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THE STATE OF
FOOD AND
AGRICULTURE
VALUE-DRIVEN TRANSFORMATION
OF AGRIFOOD SYSTEMS

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COUNTRY NOT SPECIFIED. Variety of healthy foods for filling arepas, a typical Latin American dish.

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THE STATE OF FOOD AND AGRICULTURE

VALUE-DRIVEN TRANSFORMATION OF AGRIFOOD SYSTEMS

Food and Agriculture Organization of the United Nations
Rome, 2024

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FOREWORD

Global agrifood systems feed us and sustain the livelihoods of many. However, these systems are at a pivotal moment, facing unprecedented challenges that demand innovative solutions and collective action. The 2024 edition of *The State of Food and Agriculture* builds on the groundbreaking work of the previous edition, delving deeper into the hidden costs of our agrifood systems and charting a course for transformative change.

In 2023, we revealed that the global hidden costs of agrifood systems exceeded 10 trillion US dollars at purchasing power parity in 2020. This year, we refine our understanding of these costs, particularly in the realm of health, and explore how they manifest in different agrifood system types worldwide. Our findings underscore the urgency of action. From the burden of non-communicable diseases in formalizing and industrial agrifood systems, to the persistent challenges of undernourishment in traditional ones, the hidden costs of our agrifood systems touch every corner of the globe.

Agrifood systems, which employ an estimated 1.23 billion people globally, are deeply interconnected, yet all actors do not share equally the burden of hidden costs and the transformation that is needed. Despite their critical role in providing employment, agrifood systems do not always ensure an acceptable standard of living and quality of life. Vulnerable populations, including the poor and food insecure, small-scale value chain actors, women, youth, persons living with disabilities, and Indigenous Peoples, often bear the greatest burden of social hidden costs in these systems. Inequalities and power imbalances are deeply embedded in our agrifood systems.

Addressing these challenges requires tailored solutions for diverse agrifood systems. The innovative agrifood systems typology adopted for this report reveals that different systems face unique challenges and require targeted interventions. It is crucial to address the double burden of malnutrition in transitioning agrifood systems and to tackle the health and environmental hidden costs of industrial agrifood systems with context-specific strategies. Agrifood systems in countries and territories in protracted crisis stand out for their significant burdens of environmental and social hidden costs, underlining the importance of incorporating long-term solutions into exit strategies and/or crisis response.

The importance of true cost accounting (TCA) and stakeholder engagement cannot be overstated. By applying TCA and fostering inclusive stakeholder dialogue, we can identify effective levers for reducing hidden costs and creating more efficient, inclusive, resilient, sustainable and healthy agrifood systems. This approach enables us to make informed decisions that benefit both people and the planet.

Transforming our agrifood systems also requires unprecedented collaboration between policymakers, producers, consumers and financial institutions. Producers, who are on the front line of the impacts of the climate crisis, bear a significant share of the burden while facing challenges to adopt sustainable practices. Mechanisms need to be put in place to ease their financial and administrative burdens, thereby incentivizing transformational change. There is a need to ensure that the benefits and costs of transformation are equitably distributed among stakeholders in agrifood value chains.

Businesses and investors in agrifood systems also have critical roles to play. Agribusinesses range from micro- and small enterprises to global corporations, and their influence can drive sustainable practices across supply chains. Consumer demand for healthier, sustainable and fair production practices is a significant driver of change. Similarly, the investment community must incorporate environmental and social responsibility into their operations, recognizing that "business as usual is a high-risk proposition" in the face of a changing climate.

Consumers, the largest group of agrifood actors globally, can drive transformative change through their purchasing decisions. Dietary shifts to address the low consumption of fruits and whole grains and the overconsumption of sodium are key in all agrifood systems categories, whereas the overconsumption of processed and

FOREWORD

red meat is particularly relevant in industrial agrifood systems. Addressing these dietary risks would tackle not only health hidden costs, but also a significant portion of environmental costs through land-use change and input use, based on the dependencies captured in this report. Accumulating evidence suggests that interventions to build consumer agency and shape consumer preferences and procurement practices can spur change across food supply chains, promoting sustainability and health.

These insights provide a strategic guide for action, underscoring the urgent need for transformative change in global agrifood systems. The transformation of our agrifood systems is fundamental to achieving the Sustainable Development Goals and securing a prosperous future for all. It requires us to bridge sectoral divides, align policies across health, agriculture and the environment, and ensure that the benefits and costs of change are equitably distributed, including across generations.

As we move forward, it is important to remember that real change begins with individual actions and initiatives. A smallholder farmer adopting sustainable practices, a community coming together to support value generation in local agrifood systems, or a consumer choosing to buy fair trade products that are sustainably produced – all these actions contribute to the larger goal. These individual actions need to be further incentivized through enabling policies and targeted investments. Each of us has a role to play, and our collective efforts can drive the transformation needed to build a better future through the four betters: better production, better nutrition, a better environment and a better life – leaving no one behind. Let us be inspired by the stories of those who are already making a difference and come together to create a global movement for sustainable and inclusive agrifood systems.

The journey ahead will be challenging, but the potential rewards are immense. By embracing the insights and recommendations of this report, we can build agrifood systems that nourish both people and the planet, today and for generations to come. The time for action is now, and the path forward is clear. Let us seize this moment to transform our agrifood systems and create a more sustainable, healthier and inclusive world for all.

Qu Dongyu
FAO Director-General

METHODOLOGY

Preparation of *The State of Food and Agriculture 2024* took place in tandem with that of the 2023 edition,[1] with both reports built on the theme of the true cost of food. An advisory group representing all relevant technical units of the Food and Agriculture Organization of the United Nations (FAO) was formed, alongside a panel of external experts, to assist the research and writing team. The advisory group convened from 22 to 24 March 2023, both virtually and in Rome, to review the draft of the 2023 edition and outline the scope of the 2024 edition.

This report drew upon an extensive review of case studies on the hidden costs of agrifood systems. The identification of case studies relied on a two-step approach. The first step aimed to move the needle on true cost accounting (TCA) applications, especially in regions and countries not receiving as much attention. Through an open call for proposals on case studies from 6 to 27 October 2023 and in consultation with the FAO Regional Offices, FAO commissioned a total of seven studies as background papers for this report. Second, it gathered case studies through a call for submissions, entitled "How can the hidden costs and benefits of agrifood systems be effectively incorporated into decision-making for transformation?", on the Global Forum on Food Security and Nutrition between 5 December 2023 and 29 January 2024. This resulted in 70 responses.[2] The platform also allowed for inputs through a pilot artificial intelligence-based interviewer application, which mimicked a key informant interview, following the steps of Chopra and Haaland (2023).[3] The call for submissions also accepted case studies that look at two or more aspects of the hidden costs under environmental, social or health categories. Out of all the responses, a total of 28 case studies were assessed as relevant to feature in this report. Through these steps, FAO created an inventory of TCA case studies, incorporating additional examples identified by the research and writing team through literature review and those shared by the advisory group.[a]

The team presented the drafts of the first three chapters to the advisory group and panel of external experts in advance of a workshop held both virtually and in Rome from 3 to 5 April 2024. With guidance from the workshop, the report was revised and the final chapters completed. The revised draft was sent for comments to the management team of FAO's Economic and Social Development stream, and to other FAO streams and the FAO Regional Offices for Africa, Asia and the Pacific, Europe and Central Asia, Latin America and the Caribbean, and the Near East and North Africa. Comments were incorporated in the final draft, which was reviewed by the Director of FAO's Agrifood Economics and Policy Division, the FAO Chief Economist and the Office of the Director-General.

a The inventory of case studies is available upon request.

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This edition of the report is dedicated to the memory of Terri Raney (1 August 1956 – 2 September 2024), former FAO Senior Economist and Editor of *The State of Food and Agriculture* from 2003 to 2015.

The State of Food and Agriculture 2024 was prepared by a multidisciplinary team from the Food and Agriculture Organization of the United Nations (FAO), under the direction of David Laborde, Director of the Agrifood Economics and Policy Division, and Andrea Cattaneo, Senior Economist and Editor of the publication. Overall guidance was provided by Máximo Torero Cullen, Chief Economist, and by the management team of the Economic and Social Development stream.

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ANNEXES

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ABBREVIATIONS

AMR	antimicrobial resistance
BMI	body mass index
BRIC	Brazil, Russian Federation, India and China
CBA	cost–benefit analysis
CFPP	City Food Policy Project
CMF	commercial milk formula
CNF	community-managed natural farming
CSDDD	Corporate Sustainability Due Diligence Directive
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSR	corporate social responsibility
DALY	disability-adjusted life year
ESG	environmental, social and governance
FABLE	Food, Agriculture, Biodiversity, Land-Use and Energy
FAOSTAT	FAO's Corporate Database for Substantive Statistical Data
FBDGs	food-based dietary guidelines
FiBL	Research Institute of Organic Agriculture
FOAG	Federal Office for Agriculture
FSDP	Full Sustainable Development Pathway
FSEC	Food System Economics Commission
FSN Forum	Global Forum on Food Security and Nutrition
FST	food systems transformation
GAFF	Global Alliance for the Future of Food
GBD	Global Burden of Disease
GCFRP	Ghana Cocoa Forest REDD+ Programme
GDP	gross domestic product
GDQS	Global Diet Quality Score
GFP	Good Food Purchasing
GHG	greenhouse gas
GIZ	German Agency for International Cooperation
HDP	humanitarian–development–peace
IDH	Sustainable Trade Initiative
IFPRI	International Food Policy Research Institute
IIASA	International Institute for Applied Systems Analysis
IPC	Integrated Food Security Phase Classification
LCA	life cycle assessment
LMIC	lower-middle-income country
MDB	multilateral development bank
NCD	non-communicable disease
NDB	national development bank
NSRI	National Salt Reduction Initiative
OECD	Organisation for Economic Co-operation and Development
PDS	Public Distribution System
PH	public health
PIK	Potsdam Institute for Climate Impact Research
PN	public nutrition
PPP	purchasing power parity
REDD	reducing emissions from deforestation and forest degradation in developing countries

SBTi	Science Based Targets initiative
SDGs	Sustainable Development Goals
SDSN	Sustainable Development Solutions Network
SSB	sugar-sweetened beverage
TCA	true cost accounting
TEEB	The Economics of Ecosystems and Biodiversity
TIFS	Transformational Investing in Food Systems
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UPA	urban and peri-urban agriculture
UPFs	ultraprocessed foods
VAT	value added tax
VoP	Value of Production
WBF	World Banana Forum
WFP	World Food Programme
WHO	World Health Organization
WIUT	Westminster International University in Tashkent
WUR	Wageningen University & Research

GLOSSARY

Agrifood systems. Cover the journey of food from farm to table – including when it is grown, fished, harvested, processed, packaged, transported, distributed, traded, bought, prepared, eaten and disposed of. They also encompass non-food products that constitute livelihoods and all of the people, activities, investments and choices that play a part in getting us these food and agricultural products. In the FAO Constitution, the term "agriculture" and its derivatives include fisheries, marine products, forestry and primary forestry products.[1]

Agrifood systems transformation. For the purpose of this report, agrifood systems transformation is the process by which the functioning of agrifood systems is changed to make them more efficient, inclusive, resilient and sustainable for better production, better nutrition, a better environment and a better life, leaving no one behind.[2]

Agricultural support. The monetary value of gross transfers to agriculture from consumers and taxpayers arising from government policies that support agriculture, regardless of their objectives and economic impacts.[3]

Capital. The economic framing of the various stocks in which each type of capital embodies future streams of benefits that contribute to human well-being (see also "stock", "human capital", "natural capital", "produced capital" and "social capital").[4]

- **Human capital.** The knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being.[4]
- **Natural capital.** The stock of renewable and non-renewable natural resources that combine to yield a flow of benefits to people.[5, 6]
- **Produced capital.** All manufactured capital, such as buildings, factories, machinery and physical infrastructure (e.g. roads, water systems), as well as all financial capital and intellectual capital (e.g. technology, software, patents, brands).[4]
- **Social capital.** Networks, including institutions, together with shared norms, values and understandings that facilitate cooperation within or among groups.[4]

Corporate social responsibility (CSR). A business model that enables a company to be socially accountable to itself, stakeholders and the public. Through CSR, companies consciously assess and manage their economic, social and environmental impacts, going beyond compliance with regulatory requirements and extending into actions that further social good, beyond the interests of the firm and the requirements of law.[7]

Cost. In common usage, a cost is the monetary value of goods and services that producers and consumers purchase. However, there are situations where such a definition is not helpful. Economists distinguish between the following types of costs:

- **Abatement cost.** The monetary cost to reduce a hidden cost from capital change. Can also refer to the minimal monetary cost of reducing hidden costs to a certain level given a costed portfolio of actual or potential abatement measures.[8]
- **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.[9]
- **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 (i.e. a negative externality) or economic losses triggered by other market or policy failures.
- **Private cost.** Costs paid by a consumer to purchase a good or by a firm to purchase capital equipment, hire labour or buy materials or other inputs. These costs are included in production and consumption decisions.[9]

Social cost. The decrease in economic value to society from a capital change. Estimated in monetary terms by an economic valuation of the decrease.[8]

Cost–benefit analysis. A process for calculating and comparing the benefits and costs of a given policy or project, based on assigning a monetary value to all the associated activities. It is used to evaluate the feasibility or profitability of projects and public policy interventions. It aggregates the costs and benefits in different periods to a single value using a discount rate, assigning lower weight to the costs and benefits as they happen further into the future.[4]

Decision-makers. Those who determine or influence which, when, where and how levers, such as policies and investments, are activated. They include key private, public and civil society agrifood systems actors, as well as donors, governments, local authorities, international organizations and academia.

Dietary pattern. The combination of foods that form diets in context and time. Dietary patterns are contextual, driven by factors of food access and affordability, but also by culture, traditions, values, preferences and other considerations.

Healthy diets. Diets comprising four key aspects: diversity (within and across food groups), adequacy (sufficiency of all essential nutrients compared to requirements), moderation (foods and nutrients that are related to poor health outcomes) and balance (energy and macronutrient intake). Foods consumed should be safe.[10]

Dietary risk factors. The estimated burden of non-communicable diseases for adults aged 25 and older associated with consumption of fruits, vegetables, legumes, whole grains, nuts and seeds, fibre, seafood omega-3 fatty acids, omega-6 polyunsaturated fatty acids, calcium, milk, sodium, red meat, processed meat, sugar-sweetened beverages and trans fats. These dietary risk factors can be harmful (e.g. sugar-sweetened beverages), meaning they increase the risk of disease; protective (e.g. fruits and vegetables); or with mixed effects depending on the amount consumed and the disease outcome in question.[11]

Disability-adjusted life year (DALY). A universal metric that allows researchers and policymakers to compare very different populations and health conditions over time. DALYs equal the sum of years of life lost and years lived with disability. One DALY equals one lost year of healthy life. DALYs allow us to estimate the total number of years lost due to specific causes and risk factors at the national, regional and global levels.[12]

Elasticity. Price elasticity of demand gives the percentage change in the demand of a good per percentage change in the price of the same good. Price elasticity of demand is almost always negative, but is generally expressed in absolute value (without sign). When the price elasticity of demand is above 1 (in absolute value terms), demand is said to be "**elastic**", that is, demand changes proportionally more than price. When the price elasticity of demand is below 1 (in absolute value terms), demand is said to be "**inelastic**", that is, it changes proportionally less than the price.[13] For example, soft drinks are typically considered an elastic food item, because if the price increases, demand decreases significantly, as consumers can easily switch to other beverages, whereas bread is considered inelastic because even if prices increase, demand decreases only slightly, as it is a staple food item.

Environmental, social and governance (ESG). Refers to the three pillars – environmental issues, social issues and corporate governance – of reporting frameworks aimed at capturing all the non-financial risks and opportunities inherent in a company's day-to-day activities. There is no standard ESG reporting framework, but reporting is typically done by publishing a sustainability report and, increasingly, by disclosing data online.[14]

Externality. A positive or negative consequence of an economic activity or transaction that affects other parties without this being reflected in the price of the goods or services transacted.[4]

GLOSSARY

Fiscal space. The scope a government has to undertake discretionary fiscal policy (e.g. agricultural support) within existing budgetary plans without endangering market access and debt sustainability.[15]

Food literacy. The knowledge to understand and evaluate food-related information associated with the social aspects of food: how it is produced, where it comes from, who grows it and how these things affect our health.[16]

Food security. A situation in which all people at all times have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.[10]

Food supply chain. A connected series of activities encompassing the primary production of food from crops, livestock, forestry, fisheries and aquaculture, along with the value-adding activities of storage, transportation, processing, wholesale, retail and food service. This definition differs from that of "food value chains" as proposed by FAO (2014) by excluding food consumption and disposal.[17]

Flow. A cost or benefit derived from the use of various capital stocks.[4]

Gender wage gap. Difference between the average daily male and female wages for the same type of work as a percentage of the average male wage.[18]

Hidden benefit. Positive impact on society of a product or economic activity that is not reflected in its market price.[19]

Institutional procurement. The long-term process of acquiring goods and services that are essential to institutional operations. Procurement focuses on building strong and mutually beneficial relationships between buyers and suppliers. Unlike purchasing, procurement processes consider the value of the transaction as a whole, not just the price of the goods or services.[20]

Malnutrition. An abnormal physiological condition caused by inadequate, unbalanced, or excessive intake of macronutrients and/or micronutrients. Malnutrition includes undernutrition (child stunting and wasting, and vitamin and mineral deficiencies) as well as overweight and obesity.[10]

Market failure. A situation in which the allocation of goods and services by a free market is not efficient, often leading to a net loss of economic value to society, that is, the full benefits of the use of social resources are not realized. There are many types of market failure, including demerit goods, externality, market power, missing markets and public goods.

Materiality. Generally defined as a measure of how important a piece of information is when making a decision,[21] or the importance, worth or usefulness of something.[22] In the context of true cost accounting, it reflects significant economic, environmental and social impacts that substantially influence the assessments and decisions of stakeholders. An impact may be considered material if measurement and communication of the impact have the potential to alter decision-making processes.[22]

> **Double materiality.** Applied to the private sector (i.e. businesses and investors), it is the principle that businesses and investors must disclose not only how they are affected by sustainability issues, such as climate change ("outside in"), but also how their activities impact society and the environment ("inside out").

Non-communicable diseases (NCDs). Medical conditions that are not transmissible directly from one person to another. They tend to be of long duration and are the result of a combination of genetic, physiological, environmental and behavioural factors.[23] The main types of NCDs are cardiovascular diseases, cancers, chronic respiratory diseases and diabetes.[24]

Nudge. Any form of choice architecture that alters people's behaviour in a predictable way without restricting options or significantly changing their economic incentives.[25]

Nutritious foods. "Safe foods" that contribute essential nutrients, such as vitamins and minerals (micronutrients), fibre and other components, to healthy diets that are beneficial for growth, health and development and guard against malnutrition. In nutritious foods, the presence of nutrients of public health concern, such as saturated fats, free sugars and salt/sodium, is minimized, industrially produced trans fats are eliminated and salt is iodized.[10]

Political economy. The social, economic, cultural and political factors that structure, sustain and transform constellations of public and private actors and their interests and relations over time. It affects the type of political and institutional reform needed to enable and facilitate policy support.[26, 27]

Public goods. Products that one individual can enjoy without reducing the amount available to others (e.g. roads, public parks, clean air and other basic societal goods). In other words, they are non-rivalrous and non-excludable.[28] The private sector has little incentive to produce public goods, resulting in underproduction and market failure.

Purchasing power. A measure of the amount of goods and services that can be purchased with a given amount of money.

Prevalence of undernourishment. Percentage of the national population experiencing undernourishment, as calculated by FAO *et al.* (2022).[10, 29]

Resilience. The ability of individuals, households, communities, cities, institutions, systems and societies to prevent, anticipate, absorb, adapt and transform positively, efficiently and effectively when faced with a wide range of risks, while maintaining an acceptable level of functioning, without compromising long-term prospects for sustainable development, peace and security, human rights and well-being for all.[30]

Scenarios. Representations of possible futures for one or more components of a system, including alternative policy or management options.[31]

Simulations. Quantified scenarios generated using simulation models that are simplified representations of reality that use mathematical formulations to assess potential impacts and/or generate projections. Such projections can be used for backcasting (e.g. what policy mix is required to reach a stated objective) and forecasting (e.g. how close to the objective a given policy mix would deliver).[32] Examples of simulation models include global economic models or Excel-based calculators such as the FABLE Calculator.

Stock. The physical or observable quantities and qualities that underpin various flows within the system, classified as being produced, natural, human or social (see also "capital").[4]

Stunting. Low height-for-age, reflecting a past episode or episodes of sustained undernutrition. In children under five years of age, stunting is defined as height-for-age less than –2 standard deviations below the WHO Child Growth Standards median.[10]

Sustainable diets. Diets with low environmental impacts and which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems; culturally acceptable; accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources.[33]

True cost accounting (TCA). A holistic and systemic approach to measuring and valuing the environmental, social, health and economic costs and benefits generated by agrifood systems to facilitate improved decisions by policymakers, businesses, farmers, investors and consumers.[34]

True pricing. The process of incorporating hidden costs into transactions to improve transparency and decision-making. The goal of true pricing is to eliminate or reduce hidden costs as much as possible and ensure affordable and healthy food is accessible to people, in alignment with the right to food.[35]

GLOSSARY

Undernourishment. The condition in which an individual's habitual food consumption is insufficient to provide the amount of dietary energy required to maintain a normal, active, healthy life. For the purposes of this report, hunger is defined as being synonymous with chronic undernourishment. The prevalence of undernourishment is used to measure hunger.[10]

Undernutrition. The outcome of poor nutritional intake in terms of quantity and/or quality and/or poor absorption and/or poor biological use of nutrients consumed as a result of repeated instances of disease. It includes being underweight for one's age, too short for one's age (stunted), dangerously thin for one's height (wasted) or deficient in vitamins and minerals (suffering from micronutrient deficiency).[10]

Voluntary standards. Non-mandatory rules, guidelines or characteristics about a product or a process developed by private-sector actors, representatives of civil society or public-sector agencies.

Wasting. Low weight-for-height, generally the result of weight loss associated with a recent period of inadequate dietary energy intake and/or disease. In children under five years of age, wasting is defined as weight-for-height less than –2 standard deviations below the WHO Child Growth Standards median.[10]

CORE MESSAGES

1 Using true cost accounting (TCA), *The State of Food and Agriculture 2023* presented preliminary estimates of the global hidden costs of agrifood systems and stressed the urgent need to address them. This edition refines these estimates, confirming that the global quantified hidden costs of agrifood systems exceed 10 trillion dollars at 2020 purchasing power parity (PPP). Strategic actions are needed by all actors to enhance the value of agrifood systems to society.

2 Unhealthy dietary patterns related to non-communicable diseases account for 70 percent of all quantified hidden costs. The biggest global risk factors are low intake of whole grains, high intake of sodium, and low intake of fruits. Due to data constraints, undernutrition costs (wasting, stunting, and micronutrient deficiency) were not calculated, making these figures for health hidden costs a lower bound.

3 This report adopts an agrifood systems typology with six categories – protracted crisis, traditional, expanding, diversifying, formalizing and industrial. Based on this typology, it analyses the quantified hidden costs for 153 countries, covering 99 percent of the world's population. Industrial and diversifying agrifood systems account for the highest global quantified hidden costs (amounting to 5.9 trillion 2020 PPP dollars), and these are dominated by health hidden costs.

4 No single transformational strategy exists, given the diversity of possible policy interventions and investments. In the historical transition from traditional to industrial agrifood systems, both outcomes and hidden costs vary. While there is scope for improving efficiency and safety, care must be taken to avoid exacerbating power imbalances, environmental and social hidden costs, and unhealthy dietary transitions.

5 Environmental hidden costs are largest in diversifying agrifood systems (720 billion 2020 PPP dollars), followed by formalizing and industrial. However, countries in protracted crisis are the most burdened by environmental hidden costs, when considered as a share of their gross domestic product (GDP) (20 percent).

6 Social hidden costs are prevalent in traditional and protracted crisis agrifood systems, accounting for 8 and 18 percent of GDP, respectively. These costs – driven by undernourishment and poverty – emphasize the importance of raising livelihoods and bridging the humanitarian–development–peace nexus.

7 Health hidden costs are relevant across all agrifood systems categories. The leading dietary risk related to non-communicable diseases is low consumption of whole grains in all agrifood systems except protracted crisis and traditional, where the greatest risk is low intake of fruits and vegetables.

8 In countries and territories with formalizing and industrial agrifood systems, diets high in red and processed meat as well as sodium are significant. Food-based dietary guidelines need to take into account such patterns to more effectively promote healthy diets that decrease health hidden costs.

9 Transforming agrifood systems to reduce hidden costs will improve well-being. However, the distribution of benefits and costs will be uneven across different stakeholders, countries and time frames.

10 Everyone has a role to play in driving agrifood systems transformation. It is crucial to integrate efforts made within agrifood systems – such as those made by the public and private sectors, research institutions and civil society.

CORE MESSAGES

11 In increasingly global food supply chains, power imbalances often shift the burden of change onto vulnerable parties such as producers, who end up facing higher regulatory costs and downward price pressures. In contrast, the benefits of change may be reaped by parties who avoid or pass on additional costs. It is possible to minimize business disruption by staying ahead of anticipated regulatory change and adopting early on sustainable and fair practices.

12 Consumers can influence agrifood systems through their purchasing decisions by choosing products that are sustainably produced and healthy. Financial incentives, information and educational programmes, and regulations can support this shift, ensuring that even vulnerable households can participate in and benefit from these changes.

13 The significant purchasing power of institutions can be leveraged to reshape food supply chains and improve food environments. By encouraging consumption of sustainable and nutritious foods, these institutions can influence consumption patterns over generations. This impact can be further enhanced when paired with comprehensive food and nutrition education.

14 Targeted TCA assessments of agrifood systems carried out across varying levels – from product and value chain to national – can help public and private decision-makers assess priorities and manage trade-offs. Strong consultative engagement of agrifood systems stakeholders identifies effective and fair actions.

EXECUTIVE SUMMARY

For the first time, in 2024, *The State of Food and Agriculture* builds on the previous year's edition, which quantified the preliminary global hidden costs of agrifood systems using true cost accounting (TCA) – a systems approach that captures the environmental, social, health and economic impacts, both visible and invisible, of agrifood systems. Using publicly available data for 154 countries, *The State of Food and Agriculture 2023* revealed that the global hidden costs of agrifood systems were highly likely to have exceeded 10 trillion dollars at purchasing power parity (PPP) in 2020. This preliminary figure would probably be even higher without the data constraints preventing the quantification of several relevant hidden cost components for those 154 countries. A notable finding was that global hidden costs are largely driven by health hidden costs, followed by environmental hidden costs, in upper-middle- and high-income countries. Social hidden costs from poverty and undernourishment are predominant in low- and lower-middle-income countries.

Against this backdrop, global visions for transforming agrifood systems are on the rise. Such transformation requires a deeper understanding of national agrifood systems and their hidden costs to identify clear policy levers. Consequently, *The State of Food and Agriculture 2024* refines the global estimates presented in the 2023 edition, providing a detailed breakdown of the health hidden costs for 156 countries, and moves forward, including targeted TCA assessments through case studies. Targeted TCA assessments enable stakeholder consultation and the identification of policy levers needed to address the main drivers of hidden costs, and are, therefore, a fundamental precondition to successful transformation on any scale.

GLOBAL QUANTIFIED HIDDEN COSTS OF AGRIFOOD SYSTEMS

Revising and refining the 2023 estimates

The quantification of hidden costs in the 2023 edition of this report amounted to 12.7 trillion 2020 PPP dollars in 2020, of which more than 9 trillion (or 73 percent) were due to health-related costs. Because of the overwhelming share of health hidden costs associated with dietary patterns that lead to obesity and non-communicable diseases (NCDs), this 2024 edition makes three refinements to their quantification. First, it drops the hidden costs of high body mass index (BMI), as this can be driven by factors other than agrifood systems. Second, the health hidden costs of diets high in sugar-sweetened beverages are added, whereas these were previously excluded to prevent double-counting with BMI. Third, health hidden costs are now broken down into dietary risk factors associated with NCDs from the Global Burden of Disease study to help identify more tangible policy levers.

With these refinements, the new quantified hidden costs amount to 11.6 trillion 2020 PPP dollars for 156 countries globally, with health hidden costs decreasing by around 13 percent to 8.1 trillion 2020 PPP dollars, but remaining equivalent to 70 percent of global hidden costs, confirming the 2023 edition's conclusions that urgent strategic action is needed. Breaking down these results by dietary risk associated with NCDs, this report finds that diets low in whole grains are of concern (18 percent of global quantified health hidden costs), alongside diets high in sodium and low in fruits (16 percent each), although there is significant variation across agrifood systems.

An agrifood systems typology to identify context-specific policies

To facilitate policy recommendations better suited to specific contexts, this report analyses quantified hidden costs through the lens of an agrifood systems typology covering 153 countries

with six categories – protracted crisis, traditional, expanding, diversifying, formalizing and industrial. A set of four variables, comprising agricultural value added per worker, number of supermarkets per capita, diet diversity, and urbanization, was used to create this typology, which has been shown to have strong correlations with a number of indicators relevant to sustainable agrifood systems transformation.

Industrial and diversifying agrifood systems make the highest contribution to global quantified hidden costs (adding up to 5.9 trillion 2020 PPP dollars), dominated by health hidden costs linked to NCDs. These health hidden costs also account for a significant share of the total quantified hidden costs of other agrifood systems, except for those in the protracted crisis category.

Presenting hidden costs as a share of gross domestic product (GDP) gives a sense of the burden placed on the economy. In this respect, the burden of hidden costs is highest in countries in protracted crisis (47 percent of GDP) and those with traditional agrifood systems (23 percent of GDP), with social hidden costs being particularly important. The burden of hidden costs decreases as agrifood systems transition towards industrial (6 percent of GDP), as does the relevance of social hidden costs.

