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Hidden costs of the Swiss Agrifood System

Case Study to the FAO State of Food and Agriculture SOFA-Report 2024

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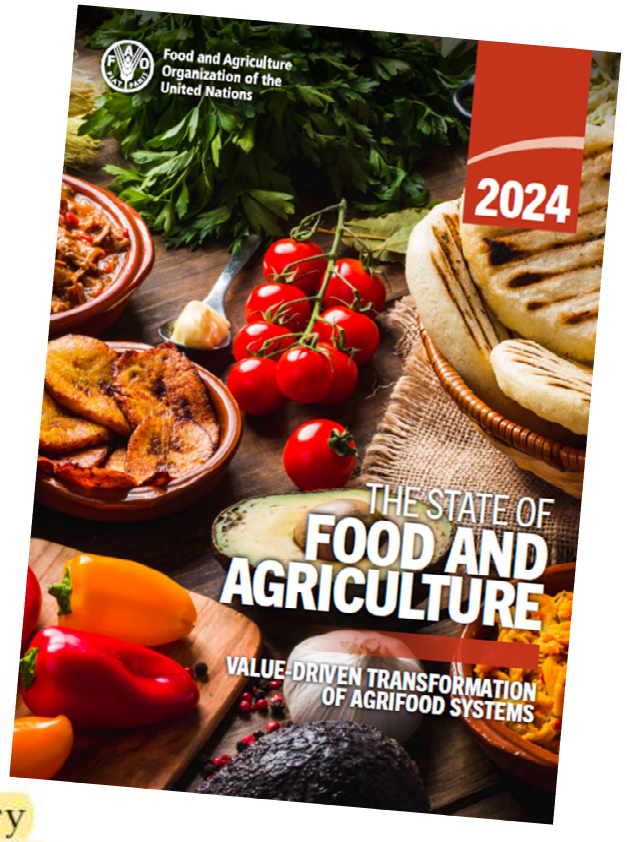
30.3.2026, 2nd Hidden Cost Webinar of INRAe, online

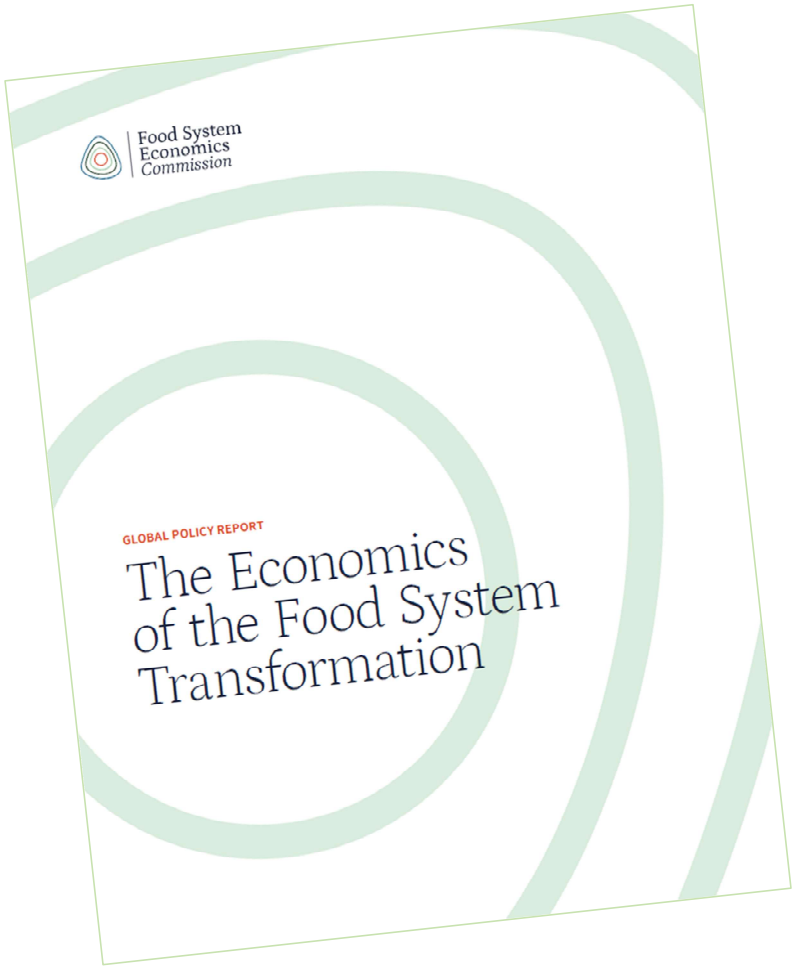
State of Food and Agriculture SOFA 2023

This year's report introduces true cost accounting (TCA) as an approach to uncovering the hidden impacts of our agrifood systems on the environment, health, and livelihoods, so that agrifood systems actors are better informed and prepared before making decisions. There is always

systems, action to address these costs will have to be taken at country level. In this context, the next edition of *The State of Food and Agriculture* will aim to improve upon this initial preliminary quantification and analysis using country-specific information and input from in-country stakeholders and experts. This can then inform the planning for more in-depth, tailored analyses to guide transformational policy actions and investments in specific countries.



State of Food and Agriculture SOFA 2023 – The FSEC Report



obesity epidemic, loss of biodiversity, environmental damage and climate change. The economic value of this human suffering and planetary harm is well above 10 trillion USD[1] a year, more than food systems contribute to global GDP. In short, our food systems are destroying more value than they create.[2]

Ignoring the consequences of today's food

How to rather not communicate….

«Hidden costs» - what are we talking about?

SOFA 2023

- "**Hidden cost**. Any cost to individuals or society that is not reflected in the market price of a product or service. It refers to external costs (that is, a negative externality) or economic losses triggered by other market, institutional or policy failures." In this, "hidden costs" encompass "external costs", where the latter arise from market failures in the narrower sense of microeconomic externality theory, while the former include any costs that may arise due to other than market failures, i.e. institutional or policy failure (cf. definitions below). It has also to be emphasized that hidden costs are not necessarily "invisible" in the sense that decision makers or society at large would not be aware of them – they are hidden/invisible in the sense that they are not accounted for in decisions.

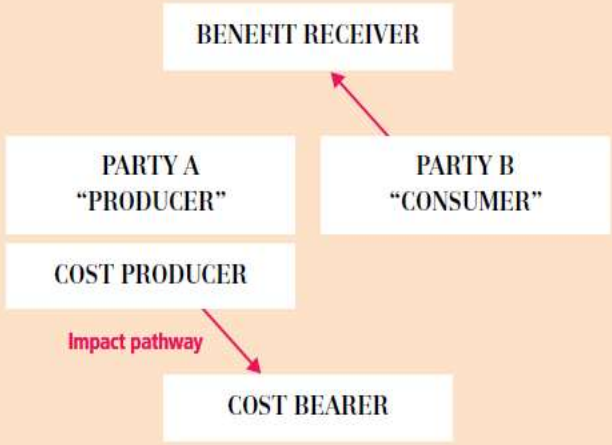
SOFA 2024

Hidden cost. Any cost to individuals or society that is not reflected in the market price of a product or a service. It refers to external costs (that is, a negative externality) or economic losses triggered by other market or policy failures.

«Hidden costs» - what are we talking about?

