling environment that supports unsustainable, externalizing practices. This creates an uneven playing field where unsustainable business models are incentivized, despite causing significant environmental and social harm in the medium and long term.

The costs that are currently being externalized in order to maintain short-term profits represent significant risks and losses for businesses and society. With investors increasingly recognizing the risks associated with negative externalities and consumers becoming increasingly aware of the hidden costs, it is crucial for businesses to assess and document their impacts from a holistic perspective, enabling them to make informed decisions. This is becoming increasingly clear for companies with regard to the climate crisis, but it also applies to all other externalities.

For transformative change to take place in the agrifood sector, the way such businesses are conducted and evaluated must change. There is a need for a new standard accounting system that takes into account all types of capital to support sustainable efforts. TCA can support sustainable decision-making by providing a comprehensive understanding of the true environmental, social and health costs of food production and consumption. TCA allows companies to identify and address negative externalities, such as GHG emissions and environmental degradation, and incorporate these into their decision-making processes.

Marketing products and services as sustainable has become an increasingly attractive business option, increasing the risk of greenwashing. Robust standard-setting systems are needed to prevent the deception of investors and consumers and to provide clarity about the sustainability attributes of agrifood companies, products and services.

A transparent and evidence-based accounting system that mandates reporting on non-financial impacts and risks is needed. This requires a coordinated effort by the stakeholders of the four different types of capital mentioned: natural, human, social and produced. An appropriate governance framework must be in place to facilitate this effort.

The transition from the current accounting model to one that considers all types of capital must be conducted with great care and thoughtful analysis.

TCA cannot be introduced to the agrifood sector in isolation from other sectors. Externalities and hidden costs are not a specificity of agriculture and food. To transform the economy and

our society towards sustainability, all economic activities need to be assessed and evaluated differently. The agrifood sector is leading the way.

While TCA may be applied to all economic sectors, the specificities of each sector need to be considered. Agriculture not only produces goods and services for markets, but also manages public goods and natural resources. The design of new standard reporting guidelines for business must take this into account. It will also have far-reaching implications for national accounting, such as GDP.

An enabling environment that would allow SMEs to fully and responsibly participate in developing new standards needs to be created with appropriate financial support. It is of the utmost importance to consider right from the beginning, and in a systematic way, the needs of smallholder farmers and SMEs in such a process of standard-setting. The importance of agriculture to the livelihoods of billions of people and of local markets to food and nutrition security requires special attention in such a transformation.

In conclusion, TCA has the potential to transform agrifood systems by providing a more holistic and sustainable system of accounting and reporting. To achieve this transformation, standard-setting is needed to create a level playing field.

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Annex 1. Glossary

Accounting and reporting standards. A set of rules and guidelines for the preparation, presentation and reporting of financial information by companies and organizations. The purpose of accounting and reporting standards is to ensure consistency, transparency and accuracy in financial reporting.

- **Accounting standards** are typically developed and published by national or international standard-setting bodies and cover topics such as the recognition, measurement and disclosure of financial assets and liabilities, revenue recognition and the publication of financial statements.
- **Reporting standards** refer to the guidelines and requirements for how financial information is presented and disclosed in various formats, such as annual reports, financial statements and regulatory filings. They specify the information that must be disclosed, the format and presentation of the information and the timing and frequency of reporting.

Agrifood business. Businesses and industries involved in the production, processing, distribution and marketing of food and agricultural products. It encompasses all stages of the food supply chain, from primary production to retail.

Agrifood systems. Agrifood systems include all actors and activities involved in the generation, production, aggregation, processing, distribution, consumption and disposal of food products originating from agriculture, hunting, pastoralism, forestry or fisheries, and the primary production of non-food agricultural products.

Approach. The broader context in which the impact assessment is undertaken. True cost accounting (TCA) is an approach for assessing and evaluating the impacts of business activities.

Business. An organization or entity engaged in commercial, industrial or professional activities intended to produce or provide goods or services to customers in pursuit of profit. The definition used in this paper excludes the financial sector, which is focused on the management of money, investments and financial transactions rather than the production or provision of goods and services.

Business accounting. The process of tracking, recording and reporting the financial transactions and activities of a business. The goal of business accounting is to provide accurate and reliable financial information that can be used to make informed decisions about the operations, profitability and future direction of the business.

Business management. Process of planning, organizing, directing and controlling the activities of an organization in order to achieve its objectives.

Business reporting. The communication of current data on performance and other key metrics to stakeholders such as investors, employees, clients and regulators. Business reporting can take many forms, including financial statements, performance reports and sustainability reports.

Carbon bubble. A hypothetical situation in which the valuation of companies that rely on fossil-fuel-generated energy is inflated due to projected decreases in the value of fossil-fuel reserves as they become unusable due to restrictions imposed by carbon budgets and because the negative externalities of carbon fuels are not reflected in stock-market values.

Carbon budget. The total amount of greenhouse gas (GHG) emissions that can be released into the atmosphere without causing global temperatures to rise above a certain level. It is typically expressed as a limit on the total amount of carbon dioxide (CO₂) that can be emitted over a specified period of time.