The burden of health hidden costs associated with NCDs is largest in the diversifying category (10 percent of GDP) and decreases as systems transition towards formalizing and industrial categories. This pattern reflects the dietary transition that accompanies structural transformation. The decreasing share of health hidden costs in GDP in formalizing and industrial systems also reflects higher financial and institutional capacity and better health systems to address the burden of NCD-related health hidden costs, as well as the rise in demand for healthier diets as incomes increase.

The dietary risk factors associated with NCDs driving health hidden costs are also highly diverse across systems, so breaking them down can help gain insights into potential levers. Diets low in whole grains are the leading risk in all agrifood systems categories, except for protracted crisis and traditional systems. In these two categories, diets low in fruits and vegetables prevail, although these are also relevant in other categories. Diets high in sodium are also problematic and show an increasing pattern as agrifood systems transition from traditional to formalizing, where they peak and then decrease for industrial agrifood systems. Diets high in processed and red meat, in contrast, increase consistently as agrifood systems transition from traditional towards industrial, where they feature among the top three dietary risks.

CAPACITY OF AGRIFOOD SYSTEMS TO IMPLEMENT TRANSFORMATIVE ACTIONS

Countries' capacity to take transformative action will depend to some extent on their institutional and fiscal space, as well as their supply chain structures and food environments, which vary widely across the agrifood systems typology.

Resources available for repurposing government support towards sustainable, inclusive and healthy food production and consumption patterns are highest in the industrial and formalizing agrifood systems categories. These categories also boast the highest government effectiveness index scores – that is, the overall capacity of governments to enact transformative policies – and highest level of social protection coverage.

Diversifying systems face significant challenges due to low government effectiveness and fiscal space. Out of all agrifood systems categories, diversifying has the highest burden of health hidden costs as a share of GDP. Furthermore, 27 percent of the population living in these countries cannot afford a healthy diet, indicating that in addition to dietary risks leading to NCDs, they also face the burden of malnutrition leading to child stunting and wasting. Countries in this category require policy action

specifically targeting the different types of dietary risks faced, as well as the affordability of nutritious food.

Countries and territories in protracted crisis perform worst on most agrifood systems indicators, with particularly low levels of government effectiveness, agricultural support, social protection coverage, fertilizer use intensity and rural electrification. In these contexts, social and environmental hidden costs stand out (averaging 18 percent and 20 percent of GDP, respectively). This is likely due to the vicious cycle of social and environmental stressors and conflict. While short-term agrifood systems interventions in such situations may focus on food aid, medium- to long-term actions to address environmental stressors, poverty and social inclusion can be a first step towards agrifood systems that can break this cycle.

Stakeholder engagement and scenario analysis to address the quantified hidden costs of agrifood systems

National stakeholder consultation is needed to assess the plausibility of the quantified hidden costs (including of targeted assessments), acknowledge and potentially fill data gaps, and contextualize the challenges based on national priorities and commitments. Scenario analysis, including simulations of alternative futures, is another fundamental tool in informing policy actions in targeted assessments. This report commissioned six country case studies by the Food, Agriculture, Biodiversity, Land-Use and Energy Consortium – Australia, Brazil, Colombia, Ethiopia, India and the United Kingdom of Great Britain and Northern Ireland. These case studies, representing different types of agrifood systems according to the typology introduced in this report, combine scenarios (based on stakeholder consultations) with TCA of the hidden costs of their agrifood systems.

Three scenarios were assessed in each country: i) the current trends scenario with a low-ambition vision of feasible actions towards sustainable agrifood systems, strongly dependent on current policies; ii) the national commitments scenario reflecting the actions needed to meet existing national commitments and targets; and iii) the global sustainability scenario corresponding to efforts compatible with achieving global sustainability targets.

The stakeholder consultations identified nationally relevant variables that would have to change to increase the sustainability of their agrifood systems. These variables included improvements in crop and livestock productivity, reduced stocking rates (ruminant density) on pasture, and decreased post-harvest losses in all countries. Preventing deforestation and increasing afforestation are included in the national commitments and global sustainability scenarios. Other variables considered by some countries include changes in trade, biofuels, agroecological practices and irrigation. Dietary changes for healthier consumption patterns are also seen as a key factor.

The results of the scenario analysis show significant variation from country to country in terms of which of the modelled outcomes is the most effective in reducing the hidden costs of agrifood systems. Drawing on the agrifood systems typology, however, an interesting pattern can be observed. For the majority of the agrifood systems studied in the industrial and transitional categories, changing dietary patterns is not only the main means of decreasing quantified health hidden costs, but also a very effective way of reducing the quantified environmental hidden costs by freeing land, reducing and sequestering greenhouse gases (GHGs) and reducing nitrogen emissions.

The role of stakeholder consultation in identifying nationally relevant levers was particularly evident in a Swiss Government-backed study. One of the most important enablers of this process is the existence of a national commitment to agrifood systems transformation. The results provide an

initial validation of the hidden costs quantified in *The State of Food and Agriculture 2023* and indicate that national-level assessments of the same hidden cost components fall within the uncertainty bounds of the 2023 assessment for Switzerland. The refined and amended hidden cost estimates send a relatively simple message: key entry points for agrifood systems transformation could focus on addressing dietary patterns, biodiversity loss and GHG emissions.

The importance of stakeholder participation is also evident in the application of The Economics of Ecosystems and Biodiversity (TEEB) AgriFood Evaluation Framework in several countries, which offers further examples of combining a consultative scenario-building process with TCA. It adopts a comprehensive strategy for policy intervention for agrifood systems transformation. Following a scoping stage to collect documentary insights, identify stakeholders and conduct a preliminary evaluation of policy interventions, policy mapping is conducted to pinpoint pertinent policies and their governing mechanisms. Pilot projects are subsequently devised to serve as models for policy intervention scenarios. Lastly, communication and outreach initiatives are undertaken to enhance awareness and comprehension of the significance of integrating the (hidden and visible) values of nature into government decision-making and education.

A closer look at who bears the highest burden of agrifood systems hidden costs

The core actors whose decisions depend on and affect the value provided by agrifood systems range from input suppliers and producers, through processors and wholesalers, to retailers, food service providers and consumers. The decisions of one actor at one point in time in one location have implications for actors in another time or location. Consumers may not see the value of improving fertilizer use efficiency on farms that produce their food in another region or country, for instance. Similarly, producers of highly processed food may not see the value of changing their product compositions if associated hidden costs are borne by society at large and mostly in the future.

As the disconnect between the producers of hidden costs and the cost bearers grows, the benefits to society and the planet of transforming agrifood systems become less visible. This gap can be impossible to bridge if the damage occurs in the distant future or abroad. The inequalities on multiple dimensions (for example, socioeconomic, gender and generational) between who benefits from producing hidden costs and who bears those costs are one of the key challenges of transforming global agrifood systems. The role of governments and intergovernmental organizations is particularly important in cases where international or intergenerational transfers are needed to address these inequalities.

An estimated 1.23 billion people are directly employed in agrifood systems, bringing food to our tables by way of food supply chains. While agrifood systems provide employment around the world, they do not always provide an acceptable standard of living and quality of life. In fact, too often, vulnerable populations are left behind across agrifood systems, for example, the poor and food insecure, small-scale value chain actors, migrants and refugees, women, children and youth, persons living with disabilities, and Indigenous Peoples. These groups bear the greatest burden of the social hidden costs of agrifood systems.

The informality of agrifood operations also presents an overlapping set of challenges for agrifood systems transformation. While informal or semi-formal activities serve as the main source of revenue and income for many vulnerable segments of society, they can preserve poor working conditions (such as unofficial employment contracts) and not comply with food safety and hygiene regulations.

Producers are on the front line of agrifood systems transformation

To bring about change effectively, the concept of a living income, or living income benchmark, can be useful. It refers to the net annual income required for a household in a particular place to afford a decent standard of living for all members of that household. The discrepancy between the living income benchmark and actual earnings is particularly notable in the food and agriculture sector, with figures ranging from 50 to 94 percent for the typical smallholder farmer household. The living income perspective is an important one, because a successful agrifood systems transformation must recognize the unique position of producers: they are on the front line of climate change impacts and bear a significant share of the burden of adopting sustainable practices. While the necessary changes are warranted for society, the benefits of addressing hidden costs are realized all along the supply chain, but producers are not always compensated for the expenses they incur in addressing these costs. In other words, mechanisms need to be put in place to ease the financial and administrative burdens, thereby incentivizing transformational change. Furthermore, acknowledging the diversity within the agriculture sector is crucial for the development of effective policies.

When individual producers join forces by way of collective action, they create a bargaining power they can leverage to advance their goals for economic growth, as well as transformational change. Recent protests by farmers globally underscore the importance of integrating political economy considerations from the outset, by initiating processes that are inclusive and address issues of distributive justice and participation. European farmers have protested against policies, the increase in red tape and the tightening of environmental laws. Transformational change, therefore, needs to be designed so that the costs of taking action today are paid by those reaping the long-term benefits. Government pressure for agrifood systems reform, be it in the form of regulation or incentives, must be carried out in an inclusive manner.

One option is participation in certification programmes, known as voluntary sustainability standards, such as fair trade or organic certifications, which can be a means for producers to receive compensation for the costs of transition. However, although the effect of such certifications on producers' welfare is generally positive, it varies substantially by standard, crop and farmer organization. Standards that apply a system of quality-based price differentiation have the greatest impact on net farm revenue through a price effect. Certification schemes that enable producers to sell their products with a price premium facilitate the internalization of some, but not all, hidden costs, depending on the specific objectives of the programme. A study on banana supply chains finds external costs 45 percent lower for fair trade producers, making the social case for such quality standards and certifications.

Agribusinesses and investors have an important role to play

Businesses in agrifood systems engage in various activities beyond primary production, including aggregating, transporting, processing and selling food products to consumers. These businesses range from micro- and small enterprises to global corporations, with varying levels of concentration across agrifood systems types. Each subsequent agribusiness in the chain can exert business leverage over the preceding one, depending on its scale and market domination.

The investment community – including international financial institutions, banks and insurance companies – is facing increasing pressure from investors and stakeholders to incorporate environmental and social responsibility into its operations. It is becoming increasingly clear that any investment in agrifood systems must become future-proofed in the face of a changing climate. The notion that "business

as usual is a high-risk proposition" is resonating. This is reflected in the increasing participation of large firms conducting environmental, social and governance (ESG) reporting. Interestingly, ESG practices promoted by agrifood businesses are often implemented at the primary production level, but the benefits of the changes are enjoyed by other actors in the supply chain, highlighting once again distributional issues along value chains.

Agribusinesses and financial institutions with more leverage have roles to play beyond exerting their influence over other actors, by investing in better practices, be it through finance, contract arrangements, technical assistance or overall skills and awareness building. Meanwhile, forums such as the World Banana Forum foster collaboration across the different levels of food supply chains and can be a key means of ensuring a just transition.

Consumers are the last – vital – piece of the puzzle

Consumers are the largest group of agrifood actors globally, even though they may lack political clout and visibility. When in a position of agency, consumers can drive the transformative change needed in agrifood systems through their purchasing power.

From an environmental perspective, dietary shifts, especially reducing overall animal product consumption in countries where it is excessively high, can significantly lower GHG emissions and mitigate other environmental harms, such as biodiversity loss, land-use change and nutrient runoff. However, given the large discrepancies in dietary quality around the world, in some places, higher consumption of animal products may be necessary for a balanced diet, and the burden of countering the environmental damage wrought since the Industrial Revolution cannot be equally distributed.

In many countries, populations are facing a double burden of malnutrition, where undernutrition coexists with overweight, obesity or diet-related NCDs, probably requiring a combination of shifting consumer demand, economic measures and social safety nets. The prevalence of the double burden of malnutrition is especially high in countries with protracted crisis and traditional agrifood systems (70 percent) and it decreases as one moves towards industrial agrifood systems (27 percent). The opposite is seen with adult obesity and overweight (from 30 percent in protracted crisis and traditional agrifood systems to around 60 percent in industrial agrifood systems).

Special consideration needs to be given to the nutritional status of children. Children that suffer from undernutrition, particularly before the age of five, face profound and lasting impacts on their physical and cognitive development. Worldwide, in 2022, an estimated 148.1 million children under five years of age (22.3 percent) were stunted, 45 million (6.8 percent) were wasted and 37 million (5.6 percent) were overweight. A methodology applied by the World Food Programme, known as "The Cost of Hunger", estimates the social and economic impacts of child undernutrition, focusing on the health, education and labour sectors. The results highlight the cross-sectoral need for early childhood nutrition interventions.

The strength of consumers' purchasing power in driving agrifood systems transformation depends on both their ability and their willingness to pay for a different basket of food products, which may come at a higher price. However, economic constraints do not explain all consumption behaviour. Food preferences, stemming from taste and required preparation time and skills, for instance, as well as food access and environments, are also pertinent. In general, however, individual consumers, as well as institutions with significant food procurement needs, such as schools and hospitals, can capitalize on their purchasing power to simultaneously achieve transformation goals and raise awareness.

Other levers for influencing consumer demand

Economic levers can affect household consumption patterns by varying either relative prices or the incomes available for food purchases. Price measures include taxes and subsidies on food products. For example, taxes on sugar-sweetened beverages, implemented in over 100 countries, have been effective in reducing sales and associated health costs linked to obesity and chronic diseases. Conversely, subsidizing fruits and vegetables has shown positive results where demand is price sensitive. Reforming existing tax regimes, such as differentiating value added tax rates based on health and environmental considerations, could address environmental and health costs without reducing government revenue. Combining these financial measures with improved information, labelling measures, regulations and educational programmes on nutrition, health and sustainability is essential to change diets.

The effectiveness of taxes and subsidies in improving diets hinges on the assumption that consumers do not face budgetary constraints to cover basic nutrient needs. Where undernourishment remains a problem, measures that target income can be effective. These measures include nutrition-sensitive social safety nets that try to enhance food security, promote social inclusion and boost diet quality, either through cash transfers or vouchers that supplement income or with in-kind food assistance. Institutional procurement, such as school and hospital meals, can also have a ripple effect, prompting long-term change. School meals, the most widespread food safety net, can be particularly instrumental in changing consumption patterns over generations when accompanied by effective food and nutrition education. Entities involved in food procurement can have a profound impact by requiring TCA data for the products they buy and shifting their decision-making to maximize true value.

Stakeholder engagement for a true systems approach to transformation

This report has highlighted the need to document the connections between the beneficiaries of today's actions (carried out by producers, agribusinesses and consumers) and the bearers of the hidden costs of these actions, be they local or global actors of today, tomorrow or generations to come. Involving all interdependent actors within agrifood systems is needed to identify effective levers towards the most suitable development paths.

For instance, under increasing consumer pressure for sustainability and amid government regulations on health and environment, agrifood businesses have been self-regulating for a long time. Voluntary sustainability standards, ESG reporting and multicriteria accounting are all steps in the right direction. However, these are not sufficient for transformation to occur at scale, especially as agribusinesses may meet only the standards required to maintain brand value and fall short of necessary transformative action. As such, these principles need to be combined with well-designed incentive structures, government regulation and action, as well as guidance from international organizations and the TCA community.

Despite the overwhelming importance of sustainable and healthy diets in agrifood systems transformation, health ministries remain largely absent from the current discourse on stakeholder engagement needed to achieve it. Their involvement is an important next step for global agrifood systems transformation, as even in places where health hidden costs are still relatively low, having health ministries at the table can ensure that food value chains and social safety nets can be designed to nip the problem in the bud or avoid the historical peak in unhealthy diets seen during agrifood systems transitions.

Shaping government policy to meet multiple objectives

Governments make many decisions based on imperfect information to meet their national commitments under current agrifood systems structures. This report analyses quantified hidden costs through the lens of an agrifood systems typology, which can facilitate policy recommendations better suited to specific contexts.

In industrial agrifood systems – where primary production is input intensive, value chains are long, urbanization is high and unhealthy dietary patterns create the highest hidden costs – interventions to address unhealthy dietary patterns can be prioritized, thus also addressing a substantial share of environmental hidden costs. Upgrading food-based dietary guidelines to an agrifood systems approach, mandatory nutrient labels and certifications, and information campaigns on health and environmental impacts (including advertisements, regulations on transparency and reporting standards) are all effective levers. However, as policies aiming to change consumption behaviour may take a long time to reduce health hidden costs effectively (even in part), this lever cannot be implemented at the expense of actions to address environmental hidden costs. True cost accounting can help parse value created by various interventions.

In traditional agrifood systems – where primary production is inefficient, value chains are shorter, urbanization is low, and poverty and undernourishment create the highest hidden costs – social safety nets will remain integral policy levers to ensure the food security and nutrition of the most vulnerable. At the same time, the double burden of malnutrition is also highest in these agrifood systems, suggesting a need to complement conventional productivity-enhancing interventions with environmental and dietary levers from the outset to avoid the increase in environmental footprint and peak health costs historically observed during agrifood systems transitions.

Transitional agrifood systems (expanding, diversifying and formalizing categories), where urbanization is increasing and food value chains are lengthening as health hidden costs peak, need to invest in redesigning food value chain development to divert the course of nutrition transitions, leapfrog certain historical transitions and avoid the mistakes of industrial agrifood systems.

There is a growing amount of encouraging evidence on the effectiveness of policy mixes that combine traditional economic and behavioural incentives, though more research is needed to expand this evidence to cover traditional and transitional agrifood systems.

Financing the transformation

It is now well established that financial flows to agrifood systems need to increase significantly to finance the necessary transformation. Many promising initiatives by the finance sector are increasingly incorporating environmental and social responsibility into their operations. Scaling these up sufficiently to achieve global agrifood systems transformation, however, seems bound by "hidden constraints". These include the distributional issues that arise between different agrifood systems actors and the institutional status quo that makes financing the needed transformations very challenging.

The global cost of transformation is estimated to be within the means of global financial resources; however, as its distribution between countries is highly uneven, financing may be necessary. Especially countries affected by multiple drivers of food insecurity and malnutrition, climate extremes and conflict have limited access to financing, which calls for innovative and collaborative financing partnerships to ensure a just transition.

THE WAY FORWARD

Addressing the hidden costs revealed in *The State of Food and Agriculture 2023* and refined in this report inherently requires the distributional issues entrenched in global and local agrifood systems to be addressed as well. Globally, distributional imbalances occur between populations that enjoy the benefits of the status quo and those that bear the hidden costs – which may be those same populations at some point in the future or future generations separated by space and time. Even within national boundaries, trade-offs between different constituencies arise, as evidenced by the recent farmer protests in many parts of the world.

One of basic prerequisites to transforming any large system that comprises interconnections between actors with overlapping and conflicting interests is the existence of an effective institutional and regulatory environment. Creating clear rules and standards and instilling trust that they will be applied fairly to all stakeholders, regardless of size or political influence, takes some of the uncertainty out of investments that contribute to sustainability and fuel innovation.

It is also clear that bringing about the dietary shifts necessary to drive agrifood systems transformation will require a mix of levers. These can use economic influences, such as taxes, subsidies and social safety nets, or aim to affect behavioural change by increasing food literacy and raising awareness about the multidimensional impacts of available food choices. Institutions can also play a critical role by facilitating a unique food environment, such as schools that provide meals and involve children in hands-on and skills-building activities to do with food, while also channelling their purchases to the broader benefit of society.

While the global community can always hope for innovation to solve many of the problems of agrifood systems, this alone is unlikely to steer agrifood systems towards sustainability. Governance across agrifood systems needs to be transformed through political will and strong accountability at the international level. ■

UKRAINE
Preparing dough by hand.
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CHAPTER 1
CREATING VALUE IN AGRIFOOD SYSTEMS THROUGH AN INTEGRATED APPROACH

KEY MESSAGES

➔ As demonstrated in *The State of Food and Agriculture 2023*, true cost accounting (TCA) is a powerful approach to uncovering the hidden costs generated by current agrifood systems and identifying policy levers to enhance the value of agrifood systems to society.

➔ Following on from the awareness-building of last year's edition, which revealed that the global hidden costs of agrifood systems were likely to have exceeded 10 trillion dollars at purchasing power parity (PPP) in 2020, this edition refines the global TCA assessment and undertakes targeted assessments that link impacts to pathways, with extensive stakeholder consultations to prioritize feasible actions.

➔ The environmental, social and health hidden costs are analysed through the lens of an agrifood systems typology with six categories – protracted crisis, traditional, expanding, diversifying, formalizing and industrial – to facilitate policy recommendations better suited to each specific context.

➔ By improving on the hidden costs quantified in *The State of Food and Agriculture 2023*, this report unpacks the health hidden costs associated with unhealthy dietary patterns linked to an increased risk of non-communicable diseases (NCDs).

➔ Case studies show how targeted TCA assessments conducted across multiple agrifood systems categories provide more nuanced insights into the requisite agrifood systems transformation and potential actions moving forward.

We can no longer think and act in silos when it comes to agrifood systems transformation. Coordinated action between ministries, the public and private sectors, research institutions and policymakers, as well as other agrifood systems actors, is essential to make agrifood systems sustainable and inclusive. The complexity of agrifood systems combined with the increasing pressure they face to meet multiple goals amid numerous constraints has amplified the need to apply a systems lens to all endeavours to achieve the Sustainable Development Goals (SDGs).

On current trends, global agrifood systems are set to fall short of this objective, particularly in the case of SDG 2 (Zero Hunger), as projections estimate that about 582 million people will be chronically undernourished in 2030.[1] The 2024 *Global Policy Report* of the Food System Economics Commission clearly sets out the urgency of agrifood systems transformation, as well as the benefits and costs involved.[2] It finds that inclusive, health-enhancing and environmentally sustainable global agrifood systems are feasible if a set of transformative measures is adopted. Global feasibility, however, does not necessarily translate into national feasibility, as the costs to low-income countries, for instance, are beyond their financing capacity, requiring a global financial system to support them.[3]

The United Nations Food Systems Summit in 2021 and the UN Food Systems Summit + 2 Stocktaking Moment (UNFSS+2) in 2023 were significant turning points for national, regional and global governance structures. The COVID-19 pandemic laid bare the challenges surrounding

agrifood systems, amid ever more intense and frequent climatic shocks and political instability. Despite the complexity of the challenges, many countries have reiterated their commitment to the SDGs and formulated new commitments through national food systems transformation (FST) pathways. As of 2023, 127 of the 193 United Nations Members had submitted FST pathways. Adding more commitments to existing national priorities, however, increases the probability of trade-offs and challenges, especially in the face of political, institutional and financial constraints. Decision-makers and stakeholders increasingly need tools to help prioritize multiple objectives, minimizing trade-offs and maximizing synergies.

True cost accounting is a tool that can help prioritize multiple objectives and levers based on the true costs and benefits of agrifood systems. The foundational definition of TCA rests on a holistic systems approach, capturing the impacts and dependencies of agrifood systems on natural, social, human and produced capitals.[4] Although the large-scale use of TCA faces challenges due to data and resource limitations, its aspirational goal of measuring and valuing all hidden costs and benefits to guide the decisions of all agrifood systems actors has been gaining traction. The growing use of TCA in different situations by governments, businesses, financiers, civil society and academics is already contributing to the way we think and act about agrifood systems transformation.[5, 6] Box 1 further explores the definition of TCA and how a two-phase approach can inform agrifood systems transformation.

Using the TCA approach at national level, with publicly available data for 154 countries, *The State of Food and Agriculture 2023* revealed that the global hidden costs of agrifood systems were likely to have exceeded 10 trillion dollars in 2020.[b] This preliminary figure would have probably been even higher without the data constraints preventing the quantification of several relevant hidden cost components for those 154 countries. Global hidden costs are predominantly driven by health hidden costs in upper-middle- and high-income countries; however, the burden on national budgets is greatest in low-income countries (where social hidden costs prevail). This finding sparked considerable interest in conducting targeted context-specific TCA assessments proposed as phase two of the TCA approach in the 2023 edition of this report.

An important and unintended consequence of adopting TCA to reveal the true cost of food with a view to transforming agrifood systems was the perceived failure to acknowledge the full scale of hidden benefits. As stated in the opening paragraphs of *The State of Food and Agriculture 2023*, the value of agrifood systems to society is probably well beyond what is measured in gross domestic product (GDP), given the array of non-monetizable hidden benefits. These range from biodiversity conservation, carbon storage and sequestration, watershed regulation and cultural identity to the nourishment of the entire human population, sustaining not only agrifood systems but also the broader economy. In a sense, the world's entire GDP can be counted as a benefit of agrifood systems, as human productive activity would not exist without food. It is important to note that the TCA results published in the 2023 edition of this report are not meant as a cost–benefit assessment for making decisions based on the indisputable existence of agrifood systems. Rather, they help quantify the marginal (rather than total) hidden costs (and benefits) of our actions throughout agrifood systems to inform decisions on national, regional and global commitments. Box 2 discusses the scope and limitations of various approaches to quantifying the hidden benefits of global agrifood systems. ■

HOW CAN TRUE COST ACCOUNTING HELP UNPACK THE COMPLEXITY OF AGRIFOOD SYSTEMS?

The complexity of agrifood systems increases with a shift from traditional and local systems to more interconnected national, regional and global systems. This is driven by the increased number of stakeholders involved in longer value chains, leading to more complex impacts and interdependencies of action on all four capitals (natural, social, human and produced) »

b All results of TCA assessments are expressed in 2020 PPP dollars throughout this report.

BOX 1 UNDERSTANDING TRUE COST ACCOUNTING: A TWO-PHASE ASSESSMENT

Recent advances in evaluation and accounting frameworks create an unprecedented opportunity for comprehensive assessments of agrifood systems activities through the true cost accounting (TCA) approach, defined in *The State of Food and Agriculture 2023* as:

> a holistic and systemic approach to measure and value the environmental, social, health and economic costs and benefits generated by agrifood systems to facilitate improved decisions by policymakers, businesses, farmers, investors and consumers.

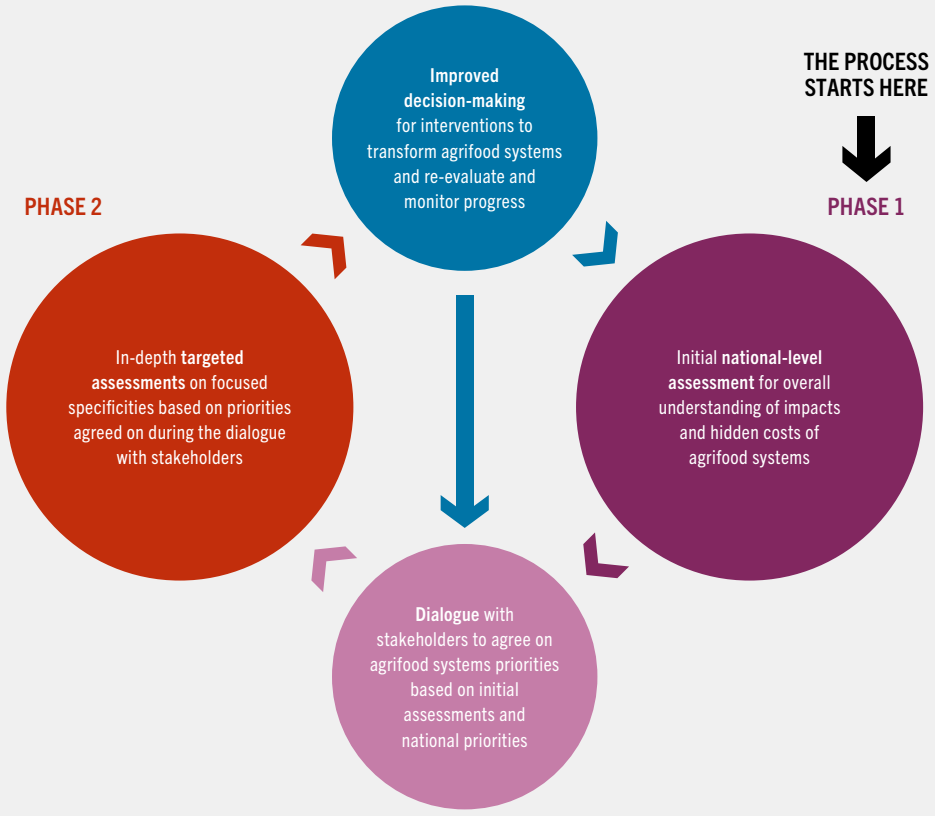
A fundamental aspect of TCA is that it extends assessments beyond market exchanges to measure and value all flows to and from agrifood systems, including those not captured by market transactions. True cost accounting assessments can adopt a variety of methods depending on a country's resources, data, capacity and reporting systems. Valuation can be either qualitative or quantitative, including monetary. The four dimensions covered – environmental, social, health and economic – are reflected in the four capitals: natural, social, human and produced.

Given that TCA is often hampered by data gaps, methodological limitations and institutional barriers, *The State of Food and Agriculture 2023* proposed a two-phase assessment in which available data and information are first analysed to provide an initial understanding of agrifood systems (see the figure). Such initial analyses can prompt dialogue between relevant stakeholders to identify the most important challenges and the most urgent data gaps to be filled to better understand the context and guide interventions.

National-level estimates presented in last year's edition of the report served as this first phase, which aimed to raise awareness, even if the quantified hidden costs of agrifood systems were incomplete, subject to a high degree of uncertainty and mute on the costs of transformation. This edition moves the needle further on these national estimates, with refinements to the data used.

The second phase is to carry out targeted and context-specific TCA assessments to better inform decision-makers on how to leverage policy, regulation, standards and private capital for a transition to sustainable agrifood systems. The case studies presented herein showcase how such targeted TCA assessments can delve into the multiple dependencies within agrifood systems, providing nuanced insights to inform the transformation.

FIGURE TWO-PHASE AGRIFOOD SYSTEMS ASSESSMENT PROCESS



SOURCE: FAO. 2023. Figure 3. In: *The State of Food and Agriculture 2023 – Revealing the true cost of food to transform agrifood systems*. Rome. https://doi.org/10.4060/cc7724en

BOX 2 CAN AND SHOULD THE HIDDEN BENEFITS OF AGRIFOOD SYSTEMS BE QUANTIFIED? HOW?