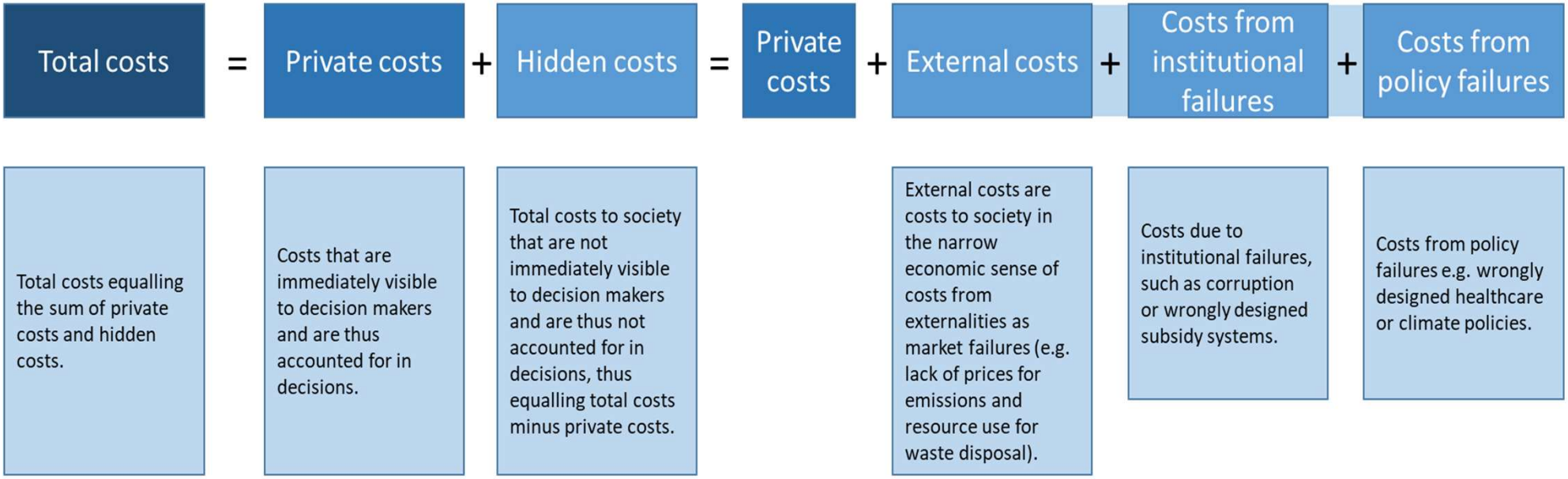
- "**External cost**. A cost incurred by individuals or a community as a result of an economic transaction in which they are not directly involved. The difference between private costs and the total cost to society of a product, service or activity is called an external cost." We emphasize that the "total costs to society" here refers to those due to market failures only, cf. also the definition of "hidden cost" below; examples of market failures are "externalities" (cf. the following definition), but also monopoles or information asymmetries.

In the context of the studies on external costs of traffic in Switzerland (Ecoplan/Infras, 2014; Infras & ecoplan, 2019), external costs are defined somewhat differently as describing all costs that are NOT borne by the cost producers. "**Internal costs**" are then defined as the costs borne by cost producers – covering material and immaterial costs, which thus also cover part of the hidden costs as understood in the SOFA report. The total of these external and internal costs are then termed "**social costs**" in these studies.



Notes: A cost bearer may be a third party or a party to the transaction at a later time. The benefit receiver here receives additional benefits due to the cost bearing of the cost bearer. Party A, party B or both may be cost producers or benefit producers due to their activities. The classical example is external costs of pollution in the production of goods, where damages caused by pollution are not included in the costs of production for A. The buyer B purchases at a lower price, enabling lower production costs and higher profit from the sale of B's own goods, which increases returns to investors, among benefit receivers. The cost bearer of pollution from A has paid for free benefits to the investor of B. The complex path from the production of pollution such as GHGs to the bearing of costs by economic actors in a future economy is one of the challenges in estimating agrifood systems external costs and the costs of market failures.

«Hidden costs» - what are we talking about?



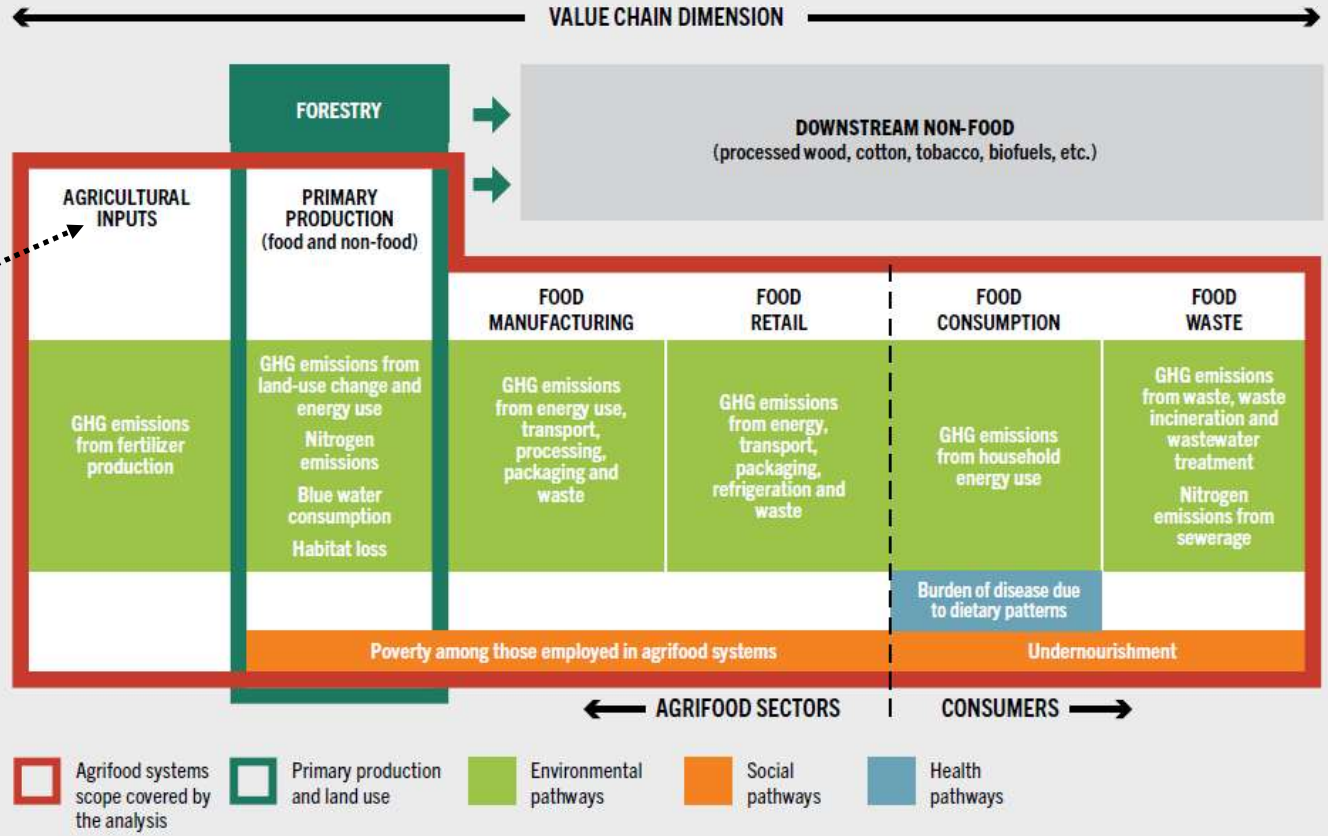
Pragmatic bottom-line:

hidden costs are costs that decision makers do not take into account when taking their decisions

SOFA 2023 system boundaries

Only what is produced IN the country – NO imports

FIGURE 5 SCOPE OF THE ANALYSIS: AGRIFOOD SYSTEMS STAGES AND PATHWAYS THROUGH WHICH HIDDEN COSTS MANIFEST



NOTES: GHG = greenhouse gas. For more information on the scope of the analysis, data sources and valuation, see **Annex 1**.
SOURCE: Lord, S. 2023. *Hidden costs of agrifood systems and recent trends from 2016 to 2023 – Background paper for The State of Food and Agriculture 2023*. FAO Agricultural Development Economics Technical Study, No. 31. Rome, FAO.

