Executive Summary

State of Food and Agriculture (SOFA) 2024
Background report

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SUSTAINABLE DEVELOPMENT SOLUTIONS NETWORK
A GLOBAL INITIATIVE FOR THE UNITED NATIONS

FABLE CONSORTIUM

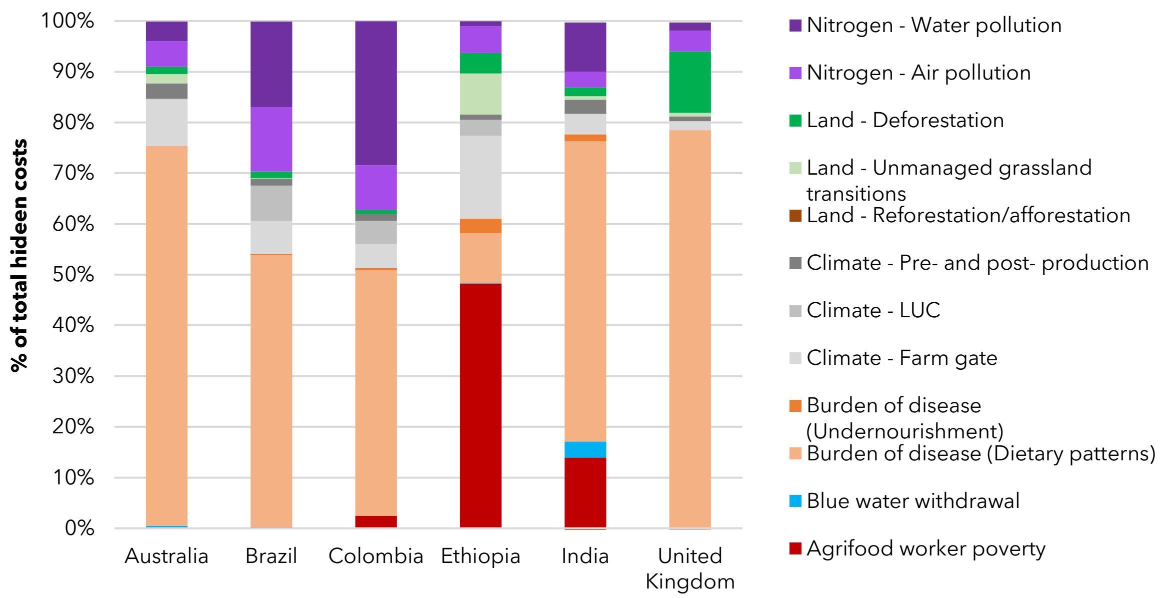
EXECUTIVE SUMMARY

True cost accounting (TCA) methods offer an opportunity to support decisions to reduce existing hidden costs instead of perpetuating them and to transition towards just and sustainable agrifood systems. For the State of Food and Agriculture (SOFA) 2023 report, annual hidden costs – including the external costs of food production on natural resources, the costs of distributional failures within agrifood systems, and productivity losses due to current dietary patterns – were computed for 154 countries over 2016–2023.

This study focuses on six countries, **Australia, Brazil, Colombia, Ethiopia, India, and the United Kingdom**, building on the TCA results from SOFA 2023, the SPIQ-FS model (Lord et al., 2023), and the network and tools of the Food, Agriculture, Biodiversity, Land-Use, and Energy (FABLE) Consortium. With input from in-country stakeholders and experts, the results on hidden costs published in SOFA 2023 have been scrutinized and future scenarios have been tested in quantitative agrifood system models to highlight the most desirable and urgent actions for reducing the hidden costs of agrifood systems.

Accounting for hidden costs in 2020 would reduce the world average PPP GDP by 10% and reduce the national PPP by 16% in Brazil, 12% in Colombia, 16% in India, 6% in Australia and 8% in the UK. In all countries but Ethiopia, the main source of the total hidden costs is the cost of burden of disease due to dietary patterns (Figure 1) and this has been steadily increasing from 13% in 2016 to 33% in 2023. In Ethiopia, with a high share of rural population living below the poverty line, poverty among agrifood workers emerges as the most significant contributor (48%).

Figure 1: *Comparison of agrifood systems' hidden costs for the six countries in % of total hidden costs in 2020*



It was not always possible to compare the data used in the global hidden costs analysis with national statistics because the categories used were inconsistent. For a tailored country analysis of hidden costs, the main recommendation is that national data should replace the by-default data used in SOFA 2023. This is especially important for land use change (as the global HILDA+ land use data does not match currently observed trends in

Australia, Brazil, Colombia, and the UK), greenhouse gas (GHG) emissions, the national poverty line, and undernourishment.