The hidden benefits of agrifood systems can be just as important as the hidden costs. This report does incorporate some hidden benefits of interventions by including them as negative hidden costs. For example, the approach allows for accounting for interventions that balance the needs of agriculture and forestry in land-use practices, which could create synergistic opportunities to increase sustainable crop productions and improve rural livelihoods, while reducing deforestation. Other hidden benefits may be perceived as hidden for those who generate them, but are captured by other economic actors and enter into market transactions. One such case is the tourism sector, which benefits economically from beautiful agricultural landscapes that attract visitors. In such cases, the "hidden" benefits are redistributed across the economy, but are not really hidden from gross domestic product (GDP). However, there are also hidden benefits that are not usually factored into traditional true cost accounting assessments. There are different ways of approximating them, but all are imperfect "back-of-the-envelope" approaches. Such estimates of the hidden benefits of agrifood systems can range from the quantification of consumer surpluses to considering global GDP in its entirety, based on the fact that without food there would be no labour, hence no GDP.

The consumer surplus is the difference between what consumers are willing to pay for food and the amount they actually pay. The surplus, which is an economic benefit not reflected in GDP, is often sizeable, thanks to the efficient functioning of markets. If consumer willingness to pay could be estimated for each unit of food demand globally (which is no easy task), the consumer surplus could be quantified.

Whichever way one calculates them, the total benefits of agrifood systems are unlikely to change much with policy interventions. Rather, there will probably be a redistribution of benefits between those that are visible through market transactions and those that are hidden. Suppose, for example, that the price of food increases due to a regulation that addresses environmental hidden costs. As prices rise, part of the hidden consumer surplus becomes more visible. Consumers end up spending more on food, which shifts the economic benefits from being hidden in the consumer surplus to being visible in market transactions. In this scenario, the benefits that were once intangible and not captured in GDP statistics become apparent through higher expenditures recorded in the market. The resulting change in total benefits would be relatively small, with the most significant burden being borne by vulnerable households, who would no longer be able to afford food as they did before the price increase.

This shift underscores the delicate balance needed in agrifood systems transformation to address hidden costs without disproportionately affecting vulnerable stakeholders – in this case, the need to ensure continued access to affordable and healthy diets. However, it is important to note that this is a distributional issue to be resolved through inclusive rural transformation complemented by redistributive policies and social protection rather than through accounting for hidden benefits, as the bulk of the impact will be the *visibility* of the hidden benefits of agrifood systems, without a major change in total benefits. Based on this observation, focusing on reducing the hidden costs of agrifood systems makes sense, as long as the potential associated trade-offs between social, environmental and health hidden costs are taken into account.

SOURCE: Authors' own elaboration.

» at increasingly larger scales. It is, therefore, not surprising that efforts to measure and value the impacts of agrifood systems activities started on a smaller scale (product or value chain), with capitals that are relatively easier to value (that is, natural and produced). The principles of cost–benefit analysis have been extended to cover environmental impacts in well-established environmental valuation literature, leading to greater use of life cycle assessments over the past 30 years.[7] True cost accounting brings a much broader systems lens to account for all capitals and uses these valuation approaches, among others, as tools. Despite the reference to accounting in its name, TCA acknowledges that not all impacts are quantifiable or monetizable, so qualitative assessments are a critical complement to quantitative measurement and valuation in TCA assessments.[5, 8]

Applications of TCA have been increasing over the last decade, aided by the proliferation of frameworks and guidelines that can be implemented for different functional units, ranging from product, organizational and investment to sectoral and geographical.[9–12] While the first three of these functional units are classified as bottom-up approaches, the latter two are top down. True cost accounting applications in the former category are typically smaller in scope and are relevant to operational and organizational decision-makers and consumers, while applications in the latter category are more relevant to local and international policymakers in agrifood systems.[5]

The preliminary estimates of the hidden costs of agrifood systems published in *The State of Food and Agriculture 2023* are based on the largest-scope TCA exercise to date in the top-down category in 154 countries. Because of the trade-off between scope and detail, the impacts and dependencies assessed covered those that could be quantified using globally available public data, so exclude some components relevant to guiding policy at local level. Nevertheless, they constitute a leap forward in assessing the hidden costs of global agrifood systems in a consistent and comparable manner and pave the way for the phase two assessments outlined in the conceptual framework introduced in the 2023 edition of this report (Box 1).

Two pillars of the second phase of TCA assessments for an informed agrifood systems transformation are: i) stakeholder consultation; and ii) clear identification of policy levers. Policy levers need to address the main drivers of the hidden costs to be effective, so the links between impact pathways and impacts need to be clearly identified. Guidelines for TCA implementation of smaller scope lay out the process of identifying how agrifood systems activity affects changes in capital stocks, flows and outcomes for all four capitals to define the impacts to be measured and valued. This process relies on materiality assessments with strong stakeholder engagement to identify pathways for change.[10–12]

The 2024 edition of *The State of Food and Agriculture* showcases phase two of the global TCA assessment through targeted case studies of varying scope and presents them within an agrifood systems typology to identify pathways for change. The hidden costs of global agrifood systems quantified in 2023 were categorized by the environmental, social and health pathways – unlike TCA applications of smaller scope, which categorize findings by impact domain. These pathways capture the drivers of an impact that can occur in another domain; therefore, distinguishing pathways from the impacts themselves is important when it comes to identifying entry points for action (Box 3).

Evaluating the full range of impacts stemming from the environmental, social and health pathways is the aspirational goal of TCA, though the data and institutional challenges make it very hard to cover all impact domains in practice. Case studies sourced from around the world for this study attest to these challenges and are featured in this report if they address two or more domains relevant to the policy applications of the TCA approach. They also underline the importance of including a mapping and discussion of all capitals to ensure that all trade-offs and synergies are captured in future assessments, even if necessary data are not available. ■

REFINING THE HIDDEN COST ESTIMATES

The quantification of hidden costs in the 2023 edition of *The State of Food and Agriculture* for 154 countries amounted to 12.7 trillion dollars in 2020, of which more than 9 trillion (or 73 percent) were due to health-related costs. Because of the overwhelming share of health hidden costs associated with dietary patterns, the 2024 edition makes some refinements to their quantification. These refinements have led to the analysis expanding to 156 countries, up from 154, due to new data sources.[c] The new quantified hidden costs for these 156 countries amount to 11.6 trillion dollars globally, thereby confirming the previous edition's conclusions »

c In relation to the 2023 quantification of hidden costs, this year's quantification excludes Cabo Verde, Cyprus, Lesotho and Palestine, but includes Bosnia and Herzegovina, Burundi, Fiji, Papua New Guinea, Solomon Islands and Vanuatu.

BOX 3 TRACING PATHWAYS FROM HIDDEN COSTS TO IMPACTS

Distinguishing hidden cost pathways from impacts is crucial in identifying policy entry points for transforming agrifood systems and making them more efficient, inclusive, resilient and sustainable. Hidden costs are generated by agrifood systems activities, and impacts – be they environmental, socioeconomic or health – are the direct consequence of these actions. The pathways capture the drivers of the impacts.

The pathways are useful for clarifying when the cause of an observed impact takes place in another domain. For example, negative impacts on health could be an outcome of the inappropriate use of pesticides (environmental pathway to hidden costs) or undernourishment (social pathway to hidden costs), in addition to unhealthy dietary patterns and malnutrition (health pathway to hidden costs). The figure is a stylized representation of how the hidden costs (left-hand column) link through the environmental, social and health pathways to the impacts (right-hand column), which are categorized as environmental, socioeconomic and health. The colouring of each pathway matches the domain of the associated hidden cost, rather than the impact, to highlight the root cause.

Hidden costs created through the environmental pathway, shown in light green, lead not only to environmental impacts (dark green), but also socioeconomic impacts (dark orange) and health impacts (dark blue). Water pollution is a case in point, whereby the effects include ecosystem service losses (environmental impact), harmful exposure and labour productivity losses (socioeconomic impacts), and morbidity (health impact). Nevertheless, water pollution is considered an environmental hidden cost because the actions needed to tackle the diverse impacts are rooted in how agrifood system activities interact with the environment.

The social pathway (light orange) pertains to those costs incurred by society due to a range of interconnected issues rooted in market failure and poor institutions and policies. Undernourishment, for example, is a social hidden cost because it is the result of distributional failures in available food supply. Poverty among agrifood workers is also a social hidden cost because it is driven by distributional failures in agrifood systems leading to low productivity and wages. Other social hidden cost pathways, as noted in the figure, include food loss, gender wage gaps, child and forced labour, occupational safety incidents and unsafe food. Addressing social hidden costs requires comprehensive strategies that prioritize inclusive rural transformation and social inclusion within agrifood systems.

Lastly, the health pathway (light blue) is characterized by unhealthy dietary patterns leading to undernutrition or increased risk of disability or death due to non-communicable diseases, as shown by the dietary risks in the figure. These unhealthy dietary patterns have impacts beyond health, including on labour productivity and a wide range of environmental impact indicators.[13, 14]

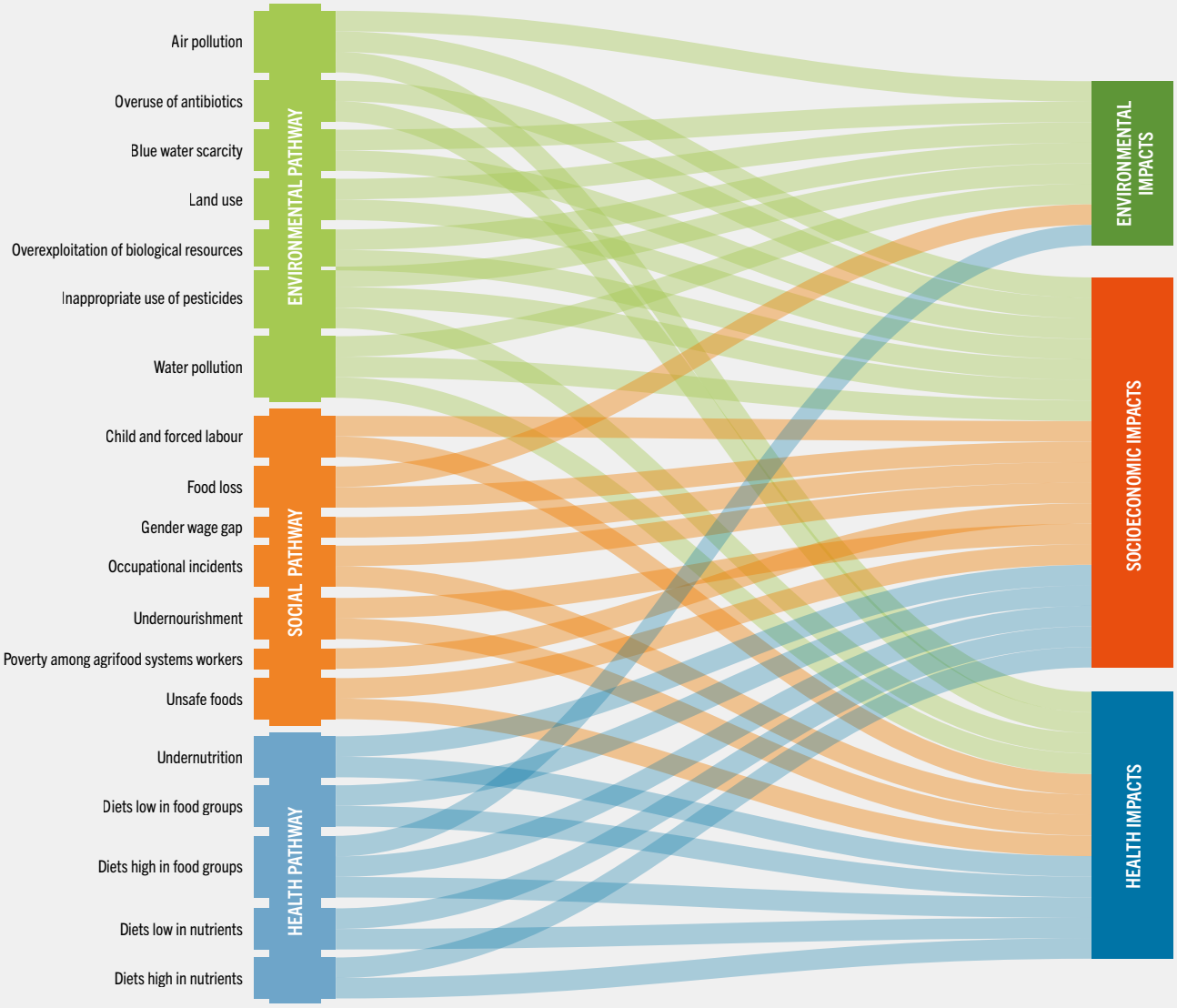
The figure aims to clarify how the hidden costs quantified in *The State of Food and Agriculture 2023* are categorized by pathway, with a view to creating a direct link to policy entry points. Nonetheless, the figure represents more hidden costs than were quantified in the report. The 2023 edition quantified the following hidden costs:

- Environmental pathway: as a result of i) greenhouse gases (GHGs) emitted along the entire food value chain from food and fertilizer production and energy use, which contribute to a changing climate and, consequently, agricultural losses; ii) nitrogen emissions at primary production level (ammonia and nitrogen oxide emissions to air, nitrogen runoff and leaching) and from sewerage; iii) blue water use, causing water scarcity and, in turn, agricultural losses and labour productivity losses from resulting undernourishment; and iv) land-use change at farm level, causing ecosystem degradation and destruction and, thus, loss of environmental services.
- Social pathway: associated with i) distributional failures of available food supply, resulting in undernourishment in national populations,[15] leading to labour productivity losses;[16] and ii) moderate poverty among agrifood workers due to distributional failures in agrifood systems.
- Health pathway: as a result of consuming unhealthy diets associated with obesity and non-communicable diseases, leading to productivity losses, negatively impacting the economy.[17]

Other studies quantifying the hidden costs of agrifood systems may classify them according to impact, which is another way of presenting the complex set of domains linked to agrifood systems and may lead to differences between various true cost accounting (TCA) assessments. The figure does not aim to represent the full range of changes in all capital stocks, outcomes of these changes or impacts on people and nature from agrifood systems actions (see Figure 6.1 in the TEEBAgriFood Foundations report for a full representation of these dependencies, which make up the core of TCA assessments).[4]

BOX 3 (Continued)

FIGURE HIDDEN COST DRIVERS ALONG THE ENVIRONMENTAL, SOCIAL AND HEALTH PATHWAYS AND THEIR IMPACT DOMAINS



SOURCE: Authors' own elaboration.

» that urgent and strategic action is needed to address them.

The new hidden cost estimates have changed what was considered to fall under unhealthy dietary patterns. The 2023 edition covered the quantified hidden costs associated with dietary patterns that lead to both obesity and non-communicable diseases. However, given concerns about the attribution of the hidden costs of high body mass index (BMI) to agrifood systems, as debated in the literature, the refinements drop BMI. The changes also break down the health hidden costs into dietary risk factors for NCDs from the Global Burden of Disease (GBD) study to highlight direct policy entry points.[18] Box 4 provides an overview of the GBD data and Box 5 further details these refinements.

BOX 4 GLOBAL BURDEN OF DISEASE DATA

Global Burden of Disease (GBD) data remain the most comprehensive and widely used global dataset on disease burdens in more than 200 countries. The standardized GBD estimates have been used by researchers, and national and international organizations to compare populations, track changes over time and monitor progress towards policy targets, including the Sustainable Development Goals.

To compile their estimates, GBD researchers contact numerous collaborators for pertinent data, such as official records and surveys. They prioritize those appearing in systematic reviews and meta-analyses to ensure their estimates are scientifically sound. There is then an extensive process of data cleaning and standardization. Subsequently, the researchers test a wide array of models for their predictive capabilities and select the combination that offers the highest predictive accuracy.[20]

Despite the careful treatment of data, GBD researchers acknowledge limitations to their estimates. In many cases, the primary data necessary for the estimate are lacking. In others, the data may be of low quality. In addition, some parameters of interest are still in the early stages of research, with various studies producing different estimates. Lastly, the mathematical models used to process and predict the data are subject to improvements in subsequent releases of the GBD dataset.

The continuous refinement of data and prediction methodologies has led to significant fluctuations in certain estimated relationships between diseases and their risk factors, sparking debate. Notably, estimates of deaths linked to unprocessed red meat consumption saw a 36-fold increase from 2017 to 2019. This surge was primarily due to the incorporation of additional causes of death related to red meat consumption. This dramatic change has drawn considerable criticism of the data sources used by the GBD.[21, 22] Collaborators on the GBD report that the 2021 version of the GBD data – used herein – addresses these issues as much as possible.[23]

All things considered, the GBD data possess the scientific rigour necessary for the global analysis conducted in the 2023 and 2024 editions of *The State of Food and Agriculture*. Nonetheless, the subsequent estimates are, like all empirical results, subject to variability due to new evidence based on more and better primary data and methodologies, particularly in areas where research outcomes show greater heterogeneity.

SOURCE: Authors' own elaboration.

With these refinements, the global quantified health hidden costs pertaining to increased risk of NCDs amount to 8.1 trillion dollars. This is a decrease of around 13 percent, though these quantified health hidden costs still pertain to 70 percent of the global quantified hidden costs.[d] In addition, the patterns observed by country income group remain the same, with these costs highest in upper-middle- and high-income countries. By separating out the hidden costs of each diet-related risk factor for NCDs using the latest GBD data, this edition of the report provides more tangible policy levers for addressing them within a systems framework. **Chapter 2** explores these results further through the lens of the agrifood systems typology. ■

d For details on the updated methodology, see Lord (2024).[19]

CONTEXTUALIZING AGRIFOOD SYSTEMS WITH A TYPOLOGY

Because of the complexity of agrifood systems, there have been many attempts to create a typology of agrifood systems to categorize countries based on shared economic, political, institutional and geographical characteristics.[25–28] More recently, the extension of systems thinking to include the broader components of agrifood systems from primary production (including other supporting systems) to processing, packaging, consumption and disposal has increased dimensional complexity and, with it, the need for a typology to structure the discourse around the impacts of potential policy levers.[2, 29] Typologies distil the dimensions of complex systems into a set of easily understandable characteristics and facilitate the identification of commonalities within and distinctions between groups. Although they may mask relevant heterogeneity within groups, they are useful complements to context-specific analyses.[27]

BOX 5 REFINING AND BREAKING DOWN GLOBAL HEALTH HIDDEN COSTS IN ORDER TO IDENTIFY LEVERS

The health hidden costs for 154 countries quantified in *The State of Food and Agriculture 2023* pertained to unhealthy dietary patterns contributing to obesity and non-communicable diseases (NCDs). Specifically, the analysis was based on data from the Global Burden of Disease (GBD) 2019 study and referred to 15 dietary risk factors leading to NCDs.[24] It was assumed that 75 percent of the hidden costs due to high body mass index (BMI) could be attributed to agrifood systems. The analysis in this edition makes refinements to these estimates using data from the latest edition of the GBD study released in 2024, expanding the coverage to 156 countries, up from 154 in 2023.[18]

First, this edition of *The State of Food and Agriculture* removes the hidden costs of high BMI. This change is because the assumption regarding the attribution of BMI to agrifood systems is debated in the literature, as high BMI can be driven by other factors outside agrifood systems.[17] The previous edition attempted to addressed this with a sensitivity analysis that varied the assumption from 50 to 100 percent to establish robustness. Second, this edition adds the dietary risks for NCDs associated with diets high in sugar-sweetened beverages in the refined global estimates, which were previously excluded to prevent double-counting with BMI. And third, health hidden costs are now broken down into dietary risk factors associated with NCDs from the GBD 2021 study. These refinements to the analysis are done with a heightened focus on direct policy entry points linked to dietary risk factors.

Globally, the hidden costs of diets low in whole grains account for 18 percent of all health hidden costs due to dietary risks associated with NCDs, followed by diets high in sodium and low in fruits (16 percent each). While diets high in processed and red meat receive a lot of attention in climate change discourse due to their significant impacts on the environment,[13, 14] their share of hidden costs due to dietary risk factors associated with NCDs is far lower (8 and 7 percent, respectively) and comparable to the share of diets low in vegetables or diets low in nuts and seeds (see the figure). As the dietary risk factors account for the biggest share of the quantified health hidden costs of agrifood systems, potential policy levers to effectively address these hidden costs can only be identified through more granular context-specific assessments of risk factors, as in this report.

It is important to recognize that while these hidden costs help clarify some of the needed changes in dietary patterns, they only cover health hidden costs due to dietary risks related to NCDs. Unhealthy dietary patterns leading to other forms of malnutrition, which can be significant to varying degrees in different agrifood systems, are not included due to data limitations.

The agrifood systems typology proposed in this report is based on the established methodology created for the Food Systems Dashboard,[30] which creates five food system types based on a rigorous scoping review and conceptual framework.[27] An additional category is introduced to capture the significant distortionary effects of medium- to long-term conflict and fragility on agrifood systems using the FAO list of countries in protracted crisis as of September 2022.[e, 31]

The resulting agrifood systems typology, therefore, includes the following six categories: protracted crisis, traditional, expanding, diversifying, formalizing and industrial.[f] For the sake of simplicity, this report also refers to the categories of expanding, diversifying and formalizing as "transitional" to describe their position in historical transformations of agrifood systems. The typology covers 171 countries, and the hidden costs of agrifood systems were quantified for 153 of them – down from 156 – for this edition of *The State of Food and Agriculture*, covering 99 percent of the world's population (Figure 1 and **Annex 1**).[g]

The core of this typology (without the protracted crisis category) has already been used to document the challenges that global food systems

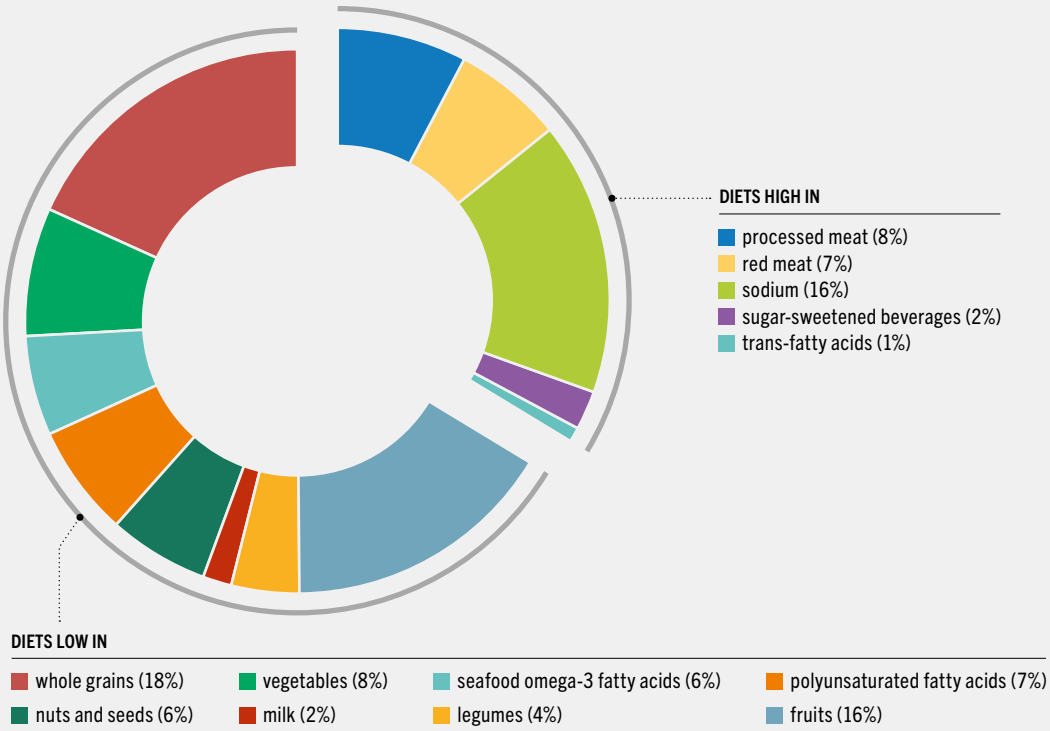
e This list encompasses the countries that meet all three of the following conditions: i) humanitarian assistance from official development assistance greater than 10 percent of the country's GDP; ii) inclusion in the list of low-income food-deficit countries; and iii) assistance required for food in four consecutive years (2018–2021) or eight of the ten previous years (2012–2021). The list includes the following countries: Afghanistan, Burundi, Central African Republic, Chad, Democratic People's Republic of Korea, Democratic Republic of the Congo, Eritrea, Ethiopia, Haiti, Liberia, Mali, Mauritania, Niger, Sierra Leone, Somalia, South Sudan, Sudan, Syrian Arab Republic, Yemen and Zimbabwe. In addition, Palestine is included in the category of countries/territories in protracted crisis in the typology. Note that this list does not include all countries in the world, and it is not necessarily endorsed by country governments.

f For more information on the methodology, see Arslan *et al.* (2024).[32]

g Hidden costs were also calculated for Equatorial Guinea, Libya and Qatar, which were also included in the analysis of last year's edition but were not classified in the agrifood systems typology due to data limitations. See **Annex 2** for results.

BOX 5 (Continued)

FIGURE DIETS LOW IN WHOLE GRAINS AND FRUITS AND HIGH IN SODIUM ARE THE LEADING DIETARY RISKS CONTRIBUTING TO GLOBAL HEALTH HIDDEN COSTS



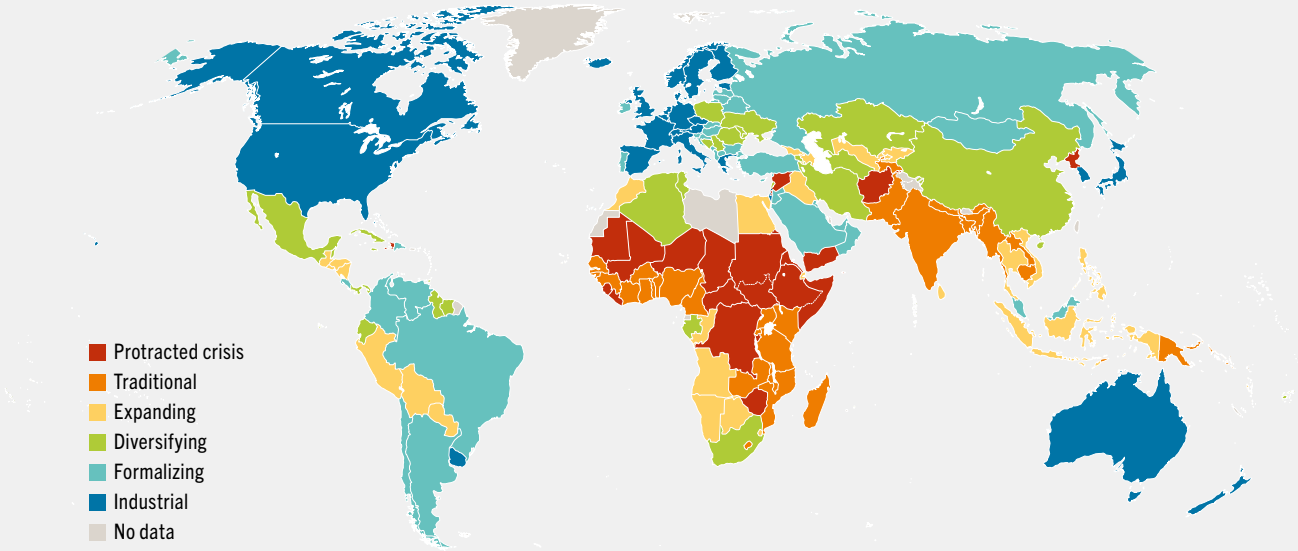
NOTES: The hidden costs presented in the figure are the global total costs of disability-adjusted life years (DALYs) lost due to dietary risks associated with non-communicable diseases (NCDs). Data on DALYs are downloaded from the 2021 Global Burden of Disease study by selecting all dietary risks and NCDs as a cause of death/disability. DALYs are costed using GDP per person employed (2019) from the World Bank.

SOURCES: Authors' own elaboration based on Global Burden of Disease Collaborative Network. 2024. Global Burden of Disease Study 2021 (GBD 2021): Results. [Accessed on 7 June 2024. https://ghdx.healthdata.org/gbd-results; World Bank. 2021. World Development Indicators: GDP per person employed (2019). [Accessed on 29 January 2021]. https://data.worldbank.org/indicator/SL.GDP.PCAP.EM.KD. Licence: CC BY-4.0.

https://doi.org/10.4060/cd2616en-figB05

face in delivering nutritious and healthy diets to all in an environmentally sustainable way and to identify pathways out of this situation.[2, 29] The typology uses a parsimonious set of four proxy variables to capture relevant components of food supply chains, diets and external drivers of food systems. Figure 2 shows how these variables are ranked across six agrifood systems types. Value added per worker in agricultural production captures the stage of rural and structural transformation, with strong implications for food supply chains.[33–36] These include longer and more complex supply chains, with increasingly formalized relationships as economies transform. The number of supermarkets per 100 000 people can signal the development level of a country's food retail sector, which drives (both positive and negative) »

FIGURE 1 GLOBAL MAP OF THE AGRIFOOD SYSTEMS TYPOLOGY

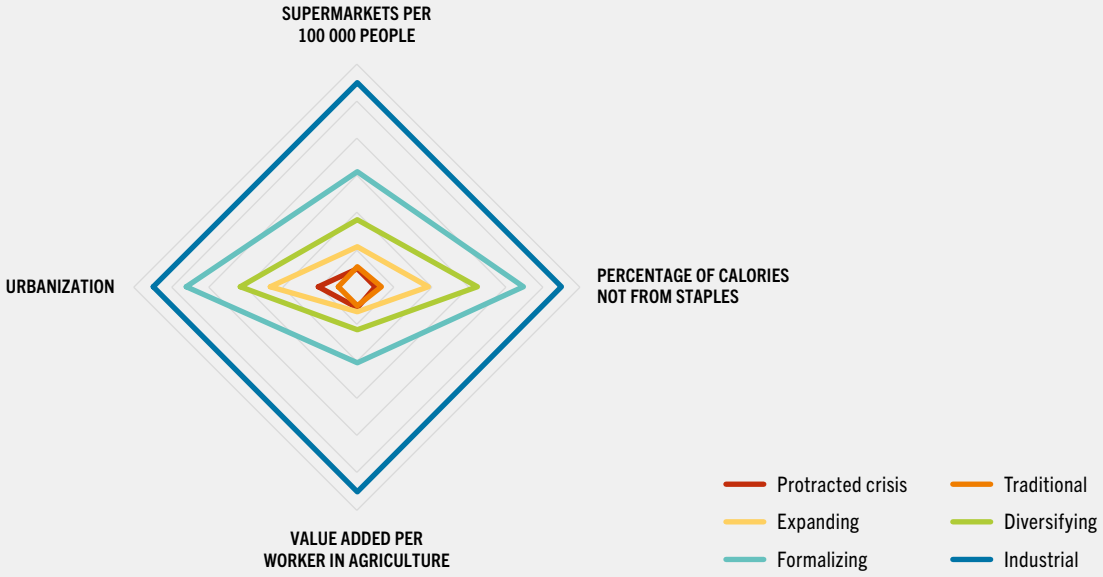


NOTES: Refer to the disclaimer on the copyright page for the names and boundaries used in this map. Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties. Final boundary between the Republic of Sudan and the Republic of South Sudan has not yet been determined.