Indicators in SOFA 2023

- GHG-emissions
  - Agricultural production («farm-gate»); Inputs and whole value chain; Land use change
  - CH_4, N_2O, CO_2 are accounted for separately
  - Impacts on ecosystems, infrastructure, etc. and also on health (as covered in the «social costs of carbon» provided by various institutions)

- Water use
  - Costs of water use in a context of water scarcity: yield losses, disruption of ecosystem dynamics, etc.

- Land use change
  - Loss of ecosystem services due to LUC (e.g. from grassland to cropland)

(from the Ecosystem Services Valuation Database ESVD)

Indicators in SOFA 2023

- Nitrogen emissions
  - Costs from water pollution, acidification, etc.
  - Health costs of emissions (NH_3 and its health impacts, etc.)
- Poverty
  - Costs to raise all wages of agricultural workers with wages below the poverty line to the level of the poverty line.
- Under-/Malnutrition
  - Productivity losses due to DALYs because of undersupply in protein and calories (DALYs: years lost in good health due to the diseases)
- Unhealthy dietary patterns
  - Productivity losses due to DALYs because of diet-related non-communicable diseases (slightly adjusted after the publication of SOFA 2023)

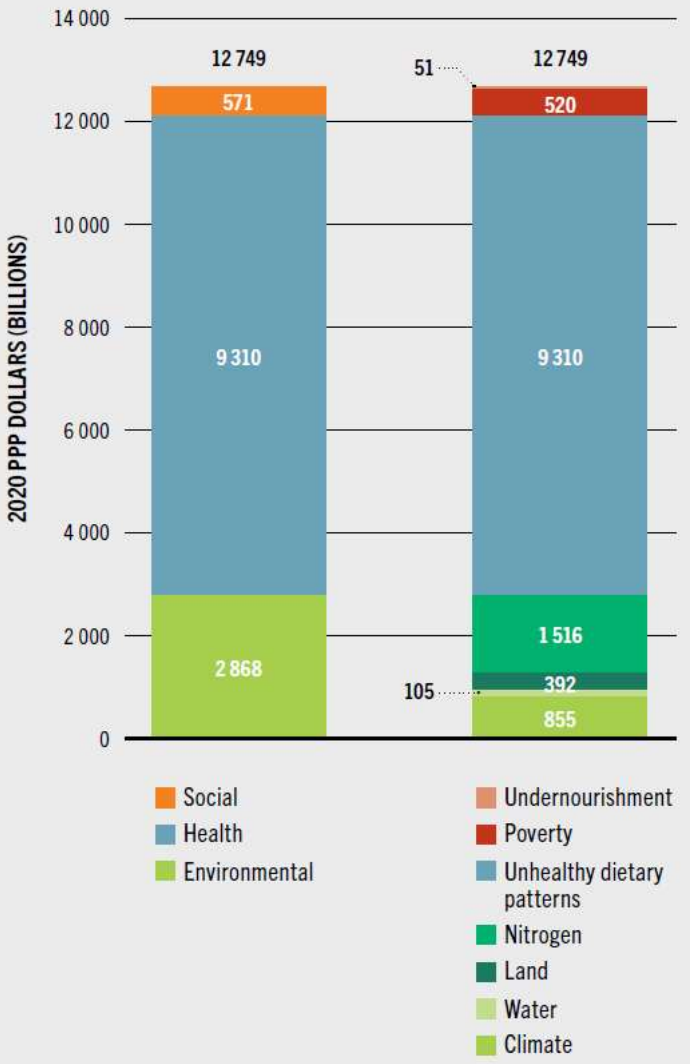
SOFA 2023 global results

- 12’700 billions US$,

  almost 10% of global GDP 2020

(Attention: “Billion” in English is “Milliarde” in German)