In this study, the FABLE Calculator is used in Australia, Brazil, Colombia, Ethiopia, and the UK, building on the FABLE Scenathon 2023 results, and the MAgPIE model is used in India building on the FSEC results. Both models focus on the agricultural sector and rely on the assumption of equilibrium between demand and supply quantities. The main difference is that the FABLE Calculator is a stepwise model where, except for the first step which sets up the demand, all steps are dependent on one (or several) variable(s) that is (are) estimated in the previous steps, with one feedback loop in case of land scarcity. MAgPIE is a global partial equilibrium model that optimizes food, material, and bioenergy demand through a cost-minimization approach. These tools have been adapted to fit the different national contexts.

Future hidden costs are projected by substituting some of the impact quantity indicators in the TCA model with some of the outputs of the FABLE Calculator or MAgPIE. An intermediate step was required to convert average food consumption by food groups into DALYs (disability-adjusted life years). This conversion was done for MAgPIE by Marco Springmann (2020) while the FABLE Calculator used the machine learning model which has been built to estimate the health hidden costs linking food availability to food intake for the SOFA 2024 (see Box 7 in FAO 2024).

All countries featured in this study assume some changes in crop and livestock productivity to increase the sustainability of their agricultural production. Dietary changes are also considered as a key element to increase the sustainability of the agrifood systems in all countries except Ethiopia. The UK derives the dietary change scenario from the UK Balanced Net Zero (BNZ) pathway of the Climate Change Committee (CCC) and the other countries use a transition towards the average EAT-Lancet planetary diet. In most case studies, deforestation is prevented beyond 2030, and afforestation is increased.

For the UK and Brazil, changing diets is the most important factor for six of the eleven modelled indicators which are used to compute hidden costs, including CO_2 and N_2O emissions, and nitrogen application (Table 1). Increasing productivity reduces cropland and pasture area and avoids some conversion of natural land; crop productivity gains have a significant positive impact on forest area in Brazil, Colombia, and Ethiopia, and on other natural land area, particularly in Ethiopia. Higher productivity per animal and ruminant stocking rate on pasture (ruminant density) have large impacts particularly in countries with large livestock herds such as Australia, Brazil, and Ethiopia. Effective deforestation control avoids about 7 million hectares of deforestation between 2045 and 2050 in Brazil, close to 5 million hectares in Ethiopia, and 0.5 million hectares in Colombia. Finally, afforestation is important to reduce net GHG emissions through carbon sequestration.

The dietary change assumed in Australia is the most effective to reduce the DALYs compared to current trends by 2050 (-27% DALYs) as it reduced almost all the dietary risk categories (Table 1). The most important changes are a higher consumption of nuts, fruits, vegetables, and legumes, and a lower consumption of processed meat, red meat, and sugar-sweetened beverages. In Brazil, Colombia, and the UK, the focus of dietary change is on reduced consumption of processed and red meat and sugar-sweetened beverages, with higher legumes and nuts consumption in Colombia and the UK. Moreover, all countries have assumed a reduction in the consumption of ultra-processed food compared to current trends. To further reduce the DALYs, a more significant increase in fruits, vegetables and wholegrains consumption should be envisaged compared to the diets that have been tested in this study.

However, the analysis reveals some risks of trade-offs if policies are implemented in isolation: a) Dietary changes assumed in Brazil and the UK emphasize environmental benefits, but adjustments could be made to ensure larger health benefits and a better consideration of local preferences; b) Dietary changes could increase water demand (e.g., to grow more fruits and vegetables) and reduce on-farm employment (e.g., in the livestock sector), showing that this type of transition needs to be carefully managed at local level; c) In some cases, productivity gain could increase demand further, which could offset some of the environmental benefits; d) Deforestation control could have negative effects on food consumption and displace agricultural expansion to non-forest natural land; e) Afforestation can lead to indirect deforestation or reduction of other natural land while benefits from afforestation for ecosystem services strongly depends on how afforestation is done. Managing these trade-offs requires an integrated strategy.

Table 1: *Scenarios that are most effective in decreasing the hidden cost subcategories by country, 2050*

Sub-categories	Australia	Brazil	Colombia	Ethiopia	India	United Kingdom
CO_2 emissions	Afforestation	Dietary changes	Crop productivity	Constraints on agricultural expansion	Afforestation and expansion of protected areas	Dietary changes
CH_4 emissions	Dietary changes	Dietary changes	Food waste	Livestock productivity*	Dietary changes	Dietary changes
N_2O emissions	Crop productivity	Dietary changes	Dietary changes	Livestock productivity*	Nitrogen efficiency	Dietary changes
Total N	Dietary changes	Dietary changes	Crop productivity	Livestock productivity*	Nitrogen efficiency	Dietary changes
Cropland	Crop productivity	Crop productivity	Crop productivity	Crop productivity*	Livestock management	Crop productivity
Forest	*No change*	Crop productivity	Constraints on agricultural expansion	Constraints on agricultural expansion	*No change*	*No change*
Pasture	Dietary changes	Dietary changes	Ruminant density	Ruminant density	Dietary changes	Dietary changes
Other land	Dietary changes	Dietary changes	Crop productivity	Afforestation	Livestock management	Dietary changes
Water irrigation requirements	Crop productivity	Irrigation	Trade	Crop productivity *	Dietary changes	Food waste
Farm labour	Crop productivity	Crop productivity	Crop productivity	Crop productivity *	Dietary changes	Food waste
DALYs	Dietary changes	Dietary changes	Dietary changes	*No change*	Dietary changes	Dietary changes