SOURCES: Authors' own elaboration based on Food Security Information Network & Global Network Against Food Crises. 2022. *Global report on food crises 2022 – Joint analysis for better decisions: Mid-year update.* Rome. https://www.fsinplatform.org/sites/default/files/resources/files/GRFC%202022%20MYU%20Final_0_0.pdf; Marshall, Q., Fanzo, J., Barrett, C.B., Jones, A.D., Herforth, A. & McLaren, R. 2021. Building a Global Food Systems Typology: A New Tool for Reducing Complexity in Food Systems Analysis. *Frontiers in Sustainable Food Systems*, 5: 746512. https://doi.org/10.3389/fsufs.2021.746512

https://doi.org/10.4060/cd2616en-fig01

FIGURE 2 RANKINGS OF VARIABLES USED TO CREATE THE AGRIFOOD SYSTEMS TYPOLOGY



NOTE: The values of the variables in radar graphs are standardized between 0 and 1 for ease of presentation.

SOURCES: Authors' own elaboration based on Marshall, Q., Fanzo, J., Barrett, C.B., Jones, A.D., Herforth, A. & McLaren, R. 2021. Building a Global Food Systems Typology: A New Tool for Reducing Complexity in Food Systems Analysis. *Frontiers in Sustainable Food Systems*, 5: 746512. https://doi.org/10.3389/fsufs.2021.746512; World Bank. 2022. Urban population (% of total population). [Accessed on 20 February 2024]. https://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS

https://doi.org/10.4060/cd2616en-fig02

» change in food supply chains and consumption habits. Diversity of diets is proxied by the share of calories from non-staples, a measure that is expected to increase as food systems transform, and the external drivers shaping food systems and consumer behaviours are proxied by the urbanization rate.[27]

The relationships between the proxy variables and agrifood systems transformation goals are complex and non-linear, so higher rankings on certain dimensions do not necessarily signal "better" agrifood systems. The categories in this typology are correlated with a wide range of variables that represent policy entry points for sustainable agrifood systems transformation, such as fertilizer use, ultraprocessed food sales, cost of a healthy diet, vegetable and meat consumption, and the environmental footprint of production.[29] These established correlations lead to highly relevant levers to address the hidden costs of agrifood systems, making the typology a useful lens for discussing policy implications in this report. ■

VALUE-DRIVEN TRANSFORMATION FOR DIFFERENT ACTORS AND AGRIFOOD SYSTEMS

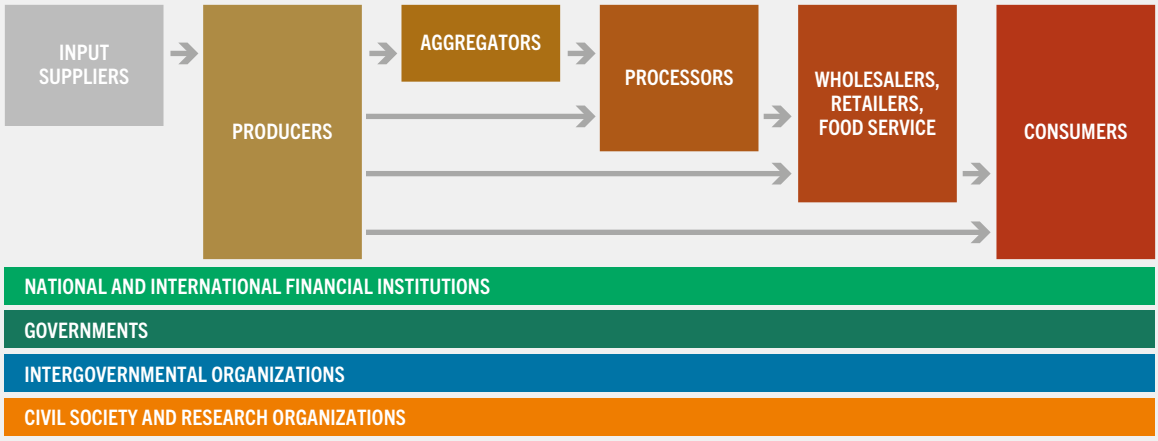
When it comes to identifying value-driven transformation levers for global agrifood systems, the actors with a stake in those agrifood systems naturally include the entire global population, as humans cannot exist without food. Figure 3 presents a stylized representation of the actors in global agrifood systems, whose decisions depend on and affect the value of agrifood systems. The six core actors cover the entire agrifood value chain, from input suppliers to consumers (including institutional procurement), each of which can be part of local, national or international processes. Consumers in one location may not see the value of improving fertilizer use efficiency on the farms that produce their food in another region or country. Similarly, food manufacturers may not see the value of changing their product compositions as long as the hidden costs due to dietary risks are borne by society at large and mostly in the future (including in other countries). Effective policy entry points can only be identified by clearly mapping such distinctions in a TCA approach, as the decisions of one actor at one point in time in one location have implications for actors in another time or location through biophysical processes and trade.

All core actors interact with national and international financial institutions and are constituents of local or national governments. National governments have a role in shaping entire agrifood systems through taxes, subsidies, laws, regulations and general services. Intergovernmental organizations play an increasingly important role in shaping transformation pathways for agrifood systems because of the interconnectedness of value and cost creation. Civil society and research organizations (both local and international) have an overarching role in creating knowledge and awareness and catalysing collective action. This report uses the systems lens afforded by TCA to identify the value of transformative action for each actor in global agrifood systems.

As the disconnect between the producers of hidden costs and the cost bearers grows, the benefits to society and the planet from transforming agrifood systems become less visible. This gap can be impossible to bridge if the damage manifests itself in the distant future or abroad, and it is one of the main reasons we find ourselves in the situation we are in today – struggling to address climate change caused by the cumulative effects of human activity since the Industrial Revolution. The inequalities on multiple dimensions (for example, socioeconomic, gender and generational) between who benefits from the production of hidden costs and who bears them are one of the key challenges to transforming global agrifood systems.[37] They also play a key role in fuelling dissent among various interest groups, seen, for example, in farmer protests in Europe against environmental regulations or school strikes for climate action. The role of governments and intergovernmental organizations is particularly important in cases where international or intergenerational transfers are needed to address these inequalities in the distribution of the hidden costs and benefits of agrifood systems.

The final chapter of *The State of Food and Agriculture 2023* introduced a range of levers that can be used by different agrifood systems actors to reduce

FIGURE 3 GLOBAL AGRIFOOD SYSTEMS ACTORS



SOURCE: Adapted from Capitals Coalition. 2023. Figure 0.3. In: *TEEB for agriculture and food: operational guidelines for business. Putting nature and people at the centre of food system transformation.* London. https://capitalscoalition.org/wp-content/uploads/2023/08/TEEB-for-Agriculture-and-Food-Operational-Guidelines-for-Business.pdf

the hidden costs of agrifood systems and it discussed briefly how trade-offs and synergies can be navigated using the TCA approach (Figure 4). Given the societal implications of the environmental, health and social hidden costs, governments are the only actors with an active role in all levers to support sustainable and inclusive agrifood systems transformation. This edition of the report illustrates through selected case studies how governments can build global and national visions for transformation using a systems approach. Other case studies in selected countries quantify the hidden costs of broader policy packages for agrifood systems transformation pathways and highlight the role of stakeholder consultations for effective implementation of the TCA approach to guide transformation.

Although the role of government in all levers for transformative action is obvious in Figure 4, the private sector – including agribusinesses, financial institutions, and research and civil society organizations – also has a critical role to play. Through case studies, this report presents a much broader set of policy levers and provides a systems lens to facilitate the use of TCA in decision-making by all actors.

With the explicit aim of channelling the awareness and interest generated by *The State of Food and Agriculture 2023* into tangible policy action, this 2024 edition provides a global framework for assessing the TCA results through an agrifood systems typology. The typology aims to place the potential policy levers informed by global simulations and targeted case studies into broad agrifood systems categories with common characteristics to facilitate an understanding of the effectiveness and feasibility of different levers when it comes to addressing the hidden costs. Such an approach provides a broad perspective on the role of value-chain structures, policies, institutions and fiscal spaces in driving agrifood systems transformation. ■

LAYOUT OF THE REPORT

This report draws on a wide variety of case studies to help demonstrate the potential of the two-phase TCA approach proposed in *The State of Food and Agriculture 2023* for identifying and prioritizing levers that represent all agrifood systems categories to varying degrees. FAO commissioned several case studies for this 2024 edition and sourced others through a call

FIGURE 4 LEVERS FOR AGRIFOOD SYSTEMS TRANSFORMATION

IMPACT AREA	LEVER	POTENTIAL TRANSFORMATION PATHWAYS
FOOD SUPPLY CHAINS	Trade and market interventions	Generate price incentives or disincentives to stimulate production of sustainable and nutritious foods
	Fiscal subsidies to producers	Stimulate production of specific sustainable and nutritious foods and influence input use
	Laws and regulations	Restrict environmental impact, safeguard labour well-being, manage food safety, food labelling and food fortification
	Public and private capital	Facilitate investment in sustainable and transparent production processes and businesses
FOOD CONSUMPTION	Fiscal subsidies to consumers	Incentivize the consumption of sustainable and healthy diets
	Taxes on foods that constitute unhealthy and unsustainable diets	Disincentivize the consumption of foods that constitute unhealthy and unsustainable diets
	Consumer purchasing power	Prioritize products with clear information, reflecting values
	Marketing and promotion	Promote the consumption of nutritious foods
	Labelling and certification	Enable consumers to choose nutritious and sustainable foods
GENERAL SERVICES	Infrastructure expenditure	Target bottlenecks contributing to inefficiencies, expensive foods and food loss and waste (e.g. invest in cold storage)
	Research and development	Advance science, innovations and technologies that improve the sustainability of agrifood systems
	Knowledge transfer services	Disseminate knowledge on sustainable agrifood systems practices and technologies
	Inspection services	Manage food safety

DECISION-MAKER OR STAKEHOLDER INFLUENCING CONTROL OF LEVER

Government · Research and civil society organizations · Businesses and financial institutions

SOURCE: FAO. 2023. Figure 15. In: *The State of Food and Agriculture 2023 – Revealing the true cost of food to transform agrifood systems*. Rome. https://doi.org/10.4060/cc7724en

for submissions on the Global Forum on Food Security and Nutrition. The case studies cover examples of different scopes and address all or selected hidden cost components. Consequently, while some of them may not necessarily fit into the foundational definition of TCA, they show the applicability of the proposed approach under political, institutional, financial and capacity constraints that are likely to be binding in practice.

The case studies featured herein illustrate different approaches to phase two TCA assessments, ranging from national to product value chain-level assessments. They represent a wide array of agrifood systems types and highlight the value of transformation to agrifood systems actors (producers, agribusinesses, financial institutions and consumers), as well as the role of global and national governance in facilitating the desired transformations.

Chapter 2 explores the process for achieving agrifood systems transformation. It first describes the agrifood systems typology and then provides the hidden cost estimates and breakdown of the dietary risks for NCDs by agrifood systems category. The chapter then details economic modelling providing insights into potential courses of action, though such options are limited by the varying institutional and fiscal capacity across the agrifood systems categories. Through a TCA case study in six selected countries, it highlights the role of stakeholder consultations to identify plausible scenarios for sustainable environmental, social and health outcomes to facilitate policy prioritization. Finally, this chapter describes how TCA can be carried out to support the decision-making process at the national level, as is underway in Switzerland, where the government is considering hidden costs as part of its national Vision 2050. The discussion on the challenges and opportunities of this approach in identifying national transformation pathways is further complemented by examples of a UNEP-led initiative in partnership with governments.

Chapter 3 demonstrates how change can be driven from within food supply chains with different structures across agrifood systems types, ranging from small to large scale, formal to informal and local to global. These structures have implications for the distribution of environmental, social and health benefits and costs (hidden or observed) along the supply chain. As mentioned, the longer the geographical and time disconnect between the cost creators and cost bearers, the harder it becomes to internalize the hidden costs due to existing incentive structures. While producers, agribusinesses and retailers may stand to gain from transformation, the benefits of doing so may be hidden from them; public intervention is thus required for societal value creation. Using case studies, this chapter identifies barriers to transformative change and considers how they can be addressed to create value for all supply chain actors across agrifood systems categories. It also identifies complementary levers that can help maximize the value of transformation through collaborations between actors, including producers, agribusinesses, financial organizations and governments.

Chapter 4 presents the challenges to and value of agrifood systems transformation from a consumer viewpoint. As consumers (including institutions with purchasing power) make up the largest group of agrifood systems actors, their demand for agrifood systems products can have a significant influence on the direction of agrifood systems, which can be leveraged to incentivize change towards more sustainable, healthy and inclusive systems. This chapter uses case studies and the growing literature on policies that aim to catalyse behavioural change when it comes to dietary patterns to demonstrate the value of demand-driven transformation by agrifood systems category.

Chapter 5 brings together the lessons learned throughout the report, using the agrifood systems typology to guide the application of the TCA approach as a tool for identifying and prioritizing effective levers for local, national and global agrifood systems transformation. It also discusses the challenges of navigating current incentive structures as a result of distributional issues that inevitably arise during large-scale transformations, such as that needed to ensure global agrifood systems can provide healthy and nutritious food for all in a sustainable way. ■

SPAIN
Fresh fruits and vegetables on a market stall.
© FAO/Alessia Pierdomenico

CHAPTER 2
ADDRESSING HIDDEN COSTS AT THE NATIONAL LEVEL

KEY MESSAGES

➔ The slow rate of progress on the Sustainable Development Goals (SDGs) and the accelerating pace of climate change are fuelling the discourse on global agrifood systems transformation in a bid to identify feasible transformation pathways and to take decisive action.

➔ As countries make progress towards their SDG commitments, their agrifood systems are likely to transform along historically identified pathways from traditional to industrial, with mixed consequences for outcomes and hidden costs.

➔ Diversifying agrifood systems face the greatest health hidden costs from NCDs at 10 percent of GDP, whereas protracted crisis agrifood systems bear the highest environmental and social hidden costs, averaging 20 percent and 18 percent of GDP, respectively.

➔ While some existing patterns across agrifood systems types can guide future pathways (for example, increased efficiency of fertilizer and water use), some need to be avoided and reversed (for example, increased consumption of highly processed foods).

➔ Actions to transform agrifood systems using true cost accounting (TCA) are only possible through consultation with all actors that have a stake in transforming agrifood systems for sustainability and inclusion.

➔ Phase two TCA assessments based on national statistics can address the shortcomings of global databases, help prioritize national commitments and raise awareness of national and subnational values from transformation.

Prompted by the pace of progress (or lack thereof) on achieving the SDGs, the *Global Sustainable Development Report 2019* issued a call to action for urgent and intentional transformation of agrifood systems that accounts for the interactions across multiple goals and targets.[1] In 2021, the United Nations Food Systems Summit further highlighted the need to transform global agrifood systems for greater sustainability and inclusion.[2] This momentum intensified efforts to evaluate potential levers that governments and intergovernmental bodies can use to accelerate progress on achieving the SDGs.[3–6] These efforts include complex models and scenarios to evaluate possible pathways to achieve desired outcomes – such as improving agricultural production efficiency, enabling healthy diets for all, reducing food loss and waste, and decarbonizing the energy sector – and TCA assessments either led by or in partnership with governments.

The necessary large-scale agrifood systems transformation requires local action, and national governments have a critical role to play in all levers to address the hidden costs of agrifood systems (Figure 4). Given the multiple and sometimes conflicting national commitments on environmental, social and economic sustainability, it is clear that governments need decision support tools, such as TCA, to prioritize different actions.

Most global agrifood systems transformation discourse looks at regional heterogeneity using country income levels. Although correlated with agrifood systems outcomes, the income level of a country does not provide a comprehensive understanding of agrifood systems. Using the agrifood systems typology presented in **Chapter 1**,

this chapter first characterizes the structure of agrifood systems, their quantified hidden costs and the associated challenges. The typology is then used to draw relevant and feasible policy implications beyond the case study locations included in this report.

The chapter goes on to explore the process for achieving agrifood systems transformation. Economic modelling exercises provide insights into potential courses of action, though such options are limited by the varying institutional and fiscal capacity across the agrifood systems categories. Scenarios carried out in consultation with stakeholders in case studies in Australia, Brazil, Colombia, Ethiopia, India and the United Kingdom of Great Britain and Northern Ireland explored the potential effectiveness of desired outcomes for sustainable environmental, social and health transformations. The consultation process served to identify plausible scenarios that mirror national commitments and aspirational sustainability pathways, whose implications for a wide range of indicators are then quantified using TCA to facilitate policy prioritization.

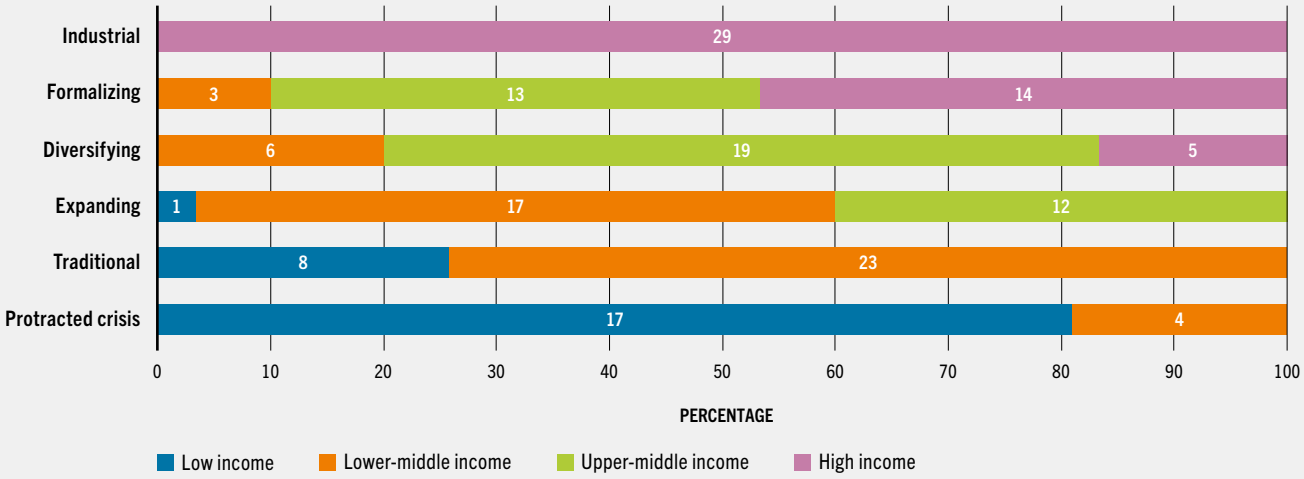
Finally, this chapter describes how TCA can be carried out to support the decision-making process at the national level. Switzerland is leading the way by advancing the use of TCA, commissioning a targeted phase two TCA assessment of its agrifood systems as part of its Vision 2050 towards food security through sustainability from production to consumption. The locally specific quantification of hidden costs through strong stakeholder engagement is a building block of national commitment to this vision, and the TCA approach is helpful in prioritizing actions in this regard. This chapter uses the case of Switzerland to discuss the challenges and opportunities of this approach in identifying national transformation pathways. It is further complemented by examples of an initiative led by the United Nations Environment Programme (UNEP) in partnership with governments. ■

ELABORATION OF THE AGRIFOOD SYSTEMS TYPOLOGY

A first step in transforming agrifood systems is to recognize their differences, similarities and interconnections, along with the country-level and global trends shaping their future. The agrifood systems typology used in this report relies on the typology of Marshall *et al.* (2021) and its previously established strong correlations with a long list of indicators that characterize agrifood systems and the trends that shape them.[7, 8] The addition of a new "protracted crisis" category aims to enhance the usefulness of this typology by capturing the unique food security challenges arising from prolonged economic, climatic or political crises in some countries and territories.[9]

The core of the typology has been verified against a set of outcome indicators related to diet, nutrition, health or environmental sustainability.[7, 8] While some indicators have an almost linear relationship with the agrifood systems categories (for example, affordability of nutritious diets, availability of eggs, meat and dairy), some show non-linear patterns (for instance, inequality, availability of fruits and vegetables). The observed patterns also differ in terms of trends within each category. For example, traditional agrifood systems show slower improvements in labour productivity and faster urbanization rates over time compared with industrial agrifood systems.[8] While this typology is used throughout the report to draw general lessons on levers to address the hidden costs of agrifood systems by category, the meaningful heterogeneity within agrifood systems categories, as well as within countries, needs to be borne in mind during the policy design stage of the second phase of a TCA assessment – as proposed in *The State of Food and Agriculture 2023*. One example is the stark difference in the growth rates of ultraprocessed food sales in the industrial group (with the Mediterranean region boasting the lowest growth rates), highlighting the role of country-specific food-supplier characteristics and dietary traditions in influencing dietary, social and health outcomes.[7]

FIGURE 5 COUNTRY INCOME GROUPS WITHIN AGRIFOOD SYSTEMS CATEGORIES



NOTES: The agrifood systems typology covers 171 countries, 153 of which are included in the true cost accounting assessment of *The State of Food and Agriculture 2024*. The numbers in each bar represent the number of countries in each agrifood systems category that belong to different income groups as indicated by different colours.

SOURCE: Authors' own elaboration.

https://doi.org/10.4060/cd2616en-fig05

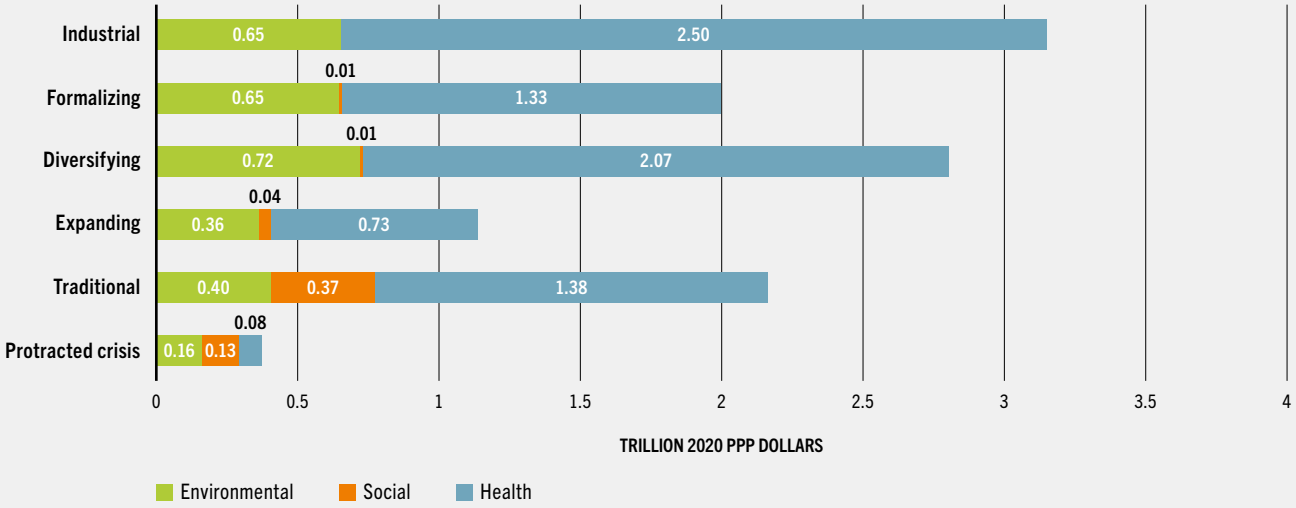
Although the agrifood systems typology is correlated with country income levels (Figure 5), the typology provides a more comprehensive snapshot of agrifood systems to contextualize the levers that may be relevant and feasible for transformation pathways. For example, while the majority of high-income countries are in the industrial group, many have agrifood systems that are formalizing or even diversifying (for example, Panama, Poland and Romania). Similarly, lower-middle-income countries and territories are found in all agrifood systems categories – with the exception of industrial – including four countries or territories in protracted crisis (Haiti, Mauritania, Palestine and Zimbabwe). While income groups provide a progressive/linear categorization, it is important to note that the typology categories are not linear, and the higher-ranked categories do not necessarily provide "better" agrifood systems on all dimensions. Identifying policies to transform agrifood systems by income category, therefore, is likely to miss the nuances of system components and potentially lead to misleading and ineffective policies. ■

HIDDEN COST BURDEN VARIES BY AGRIFOOD SYSTEMS CATEGORY

To define context-specific actions to address the environmental, social and health hidden costs of agrifood systems, it is important to understand their distribution across the agrifood systems typology (Figure 6). This systems perspective offers insights into the commonalities and disparities among agrifood systems, highlighting both the sources of hidden costs and the varying degrees of burden these costs impose on different agrifood systems.

In terms of commonalities across the typology, health hidden costs linked to NCDs are the largest contributor to the total quantified hidden costs in all agrifood systems except for those in the protracted crisis category. Environmental hidden costs are the second largest contributor for these categories.

FIGURE 6 QUANTIFIED HIDDEN COSTS BY AGRIFOOD SYSTEMS CATEGORY



NOTE: The numbers in each bar represent the total quantified environmental, social and health hidden costs of agrifood systems by agrifood systems category.

SOURCE: Authors' own elaboration.

https://doi.org/10.4060/cd2616en-fig06

Industrial and diversifying agrifood systems have the highest total quantified hidden costs (amounting to 5.9 trillion dollars), driven by health hidden costs linked to NCDs. The lowest total quantified hidden costs are in protracted crisis agrifood systems with only 0.4 trillion dollars, driven by environmental and social hidden costs.

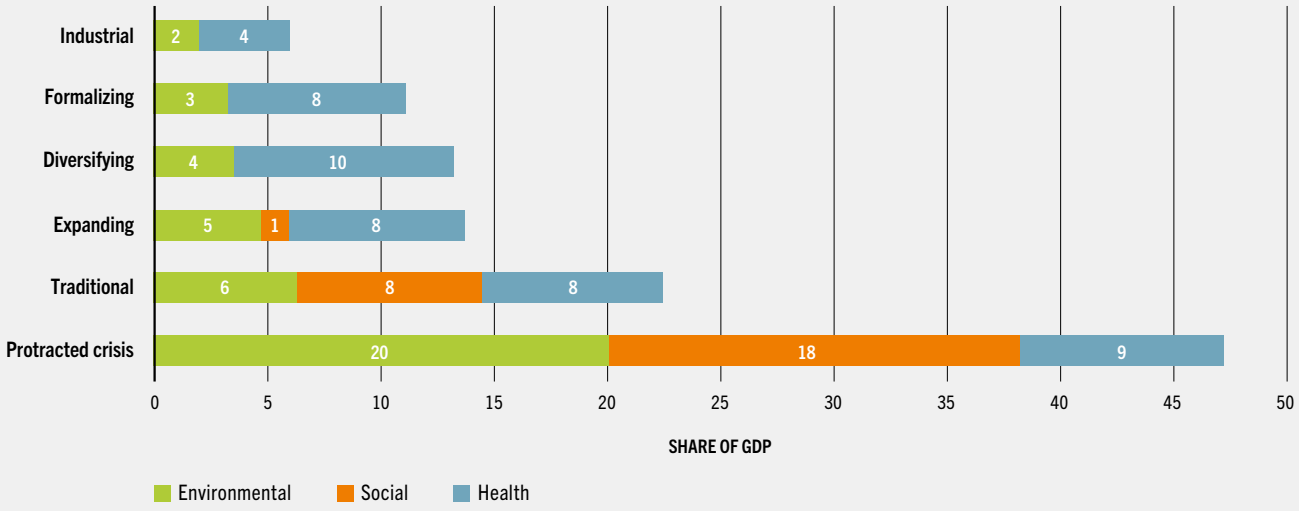
Diversifying agrifood systems stand out from the other categories for having the largest total quantified environmental hidden costs (720 billion dollars). They are followed by industrial and formalizing agrifood systems, which have environmental hidden costs of an estimated 650 billion dollars each.

Expanding, traditional and protracted crisis categories together contribute the majority of quantified social hidden costs globally. The traditional category particularly grapples with high social hidden costs (370 billion dollars) while also facing high health hidden costs (comparable to those of the other categories) and an estimated 400 billion dollars of environmental hidden costs.

Comparing the total quantified hidden costs to the GDP provides further insights into the burden of these costs on national economies. Figure 7 shows that countries with protracted crisis and traditional agrifood systems have the highest burden of social hidden costs. Consequently, reducing poverty and undernourishment will remain the highest priorities in these countries, primarily by investing in inclusive rural transformation to ensure job creation and better livelihoods.

As for the burden of health hidden costs associated with NCDs, the diversifying category is at the peak (10 percent of GDP), while the industrial category has the smallest burden (4 percent of GDP). This pattern reflects the nutrition transition that accompanies structural transformation.[10] Agricultural productivity, urbanization and changing food environments (including the increasing use of supermarkets) – that is, the indicators used to create the typology – are closely correlated with structural transformation and incomes. As structural transformation unfolds and incomes increase, demand for dietary diversity increases (Bennett's

FIGURE 7 QUANTIFIED HIDDEN COSTS AS A SHARE OF GROSS DOMESTIC PRODUCT BY AGRIFOOD SYSTEMS CATEGORY



NOTE: The numbers in each bar represent the share of the quantified hidden costs in the gross domestic product (GDP) of countries on average by agrifood systems category.