FIGURE 6 QUANTIFIED HIDDEN COSTS OF AGRIFOOD SYSTEMS BY COST CATEGORY (LEFT) AND SUBCATEGORY (RIGHT), 2020

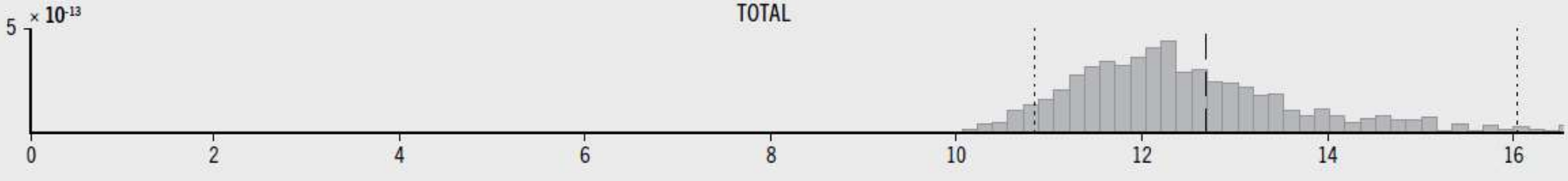


SOFA 2023 global results

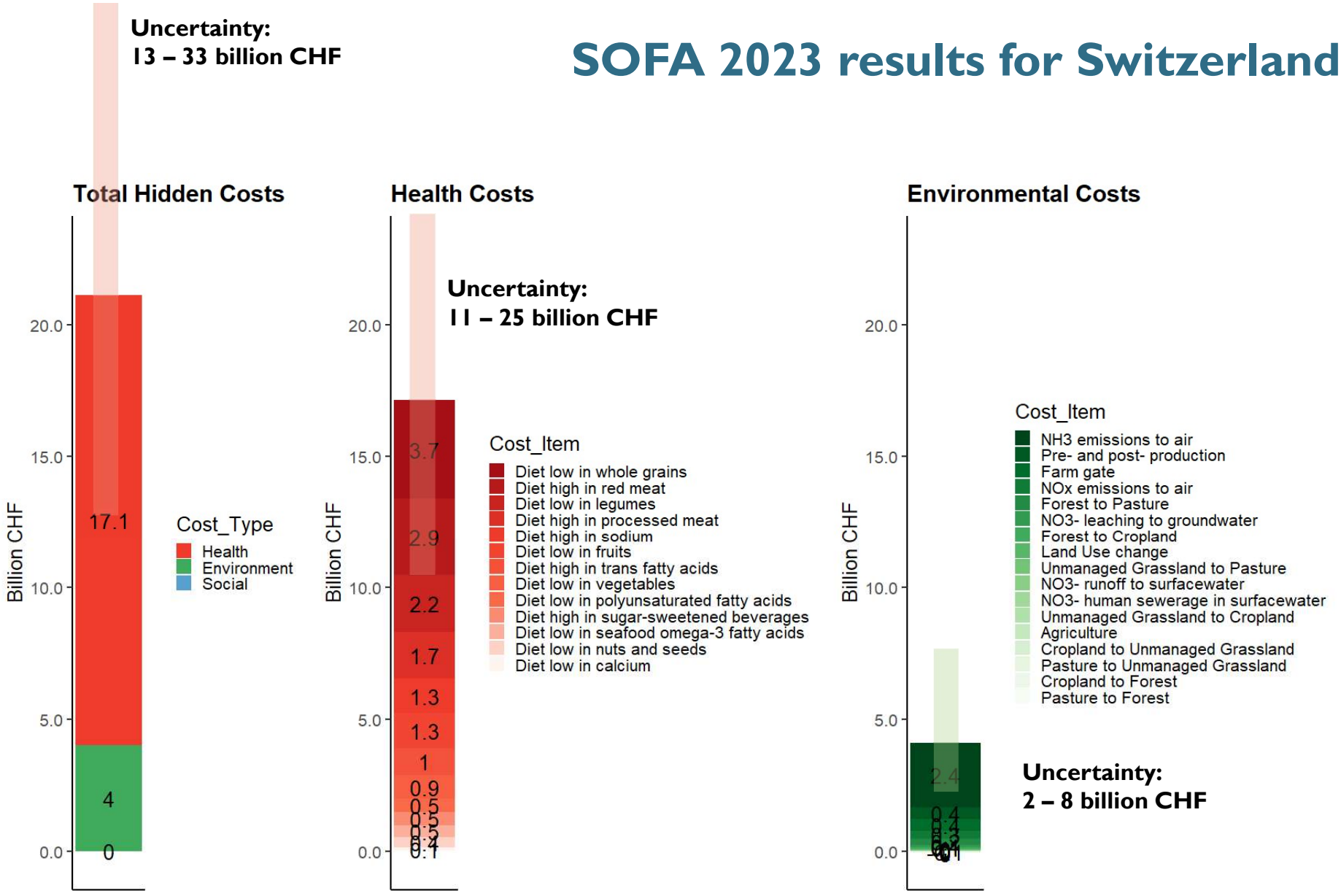
- Large uncertainties,

  but a 95% probability that hidden costs are higher than 10’800 billions US$

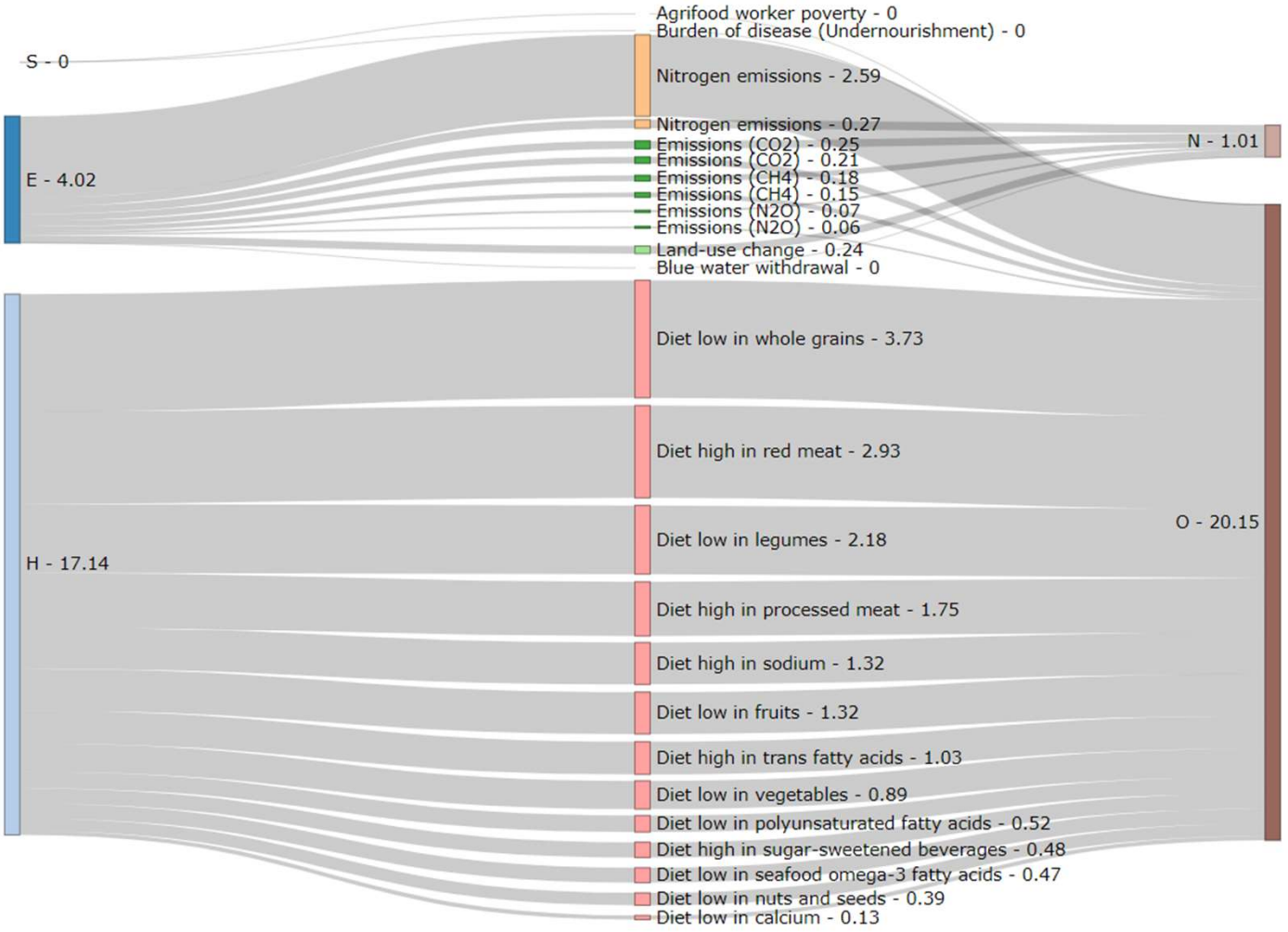
FIGURE GLOBAL QUANTIFIED HIDDEN COSTS OF AGRIFOOD SYSTEMS, WITH UNCERTAINTY, BY COST CATEGORY, 2020



SOFA 2023 results for Switzerland



SOFA 2023 results for Switzerland



SOFA 2023 results CH vs. other regions

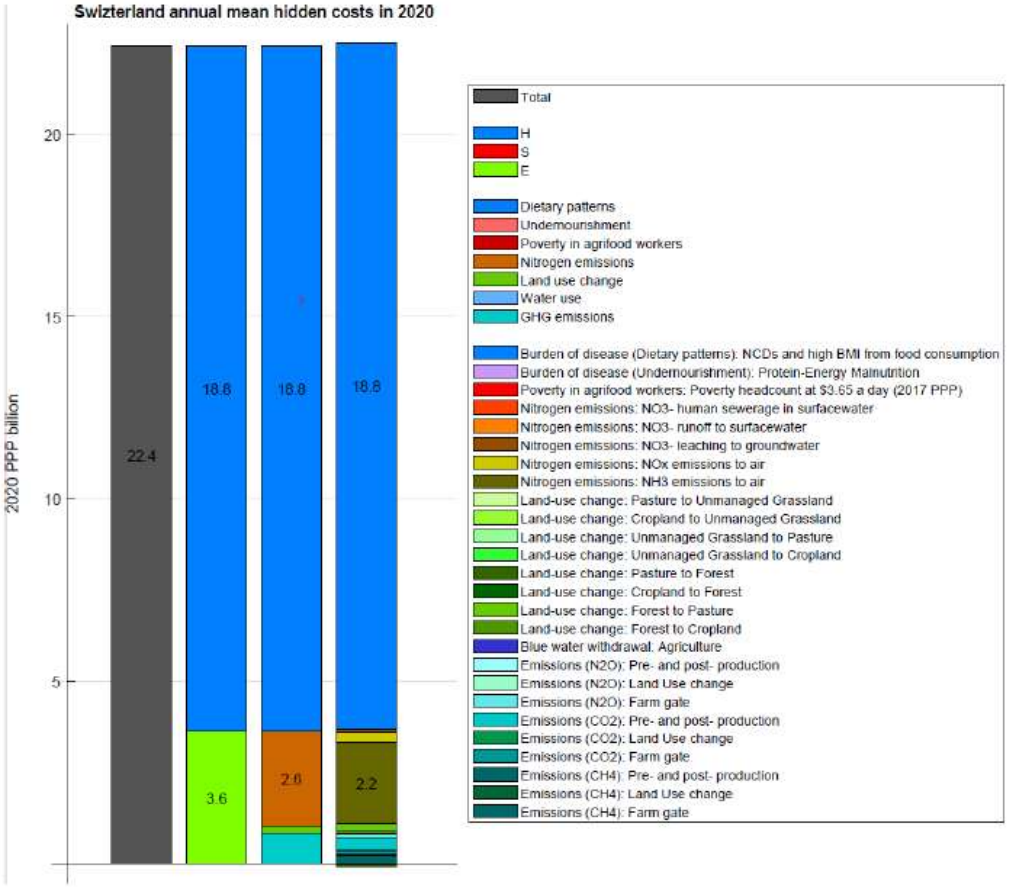


Figure 1: Expected hidden costs of the Swiss agrifood system in 2020 based on the results of the State of Food and Agriculture 2023 study. The breakdown of cost items into species of pollutants and different activities follows Table 1. Future productivity losses from current unhealthy dietary intake are the largest cost component (~18.8 billion USD 2020 PPP). Up to the uncertainty modelled, ~2.6 billion USD 2020 PPP in damage