Corporate social responsibility. Management practice of incorporating social and environmental concerns into a company's business operations. Corporate social responsibility balances economic, environmental and social priorities (the "triple-bottom-line approach"), while addressing the concerns of shareholders and stakeholders.

Credit rating agency. An independent company that assesses the creditworthiness of entities including corporations, governments and other organizations that issue debt securities. Their main role is to evaluate the ability of the issuer to meet its financial obligations (for example, repay debt) and to assign a rating score based on this assessment.

Environmental, social and governance (ESG). ESG is a framework that evaluates a organization's business practices and performance in relation to sustainability and ethics. It also provides a way to measure business risks and opportunities in those areas. In capital markets, some investors use ESG criteria to assess companies and guide their investment strategies, a practice referred to as "ESG investing".

EU Taxonomy. A classification system developed by the European Union (EU) to facilitate sustainable investment by establishing a common language for defining and measuring the environmental sustainability of economic activities. It stipulates six environmental objectives and a set of technical screening criteria that economic activities must meet in order to qualify as environmentally sustainable.

Externality. Cost or benefit that is not reflected in the price of a good or service and is, therefore, not directly borne or received by those who produce or consume it. A positive or negative externality occurs when a third party either benefits from or is harmed by a transaction between two other parties, without being directly involved. Externalities are an example of market failure, as they can lead to inefficiencies in the allocation of resources.

Financial institution. An organization or entity engaged in the management of money, investments and financial transactions. They can take many forms, including banks, credit unions, insurance companies, investment firms and stock exchanges. They may offer a range of services, such as deposit accounts, loans, investment products, insurance policies and payment services. Financial institutions are typically subject to regulatory oversight by government bodies such as central banks and financial regulatory authorities to ensure the stability and integrity of the financial system.

Financial sector. Part of the economy that is involved in the management, investment and exchange of money and other financial assets. This includes a wide range of institutions and businesses, such as banks, investment firms, insurance companies, brokerage firms and other financial intermediaries.

Greenwashing. Practice of making false or misleading claims about the environmental benefits of a product, service or company in order to make it appear more environmentally friendly than it actually is.

Hidden costs. Expenses that are not immediately apparent or accounted for in the stated or advertised price of a product or service. These costs may not be obvious to consumers or may

not be included in the initial quotation, but can have a significant impact, for example, on the environment.

Human capital. Knowledge, skills, competencies, well-being and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being.

Initiative. A specific project, programme or action undertaken by an individual, organization or government to advance or implement TCA. This may involve assessing the true costs and benefits of a particular product or service, improving supply-chain transparency, adopting more sustainable practices or promoting TCA more broadly.

Investors. Individuals, organizations or entities that commit money or capital to an investment with the expectation of generating a financial return.

Method. Collection of methodological elements defining how impacts and dependencies are being measured, valued and reported. These can include sets of indicators, impacts and dependency pathways, valuation techniques and other assessment rules.

Methodology. A broader set of procedures and principles used to conduct TCA, including the methods employed, the assumptions made and the ways the results are interpreted and communicated.

Natural capital. A stock of renewable and non-renewable natural resources (for example, plants, animals, air water, soils and minerals) that combine to yield a flow of benefits to people.

Non-financial impacts and risks. The effects and potential dangers of a decision or action that are not directly related to financial considerations. These may include social, environmental or cultural effects that do not have a direct financial value but can significantly influence the success or failure of an organization. Non-financial impacts and risks can have indirect financial consequences.

Private investment. Investments made in private companies or other assets that are not publicly traded on a stock exchange.

Private sector. The part of a country's economy that consists of industries and commercial companies not owned or controlled by the government.

Produced capital. All man-made assets, such as buildings, factories, machinery, physical infrastructure (roads, water systems) and intellectual property, as well as all financial assets.

Standard setter. Organizations or entities responsible for developing and establishing accounting, financial reporting, auditing and other professional standards that guide the practices of companies, auditors and other professionals in the financial sector. Key standard-setting organizations include the International Accounting Standards Board, the Financial Accounting Standards Board, the International Auditing and Assurance Standards Board and the International Organization of Securities Commissions. These organizations work to develop and revise accounting and auditing standards, ensure their adoption and implementation, and monitor compliance with these standards.

Social capital. Networks, together with shared norms, values and understanding, that facilitate cooperation within and among groups.

TEEBAgriFood Evaluation Framework. A framework developed by the "The Economics of Ecosystems and Biodiversity for Agriculture and Food" (TEEBAgriFood) initiative, which was launched in 2015 by the United Nations Environment Programme (UNEP) in collaboration with

the Food and Agriculture Organization of the United Nations (FAO), the European Union and others. It provides the basis for a systemic economic evaluation of “eco-agrifood systems” and defines the fundamental concepts of TCA in the agrifood context.

True cost accounting (TCA). An approach for measuring, valuing, accounting and reporting positive and negative environmental, social and health externalities in order to inform decision-making in the public, private and financial sectors. TCA is usually a multistakeholder systems approach.

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