SOURCE: Authors' own elaboration.

https://doi.org/10.4060/cd2616en-fig07

law), improving essential nutrient intake, which may at the same time introduce foods with harmful attributes.[11] The decreasing share of health hidden costs in GDP in formalizing and industrial agrifood systems also reflects higher financial and institutional capacity and better health systems to address the burden of NCD-related health hidden costs, as well as the rise in demand for healthier diets as incomes increase. The following section explores the different unhealthy dietary patterns in order to provide insights for policies aimed at avoiding the increase in health hidden costs traditionally observed along the agrifood systems transformation pathway.

The usefulness of the adopted typology is apparent when looking at countries in protracted crisis. It is notable that countries in this category have the highest burden of environmental and social hidden costs as a share of GDP, equivalent to 20 percent and 18 percent of GDP on average, respectively. In this category, 17 out of 21 countries are low-income countries (Figure 5), underlining the connections between low income levels and prolonged crisis. Countries in the protracted crisis category need to prioritize addressing the drivers of long-term crisis, such as conflict and insecurity, global and national economic shocks, and weather extremes,[12] which would also contribute to decreasing the social and environmental hidden costs. ■

DIETARY RISKS CAUSING NON-COMMUNICABLE DISEASES BY AGRIFOOD SYSTEMS CATEGORY

Several unhealthy dietary patterns contribute to NCDs. Therefore, understanding which dietary risk factors are driving the quantified health hidden costs and the variations among agrifood systems categories is crucial for identifying which aspects of consumption patterns need to be addressed to promote healthier diets.

Figure 8 provides this breakdown in four panels detailing the dietary patterns that result in the under-consumption of foods (fruit, legumes, milk, nuts and seeds, vegetables, and whole grains) and nutrients (polyunsaturated and omega-3 fatty acids), shown on the left, and over-consumption of foods (processed meat, red meat and sugar-sweetened beverages [SSBs]) and nutrients (sodium and trans-fatty acids), shown on the right. Moving from traditional towards industrial agrifood systems, standardized disability-adjusted life year (DALY) rates due to NCDs associated with most dietary risk factors first increase and then decrease, exhibiting a pattern similar to the Kuznets curve.[h, 13] This is observed with diets low in whole grains – the leading risk in all agrifood systems categories, except for protracted crisis and traditional (Figure 8). The average standardized DALY rates (per 100 000 people) due to diets low in whole grains increase from traditional to diversifying agrifood systems, where they peak. Diets low in polyunsaturated and omega-3 fatty acids (Panel C) and high in sodium (Panel D) follow a similar pattern.[14]

The notable exceptions to the Kuznets curve are diets low in fruits and vegetables (Panel A) and diets high in red and processed meat (Panel B). While DALY rates due to diets low in fruits and vegetables are highest in crisis and traditional categories and mostly decrease over other categories, DALY rates due to diets high in red and processed meat show an ever-increasing pattern. Red meat, despite the attention received in the media, falls within the top five DALYs only in the industrial category.

The dietary risks for NCDs quantified here represent components of an unhealthy diet, and the relative differences in food groups and nutrients across agrifood systems categories should not be interpreted as silver bullets to meet the challenge of enabling healthy diets for all. Policy interventions to address health hidden costs due to NCDs while countries transform their agrifood systems can be more effective if these patterns are considered when designing packages of interventions. This includes the design of food-based dietary guidelines (FBDGs) to ensure a healthy diet for all that is also environmentally and socially sustainable, as well as the use of other levers such as labelling, information, nudges, taxes and subsidies – discussed in detail in **Chapter 3** and **Chapter 4**.[3]

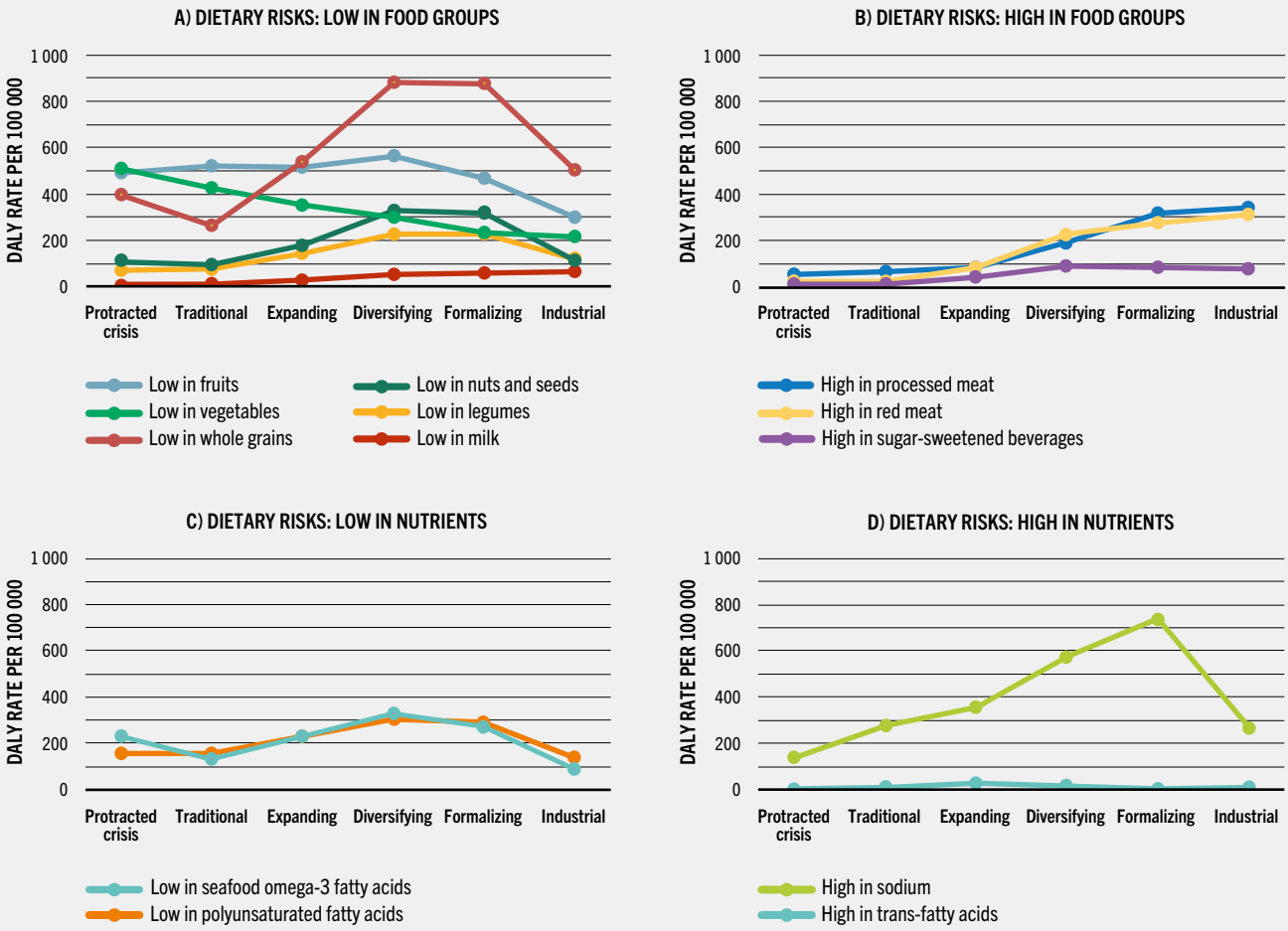
This edition of *The State of Food and Agriculture* highlights the importance of a detailed understanding of dietary risks causing NCDs, combined with a holistic assessment of healthy diets within a TCA approach for effective policy design. Phase two assessments required to achieve this would need to go beyond the national-level patterns summarized here and account for heterogeneities across different geographies and socioeconomic groups, especially for the most vulnerable populations. ■

INSTITUTIONAL AND FISCAL CAPACITY BY AGRIFOOD SYSTEMS CATEGORY

The capacity of countries to take transformative action correlates to their institutional and fiscal spaces, as well as their supply chain structures and food environments. Figure 9 shows selected indicators to assess these dimensions by agrifood systems category.[15] The radar graph in Panel A captures the capacity of governments to enact policies that can address different components of agrifood systems. The government effectiveness index captures overall implementation capacity. The proportion of recurrent central government agricultural support in agricultural value added captures both the capacity to reform the primary production sector and the fiscal space available for repurposing government support. Social protection coverage and the existence of a tax on SSBs capture the capacity to address social and health hidden costs, respectively. Panel B shows selected indicators of the production, infrastructure and consumption dimensions of agrifood systems, which can act as potential policy entry points to address hidden costs.

h Note that non-standardized DALY figures exhibit a different pattern, as they are driven by population size in each agrifood systems category. The traditional category hosts 33 percent of the total population, followed by the diversifying group (25 percent). Therefore, standardized DALY rates are used in this discussion.

FIGURE 8 DIETARY NON-COMMUNICABLE DISEASE RISKS OF UNDER- AND OVER-CONSUMPTION OF FOODS AND NUTRIENTS BY AGRIFOOD SYSTEMS CATEGORY



NOTES: NCD = non-communicable disease; DALY = disability-adjusted life year. The DALY rates presented in the figure are the average DALY values per 100 000 people in each country by agrifood systems category. Data are downloaded from the 2021 Global Burden of Disease Study (GBD 2021) by selecting all dietary risks and NCDs as a cause of death or disability.

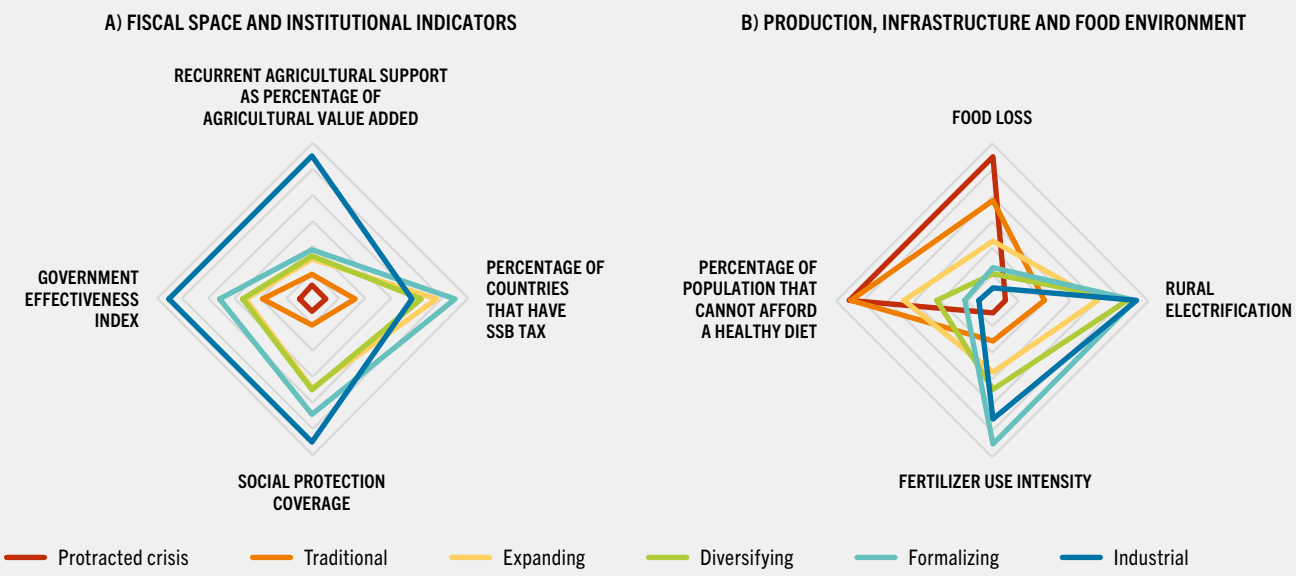
SOURCE: Authors' own elaboration based on Global Burden of Disease Collaborative Network. 2024. Global Burden of Disease Study 2021 (GBD 2021): Results. [Accessed on 7 June 2024]. https://vizhub.healthdata.org/gbd-results

https://doi.org/10.4060/cd2616en-fig08

The fiscal space available to governments for agrifood systems transformation is critical in assessing the feasibility of levers and varies widely across agrifood systems categories. Countries in industrial and formalizing agrifood systems categories have the most resources available for repurposing government support towards safe, nutritious diets with sustainable and inclusive food production and consumption patterns. They dedicate an amount equivalent to around 33 percent of their agricultural value added to recurring agricultural support, on average, while no other category exceeds 10 percent. Traditional and protracted crisis groups allocate an amount equivalent to less than 3 percent of their agricultural value added to recurrent agricultural support, while at the same time having the greatest need for funding to finance agrifood systems transformation.[16] Agrifood systems categories with the most fiscal space are also those with the highest government effectiveness indices and social protection coverage, further indicating the capacity to implement transformative policies.

Countries and territories in the diversifying category with the highest burden of health hidden costs as a share of GDP face significant challenges

FIGURE 9 SELECTED AGRIFOOD SYSTEMS INDICATORS BY AGRIFOOD SYSTEMS CATEGORY



NOTES: SSB = sugar-sweetened beverage. The values of the variables in the radar graphs are standardized between 0 and 1 for ease of presentation. They represent rankings rather than absolute values: being closest to the centre of the radar graph means that the agrifood systems category has the lowest ranking on that indicator rather than having a zero value.

SOURCES: Authors' elaboration based on Food Systems Dashboard. 2024. Food Systems Dashboard. [Accessed on 1 March 2024]. https://foodsystemsdashboard.org; data for Panel A are from FAO. 2024. FAOSTAT: Country Investment Statistics Profile. [Accessed on 20 February 2024]. https://www.fao.org/faostat/en/#data/CISP. Licence: CC-BY-4.0; FAO. 2024. FAOSTAT: Government Expenditure. [Accessed on 20 February 2024]. https://www.fao.org/faostat/en/#data/IG. Licence: CC-BY-4.0; Kaufmann, D. & Kraay, A. 2023. Worldwide Governance Indicators: 2023 Update. [Accessed on 19 October 2023]. www.govindicators.org; World Bank. 2022. World Bank: Global SSB Tax Database. [Accessed on 5 May 2024]. https://datacatalog.worldbank.org/search/dataset/0063310; World Bank. 2024. Data catalog: Coverage (%) - Active Labor Market. [Accessed on 20 February 2024]. https://datacatalog.worldbank.org/indicator/4bca7d49-fdce-eb11-bacc-000d3a596ff0/Coverage------Active-Labor-Market; data for Panel B are from FAO. 2021. FAOSTAT: Fertilizers by nutrient. [Accessed on 20 February 2024]. https://www.fao.org/faostat/en/#data/RFN. Licence: CC-BY-4.0; FAO. 2024. FAOSTAT: Cost and Affordability of a Healthy Diet (CoAHD). [Accessed on 29 July 2024]. https://www.fao.org/faostat/en/#data/CAHD; FAO. 2024. FAOSTAT: Supply Utilization Accounts (2010-). [Accessed on 2 October 2024]. https://www.fao.org/faostat/en/#data/SCL; FAO. 2024. FAOSTAT: Value of Agricultural Production. [Accessed on 2 October 2024]. https://www.fao.org/faostat/en/#data/QV; World Bank. 2023. Access to electricity, rural (% of rural population). [Accessed on 20 February 2024]. https://data.worldbank.org/indicator/EG.ELC.ACCS.RU.ZS. Licence: CC-BY-4.0.

https://doi.org/10.4060/cd2616en-fig09

in the form of low government effectiveness and fiscal space (Figure 9, Panel A). Yet only 30 percent of countries in this category have an SSB tax. Panel B in Figure 9 shows that these same countries also have a high average rural electrification rate (95 percent), signalling high capacity to produce, process and preserve food, and the second-lowest food loss rate; yet 27 percent of their population cannot afford a healthy diet. This finding suggests that levers aimed at addressing health hidden costs in the diversifying category need to consider the detailed dietary risks and affordability of nutritious foods.

Unsurprisingly, countries and territories in protracted crisis fare worst on most agrifood systems indicators, as depicted in Figure 9, with particularly low levels of government effectiveness, agricultural support, social protection coverage, fertilizer use intensity, and rural electrification. They also have the highest DALY rates due to diets low in fruits and vegetables, as shown in Figure 8. The 21 countries in this group account for 23 percent of global social hidden costs, despite being home to just 6 percent of the total population. The high burden placed on their GDP by social and environmental hidden costs stands out (18 percent and 20 percent on average, respectively), specifically for the latter, which is the highest GDP burden of any agrifood systems category in any hidden cost domain. This is probably due to the vicious cycle of social and environmental stressors and conflict. Agrifood

BOX 6 CHALLENGES OF AGRIFOOD SYSTEMS IN PROTRACTED CRISIS COUNTRIES AND TERRITORIES

Agrifood systems in countries and territories in protracted crisis present unique challenges and complexities compared with other countries, stemming from their geopolitical context, environmental vulnerabilities and socioeconomic factors.[20] Prolonged political instability, ongoing conflict and regional tensions significantly impact these agrifood systems.[21] The fragmentation of governance structures, disruptions to trade routes and insecurity in rural areas lead to diminished productivity and increased vulnerability to food insecurity.[22] Most countries in this category have populations consistently in Phase 3 or above (crisis or worse) in the IPC* Acute Food Insecurity classification system for several consecutive years. These populations struggle to meet their essential food requirements, resort to unsustainable coping measures, and require urgent action to protect their livelihoods and reduce food consumption gaps.[21]

Environmental challenges, including water scarcity, land degradation and susceptibility to climate change, further strain agrifood systems in these countries and territories. Moreover, recurrent droughts and erratic rainfall patterns disrupt agricultural cycles, exacerbating food insecurity and rural poverty.[23] Their agrifood systems are, therefore, intricately linked to socioeconomic factors such as poverty, unemployment and rural–urban disparities. Subsistence farming predominates, and limited access to credit and agricultural inputs, and inadequate infrastructure impede agricultural development and perpetuate poverty.[24] Gender inequalities in landownership and resource access further exacerbate vulnerabilities within rural communities, affecting household food security and nutritional outcomes.[25]

The hidden costs of agrifood systems in the protracted crisis category reflect these challenges. Social hidden costs, such as the poverty and food insecurity of agrifood systems workers, perpetuate cycles of vulnerability and instability. Environmental hidden costs, such as land degradation and water pollution, undermine the long-term resilience of agricultural ecosystems, causing biodiversity loss and exacerbating resource scarcities, and negatively impact human health.[26] Health hidden costs from malnutrition impose a significant burden on public health systems and human well-being.

In these contexts, hidden costs are often overlooked, but have profound implications for sustainable and inclusive development. Addressing the complex problems affecting protracted crisis countries requires a multidimensional and immediate policy response.[27] Most countries in this category have a food systems transformation pathway as part of the 2021 United Nations Food Systems Summit. These national pathways offer a significant opportunity to address the challenges of agrifood systems comprehensively. Effective implementation of the humanitarian–development–peace (HDP) nexus approach through multistakeholder mechanisms such as the HDP Nexus Coalition can facilitate this transformation.[17]

The successful abatement of hidden costs requires a careful analysis of the specific vulnerabilities of these countries to various shocks – economic, environmental and social – and agile implementation strategies. Effective policies should consider exit strategies from aid dependency, creating the conditions for rural transformation that can improve income-generating opportunities, purchasing power and access to healthy and nutritious foods.

NOTE: * IPC = Integrated Food Security Phase Classification.

SOURCE: Zurayk, R., Harik, G. & Al Kareem Yehya, A. 2024. *True cost accounting and national food systems transformation pathways – Background paper for The State of Food and Agriculture 2024*. Rome, FAO. Internal document.

systems interventions in such situations should not only focus on food aid, but also provide medium- to long-term perspectives to address environmental stressors, poverty and social inclusion, and break this cycle (Box 6).

Recognizing that humanitarian assistance remains the most significant source of funding for countries and territories in protracted crisis, effective application of the humanitarian–development–peace nexus approach – integrating

the agendas on relief and development, resilience, disaster risk reduction, and sustaining peace – is essential in this regard.[17–19] ■

GLOBAL SCENARIOS OFFER INSIGHTS BASED ON STRONG ASSUMPTIONS

Scenario analysis, including simulations of alternative futures, is a fundamental tool in informing policy actions. An increasing number of global scenarios using economic models are proposing paths forward to agrifood systems transformation.[4, 6, 28] These scenarios can help navigate the complexity of the transformation required, which involves multiple and interacting policy levers and trade-offs. Nonetheless, scenarios include multiple assumptions and can only provide a high level understanding of potential pathways towards the desired outcomes. They need to be complemented with national-level assessments based on stakeholder consultations to identify effective levers for progress towards the desired outcomes. Nevertheless, scenario-building exercises are a useful policy tool.[29]

Scenarios for addressing hidden costs of agrifood systems

The Global Policy Report of the Food System Economics Commission (FSEC)[4] uses an integrated modelling framework to compare the hidden costs of agrifood systems under current pathways with those under a transformation pathway, including the most comprehensive set of levers modelled to date (19 selected levers) in a single comprehensive framework.[4, 30] The report finds that a global transformation pathway to address these quantified hidden costs is possible and would bring net benefits globally.

The impacts on environmental, social and health hidden costs show that the transformation pathway modelled has the potential to reduce global hidden costs by at least 5 trillion 2020 PPP dollars annually. The detailed results indicate that changes in dietary patterns drive 70 percent of this decrease across all dimensions – environmental, social and health impacts – again underlining the importance of clearly linking impacts to pathways where interventions need to happen (Box 3).

The annual cost of transforming agrifood systems globally is estimated to be between 200 billion and 500 billion dollars a year to 2050.[31] Compared with the global hidden costs quantified at more than 10 trillion dollars in 2020, this translates into significant global net benefits.

The FSEC transformation pathway, however, is based on bold assumptions on the feasibility of implementing levers for agrifood systems transformation. Two key examples are the assumptions of a global redistribution system to reallocate financial resources between countries and a smooth dietary transition to the EAT-Lancet Commission's diet everywhere.[32, 33] As there is no global redistribution system, low-income countries will not be able to afford the envisioned transformation, as the cost of the social safety nets sorely needed in these countries is the highest of all transformation costs.[4] Moreover, and notwithstanding the nutritional and environmental challenges associated with the EAT-Lancet diet, the smooth dietary transitions are assumed as exogenous in the FSEC analysis without estimating their costs given they are difficult to engineer due to current market, institutional and distributional failures.

A starting point for each country, therefore, is to prioritize existing commitments and implement those levers that are within reach in the confines of their fiscal and political spaces. This process can be informed using hidden costs and the agrifood systems typology.

Repurposing government support for food and agriculture

Given the pressure on public budgets and the multitude of national commitments, budget-neutral policy options to transform agrifood systems can, in principle, be considered "low-hanging fruit". Total public resources allocated to agricultural support amounted to around USD 630 billion per year in 2013–2018, increasing to USD 817 billion per year in 2019–2021.[34, 35] This makes the reform of public

policies leading to this significant expenditure an important lever in the discourse on sustainable agrifood systems transformation.[3, 4, 36, 37] Most of the discourse on repurposing concurs that while it may be effective in countries with a large amount of current agricultural support, it is only of limited use in countries with little or no support. Nevertheless, a synthesis of existing evidence on repurposing agricultural support to transform agrifood systems can highlight opportunities for and challenges to charting potential pathways for governments that may want to use this lever.

As shown in Figure 9, the fiscal space available for repurposing current agricultural support is very limited in most agrifood systems categories. In countries and territories with enough fiscal resources (falling within industrial and formalizing agrifood systems), repurposing agricultural support has the potential to reduce health and environmental hidden costs. However, the immediate reduction would be limited, as the behavioural and technological changes needed to decrease the dietary risks and environmental impacts take a long time and the nascent literature on what works and why is still building evidence to guide effective policy design.

Table A3 in **Annex 3** summarizes a selection of prominent studies investigating the impacts of removing or repurposing agricultural support for various agrifood systems transformation objectives. A publication by FAO, the United Nations Development Programme (UNDP) and UNEP increased the visibility of this important lever in global agrifood systems transformation in the run-up to the United Nations Food Systems Summit.[38] It documents the potential positive and negative impacts of agricultural support, as well as the trade-offs between environmental, social and health outcomes that a removal of all support would create globally and regionally. By establishing the inevitable need to redirect scarce public resources to nature-positive, low-emission and environmentally sustainable production and consumption, this report places this lever high on the discourse on agrifood systems transformation. Glauber and Laborde (2023)[36] is the most detailed study exploring repurposing scenarios, including the redirection of fiscal subsidies and border support to consumers, producers or both. Although it does not assess hidden costs, it indicates that carefully targeted subsidies that improve the affordability of healthy diets, equity and climate outcomes would be expected to decrease health hidden costs significantly, as well as to change environmental and social hidden costs within a TCA approach. Heterogeneities across regions and agrifood systems categories are inevitable due to significant differences in fiscal, governance and technological capacity, which need to be considered when moving from global visions to national actions.

Springmann and Freund (2022)[37] assess the impacts of repurposing agricultural subsidies towards producing healthier and more sustainable food groups in terms of GHGs and NCDs. The study finds that agricultural subsidy reform could lead to improvements in health, environment and economic welfare, though existing trade-offs need to be managed. Moreover, the scenario that best achieves this rests on the existence of a compensation system for countries without enough subsidies to ensure global inclusion. This study does not assess impacts on social indicators or combine all impact quantities leading to hidden costs to facilitate comparison.

While the aforementioned FSEC transformation pathway does not include the repurposing of agricultural support, a background paper for the report explores the potential for repurposing and reallocating support to agrifood systems globally.[39] The study investigates impacts on production, the cost of a healthy diet, poverty, undernourishment, prices and GDP, though it does not consider health impacts or quantify the implications for hidden costs. Similarly to the other studies mentioned above, it emphasizes the importance of providing adequate financial resources to the Global South to enable innovation, technology transfer and adoption during the transition.

Only Lord (2022)[40] calculates the impacts of removal scenarios on the hidden costs of agrifood systems.[40] This study explores the impact on environmental and social hidden costs of removing all forms of agricultural support and concludes that this would lead to increased global hidden costs of about 460 billion 2020 PPP dollars. This study, however, does not measure

the impact on health hidden costs due to a lack of data linking changes in food availability to food intake. This edition of *The State of Food and Agriculture* addresses this missing link in a case study, by connecting food availability in a country to dietary risks leading to NCDs that drive DALYs used to quantify health hidden costs (see next section). Future studies on global agrifood systems transformation would benefit from combining such a breakdown with a TCA approach to assess the impacts of various levers and address the remaining knowledge gaps.

Providing consumers with fiscal incentives to encourage dietary changes towards healthier and more sustainably produced foods is an important and effective lever,[41–43] but these can be politically controversial when added as new measures increasing the fiscal burden.[44–46] Another promising lever that would not increase the fiscal burden, therefore, is to reform the current system of taxation to complement the repurposing of agricultural support. A recent study on the impacts of reforming the existing value added tax (VAT) mechanisms in Europe – considering that VAT accounts for over one-fifth of public revenues in the European Union[47] – finds that aligning VAT rates with health and environmental objectives could decrease food-related GHG emissions, reduce the dietary risks associated with NCDs and increase tax revenues, while leaving the cost of a healthy food basket mostly unchanged.[48] The modelled health improvements (that is, lower mortality and disease burden attributable to dietary and weight-related risk factors) are linked to cutting VAT rates on fruits and vegetables, whereas most environmental and revenue benefits are driven by increased VAT rates on meat and dairy. Using taxes in a way that does not discriminate among who bears the costs can inevitably be regressive (that is, have a disproportionate impact on poorer consumers);[49, 50] therefore, policy packages including such levers need to combine them with other health-related programmes to prevent disproportionate impacts on low-income households and children.[51]

The scenario analyses summarized above, by definition, include multiple assumptions about the way in which policies are made, implemented and adapted and how they lead to impacts. Even if a scenario is deemed to be win–win in such models, it may not be implemented because of multiple political economy constraints. Therefore, a deeper understanding of the reasons why policies cannot be implemented or may face resistance is needed to assess options for reform and their political feasibility.[52] The trade-offs and synergies generated by various scenarios quantified using TCA need to be assessed with relevant political economy dynamics in mind.[53] Such an approach would further underline the importance of international cooperation and transnational constituencies in implementing the repurposing scenarios and the requisite complementary initiatives for an inclusive global transformation.[52] ■

CASE STUDY: SCENARIOS FOR DESIRED OUTCOMES OF NATIONAL AGRIFOOD SYSTEMS

After quantifying the national-level hidden costs of global agrifood systems, the next step of the TCA approach, as proposed in *The State of Food and Agriculture 2023*, is to engage with stakeholders at country level. This is an opportunity to validate the quantified hidden costs, acknowledge and potentially fill data gaps, and contextualize the challenges to address the hidden costs and the possible solutions to do so based on national priorities and commitments. This engagement with stakeholders is crucial if targeted assessments are to succeed in guiding policy actions based on TCA. A case study commissioned as a background paper for this report showcases the usefulness of combining scenarios based on stakeholder consultations with TCA to assess the implications for national hidden costs.

The study was conducted by the Food, Agriculture, Biodiversity, Land-Use and Energy (FABLE) Consortium, a global network of national research organizations developing national-scale food and land-use strategies aligned with national and global goals. For this study, the FABLE Consortium validated the findings of *The State of Food and Agriculture 2023* and held consultations with stakeholders to identify nationally relevant

desired outcomes to increase the sustainability of their agrifood systems. A set of future scenarios estimated the effectiveness of each desired outcome in addressing the hidden costs in the following countries: Australia, Brazil, Colombia, Ethiopia, India and the United Kingdom of Great Britain and Northern Ireland.