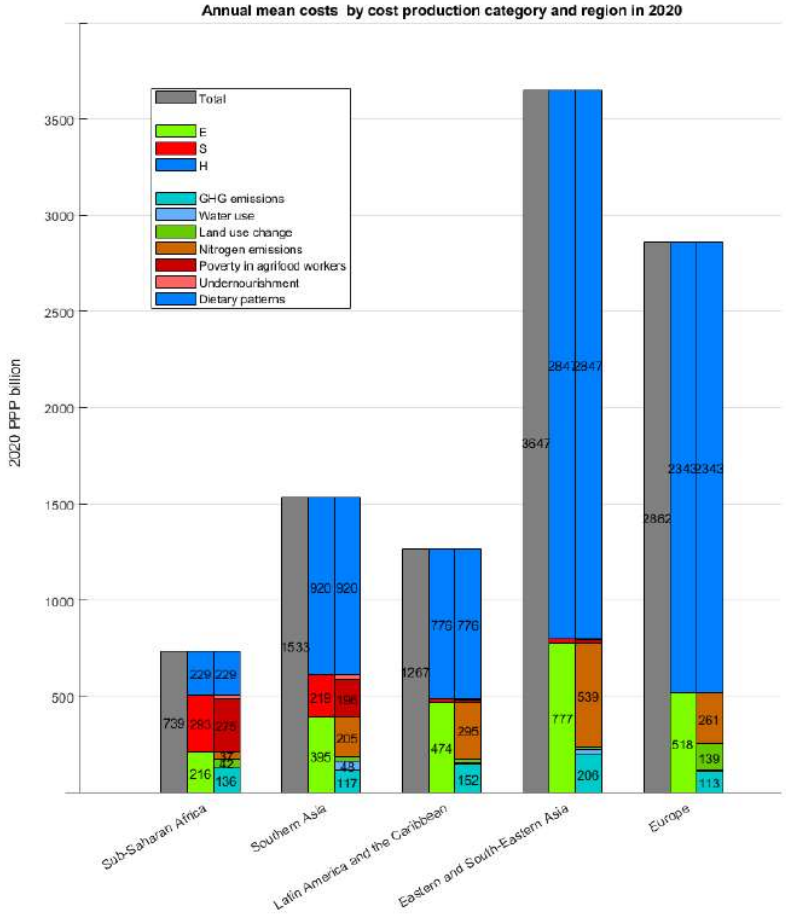
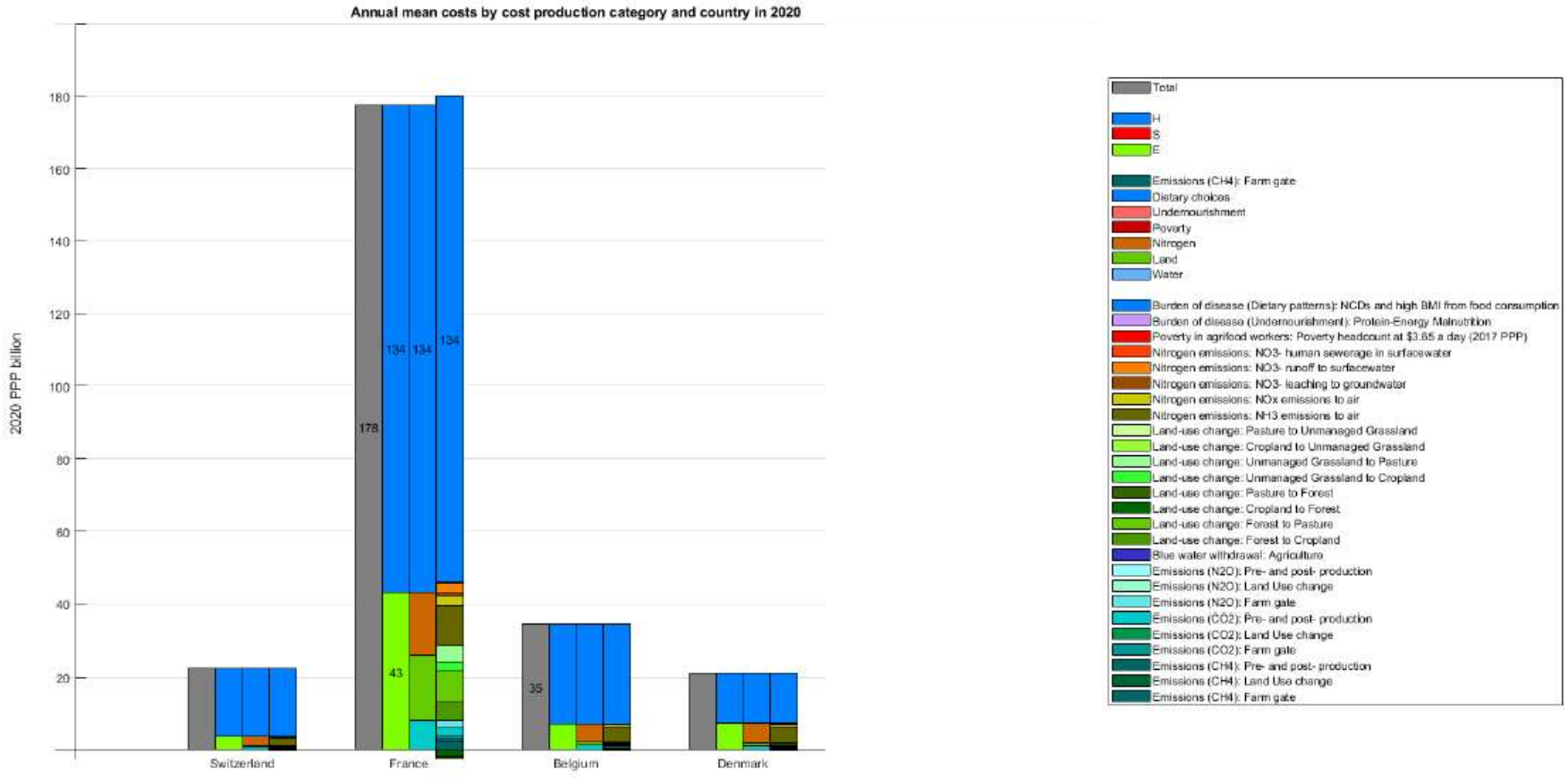


Figure 2: European agrifood system hidden costs in 2020 compared to Sub-Saharan Africa, Southern Asia, Latin and South America, and Eastern and South-Eastern Asia. Left axis in billions USD 2020 PPP, and breakdown of hidden costs follows Table 1. Note that CO2 emissions from indirect land-use change (e.g. deforestation) are counted under the GHG emission cost item.