Frequency

1	2	3	7	16	31

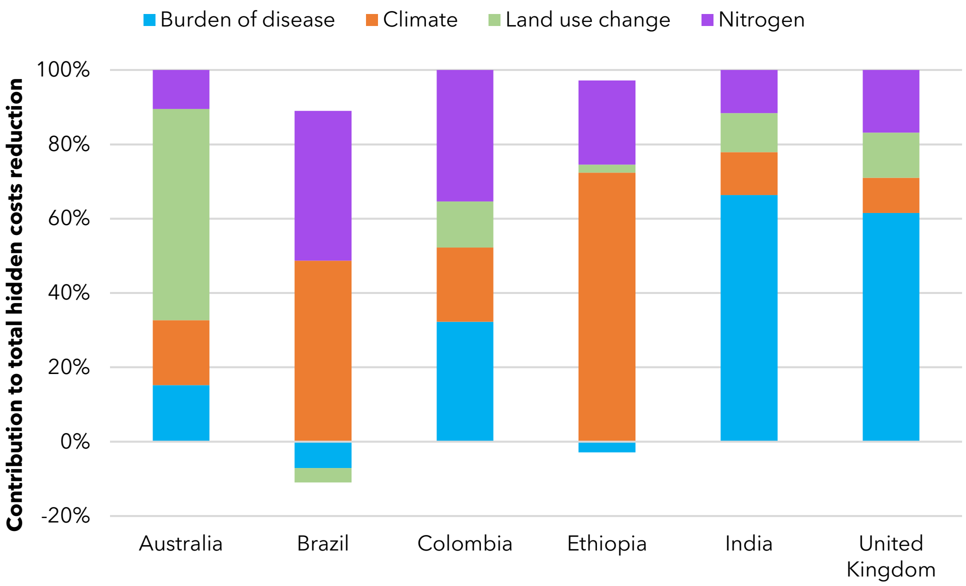
NOTES: CO2 = carbon dioxide; CH4 = methane; N2O = nitrous oxide; N = nitrogen; DALY = disability-adjusted life year; SSB = sugar-sweetened beverage. Dietary changes modelled include the following for each country: Australia – Higher intake of nuts and seeds, fruits, vegetables, legumes; lower intake of processed and red meat, and SSBs; Brazil – Lower intake of processed and red meat, and SSBs; Colombia – Lower intake of processed meat and SSBs; higher intake of legumes; India – Lower intake of sugars, salt, and processed foods; United Kingdom – Lower intake of processed meat; higher intake of legumes.

**The Global Sustainability scenario in Ethiopia includes a lower population assumption in line with the Ethiopian National Statistical Office's projections. While the largest decrease in hidden costs in these subcategories is attributable to this assumption, we show the most impactful outcome related to agrifood systems transformation – namely, livestock and crop productivity improvements – in this table.*

The combination of several factors at the same time (i.e., the global sustainability pathway) leads to the best outcome compared to a path following current trends (CT): between 2020 and 2050 our results show a reduction in accumulated hidden costs compared to the CT scenario by 32% in Brazil, 24% in Colombia, 25% in Ethiopia, 57% in India, and 15% in the UK[1] (in 2020 PPP). In Australia, the reduction is 140%, i.e., the hidden deficit of current trends that would have accumulated over 2020–2050 is eliminated and benefits of the order of 40% of the CT hidden deficit are accumulated. Here, the agrifood system transitions from net hidden costs to net hidden benefits, but this is subject to large uncertainty.

In Figure 2 we can see that despite the dominant contribution of unhealthy diets to current hidden costs in all countries but Ethiopia, dietary change is only the main component of total hidden cost reductions for India and the UK. Although the number of DALYs decreases in the sustainable pathway, the hidden costs related to diets increase because each DALY is more expensive, due to higher GDP per capita, Human Development Index, and labor productivity.

Figure 2: *Source of the computed reduction in the hidden costs of agrifood systems in the sustainable pathway compared to current trends in 2050 by country*



[1] This does not account for the hidden costs that are not computed based on the model's outputs, e.g., agri-food worker poverty.