The desired outcomes identified included improvements in crop and livestock productivity, lower stocking rates (ruminant density) on pasture, and reduced post-harvest losses in all countries. In most countries, preventing deforestation beyond 2030 and increasing afforestation to meet official commitments to the Bonn Challenge (Brazil, Colombia, Ethiopia and India) or other national targets (Australia, India and the United Kingdom of Great Britain and Northern Ireland) are included in the national commitments and global sustainability scenarios. Dietary changes for healthier consumption patterns are also seen as key – except in Ethiopia, which is as expected, because health hidden costs account for only a small share (13 percent) of the country's total hidden costs, which are dominated by social hidden costs (46 percent).[54] Only a few countries include outcomes such as increased use of agroecological practices and irrigation, and changes in trade, biofuel demand, and population growth.

Three scenarios were assessed in each country: i) the current trends scenario is a low-ambition vision of feasible actions towards environmental sustainability, strongly dependent on historical trends and current policies; ii) the national commitments scenario reflects the actions needed to meet existing national commitments and targets; and iii) the global sustainability scenario corresponds to efforts compatible with achieving global sustainability targets.[i] Because of the large number of desired outcomes included in each scenario, the FABLE Consortium undertook a separate assessment of each to identify which would be most influential in reducing the hidden costs of agrifood systems.

The dietary indicators generated by these scenarios are expressed in terms of changes in the availability of food groups, which must be transformed into dietary intakes to be linked to the dietary NCD risk factors costed as health hidden costs. This link is non-trivial, as the way food groups are consumed (namely, fresh, processed or highly processed) has immense implications for dietary risks and NCD outcomes, as well as environmental impacts.[55] To overcome this limitation, a machine-learning model was used to establish the link between food availability (FABLE model outcome) and dietary risks (linked to DALYs due to NCDs in the GBD data) to quantify the implications of the scenarios for health hidden costs (Box 7).

The results show significant variation from country to country in terms of which of the modelled outcomes is the most effective in reducing the quantified hidden costs of agrifood systems (Table 1). Drawing on the agrifood systems typology, however, an interesting pattern can be observed. For most of the agrifood systems studied in the industrial and formalizing categories, changing dietary patterns is not only the main means of decreasing the hidden costs due to the burden of disease, but it is also a very effective way of reducing the environmental hidden costs (due to GHG and nitrogen emissions and land-use change). Of the 11 hidden cost subcategories reported in Table 1, dietary change is the most influential outcome in Brazil and the United Kingdom of Great Britain and Northern Ireland in six subcategories. In Australia, it is most influential in four subcategories (in addition to calorie intake), including methane and nitrogen emissions and pasture use. Dietary change is found to increase the hidden costs of blue water use, highlighting the importance of combining it with improvements in crop productivity and reductions in food waste considered in the global sustainability scenario.

In Colombia, although improving diets was a desired outcome included in the scenarios, it is most influential only for reducing the hidden

i Scenarios in India differ slightly, as they were conducted under the framework of the FSEC. The business-as-usual scenario aligns with the middle-of-the-road scenario of the second shared socioeconomic pathway of the Intergovernmental Panel on Climate Change's Sixth Assessment Report,[60–62] where the plausible future state of agrifood systems continues on current trends. The Full Sustainable Development Pathway (FSDP) is a transformative pathway that integrates 23 individual agrifood systems measures. Identifying the significance of sustainable external transitions, the FSDP also includes five transformational measures outside agrifood systems. The scope of the FSDP is remarkably close to the global sustainability scenario.

BOX 7 DESCRIPTION OF THE MACHINE-LEARNING EXERCISE TO LINK FOOD AVAILABILITY TO FOOD INTAKE

Most models used for scenario analyses only provide information on the quantities of different commodities produced, imported or exported every year in each country under different scenarios. However, what impacts the health of consumers is not the availability of food, but its actual intake, which can have an unclear correlation for various reasons.

Acknowledging this issue, *The State of Food and Agriculture 2024* has estimated the health outcomes associated with the results of the FABLE simulations* using a machine-learning model. After extensive validation by *The State of Food and Agriculture* team and background paper authors, the model architecture selected was a mixed model using XGBoost, a method based on decision trees with good empirical performance in many fields, and a linear model.

The machine-learning model was used for dietary risks not easily associated with a specific food category in food availability statistics in FAOSTAT.** For example, it is difficult to link the excessive consumption of sodium with any major food group. Therefore, the links between food availability and intake were estimated using the machine-learning model for such food and nutrient groups. The model was trained on data on the availability of food from FAOSTAT and food-intake data from the Global Burden of Disease database, so it could learn the historical relationship patterns between the two quantities. Other controlling indicators that mediate the relationship between food availability and consumption were also used (for instance, ultraprocessed food and beverage sales by country, which proxy the way in which available food is processed).

For food groups whose supply (adjusted for trade and food loss and waste) could be directly matched to intake, the linear model was used. Specifically, the changes in available supply of fruits, vegetables, red meat, milk, legumes, vegetable oils, nuts and seeds were assumed to be proportional to the changes in intake used for their (disability-adjusted life year) DALY predictions. For example, an increase of 5 percent in the supply of vegetables (after adjusting for trade and food loss and waste) was assumed to result in a 5 percent increase in the intake of vegetables.

Although the machine-learning model provides an important missing link to facilitate scenario analysis on the impacts of changing diets, its use is limited in cases where the historical data used to train the model (based on past trends) and the context for which it needs to provide predictions (a future scenario that breaks the historical patterns) diverge significantly. Historically, countries have followed strong trends (for example, as they develop, consumption increases, not only of fruits and vegetables, but also of highly processed foods). When the targeted policy scenarios depart significantly from historical trends in the relationship between food production and intake, it is important to acknowledge that simply altering the food production mix is not sufficient to achieve transformation. Incorporating other levers that target food environments and behaviours is necessary, as discussed in **Chapter 4**.

NOTES: * Simulations conducted by the Food, Agriculture, Biodiversity, Land-Use and Energy (FABLE) Consortium. ** FAO's Corporate Database for Substantive Statistical Data.

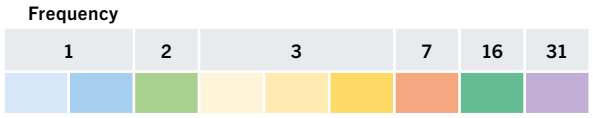
SOURCE: Authors' own elaboration.

costs of nitrous oxide emissions (in addition to calorie intake). Improving crop productivity through the sustainable intensification of production emerges as most influential for five subcategories of hidden costs, including reductions in carbon dioxide and nitrogen emissions and land-use change.

Dietary change was also included in India, particularly a transition to the EAT-Lancet diet along with increased calorie intake to eradicate underweight by 2050. It was the most influential in decreasing four subcategories of hidden costs in the country, including through reductions in methane emissions (from livestock and rice),

TABLE 1 DESIRED OUTCOMES THAT ARE MOST EFFECTIVE IN DECREASING THE HIDDEN COST SUBCATEGORIES BY COUNTRY, 2050

Subcategories	Australia	Brazil	Colombia	Ethiopia	India	United Kingdom of Great Britain and Northern Ireland
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



NOTES: CO_2 = carbon dioxide; CH_4 = methane; N_2O = 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 of Great Britain and Northern Ireland – 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.

SOURCE: FABLE. 2024. *How to reduce agrifood systems' future hidden costs? A multi-country case study – Background paper for The State of Food and Agriculture 2024*. Paris, Sustainable Development Solutions Network.

pasture, and blue water use. Curbing nitrogen runoff on croplands and managing land-use change emerged as other pivotal desired outcomes for hidden cost reductions in India.

Ethiopia, the only country where dietary change was not identified as an outcome to be modelled in stakeholder consultations, stands to benefit most from improved livestock and crop productivity, afforestation and limiting agricultural expansion into forested land to decrease environmental hidden costs. The potential actions to address social hidden costs due to poverty – the largest hidden cost in Ethiopia – were not well represented in the models used in this case study.

Overall, with the exception of Ethiopia, countries' hidden costs under the national commitments scenario are not distinguishable from those under the current trends scenario when uncertainty is taken into account, although the former does

reveal small reductions, on average. This suggests that countries should be more ambitious, striving to achieve reductions in the potential economic impacts of their agrifood systems, including levers for dietary change, which provide the clearest link to reducing overall hidden costs by freeing up land and reducing and sequestering GHGs and nitrogen, in addition to improving the accessibility of sustainable and nutritious diets for all.

The innovative machine-learning model applied to the simulations was helpful in breaking down the dietary risks associated with decreasing hidden costs so as to guide policy. The results highlight salient differences by agrifood systems category. The health hidden cost reductions between global sustainability and current trends scenarios in industrial countries are significant (–60 percent in Australia and –42 percent in the United Kingdom of Great Britain and Northern Ireland). In Australia, this is driven by an increase in consumption of nuts and seeds, fruits, legumes and vegetables and marked decreases in demand away from processed and red meat and SSBs. In the United Kingdom, this is mainly driven by lower processed meat consumption and higher legume consumption. The differences between these two scenarios are relatively lower in formalizing countries (Brazil and Colombia), with decreases in processed and red meat and SSB consumption explaining most of the reduction in hidden costs in Brazil, while decreases in processed meat and SSB consumption and an increase in legume consumption drive the reduction of hidden costs in Colombia. In traditional agrifood systems of India, healthier diets and avoiding a Western-style diet trajectory of overconsumption of sugars, salt and processed foods account for roughly two-thirds of the avoided health and environmental hidden costs. In Ethiopia, classified in the protracted crisis category, changes in health hidden costs are dwarfed by reductions in environmental hidden costs from improved production practices. Increasing the consumption of fruits, vegetables and whole grains should be envisaged – compared to the current diets modelled here – to further reduce the health hidden costs due to NCDs.

The role of stakeholder consultations in identifying nationally relevant sets of desired outcomes to be included in this case study is critical to the effectiveness of tailored assessments to guide decision-making. The overall recommendations of this case study further include the use of national datasets on land-use change and GHG emissions for tailored TCA assessments. Using country-specific thresholds for poverty and calorie consumption needs would also increase the relevance of the hidden costs to the national context. The consultations raised awareness among stakeholders and identified important data gaps, underscoring the need to invest in data collection, for instance, on nitrogen application and the value of ecosystem services in different locations. Lastly, using subnational statistics where such data are available was also highlighted as important for targeted TCA assessments to further facilitate effective policy design, especially in large countries with different agroecological zones and those with high in-country inequalities across relevant outcome indicators (Box 8). However, a limitation of this case study is that the scenarios focused on desired outcomes do not detail how these will be achieved. ■

PROCESSES FOR IDENTIFYING SPECIFIC ACTIONS FOR AGRIFOOD SYSTEMS TRANSFORMATION

Moving from desired outcomes, such as those identified in the FABLE case study, to identification and implementation of policy levers requires government backing. Governments need to prioritize objectives, as trade-offs are bound to arise during the transformation of such complex global systems. The TCA approach can facilitate the prioritization of different levers by considering all relevant impact indicators and clearly linking impacts to pathways to distinguish between cost bearers and cost producers. This can be done either through government-led TCA assessments or through those carried out in partnership with governments. Key to either approach is the engagement of stakeholders.

BOX 8 THE NEED TO GO TO SUBNATIONAL LEVEL FOR TAILORED COUNTRY-LEVEL TRUE COST ACCOUNTING ASSESSMENTS

Biophysical characteristics and the spatial organization of a territory define the actions needed to transform agrifood systems for greater sustainability. Country-level results based on national average values are likely to over- or underestimate the magnitude of the impacts on hidden costs. For example, expanding the cultivated area of a certain crop would need to happen under much poorer agronomic potential, or targeting a specific area for ecosystem restoration could lead to greater-than-average benefits. Sometimes, a problem can even become invisible at national level, as it can be offset by other regions in the country. Therefore, depending on data and resource availability, national-level data should be complemented by spatial analyses to enable the assessment of heterogeneity in the main impacts and drivers of agrifood systems.

An example of a policy with targets that vary across territories is the Forest Code in Brazil. The code is one of the most important policies in place to regulate future land-use change and, consequently, whether large amounts of carbon dioxide are emitted or sequestered. The rules govern how credits can be traded between farms, offsetting deforestation above allowed levels with permitted deforestation avoided elsewhere, but they need to account for similarity in forest type and biodiversity, among other things.

Distinguishing between agricultural production systems, for example, based on farm size or intensification level would better capture the heterogeneity across food production systems at subnational scale. This might be particularly pertinent to countries such as Ethiopia, where small-scale farmers constitute 75 percent of the population and the diverse agroecological zones (from highland areas to very arid areas) offer differing potential to reduce hidden costs.

When inequalities within a country (for example, in incomes, access to healthy food, dietary patterns and infrastructure) are significant, subnational assessments are even more necessary. For example, in remote areas of Australia, food baskets cost 39 percent more than in major supermarkets in capital cities.[56] Higher commodity prices can have a greater effect on populations that rely on extensive cattle farming or subsistence fisheries in remote areas.[57] In India, underweight prevalence among children (under five years) varies greatly across states – from 40 percent in Bihar to 12 percent in Mizoram.[58] Because inequality is not costed separately in the true cost accounting (TCA) approach used in this study, such national-level TCA assessments can mask key inequalities at subnational (population subgroup) level, which needs to be properly incorporated into policy design through consultations with civil society at the national and subnational level for inclusive transformation.

SOURCE: FABLE. 2024. *How to reduce agrifood systems' future hidden costs? A multi-country case study – Background paper for The State of Food and Agriculture 2024*. Paris, Sustainable Development Solutions Network.

Existing national processes and commitments are key to scaling up true cost accounting in policymaking

The second phase of TCA assessments can take many forms and vary in scope, as summarized in Figure 12 of *The State of Food and Agriculture 2023*. The most ambitious and complex are targeted nationwide agrifood systems assessments, which have significant data requirements in order to go beyond assessments based on publicly available global data sources. Because of this complexity, no country has so far officially integrated TCA into its nationwide policy prioritization process, although many countries use cost–benefit assessments in their policymaking and the transition to TCA should not present a major challenge.[59, 60]

In response to the spotlight shone by the 2023 edition of this report on the hidden costs of agrifood systems, a number of countries reached out to FAO to explore the potential of using TCA in

their national policy discussions. One of the case studies commissioned for the 2024 edition was a study supported by the Swiss Federal Office for Agriculture, which systematically assessed the hidden costs associated with Swiss agrifood systems and conducted a tailored assessment of the hidden costs to identify entry points for decision-makers.

The Swiss case study provides the most detailed and advanced understanding of how a tailored TCA assessment can complement existing national food security and sustainability commitments. One of the most important enablers of this process is the existence of a national commitment to agrifood systems transformation, which contributes to the country's 2050 carbon neutrality target across all sectors and society as a whole, enshrined in law as well as in the Swiss Nutrition Policy following a referendum in June 2023.[j] This process acknowledges the complex interdependencies of the country's agrifood systems and emphasizes policy coherence. The case study is an important step in working towards the Swiss Vision 2050 to guide the identification of policy entry points for transformation pathways. In addition to validating the national TCA results of *The State of Food and Agriculture 2023*, the study adapts them to national needs driven by existing commitments using more locally relevant and accepted cost categories and data sources.

The case study follows the steps for the phase two TCA assessment outlined in Figure 11 of *The State of Food and Agriculture 2023*. Starting with the system boundaries, it explores whether the assessment should include the hidden costs of imports into Swiss agrifood systems (including feed and fertilizer imports) and exclude some of the hidden costs of exports.[k] This discussion was driven by the observation that the country imports about 50 percent of its food, so some stakeholders suggested that the hidden costs of its consumption within globally interconnected agrifood systems should be acknowledged. Expanding system boundaries in this way would naturally lead to many new assumptions, such as how much of the environmental, social and health hidden costs of a trading partner country may be caused by the production of imported goods and attributed to the importing country and how they can be reduced. Such difficult decisions were deliberated in detail through stakeholder consultations and hidden costs of imported food, feed and fertilizer were calculated using existing data and a simplified approach. These hidden costs provide a lower bound estimate as they exclude the health and social hidden costs of imports, which require more detailed data and analyses that are left for future phase two TCA assessments (Box 9).

Additional topics of potential relevance for Swiss hidden cost estimates have been identified based on a review of ongoing key debates in the national agrifood discourse and the existing and planned regulatory frameworks for sustainability monitoring. These include pesticides, antimicrobial resistance (AMR), ecosystem services (such as biodiversity), soil quality and animal welfare. Even in data-rich settings such as Switzerland, the extent to which these new components are assessed and integrated into TCA vary. The hidden costs of some components are included based on existing studies, others are quantified based on many simplified assumptions, while a selected set is quantified using high-resolution national databases.

The results provide an initial validation of the hidden costs quantified in *The State of Food and Agriculture 2023* and indicate that national-level assessments of the same hidden cost components fall within the uncertainty bounds of the 2023 assessment for Switzerland. The study identifies where the largest hidden costs arise in order to indicate entry points for agrifood systems transformation pathways in Switzerland. The refined and amended hidden cost estimates send a relatively simple message: key entry points for action towards food systems transformation could focus on dietary patterns, biodiversity »

j Swiss voters endorsed the country's federal law on climate protection, innovation and strengthening energy security goals with around 59 percent of the vote in a referendum on 18 June 2023.

k The TCA assessment in *The State of Food and Agriculture 2023* assumes national cost bearing, that is, hidden costs produced in a country are borne by that country. The transborder effects are not modelled due to data limitations at global level.[30] While this does not pose an issue in a global assessment, as the world is a closed system, national-level phase two assessments need to make difficult decisions involving many assumptions and trade-offs (between detail needed for policy levers/precision and feasibility).

BOX 9 THE CHALLENGES AND OPPORTUNITIES OF STAKEHOLDER CONSULTATIONS AS PART OF TAILORED TRUE COST ACCOUNTING ASSESSMENTS: INSIGHTS FROM SWITZERLAND

A stakeholder consultation process was conducted between October 2023 and May 2024 as part of the targeted assessment of the hidden costs of Swiss agrifood systems. The participants were stakeholder representatives from Swiss research centres, academic institutions, producer organizations, consumer organizations, government departments and FAO.

The process involved a kick-off meeting and three monitoring meetings in which all of the aforementioned stakeholders took part, along with additional meetings on specific questions, as required, either bilaterally or in small groups. This enabled the collection of inputs from a very broad range of experts to clarify and refine the structure and narrative of the case study, to sharpen the arguments made, to shed light on the expectations of the various experts and institutions involved, and to identify and address gaps and unclear formulations where needed.

The key challenge was to make the group as inclusive as possible. The main challenge during the consultation involved discussions on complex topics with participants from different backgrounds; topics included how to define the various cost categories, which costs should be called "external" or "hidden", and which types of cost would warrant government intervention. There were also discussions on responsibilities for action, for example, on health hidden costs due to dietary patterns and the extent to which individual consumers or agrifood systems actors were responsible for them. Because of the complexity of the true cost accounting approach, there was disagreement on what additional costs should be added to those in *The State of Food and Agriculture 2023* and whether it would be better to aim for more accurate coverage of existing cost categories or broader coverage through additional ones.

Due to the diverse backgrounds of participants, there were different expectations as to the content, goals and impact of the report. Expert and institutional opinion differed, to some extent, regarding what the report should cover and aim to achieve. This was reflected, for example, in differing views on how concrete suggestions on policy action might be formulated and how strongly a consumer, producer or general value-chain focus should be adopted. There were also some reservations as to how the numbers might be used in public fora, underlining the importance of communicating the complex findings in a simple and contextualized way to avoid misuse.

A particularly sensitive issue related to the hidden costs associated with certain actors, which could easily have been mistaken for undue finger-pointing. Different opinions arose on how to deal with topics that were deemed relevant, but which, due to missing data, could not be included to the same quantitative extent as those already covered. Not including such topics would implicitly assign them an incorrect value of zero. Therefore, where possible, such topics were included, cautiously based on qualitative assessments to convey unbiased messages.

The stakeholder consultation process resulted in a number of important outcomes. First, it prompted participants to explore where data for additional assessment might be available and which experts to contact for details on any topic of interest, so that important gaps in hidden cost assessments were filled or acknowledged. The process was deemed very transparent – all participants could contribute and set the basis for an encompassing and widely accepted assessment. This does not mean that all experts agreed with the decisions taken on certain aspects in the final report, but the process provided an opportunity for mutual understanding on any decision, which forms a good basis for the future engagement of all stakeholders in the national policy discourse on the hidden costs of agrifood systems.

SOURCES: De Luca, K. & Mueller, A. (forthcoming). *Hidden costs of the Swiss agrifood system - Case study for The State of Food and Agriculture 2024,* Frick, Switzerland, Research Institute of Organic Agriculture; Lord, S. 2024. *Refining national true cost accounting for agrifood systems: Considerations for moving beyond The State of Food and Agriculture 2023 and 2024.* Rome, FAO.

» and GHG emissions. Another key message is that a pragmatic approach should be taken to incorporating the results of targeted assessments in decision-making. Hidden cost categories that are relatively small today may warrant early action to avoid becoming intractable problems tomorrow, such as water scarcity, AMR and soil fertility.

Though the social hidden costs of Swiss agrifood systems are estimated to be zero in national-level estimates (because of the use of the global moderate poverty line and the prevalence of undernourishment statistics), this does not mean there are no social hidden costs based on national standards. The topics of decent working conditions and the wages and incomes of agricultural workers and farmers were discussed as they are seen in the more general context of equity and justice in Swiss society and its economy. Targeted phase two TCA assessments, therefore, are recommended to adjust the thresholds used in global statistics and include other hidden cost domains as needed to capture the nationally relevant hidden cost dimensions that are of central moral importance to a society. Attribution to agrifood systems, however, needs to be assessed carefully, as some of these issues may be related to justice in the overall labour market rather than being entry points for agrifood systems transformation.

Partnering with governments to address hidden costs

In the absence of country-led TCA assessments, other than that of Switzerland, a UNEP initiative has been partnering with governments to address the hidden costs of agrifood systems.

The Economics of Ecosystems and Biodiversity (TEEB) was launched in 2008 with the aim of informing decision-making and policy outcomes through a better understanding of our impacts and dependence on the natural world.[61] The use of the TEEBAgriFood Evaluation Framework in several countries offers further examples of how to combine a consultative scenario-building process with TCA. With funding from the European Union, the TEEBAgriFood initiative has been working with governments in seven countries since 2019.[I] It adopts a comprehensive strategy for policy intervention for agrifood systems transformation. Following a scoping stage to collect documentary insights, identify stakeholders and conduct a preliminary evaluation of policy interventions, policy mapping is conducted to pinpoint pertinent policies and their governing mechanisms. Pilot projects are subsequently devised and refined to serve as models for policy intervention scenarios. Collaboration with the Capitals Coalition facilitates business engagement aimed at understanding the implications, both economic and ecological, of integrating natural capital and biodiversity assessments into corporate decision-making processes.[62]

Scenario analysis is a crucial aspect, presenting the rationale for change by juxtaposing policy scenarios against the status quo, utilizing the TEEBAgriFood Evaluation Framework. A roadmap for change is crafted to delineate key agents and drivers of change, evaluate associated risks, and outline concrete steps for implementation. Lastly, communication and outreach initiatives are undertaken to enhance awareness and comprehension of the significance of integrating the (hidden and visible) values of nature into government and corporate decision-making, as well as education.

Because of the case-specific consultations on policy objectives with government and other stakeholders, no two TEEBAgriFood studies are the same. Although most studies have a relatively narrow scope, such as niche primary production systems or the sustainability of key products in national food supply chains, some have a broader focus. For example, through sustained broad-based stakeholder engagement in India since 2019, TEEBAgriFood objectives have been aligned with the government's vision for agrifood systems transformation, starting in three states and expanding to cover nine national entities. True cost accounting principles are now being used to advance the integration of the value of nature into government decision-making, including the »

I Traditional (India), expanding (Indonesia and Thailand), diversifying (China and Mexico) and formalizing (Brazil and Malaysia) agrifood systems.

BOX 10 TEEBAGRIFOOD STAKEHOLDER CONSULTATIONS AND SUCCESS STORIES: EXAMPLES FROM INDIA AND BRAZIL

TEEBAgriFood in India

In India, the stakeholder consultation process for the TEEBAgriFood project took place over three virtual sessions in July 2020, involving around 120 participants. The inception workshop provided a crucial platform for key stakeholders, including government officials, civil society organizations, academic institutions, experts, farmer groups and international organizations to shape policy focus areas collaboratively.

A decision was taken to focus the TEEBAgriFood policy application on three states (Uttar Pradesh, Uttarakhand and Assam), targeting the upscaling and adoption of organic farming and agroforestry systems across heterogeneous agroecological zones. This choice was partly driven by the need to provide economic valuation evidence to support extant national policies and programmes, such as the National Mission for Clean Ganga, Paramparagat Krishi Vikas Yojana (Traditional Agricultural Development Scheme), Mission Organic Value Chain Development for Northeast Region and the National Agroforestry Policy.

A national-level project steering committee was established to align TEEBAgriFood objectives with the government's vision for agrifood systems transformation, co-chaired by the Ministry of Environment, Forest and Climate Change and the Ministry of Agriculture and Farmers' Welfare. Establishing the steering committee using a multisectoral approach enabled contributions to national priorities, including sustainable agrifood systems transformation, agricultural production, natural resource management, biodiversity conservation, watershed development and farmer income enhancement. State- and national-level consultations were conducted periodically to refine the technical aspects of the TEEBAgriFood project, tailor it to policy needs, share findings and foster discussions to drive change across the entire value chain.

From 2019 to 2023, with funding from the European Union, the project extended its reach significantly, collaborating with nine national-level entities. The TEEBAgriFood initiative in India achieved significant milestones in advancing the integration of nature's values into government decision-making. The true cost accounting (TCA) principles, including the TEEBAgriFood Evaluation Framework, are now engrained in leading government agricultural research institutions, with the Indian Council of Agricultural Research spearheading the nationwide integration of TEEBAgriFood principles. The project has informed national policies on sustainable agriculture more broadly, as evidenced by the Ministry of Agriculture and Farmers' Welfare seeking United Nations Environment Programme (UNEP) inputs on TCA and TEEBAgriFood for various initiatives: i) the Voluntary Carbon Market Framework for the agriculture sector; ii) the Operational Guidelines for Climate Resilient Agriculture in India; and iii) the revision of the National Agroforestry Policy and future roadmap development for agroforestry. In addition, the TEEBAgriFood Evaluation Framework is included in the G20 Compendium of Best Practices for Forest-Fire Affected Areas Restoration.

TEEBAgriFood in Brazil

In Brazil, the collaboration between UNEP and several ministries (Environment, Rural Development, Social Development, Work and Employment) on the use of the TEEBAgriFood Evaluation Framework contributed to two presidential decrees: the Urban and Peri-urban Agriculture (UPA) National Programme (Decree 11.700/2023) and the Food and Nutritional Security Strategy for Cities (Decree 11.822/2023).[63, 64] Together, they established the Guide for UPA Agendas,[65] which uses the TEEBAgriFood Evaluation Framework as the main reference on multilevel governance (municipal, state and federal) for urban food systems to promote food and nutrition security, socioeconomic development, climate resilience and net positive impacts on nature and people.

The United Nations Environment Programme worked iteratively, starting by focusing on policy demand at local level. A study by two institutes – Instituto Escolhas and Instituto Urbem – with the collaboration of UNEP for São Paulo, assessed ecosystem services related to UPA. This crucial study was timely, as the State and the Municipality of São Paulo were in the process of developing legislation on ecosystem services and sought farmer engagement. Having established the potential of sustainable UPA as a nature-based solution for urban landscapes at local level, these findings were brought to the Ministry of Citizenship at national level. A key next step was

BOX 10 (Continued)

UNEP advocating for the integration of UPA into the urban planning process. For that, UNEP and its research partner, the Centre of Sustainability of the Getúlio Vargas Foundation, established a steering and technical committee with about 60 stakeholders from civil society, research groups, municipalities, states and federal government, with a good gender balance (more than 50 percent of participants were women) and representatives from all regions of the country. In addition, more than 100 contributions from a wider public consultation process were incorporated into the final document.

The outcome was a UPA guide written using layperson's terms, presenting a range of tools for upscaling UPA according to a city's size and administrative capability, as well as the level of collaboration with civil society, and allowing for heterogeneity in local ecological, cultural and economic conditions. This guide was later complemented by a survey of 67 cities with UPA programmes, and the survey results were used to provide potential pathways for coordination between national- and subnational-level governmental authorities. This combination of compelling evidence from the TCA applications and the broad social participation achieved by the convening process attracted three additional ministries to the national UPA programme, unlocking more funds and leading to further synergistic action.

NOTE: TEEB = The Economics of Ecosystems and Biodiversity.
SOURCE: Authors' own elaboration.

» inclusion of TCA in undergraduate courses in 4 central and 51 state agricultural universities by 2025. **Chapter 4** expands on the importance of education in shaping the preferences of consumers of today and tomorrow.

Similarly, stakeholder consultations with several ministries conducted by TEEBAgriFood in Brazil led to a scaling up of the use of TCA principles from local to national level. They culminated in the development in 2023 of two presidential decrees – the Urban and Peri-urban Agriculture (UPA) National Programme and the Food and Nutritional Security Strategy for Cities. A wide stakeholder consultation led to the development of a national Guide for UPA Agendas promoting food and nutrition security, socioeconomic development and climate resilience, with net positive impacts on nature and people.

Box 10 provides more details on how stakeholder consultations at the national level led to policy impact in India and Brazil. ■

CONCLUSIONS

While all stakeholders – that is, the world population – have a stake in taking action to ensure sustainable and inclusive agrifood systems transformation, governments have a significant role to play, given the levers at their disposal to affect markets, incentives, infrastructure, laws and regulations. Nonetheless, efforts to transform agrifood systems – whether government-led or in partnership with governments – need to be informed through stakeholder engagement.

As a first step, understanding the distribution of the quantified hidden costs across the agrifood systems categories provides important context for the necessary next steps in agrifood systems transformation. Detailed analysis of health hidden costs due to NCDs by agrifood systems category underlines the differences in the most important dietary risks, which are dominated by diets low in whole grains and high in sodium in terms of magnitude. Hidden costs of diets low in fruits and vegetables are highest in protracted crisis and traditional categories and mostly decrease as countries transition towards

industrial agrifood systems. Hidden costs due to diets high in red and processed meat show an ever-increasing pattern. Considering that these food and nutrient groups are components of a healthy diet, countries can incorporate such assessments into the design of FBDGs to address quantified health hidden costs and ensure a healthy diet for all. Complementary levers such as labelling, information, nudges, taxes and subsidies are discussed in detail in **Chapter 4**.