SOFA 2023 results CH vs. other European countries



SOFA 2023: guiding principles for methods and data

- Only use globally consistent data; thus
  - health, GHG emissions, nitrogen emissions,… are included
  - pesticides, biodiversity,… are NOT included

- A prevalent challenge: double counting
- Very detailed uncertainty analysis

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SOFA 2023: general assessment of methods and data

- Positive:
  - Detailed and reliable on the topics covered
  - Cautious in communication, emphasis on large uncertainties
  - Comparisons between countries are possible

- Negative:
  - Depending on the country, central topics are missing (e.g. biodiversity in in Switzerland)
  - Missing topics are implicitly accounted for with zero costs

Role of the health indicators

- Under-/Malnutrition
- Unhealthy dietary patterns

- SOFA 2023 wanted to highlight, which role under- and malnutrition plays in low-income countries:
  - it hinders their economic development by productivity losses
- This leads to high costs in high-income countries due to unhealthy dietary patterns.

- Message: It is important to assess the indicators in context
  - LIC should really focus on improving the nutritional situation,
  - while it should not lead HIC to neglect environmental impacts, though.

SOFA 2023 results: revision of health cost by FAO

- Goal of the correction: avoid double counting between different food groups and high BMI
- Concretely:
  - The arbitrary weighting factor of 75% for DALYs is omitted
  - DALYs from sweet beverages are added
  - DALYs from high BMI are not included anymore (as already covered via the DALYs from various feed groups and as they partly do not relate to food, e.g. when related to low physical activity, etc.)
- Results in hidden health costs for CH being about 20% lower (17.1 instead of 21.1 billion CHF (15.5 instead of 18.8 billion US$)

SOFA Case Study Switzerland - Goals

- Contribute to the assessment of the plausibility of the SOFA 2023 results for Switzerland by identifying gaps and needs for more in-depth research

- Tailored quantification of Switzerland's external costs and benefits across all dimensions of sustainability (economic, social (incl. health) and environmental)

- Identification of the most pressing challenges and opportunities of the Swiss agrifood system in terms of externalities and recommendations of potential entry points for its sustainable transformation

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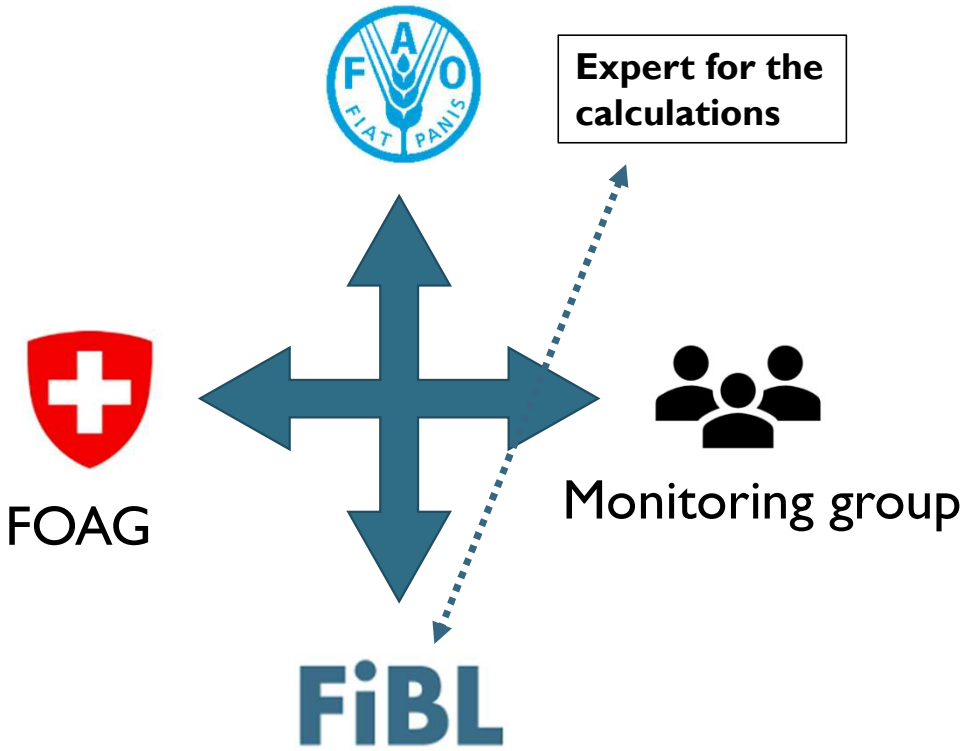
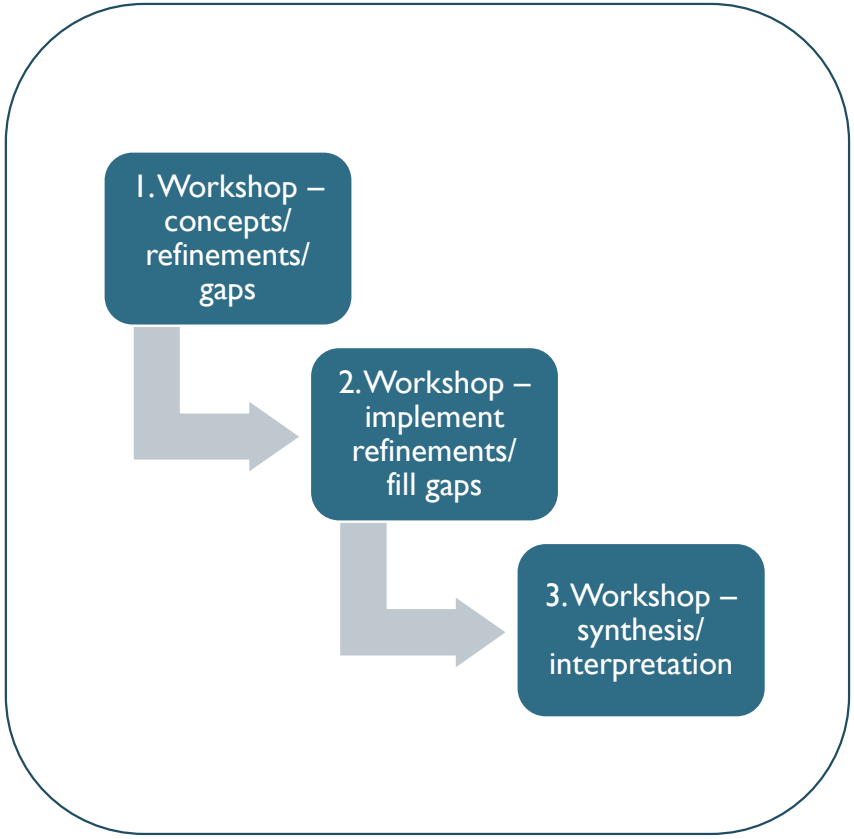
SOFA Case Study Switzerland – Process





SOFA Case Study Switzerland – Process

Process

The process ran from October 2023 till May 2024 and was organised around five types of expert groups.

- First, there was the core writing group consisting of experts at the service provider, the Research Institute of Organic Agriculture FiBL.
- Second, there were the experts from the commissioning client's side, representatives of the FAO SOFA team.
- Third, there were representatives from the Federal Office of Agriculture FOAG Switzerland, as the contact point for SOFA in Switzerland and for the core writing group.
- Fourth, there was a monitoring group of experts from various governmental, academic and other institutions in Switzerland, with the role of critically reviewing draft versions of the report and providing inputs at specific monitoring group meetings.
- Fifth, there was Steven Lord, as the author of the model behind the SOFA 2023 calculations, available for methodological questions and refined calculations for Switzerland.

Case Study Switzerland: Refinements for SOFA 2024

Checking quantities and cost values for the indicators from SOFA 2023:

- GHG-emissions *Quantities: small adjustments; assumption of much higher prices:*
  - CHF 430/t CO_2e instead of CHF 56/tCO_2e, based on the study on external costs of traffic
  - Reduction by 50% as a safety margin, due to not differentiating between different gases (it is for CO_2e) and large uncertainty of values

- Water use *(no adjustment)*

- Land use change *(no adjustment)*
  - Costs taken from The Ecosystem Services Valuation Database (ESVD), some specific estimates for Switzerland result in much higher estimates (factor 10).
  - SOFA 2023 estimates are negligible, - not anymore if costs are 10 times higher, though
  - No adjustment because of large uncertainties and risk of double counting with costs from biodiversity loss that are added

Case Study Switzerland: Refinements for SOFA 2024

Checking quantities and cost values for the indicators from SOFA 2023:

- Nitrogen emissions *(no adjustment)*
- Poverty *(no adjustment)*
  - Compare salary of agricultural workers to poverty line
  - Not relevant for Switzerland – hence no adjustment
  - However, calculations do not consider the work situation and generally low salaries of agricultural workers in Switzerland

- Under-/Malnutrition (insufficient supply of protein and calories) *costs of iron deficiency added – no large effect, remains negligible*

Case Study Switzerland: Refinements for SOFA 2024

Checking quantities and cost values for the indicators from SOFA 2023:

- Unhealthy dietary patterns(high/low consumption of various food groups such as fruits, vegetables, red meat, whole grains, etc.) *(no adjustment for the costs already covered in SOFA 2023, but complemented by estimates for treatment costs and immaterial costs)*
  - Costs: per capita annual productivity from ILO
  - Global Burden of Disease data; most important: low whole grains, high red meat, low pulses and high processed meat consumption

Additional topics for health costs

- *Direct health costs (treatment costs)*
  - There are estimates for Switzerland that 20% of total direct health costs relate diseases that also correlate with dietary patterns;
  - Assume that 50% of that are really due to diets
  - Controversial whether these are hidden costs or not (they are part of the health insurance market)
- *Immaterial costs (suffering, etc.)*
  - Based on Swiss studies on Willingness To Pay for being one year less sick

Case Study Switzerland: Amendments for SOFA 2024

- Phosphorus *(not added; difficult to get adequate data and partly covered by N)*
- Soil health, fertility and quality *(captured via a simple proxy (soil carbon losses, with the SCC per ton CO_2e))*
  - *Negligible*
- Biodiversity *(added)*
  - To small parts covered in N-emissions, LUC, GHG emissions
  - Specific studies provide estimates for CH, based on the costs incurred to compensate for losses in ecosystem services due to biodiversity losses
  - Results in high cost estimates – thus added, albeit some small part may be double counting
- Use of plant protection products *(not added)*
  - *no data available; partly already covered via biodiversity; health related impacts expectedly rather small today*

Case Study Switzerland: Amendments for SOFA 2024

- Antimicrobial resistances *(added)*
  - National studies, currently rather low costs
  - Ensure that they stay low!
- Animal welfare *(added)*
  - Some national estimate available, based on the costs that would be incurred for implementing animal welfare improvement measures
  - Currently rather low
- (hidden benefits) *(mentioned without quantification)*

Case Study Switzerland: Amendments for SOFA 2024

Furthermore, the following two topics were assessed as complements to the SOFA 2023 estimates, without summing them to the revised cost estimates

- Subsidies, border protection and other incentive schemes *(added – but not added to the overall hidden cost estimate; the share that is truly «hidden» is difficult to determine)*
  - Controversial debate on which share of it may count as "hidden costs"

Case Study Switzerland: Amendments for SOFA 2024

- Imports *(added – but not added to the overall hidden cost estimate)*
  - Important topic (monitoring group), but not consistent with SOFA system boundaries
  - Ideally: import quantities, countries of origin, LCA impact factors, SOFA cost estimates
  - Simplified approach focusing on key categories (GHG emissions, biodiversity loss, water scarcity) and based on an existing study
  - Gross estimates, based on the assumption that imports account for impacts that correspond to
    - 30% of domestic GHG emissions
    - 75% of domestic biodiversity loss
    - 300% of domestic water scarcity impacts
    - Plus the emissions from mineral fertilizer imports

Case study Switzerland: Refinements for SOFA 2024 –

Results

Category	SOFA 2023 value (billion CHF) [1]	Refined/ complemented value (billion CHF)	Cost difference SOFA 2023 to refinement
An entry "-" means that this value has not been estimated due to already being covered by other categories, lack of data or negligible size; for detailed explanations, see the corresponding sections in chapter 6; there, in section 6.4.1, a detailed version of this table with explanatory notes can be found.			
Refinements			
Health – basic estimate	17.1	17.1	0
Health – additional costs	-	8 (direct health costs) 9 (immaterial health costs)	8 9
GHG emissions	0.9	3.1	2.2
Nitrogen emissions	2.9	2.9	0
Water use	0.0013	0.0013	0
Water pollution	-	-	-
Poverty	0	0	0
Undernourishment / Malnourishment	0	0.57	0.57
Land use change	0.22	0.22	0

Case study Switzerland: Refinements for SOFA 2024 –

Results

Category	SOFA 2023 value (billion CHF) [1]	Refined/ complemented value (billion CHF)	Cost difference SOFA 2023 to refinement
Complements			
Phosphorus	-	-	-
Soil health	-	0.17	0.17
Biodiversity	-	7.5	7.5
Pesticide use	-	-	-
Antimicrobial resistance	-	0.15	0.15
Animal welfare	-	0.11	0.11

Case study Switzerland: Refinements for SOFA 2024 –

Results

Category	SOFA 2023 value (billion CHF) [1]	Refined/ complemented value (billion CHF)	Cost difference SOFA 2023 to refinement
Summed values			
Total SOFA 2023	**21.1**		
Total refinements plus complements		**31.8** (**48.8** when including additional health costs)	
Total difference between refinements/ complements and SOFA 2023			**10.7** (**27.7** when including additional health costs)
Imports (reported as a separate category due to different system boundaries than used for the other categories)			
Imports	-	6.7	6.7

Subsidies, border protection and other incentive schemes: 12.6 billion CHF

- Controversial, in particular which share may count as «hidden»

Case study Switzerland – «Entry points for food system transformation»

- Unhealthy diets

- Biodiversity losses
- GHG emissions
- Nitrogen emissions

- Food waste and loss
- Imports
- Subsidies, border protection and other incentive schemes

Case study Switzerland – «Entry points for food system transformation»

- There is a number of categories that currently report small costs only
  - Water scarcity
  - Poverty
  - Soils health, fertility and quality
  - Plant protection products
  - Antimicrobial resistances
  - Animal welfare

- It is important to not overlook those and to ensure that these costs remain small and do not become significant in the future

Key challenge to highlight: "What is not there has zero costs"

An example of how **NOT** to do TCA – here, biodiversity basically corresponds to land use but is quantified and communicated as biodiversity….