This chapter explores the varying fiscal and institutional capacities among agrifood systems and highlights the unique circumstances of those in the protracted crisis category. Further global, regional and national scenarios provide opportunities to explore potential future pathways that can help chart a vision for transformation at both global and national level. While this global transformation is a process that can be aspired to, national commitments and actions will, necessarily, be the building blocks for change.

The case studies showing the TCA approach at the national level underscore the importance of inclusive stakeholder consultation. The targeted TCA study conducted in Switzerland showcases the importance of incorporating TCA applications into existing national processes with broad-based stakeholder participation and a flexible approach. It also highlights the need to expand the scope of the work conducted by this report to include other hidden cost domains – for example, soil degradation, biodiversity, AMR or imports – that may be deemed relevant to national agrifood systems sustainability.

Global agrifood systems generate innumerable benefits for all actors, but also hidden costs and inequality between cost producers and cost bearers, as demonstrated by the models discussed in this chapter. National governments and intergovernmental organizations have a pressing responsibility to pinpoint the causes of inequality and identify how to transfer resources from current beneficiaries of hidden cost production to those who bear the costs. This responsibility is complicated and amplified when cost bearers are in a different country or not even born yet. Governments' role is discussed further in **Chapter 3** and **Chapter 4**, which zoom in on the value of transformation for actors in food supply chains and consumers, respectively. The most challenging elements of all – the distributional challenges and the political economy constraints that can stifle government action – are discussed in **Chapter 5**. ■

VIET NAM
Processing shrimp in a factory.
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CHAPTER 3
INCENTIVIZING CHANGE FROM WITHIN FOOD SUPPLY CHAINS

KEY MESSAGES

➔ To make agrifood systems transformation more inclusive, sustainable and resilient, it is essential to involve all agrifood systems actors and strategically navigate the power dynamics that influence their interactions.

➔ Much of the required change involves primary production practices, but producers need not shoulder the burden alone; partnerships with governments, agribusinesses and financial institutions must also play a role in reshaping food supply chains.

➔ Although agrifood systems actors' adherence to voluntary standards and sustainable practices is on the rise, the pace of action to counteract escalating climate change remains insufficient. Efforts need to be stepped up.

➔ Governments are increasingly modelling incentive and regulatory schemes based on existing voluntary standards, showing that voluntary action can inform and pave the way for policy measures that can ensure scale.

➔ Early adopters of more sustainable and fair practices are poised to minimize business disruptions by staying ahead of anticipated regulatory change.

➔ Given the increasingly global nature of food supply chains, international cooperation on financing and trade is essential to ensure that the benefits and costs of transformation are distributed fairly.

Business relationships underpin the various network structures of agrifood systems actors, including those in supply chains linking agricultural producers to consumers. The nature of these relationships needs to be taken into account in strategies to drive agrifood systems transformation.[1]

While much of the focus of agrifood systems transformation rests on primary producers, processors or retailers adapting their practices, no actor operates in isolation. Rather, their activities are influenced by power dynamics involving upstream and downstream partners in the supply chain, governmental entities on multiple levels and civil society organizations.[2, 3] While primary production may be the pathway through which a significant portion of environmental hidden costs can be internalized, other actors would mainly reap the benefits. The extent to which individual actors internalize externalities depends on awareness, motivation and capability, which become increasingly challenging as value chains are globalized. Governments, through policy and regulation, have a vital role to support these three pillars in order to incentivize agrifood actors to eliminate or reduce the negative externalities.[4]

The TCA systems approach of multistakeholder engagement offers the right forum for bringing different types of actors together – from governments to the private sector – to address awareness, motivation and capability constraints and to identify opportunities for change. Indeed, agrifood businesses of all sizes can identify opportunities to enhance their operational and strategic models with targeted TCA assessments. Such assessments are also an important means of determining "double materiality", how businesses are affected by sustainability issues, such as the risks of conducting business as usual, and how their activities impact society and the

environment. The social dimension under TCA assessments allows agribusinesses to incorporate human rights principles into agrifood value chains to ensure dignity, fairness, and protection from exploitation for all actors. As such, it is agribusinesses' responsibility to uphold human rights and comply with international guidelines and emerging legal frameworks, as per the United Nations Guiding Principles on Business and Human Rights. These principles combined with well-designed incentive structures can guide the ongoing state of transformation in food supply chains towards sustainability and inclusion. ■

FOOD SUPPLY CHAINS: THE ONGOING STATE OF TRANSFORMATION

An estimated 1.23 billion people – or approximately one-third of the global labour force[m] – are directly employed in agrifood systems, bringing food to our tables by way of food supply chains.[6] Primary producers occupied with crops, livestock, forestry, fisheries and aquaculture engage with those working in the value-adding stages of storage, transportation, processing, wholesale and retail distribution. Food supply chains are interconnected with supply chains for inputs (for example, equipment, fertilizer, fuel, labour and machinery) and services (such as finance). These operations range from small to large scale, the interactions can be formal or informal, and the chains vary in reach, from local to global.

Environmental, social and health hidden costs can be created at all stages of food supply chains and jeopardize their long-term viability. However, the fundamental shifts that are needed often hit political economy barriers and may even backslide on reform.[7] Actors are sometimes reluctant to change practices, imagining that actors in the chain other than themselves will benefit or deeming the benefits to be too distant in geographical or generational terms. By engaging stakeholders in documenting the complex interdependencies, targeted TCA assessments can identify policy entry points to maximize the value of transforming agrifood systems for all actors in the chain.

Food supply chains are continuously transforming, influenced by technological innovation, demographic changes, consumer preferences and economic development. It is important to understand their current state as much as possible, however, so that efforts to drive transformation can be tailor-made to local contexts.

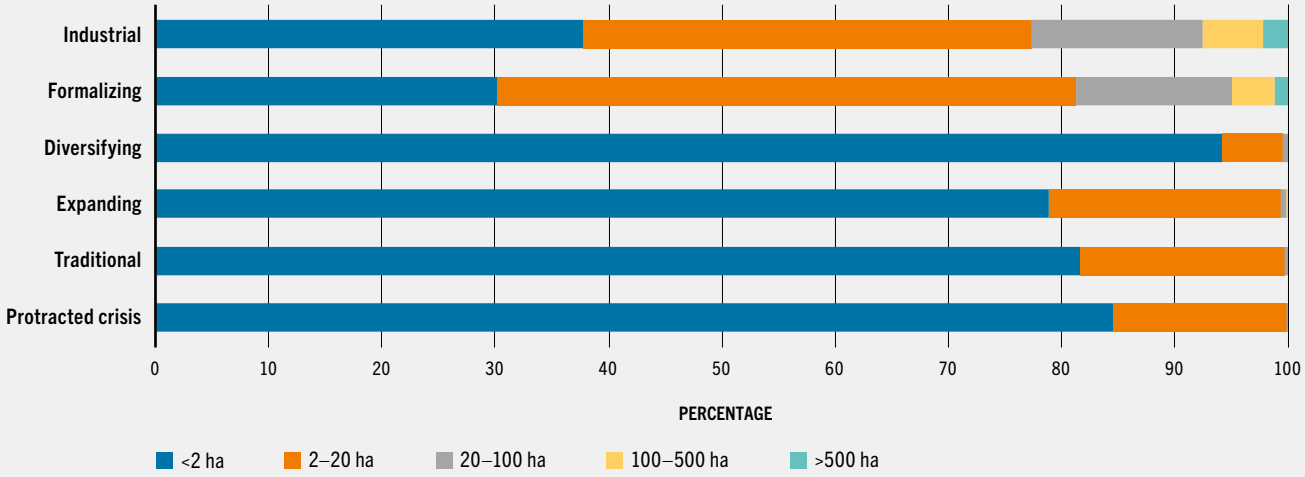
Navigating diverse food supply chains

Common patterns in food supply chains, such as those relating to primary production, infrastructure and food processing, can be identified through the lens of the agrifood systems typology, though it should be acknowledged that heterogeneity of food supply chains exists within each agrifood systems type and country. As mentioned in **Chapter 1**, the typology captures the changes that occur in food supply chains during rural transformation. As agricultural productivity in agrifood systems increases, generally fuelled by technological change, there is a reduction in the agricultural labour force as workers move towards non-farm employment.[8, 9] Combined with demographic transition and urbanization, food retail sectors transform, leading to the increased presence of supermarkets (both urbanization and supermarkets are among the indicators used to create the typology). The implications for food supply chains and consumption habits can have positive outcomes (for example, higher farm incomes due to contract farming, increased availability of fresh produce)[10, 11] and negative outcomes (such as increased inequality, greater consumption of highly processed foods),[12] which need to be assessed using other indicators to identify policy levers.

Starting with farm size, which has a bearing on the awareness, motivation and capability of actors in addressing the hidden costs of primary production, it is typical to observe the increased concentration of farmland among large farms as economies grow. Globally, the largest 1 percent of farms – each more than

m In 2019, the total global labour force amounted to an estimated 3.46 billion people.[5]

FIGURE 10 DISTRIBUTION OF FARM SIZE BY AGRIFOOD SYSTEMS CATEGORY



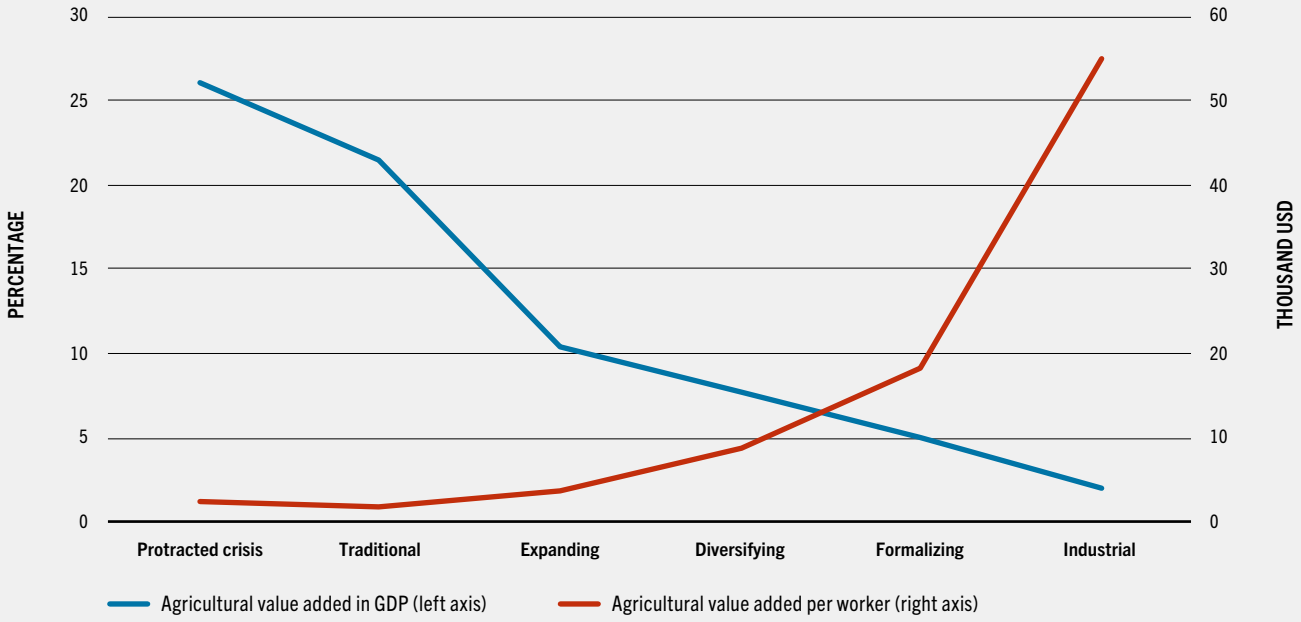
SOURCE: Authors' calculations based on Lowder, S.K., Sánchez, M.V. & Bertini, R. 2021. Which farms feed the world and has farmland become more concentrated? *World Development*, 142: 105455. https://doi.org/10.1016/j.worlddev.2021.105455

https://doi.org/10.4060/cd2616en-fig10

50 hectares – operate over 70 percent of the world's farmland. In contrast, small farms of less than 2 hectares account for 84 percent of all farms worldwide, but operate only around 12 percent of all agricultural land. Figure 10 shows the distribution of farms by land size for agrifood systems categories. The difference in farm size distribution between the industrial and formalizing categories, on the one hand, and all other agrifood systems categories, on the other, is dramatic. While farms of 20 hectares or more are rarely observed in the latter categories, they make up more than one-fifth of all farms in the former, with 5–7 percent of them larger than 100 hectares. Since many large farms are owned by families, the terms "small farm" and "family farm" should not be used interchangeably. Out of the more than 608 million farms in the world, over 90 percent are family farms, occupying 70–80 percent of farmland and producing roughly 80 percent of the world's food in value terms. Small farms produce roughly 35 percent of the world's food.[13] Nonetheless, it is important not to conflate farm size with productivity, as recent literature highlights an inverse relationship between farm size and productivity.[14]

Comparing agrifood systems using indicators of primary and secondary food production characteristics can provide important context for targeted TCA analysis. Figure 11 and Figure 12 provide insights into the differences between food supply chains in terms of production efficiency, emissions intensity, fertilizer use, food supply chain infrastructure and food processing. Figure 11 demonstrates how well the typology captures the rural transformation stages: as the share of agricultural value added in GDP declines, labour productivity in agriculture increases dramatically. These changes are accompanied by an intensification of primary production corresponding to the changes in emissions intensity (Figure 12). As emissions per area of agricultural land increase due to increased input intensification, there is a reduction in emissions per unit of value added. The highest emissions per unit of value added in agriculture are in protracted crisis, expanding and traditional agrifood systems (those with the lowest labour productivity), where improvements in the efficiency of input use and value addition in agriculture tend to be priorities of primary production. How producers can be incentivized to avoid the significant increase in emissions per

FIGURE 11 AGRICULTURAL VALUE ADDED AS A SHARE OF GROSS DOMESTIC PRODUCT AND PER WORKER BY AGRIFOOD SYSTEMS CATEGORY



SOURCES: Authors' own elaboration based on data from FAO. 2023. FAOSTAT: SDG Indicators. [Accessed on 20 February 2024]. https://www.fao.org/faostat/en/#data/SDGB. Licence: CC-BY-4.0; World Bank. 2023. World Bank Open Data: Agriculture, forestry, and fishing, value added per worker (constant 2015 US$). https://data.worldbank.org/indicator/NV.AGR.EMPL.KD. Licence: CC BY-4.0.

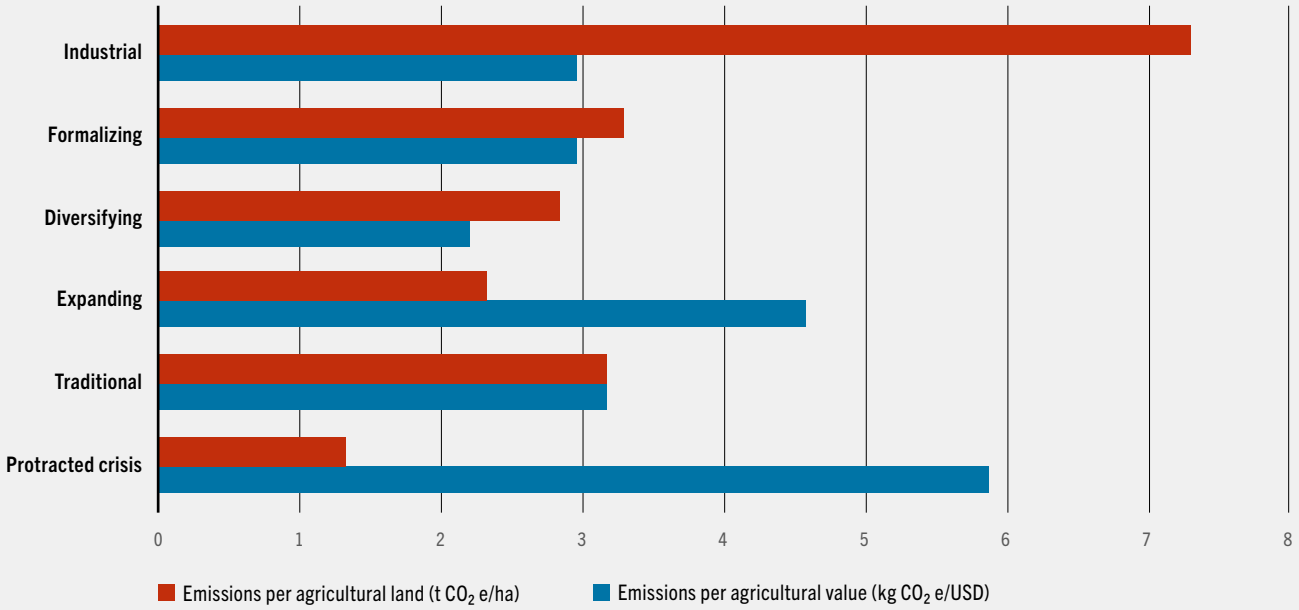
https://doi.org/10.4060/cd2616en-fig11

hectare of agricultural land during this progress with a systems approach will be discussed in the next section.

As an indicator of input use among farmers, the blue line in Figure 13 shows an increase in average fertilizer consumption per hectare of arable land across the agrifood systems types, peaking in the formalizing category before decreasing in the industrial category. These estimates are derived at the national level and do not provide detail on heterogeneity in input access among farmers, nutrient management practices, such as those leading to efficient use versus over-fertilization, or changes over time. For example, it has been documented that as countries develop economically and agricultural practices improve, phosphorus use efficiency initially declines before levelling off or increasing as management practices improve and nutrients accumulate in the soil.[15] This trend aligns with the environmental Kuznets curve, which predicts a bell-shaped relationship between pollution and income.

To minimize food loss along supply chains and facilitate market access for all, infrastructure is key. Nonetheless, the red line in Figure 13 shows how the ability to store and transport food products to market varies by agrifood systems type. The agricultural infrastructure index is a composite indicator that assesses a country's road, rail, port, air transport and irrigation infrastructure, as well as investment in crop storage facilities. A higher score indicates more developed infrastructure – and the industrial category value is more than three times that of the protracted crisis category, suggesting improved market access and the increasing presence of cold chains alongside supermarkets and modern retail.[16]

FIGURE 12 EMISSIONS PER UNIT OF AGRICULTURAL LAND AND PER UNIT OF VALUE ADDED BY AGRIFOOD SYSTEMS CATEGORY



SOURCE: Authors' own elaboration based on FAO. 2023. FAOSTAT: Climate Change: Agrifood Systems emissions, Emissions indicators. [Accessed on 20 February 2024]. https://www.fao.org/faostat/en/#data/EM. Licence: CC-BY-4.0.

https://doi.org/10.4060/cd2616en-fig12

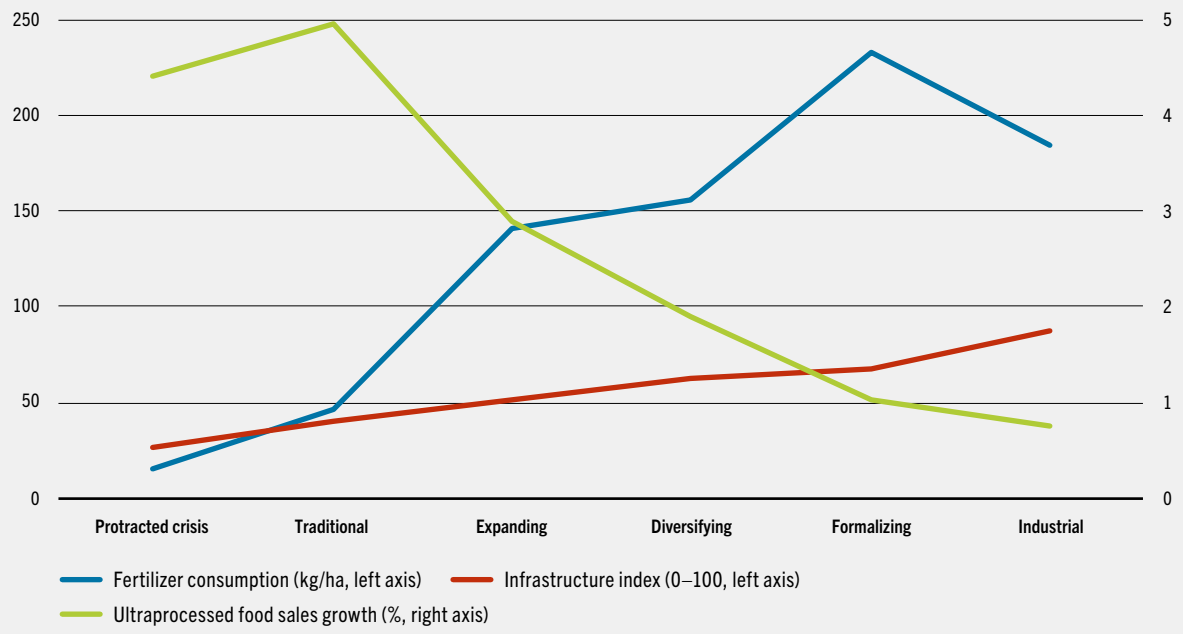
Changing food-processing and consumption patterns can be seen in Figure 13 (green line), which shows growth in the retail value of ultraprocessed foods.[n] The increase is happening fastest in traditional agrifood systems and in those in protracted crisis, as supply chains are increasingly bringing such foods to consumers even where there are no supermarkets.[17] That sales growth rates of ultraprocessed foods are zero or negative in formalizing and industrial agrifood systems may indicate market saturation (the retail value of these foods per person per day in industrial agrifood systems is 30 times the value in traditional agrifood systems), as well as changing consumer preferences.

Some of the characteristics above identify trends that need to be avoided as economies develop (such as a rise in emissions and an increase in highly processed food sales growth), while some point to trends that may need to be enhanced (such as an improvement in production efficiency) using various levers at different stages of the supply chain. Such characterization of agrifood systems creates a general backdrop, to be nuanced with further analysis for a more complete and context-specific picture of the hidden benefits and costs of agrifood systems. Therefore, these characteristics should be seen as descriptive of broader agrifood systems, as mentioned in **Chapter 1**, and are not intended to imply superior agrifood systems during observed transitions.

Moving beyond national averages, targeted TCA assessments can delve into the interconnected

n Data on ultraprocessed foods (UPFs) are from the Food Systems Dashboard, where UPFs are defined as foods made of mostly industrial ingredients and additives with minimal amounts of unprocessed foods. These additives are not naturally occurring in the food but are added in the processing phase in order to increase palatability and shelf-life. Examples of UPFs include sweet and savoury snacks, instant noodles, confectionery, meat substitutes, and soft drinks. https://www.foodsystemsdashboard.org/indicators/food-environments/product-properties/retail-value-of-ultra-processed-food-sales-percapita

FIGURE 13 PRIMARY AND SECONDARY FOOD PRODUCTION CHARACTERISTICS ACROSS AGRIFOOD SYSTEMS CATEGORIES



NOTE: Fertilizer consumption includes the nutrients of nitrogen (N), phosphate (P_2O_5) and potash (K_2O).

SOURCES: Authors' own elaboration based on data from Economist Impact. 2018. Global Food Security Index (GFSI) Database. [Accessed on 20 February 2024]. https://impact.economist.com/sustainability/project/food-security-index/download-the-index; FAO. 2021. FAOSTAT: Fertilizers by Nutrient. [Accessed on 20 February 2024]. http://www.fao.org/faostat/en/#data/RFN. Licence: CC-BY-4.0; Food Systems Dashboard. 2018. Retail value (total sales) of ultra-processed foods per capita. [Accessed on 20 February 2024]. https://www.foodsystemsdashboard.org/indicators/food-environments/product-properties/retail-value-of-ultra-processed-food-sales-per-capita

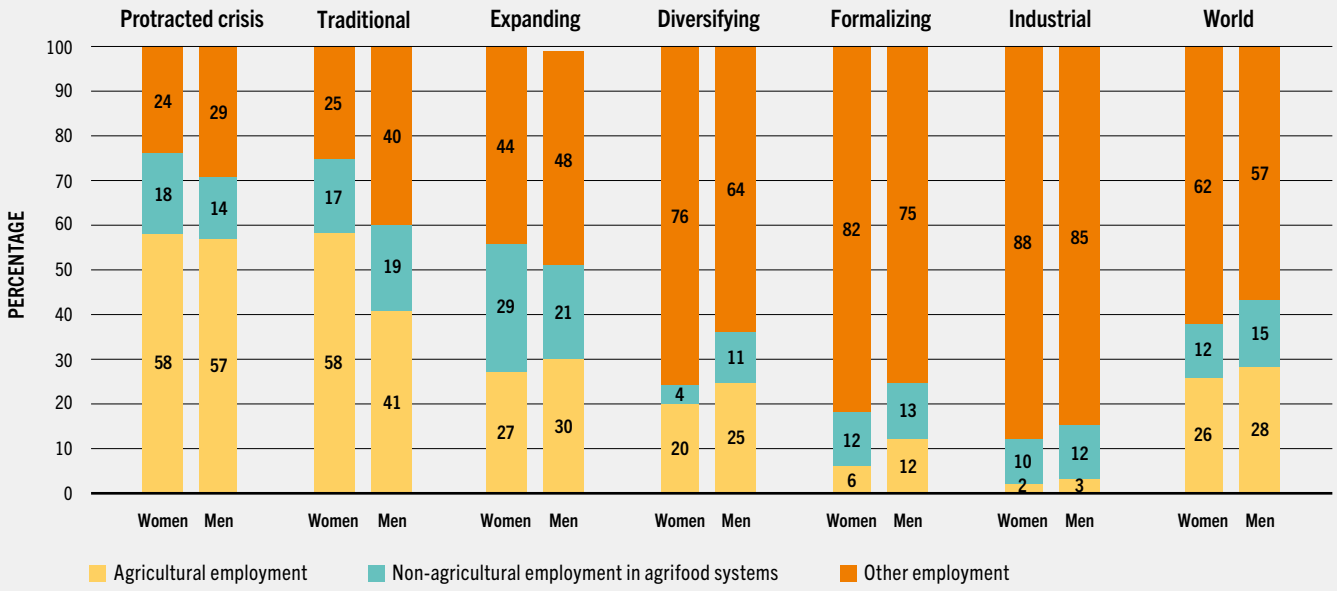
https://doi.org/10.4060/cd2616en-fig13

activities of agrifood actors across food supply chains and territories to identify their collective dependencies and impacts on all four capitals (natural, social, human and produced). Stakeholder engagement is key to pinpointing and minimizing the trade-offs of interventions to maximize gains for all. Vulnerable actors, in particular, need to be brought into the fold to ensure an inclusive agrifood systems transformation.

Bridging gaps and empowering vulnerable actors

While agrifood systems provide employment around the world, they do not always provide an acceptable standard of living and quality of life. In fact, too often, vulnerable populations are left behind across agrifood systems, for example, the poor and food insecure, small-scale value chain actors, migrants and refugees, women, children and youth, persons with disabilities, Indigenous Peoples and other groups that suffer social discrimination and marginalization based on gender, race, ethnicity, disability and/or socioeconomic class. These groups bear the greatest burden of the social hidden costs of agrifood systems, due to pay gaps and other forms of discrimination and marginalization, limited legal protections and a lack of enforcement, poverty, a lack of decent work opportunities and limited access to quality schooling, among other things. Such inequalities are exacerbated by the disproportionate impacts on vulnerable populations of climate change, natural disasters and food insecurity.[18, 19]

FIGURE 14 EMPLOYMENT IN AGRIFOOD SYSTEMS BY SEX AND CATEGORY, 2021



SOURCE: Authors' calculations based on Costa, V., Piedrahita, N., Mane, E., Davis, B., Slavchevska, V. & Gurbuzer, Y. 2023. *Women's employment in agrifood systems – Background paper for The status of women in agrifood systems.* Rome, FAO. https://doi.org/10.4060/cc9040en

https://doi.org/10.4060/cd2616en-fig14

Women make up a large share of those employed in agrifood systems, accounting for 38 percent of the global agrifood systems workforce. Often, however, they face considerable barriers, including discriminatory social norms, which constrain their agricultural productivity and access to resources.[20] Figure 14 shows patterns of employment in agriculture, non-agricultural activity in agrifood systems and other employment globally, for men and women in 2021 across the six agrifood systems types.

Women are more likely to work in agriculture in countries and territories with protracted crisis or traditional agrifood systems, where they account for almost 60 percent of agricultural employment. Consistent with a process of structural transformation, as agrifood systems become more industrialized, the relative importance of agriculture to overall employment declines for both men and women. For example, as agrifood systems transition from the traditional to the expanding category, the share of women in agriculture declines by 31 percentage points, while that of men declines by 11 percentage points. As agrifood systems continue to diversify, the gap between men's and women's employment in agrifood systems narrows to 3 percentage points in industrial agrifood systems. In these more industrialized systems, non-agricultural roles become more prevalent among both men and women. In a protracted crisis context, it is interesting to observe that agrifood systems play a fundamental role in the coping and resilience strategies of the affected population. In such situations, both women and men primarily work in agriculture, which may reflect necessity-driven involvement due to the dissolution of other employment opportunities caused by male migration or conscription into conflict.[21]

The barriers women face despite their significant participation in agrifood systems include limited access to and control over land and other assets, as well as limited access to financial services, education, technology, markets and extension

services.[22] Across all types of agrifood systems, women's roles tend to be marginalized and their working conditions worse than men's. These disparities not only undermine women's potential, but also impede the efficiency and sustainability of agrifood systems, creating hidden costs that were not quantified in the 2023 edition of this report. Addressing these gaps has the potential to increase the productivity and resilience of agrifood systems, thereby fostering economic growth and food security (Box 11).