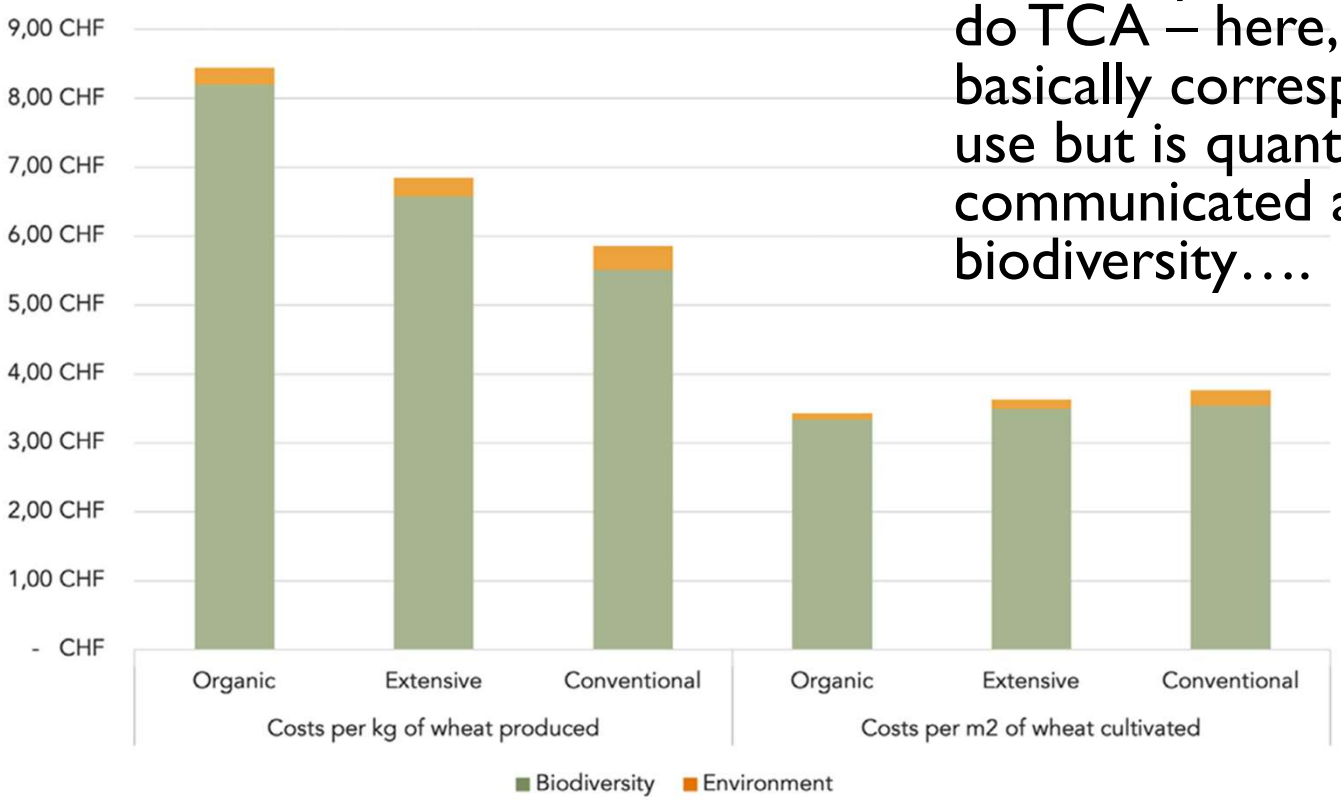
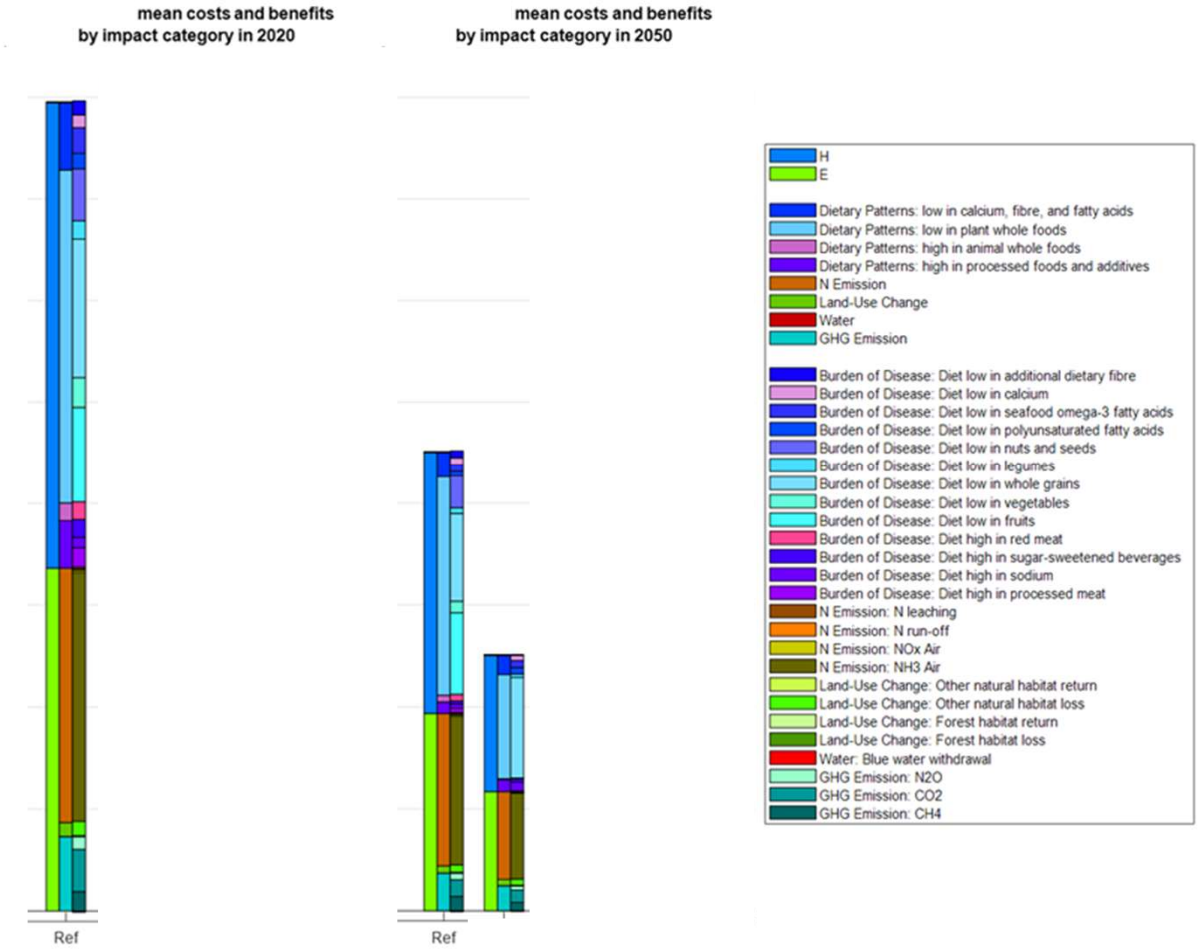


Fig. 3. Comparison of biodiversity and environment costs when expressed per kg of wheat produced versus m^2 of wheat cultivated.

Crosnier et al. 2025

Key challenge to highlight: “Future hidden costs and social discounting”



Conclusions

- SOFA 2023 is a good basis for the analysis of country-specific hidden costs of the agri-food system
  - Important aspects have to be added, though, when doing country-specific analyses (in particular biodiversity, other (higher) social costs of carbon)
  - These amendments result in annual hidden costs of the Swiss agri-food system of 31.8 billion CHF instead of 21.1 billion CHF

- It is not only about reducing costs that are high today, but also about avoiding that currently low costs raise in the future.
  - Important examples: antimicrobial resistances, water scarcity, soils

- Be cautious with communicating hidden costs at different times (e.g. 2025 and 2050) – the effects of social discounting can be difficult to communicate.

Conclusions

- The analysis of hidden costs helps to highlight aspects that are often overlooked
  - Can identify entry points for action in a thoroughly economic narrative
  - On the other hand, there is a danger that costs that are not covered because of lack of data are neglected as they are implicitly assumed to be zero

- The analysis of hidden costs can be an important instrument for information and communication
  - For this, a pragmatic approach regarding the concepts used and the level of detail and certainty of the estimates is appropriate

Thank you for your attention

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