Another pressing issue is the rising exploitation of children in labour, especially in agrifood systems, creating additional social hidden costs that are not easy to quantify. Alarmingly, child labour increased in 2023 for the first time in 20 years. There are currently 160 million children trapped in child labour worldwide, of which 79 million perform hazardous work. Seventy percent of child labour occurs in agriculture. However, child labour is also prevalent in the service and industry sectors, including the production of inputs used to manufacture final export products.[24] While the exploitation occurs in many contexts, certain global value chains, such as the coffee industry, have been called out for their use of child labour, as discussed in Box 12. As child labour is intertwined with poverty – as both a cause and an effect – its eradication requires a multifaceted strategy. This includes the collaboration of private-sector actors, stronger integration of child labour prevention and elimination into public policies, improving the provision of social services, and fostering the reintegration and retention of children in school.[25]

The informality of agrifood operations is interconnected with the status of vulnerable actors and presents an overlapping set of challenges for agrifood systems transformation. Informal workers and businesses are part of food supply chains, particularly in lower-income countries, but are invisible in national statistics; government regulation, support and social protection programmes do not reach them. Consequently, the informal sector is insufficiently included in efforts to improve livelihoods, the environment, and the safety and accessibility of healthy foods,[26] yet its activities influence food safety, availability, affordability and accessibility, various dimensions of livelihoods (including employment and labour conditions) and the environment.[27] On the one hand, informal or semi-formal activities serve as the main source of revenue and income, as well as of affordable food, for many vulnerable segments of society.[26, 28] On the other, informal activities, such as the lack of official employment contracts, can perpetuate poor working conditions and a lack of compliance with food safety and hygiene regulations.[27] True cost accounting analyses are a means of shedding light on these limitations to an inclusive agricultural transformation. One study on the true price of Kenyan coffee reports that the informality of the sector and low prices are the main drivers of human rights violations.[29]

To improve livelihoods and well-being, it is crucial to account for the distinct circumstances of waged workers compared with those who are self-employed. Here, the concepts of a living income and a living wage are different in practice. A living income, or living income benchmark, refers to the net annual income required for a household in a particular place to afford a decent standard of living for all members of that household. The discrepancy between the living income benchmark and actual earnings is termed the living income gap. These gaps vary considerably from region to region, but are particularly notable in the food and agriculture sector, with figures ranging from 50 percent to 94 percent for the typical smallholder farmer household.[33] A living wage, in contrast, means that the basic cost of living for a family is attainable by the adult wage earners each month.[34] The living income gap, coupled with excessive working hours, undermines the socioeconomic well-being of many producers, as confirmed in a study on rice and Irish potato production in Bhutan, Burkina Faso and Malawi, which found social impacts to be greater than environmental impacts.[35] ■

BOX 11 UNLOCKING POTENTIAL: THE VALUE OF ADDRESSING THE HIDDEN COSTS OF GENDER GAPS IN AGRICULTURE

Bridging the gender divide in agrifood systems could unlock unprecedented economic growth and combat food insecurity. Global analyses reveal that by closing the productivity gap between male- and female-managed farms, a substantial surge in agricultural value added could be observed, of as much as 3.2 percent. This translates into an additional USD 133.5 billion, based on the 2021 agricultural value added of USD 4.15 trillion.[23] Furthermore, addressing gender disparities in productivity and wages within the agrifood sector could catalyse a global gross domestic product (GDP) increase of USD 950 billion, or about 1 percent.

Such pivotal changes have the potential to alleviate global food insecurity by 2 percentage points, which means 45 million fewer people facing moderate to severe food insecurity.[23] The impact of these changes is particularly pronounced in least developed and more food-insecure countries, potentially leading to an increase in GDP of 1.47 percent in countries with traditional agrifood systems and 0.87 percent in expanding ones. This translates into reductions in food insecurity of 2.88 percent and 2.25 percent, respectively, as shown in the figure. In countries in protracted crisis, closing the gender gaps in productivity and wages could boost GDP by 1.15 percent and lower food insecurity by 2.12 percent. As agrifood systems develop and agriculture's contribution to GDP declines, narrowing the gender wage and productivity gaps in agrifood systems still has a positive, albeit smaller, effect on reducing food insecurity, lowering it by 0.84 percent in formalizing and 0.83 percent in industrial agrifood systems.

These findings underscore the significant benefits of addressing the hidden costs of gender disparity in agrifood systems, which stem from unequal resource allocation, marginalized working conditions, role assignment and responsibilities entrenched in social norms and gender-based discrimination, rather than efficiency-driven distribution.

FIGURE GAINS FROM CLOSING THE GENDER GAP IN AGRIFOOD SYSTEMS, 2021

SOURCE: Authors' calculations based on Mane, E., Giaquinto, A.M., Cafiero, C., Viviani, S. & Anríquez, G. 2024. *Why are women more food insecure than men? Exploring socioeconomic drivers and the role of COVID-19 in widening the global gender gap – Background paper for The status of women in agrifood systems*. Rome, FAO. https://doi.org/10.4060/cc9160en

https://doi.org/10.4060/cd2616en-figB11

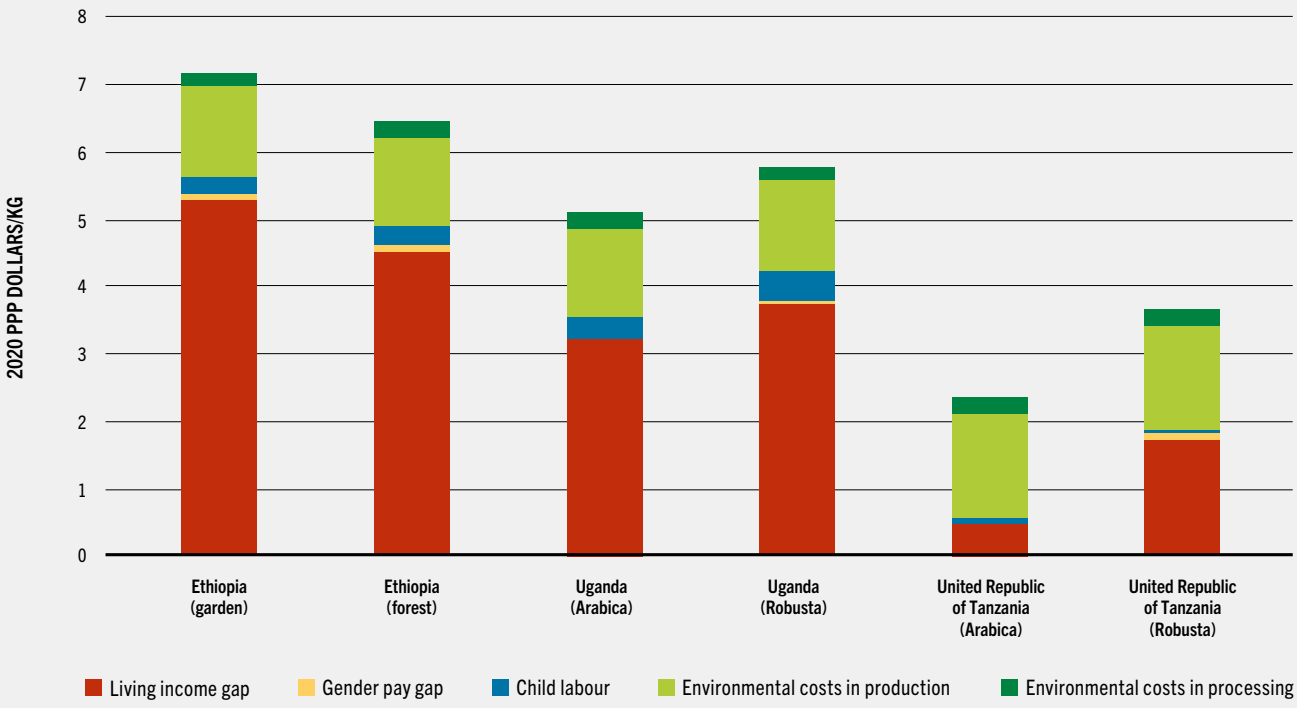
BOX 12 HIDDEN COSTS OF COFFEE PRODUCTION IN EAST AFRICAN VALUE CHAINS

Coffee is the second most traded commodity in the world and the number one traded agricultural commodity, with more than 30 million smallholder households relying directly on coffee income in 2015.[30] In addition to the substantial environmental impacts of coffee production and processing,[31] there are essential social concerns about the living and working conditions of coffee farmers and workers, their access to education, gender equality and child labour.[32] A true cost accounting (TCA) case study commissioned for this edition of *The State of Food and Agriculture* aims to quantify the significant environmental and social externalities of coffee production in the East African countries of Ethiopia, Uganda and the United Republic of Tanzania as an example of supporting the identification of possible internalization options.

The study closes a research gap by considering location- and context-specific differences within countries, between types of coffee (Arabica or Robusta) and production systems (extensive or intensive) in the quantification and valuation of social externalities, that is, the living income gap, the gender pay gap and child labour. The quantified hidden costs range from 60 percent to 150 percent of the actual farm gate price per kilogram of green coffee beans. Both environmental and social externalities contribute significantly to hidden costs, although direct comparison between their magnitudes is difficult due to differing monetization approaches.

Robusta coffee showed considerably higher total hidden costs, driven by the higher social hidden costs of the living wage gap due to lower farm gate prices, as shown in the figure. On average, total hidden costs are 7.20 2020 purchasing power parity (PPP) dollars for garden coffee and 6.45 dollars for forest coffee in Ethiopia, 5.11 dollars for Arabica and 5.80 dollars for Robusta coffee varieties in Uganda, and 2.35 dollars for Arabica and 3.65 dollars for Robusta coffee varieties in the United Republic of Tanzania. This is equivalent to between 60 and 200 percent of the farm gate price of Arabica and two to three times the farm gate price of Robusta (compared with farm gate prices at the time of the survey). The hidden costs are highest for Ethiopia, driven by Ethiopian coffee farmers' high income gap.

FIGURE AVERAGE HIDDEN COSTS IN THE COFFEE VALUE CHAINS OF ETHIOPIA, UGANDA AND THE UNITED REPUBLIC OF TANZANIA BY TYPE OF COFFEE



SOURCE: Adong, A., Kornher, L., Chichaibelu, B.B. & Arslan, A. 2024. *The hidden costs of coffee production in Eastern African value chains – Background paper for The State of Food and Agriculture 2024*. FAO Agricultural Development Economics Working Paper 24-06. Rome, FAO.

https://doi.org/10.4060/cd2616en-figB12

BOX 12 (Continued)

Farm gate prices are not uniform and are usually higher for certified coffee farmers. The study estimates that doubling the farm gate price of Robusta has two effects. First, it reduces the living income gap from 3.16 dollars to 1.16 dollars and, second, the overall hidden costs are reduced from more than 250 percent to 82 percent. While these effects are substantial, these changes must not be considered in isolation. Rather, increasing the farm gate price – unless the certification is associated with certain environmental standards – may also change the incentive for coffee farmers to cut trees and expand their plots or to use more fertilizer with negative environmental costs. Such potential trade-offs can be better managed if environmental and social hidden costs are disaggregated using TCA approaches and combined with scenario building exercises to demonstrate the costs and benefits from internalizing the substantive externalities identified in coffee production to all actors.

SOURCE: Adong, A., Kornher, L., Chichaibelu, B.B. & Arslan, A. 2024. *The hidden costs of coffee production in Eastern African value chains – Background paper for The State of Food and Agriculture 2024*. FAO Agricultural Development Economics Working Paper 24-06. Rome, FAO.

AN EQUITABLE ROLE FOR PRODUCERS IN AGRIFOOD SYSTEMS TRANSFORMATION

Agricultural producers are custodians of natural resources and the environment; they value the health of the environment that sustains their livelihoods, but their stewardship is challenged by economic interests. A successful agrifood systems transformation must, therefore, recognize their unique position: they are on the front line of climate change impacts and bear a significant share of the burden of adopting sustainable practices. While the necessary changes are warranted for society, the benefits of addressing hidden costs are realized all along the supply chain, and producers are not always justly compensated. In other words, mechanisms need to be put in place to ease the financial and administrative burdens, thereby incentivizing transformational change.

Acknowledging the diversity within the agriculture sector is crucial for the development of effective policies. Producers vary greatly in terms of key attributes – such as production systems, types of product (including fisheries, marine products, forestry and primary forestry products), market orientation, subsidized activities, off-farm employment or entrepreneurship, land tenure status and demographic characteristics – all of which need to be taken into account to capture their distinct motivations and challenges and to serve as entry points for policymaking. Some producers already have exemplary experience with sustainable production that safeguards the environment, and their participation in processes to identify how the enabling environment should incentivize similar approaches is essential (Box 13).[36] Yet, too often, the hidden benefits of the activities of producers are overlooked. A review of literature on seven commodities found that research was primarily focused on negative environmental, social and economic externalities.[37] Therefore, highlighting positive impacts – as well as tailoring interventions to the motivations of a heterogeneous producer group to garner their vested interests – is essential for transforming agrifood systems for sustainability and inclusion.

Recent protests by farmers globally underscore the importance of integrating political economy considerations from the outset, by initiating processes that are inclusive and address issues of distributive, participatory and recognition justice.[7] Box 14 discusses how European farmers have protested against the increase in red tape and the tightening of environmental laws. Though the European Commission has conceded on climate rules, tensions remain high.[38] Farmers are increasingly burdened with stresses – from the climate crisis and shrinking profits to outsiders' critique of farming practices – and the motivations behind their protests may have been avoidable only to some extent. Yet, climate resilience is in the long-term interest both of their livelihoods and of society at large. Transformational change, therefore, needs to be designed so that the costs of taking action today are paid by those reaping the long-term benefits. Government pressure for agrifood systems reform, be it in the form of regulation or incentives, must be exerted in an inclusive manner

BOX 13 ENVIRONMENTAL STEWARDSHIP AMONG SMALL-SCALE FISHERIES

Small-scale fisheries, including fishers, fishworkers and their communities, play a vital role in safeguarding aquatic resources and environments. This stewardship contributes to healthier marine and inland aquatic systems, supporting sustainable livelihoods. A recent publication gathering the experiences of small-scale fishing communities and organizations explores the key influences on their stewardship practices and how these can be supported.

The small-scale fishers emphasized that stewardship is both a perspective and a practice, a way of engaging with the natural world and the local environment. Six types of stewardship in small-scale fisheries are identified: maintaining, restoring and improving local habitat and ecosystems; improving fishing practices and post-harvest practices; engaging in fisheries management for sustainable use; stewardship of specific aquatic areas; stewardship of particular aquatic species (such as endangered species); and stewardship through outreach and advocacy. Essential motivations for stewardship action include values, relationships, culture and spiritual aspects, in addition to securing sustainable livelihoods and community well-being.

Supporting and enabling practices can be crucial for success in stewardship. Such practices build capacity for or motivate direct stewardship activities and, indeed, stewardship efforts generally must be accompanied by these measures to create an enabling environment. This goes beyond stewardship itself, being crucial to the involvement of all primary producers and their communities more broadly in decision-making. This can be done by recognizing and reinforcing secure tenure, rights and access; developing knowledge; building community and organizational capacity; and improving education and communications.

SOURCE: Charles, A., Macnaughton, A. & Hicks, S. 2024. *Environmental stewardship by small-scale fisheries*. Rome, FAO. https://doi.org/10.4060/cc9342en

that does not treat producers as external to societal decision-making and provides long-term perspectives to ensure environmentally responsible and economically viable solutions for producers.[7, 39]

Adopting more sustainable production practices is only appealing if there is an expected net gain (monetary or non-monetary) over time, which may be measured in months for subsistence farmers or in years for large-scale producers connected to financial markets. Effective levers to address the barriers to adoption will vary significantly depending on the producer and the technological characteristics.[44] Given the complex systems and alternative futures that need to be assessed to demonstrate the private and public benefits of large-scale change, TCA studies can provide valuable insights, such as the comprehensive review of the expanding adoption of agroecological production practices in Andhra Pradesh, India, described in Box 15.[45] The case study found that farmers engaged in community-managed natural farming (CNF) – a farming practice that depends on the natural growth of crops without the use of any synthetic fertilizers or pesticides and with less consumption of groundwater – saw increased crop yields and reduced production costs, among other benefits. The benefits of CNF to wider society and the environment were also documented, justifying government support for such a transition.

New **business opportunities** can be created with a just agrifood systems transition, which can be identified through targeted TCA assessments. By involving diverse producers and other stakeholders, the assessments can identify transformation mechanisms that enhance producers' economic viability rather than impose an undue burden. One such example is the diversity of maize varieties cultivated in Mexico's milpas, traditional rainfed intercropped plots of land, which have long been overlooked by global markets. A TCA assessment under the TEEBAgriFood Evaluation Framework considered the differentiation in the market for

BOX 14 FARMER PROTESTS IN EUROPE

In recent years, farmers in several European countries, many with industrial agrifood systems, have staged numerous protests. They are mainly calling for i) increased government support in various forms; ii) the reduction in or elimination of bureaucratic hurdles associated with new laws, including environmental regulations; and iii) measures to increase their competitiveness against imports.[40–42]

These demands stem largely from diminished (or even negative) profit margins, explained by several factors. First, the rise in fuel and other input costs may have exceeded the price increases these producers receive from their supply chains. This has prompted protestors to demand more agricultural support together with measures to prevent the fall in the prices they are paid by distributors.

Second, new regulations and the linking of government support to specific standards have increased the bureaucratic load on farmers. Although bureaucracy is not a direct monetary cost (except when farmers hire consultants to manage these tasks), the significant time and effort it demands is challenging, especially for those lacking the necessary skills, disproportionately impacting smaller farms.

Third, some protestor testimonies suggest there has been inadequate involvement of stakeholders in policymaking. For example, some farmers have expressed concern that government-mandated biological phytosanitary products are less precise than those previously used, harming beneficial fauna and flora essential for their crops. Policy enactment without adequate information can lead to unintended consequences and erode trust in policymakers.[43]

Lastly, while some safety and regulatory standards apply universally (including to imports), other regulations may only target domestic producers, putting them at a disadvantage (compared with imports). Many standards are not strictly mandatory, but are required for receiving agricultural support crucial to the economic survival of many farms, making these standards effectively compulsory for them. This discrepancy in standards between domestic producers and imports fuels claims of unfair competition and can also hinder farmers' ability to compete in external markets.

Following the approach expressed above for producers in general, policymakers may want to design policies that redistribute part of the net gains of agrifood systems transformation to farmers. While farmers already receive government support, their economic viability plays a key role in sustaining rural communities and their economies, and this may have greater value than the cost of support in some countries.

Importantly, farmers often wield political influence disproportionate to their population share. For instance, in the Kingdom of the Netherlands, where only 2 percent of jobs are in agriculture, the BoerBurgerBeweging, a political party championing farmer demands, won the most votes in the 2023 Netherlands provincial elections.[39] Thus, policies that diminish farmers' profits risk stalling transformative political action, while policies that enhance their profit margins could mobilize political support for agrifood systems transformation.

SOURCE: Authors' own elaboration.

a wide range of maize products and practices, documenting the considerable hidden benefits of conserving traditional, sustainable milpa practices. It recommended policy measures such as incentivizing sustainable agriculture and biocultural heritage, investing in diverse maize product markets and value chains, and certifying and labelling native maize associated with sustainable practices.[46]

Participation in **certification programmes**, known as voluntary sustainability standards, such as the Fairtrade, Organic or Rainforest Alliance certifications, can be a means of compensating producers for the costs of transition. However, although the effects of such certifications on producers' welfare are generally positive,[47] they vary substantially by standard, crop and farmer organization. Standards that apply a

BOX 15 TRUE COST ACCOUNTING OF COMMUNITY-MANAGED NATURAL FARMING IN INDIA

The largest transition to agroecology in the world is underway in Andhra Pradesh, India, where more than 630 000 farmers are adopting community-managed natural farming (CNF). The state-wide agroecological transformation of farming practices, supported by central and state governments and private philanthropy (Aziz Premji Foundation), has seen sustained upscaling, thanks to the layering of initiatives and a diversity of adoption pathways, which have allowed the practice to build. To understand the role of CNF in agrifood systems transformation, a true cost accounting assessment compared the impacts of CNF and conventional farming systems.

The results of the study found that CNF increased crop yields and reduced the costs of production (low fertilizer and pesticide use, lower costs of seeds and machinery), increasing net income per hectare. Community-managed natural farming also fostered greater diversity on farms in terms of number of crops. Increased labour intensity is a factor on CNF farms, which may be a drawback for some farmers, particularly if the availability of household labour is low, but this could be viewed as an advantage at community and regional level, providing greater employment in rural landscapes, provided there is enough labour available and farmers have the capacity to pay for it. In contrast, the health expenses and lost wages incurred by farmers due to illness were 26 percent higher in villages with chemically intensive farming than for CNF farmers. There were additional benefits from a reduction in the negative impacts of pesticide use. While public investment costs for CNF were higher than on counterfactual farms, the higher costs for farmers, communities and the environment associated with counterfactual farming (loss of work hours, poorer health and poorer soils) meant that CNF resulted in a better overall return on investment.

Helping to build momentum, early adopters of CNF had access to agricultural credit and government support, easing the constraints on transitioning to new modes of farming. The wider implication is that to achieve scale, sustained policy support is important.

SOURCE: GIST Impact & Global Alliance for the Future of Food. 2023. *Natural farming through a wide-angle lens. True cost accounting study of Community Managed Natural Farming in Andhra Pradesh, India*. Nyon, Switzerland, GIST Impact.
https://futureoffood.org/insights/true-cost-accounting-of-community-managed-natural-farming-in-andhra-pradesh-india

system of quality-based price differentiation have the greatest impact on net farm revenue through a price effect, as shown in a study in Peru.[48] Further context is needed, however, as found in one TCA study comparing the hidden costs of Fairtrade and non-Fairtrade banana supply chains in 2018.[49] The findings show social costs were considerably lower for Fairtrade producers than for the sector as a whole, while environmental costs could be higher or lower depending on the country. Consequently, certification schemes that enable producers to sell their products with a price premium facilitate the internalization of some, but not all, hidden costs, depending on the specific objectives of the programme. Still, with external costs 45 percent lower for Fairtrade producers, the study makes the social case for such quality standards and certifications. In more recent years, momentum around improving the banana, coffee and cocoa supply chains has been building. Banana supply chain actors are collaborating to improve living wages and retailers are leveraging their influence, as discussed in the next section and Box 16 and Box 17. Similarly, cocoa value chain actors in Ghana are contributing to environmental and social sustainability under the reducing emissions from deforestation and forest degradation in developing countries (REDD+) framework, as highlighted in Box 31.

When individual producers join forces by way of **collective action**, they create a bargaining power they can leverage to advance their goals for economic growth, as well as transformational

BOX 16 THE WORLD BANANA FORUM COMMISSION ON LIVING WAGES AND INCOME

The World Banana Forum (WBF), founded in 2009, is a space where the main stakeholders of the global banana supply chain work together to achieve consensus on best practices for sustainable production and trade.[69] By bringing together retailers, importers, producers, exporters, consumer associations, governments, research institutions, trade unions and civil society organizations, the WBF aims to inspire collaboration between stakeholders and produce pragmatic outcomes for the betterment of the banana industry. Its mission is also to achieve consensus on best practices with regard to workplace issues, gender equity, environmental impact, sustainable production and economic issues.

To address the issue of living wages in the banana industry, the WBF established the Commission on Living Wages and Income and two dedicated subgroups. These entities are committed to advancing multistakeholder efforts for a more equitable and economically sustainable sector:

- The Markets subgroup was created to work towards establishing minimum and sustainable prices for banana boxes, utilizing tools such as the Fairtrade Minimum Price methodology. It actively monitors legal frameworks, compiling a database of national legislation and advocating for responsible procurement practices.
- The Living Wage Methodologies and Tools subgroup was created to foster multistakeholder dialogue to enhance current living wage methodologies. Its objectives include achieving consensus on how to implement these methodologies in producing countries without harming the national industry or producers' international competitiveness, or imposing additional costs on producers.

The Fourth Global Conference of the World Banana Forum produced an Action Plan on Living Wages for 2024. The action plan states that the Markets subgroup will ensure adherence to minimum prices for producers, support the ongoing development of a sustainable purchasing practices database and toolbox, and continuously monitor and track wage improvements to ensure progress across the banana industry. The action plan also confirmed that the Living Wage Methodologies and Tools subgroup would continue to evaluate the benchmarking methodology, propose potential upgrades to and implementations of the salary matrix, and conduct audits and verifications of wage assessment tools. In addition, the commission aims to support the International Labour Organization in estimating wages across the industry.

SOURCE: Authors' own elaboration.

change. Collective action is also shown to facilitate participation in certification programmes.[47] For example, after the Association of Avocado Exporting Producers and Packers of Mexico participated in TCA training sessions and evaluated how their businesses depended on and impacted the four capitals, it then collaborated with the government to develop a national standard for sustainable avocado production. It subsequently partnered with Banorte bank to devise financing strategies for sustainable practices, demonstrating how public–private partnerships can demonstrate and enhance value from transformation for producers.[50] ■

CAPITALIZING ON AGRIBUSINESSES' SUPPLY CHAIN LEVERAGE FOR TRANSFORMATION

The private sector can be a key partner in achieving the SDGs. By investing in innovation, creating employment, improving environmental stewardship and influencing global supply chains, businesses can and are contributing to all 17 SDGs. However, business-as-usual activities have had negative impacts on climate,

waste, water and nature, posing challenges to social goals, including reducing poverty and hunger.[51] In addition, many business models rely on selling packaged products that are high in fats, sugars or salt.[52] Although the benefits of transforming these actions to promote health and sustainability may not always be immediately apparent to businesses, global trends indicate an increasing commitment to these values, with significant implications for the hidden costs of agrifood systems.

Businesses in agrifood systems engage in various activities beyond primary production, including aggregating, transporting, processing and selling food products to consumers (Figure 3). These businesses range from micro and small enterprises to global corporations, with varying levels of concentration across agrifood systems types. Each subsequent agribusiness in the chain can exert business leverage over the preceding one, depending on its scale and market power. For example, a major supplier can influence subsuppliers' compliance with sustainable principles.[53, 54] Consumer demand for healthier food options, sustainability and fair production practices is driving change in the usual practices of agribusinesses. Such change can help agribusinesses reduce financial costs or risks, gain a competitive advantage by anticipating regulations, increase productivity through employee satisfaction and improve their reputation.[55, 56] Therefore, it is in businesses' best interest to heed and respond to these signals.

In some instances, it is the private sector itself that is nudging consumers and driving change. Entrepreneurs and businesses are exploring new opportunities, introducing new products and raising awareness among consumers. For example, in the United States of America, several large manufacturers have voluntarily reformulated their products by decreasing the sodium content (among the top dietary risks leading to NCDs). However, consumers have often countered these health benefits by gravitating towards saltier alternatives, leading to a decline in sales for these healthier products. This setback suggests that reformulation occurred too quickly and without incorporating interventions to change consumption behaviour. Hence, policies aimed at transforming food supply chains need to address both supply and demand, as discussed in Box 29 in **Chapter 5**. The example highlights the importance of collaborative efforts in both the public and the private sector to achieve meaningful and lasting change.

Businesses increasingly assume environmental and social responsibilities

The case for businesses to be socially conscious has been building since the 1960s and has gained significant momentum of late, as the business case for environmental and social responsibility has advanced.[55] In 2023, 79 percent of more than 2 800 business leaders around the world (6 percent from the food and beverage sector) said they had identified a business case for contributing to at least one SDG, while 91 percent said they had made a public commitment to advancing one or more SDGs.[51] The business case narrative alone is not enough to deliver on these commitments, given the presence of trade-offs between multiple goals; it needs to be combined with a social responsibility narrative to drive voluntary action.[57]

Existing and rapidly emerging voluntary frameworks aimed at helping agrifood businesses develop, deliver and report on science-based climate and nature strategies have opened a window of opportunity for companies to get ahead in preparing for forthcoming climate and nature legislation.[58] One example is the Taskforce on Nature-related Financial Disclosures, which provides organizations with a risk management and disclosure framework to act on evolving nature-related dependencies, impacts, risks and opportunities.[59] Another is the more than 410 agrifood companies that have set, or committed to setting, approved emissions reduction targets with the Science Based Targets initiative (SBTi), a corporate climate action organization that enables companies and financial institutions worldwide to play their part in combating the climate crisis. However, action is not happening fast enough, and only a small handful of these companies have updated their targets in line with the latest 2022 guidance needed to retain SBTi validation. To speed up progress, governments can support the three conditions that help with the internalization of externalities: awareness, motivation and

capability.[4] This is particularly relevant for small and medium agribusinesses that may find it hard to make the business case for voluntary action.

Meanwhile, policymakers in several countries are using existing voluntary standards to inform the development of new regulation for greater levels of supply chain transparency and public reporting on sustainability strategies.[58] Companies can and should play a role in supporting the harmonization of national legislation with existing voluntary frameworks by working with governments and supporting the creation of long-term legislative roadmaps. With such roadmaps, companies can have the clarity they need to act confidently at scale and avoid future business disruptions. Yet, the writing is on the wall about the direction the food and agriculture sector must take.

Beyond sustainability, many large firms are conducting environmental, social and governance (ESG) reporting – an evaluation framework that assesses the environmental, social and governance factors behind business practices. It is a means of measuring and reporting on business risks and opportunities and a way of demonstrating a company's commitments to investors and consumers.[60] Of the 525 ESG indicators linked to the SDGs, 360 relate to environmental and social goals, but only ten to SDG 1 and SDG 2, which are related to the social hidden costs of poverty and undernourishment.[51] This suggests there is more work to be done to improve the ESG indicators on social hidden costs of agrifood systems and underlines the challenges of quantifying and linking them to actions of agrifood businesses. True cost accounting assessments can help and, indeed, are helping on both fronts. To extend the reach of ESG reporting, new government mandates are forthcoming. For example, the European Union's Corporate Sustainability Reporting Directive will require 50 000 companies to report on business risks and opportunities related to social and environmental issues and the impact of their operations on people and the environment from 2025.[61] However, ESG reporting is not without valid critiques; there is no single standard for ESG reporting, so there can be "smoke and mirrors" when corporate sustainability initiatives fall short of measuring impact and making more informed decisions.[62]

In other words, when not backed by genuine action, ESG reporting can lead to greenwashing or SDG-washing.[51, 63] By providing a systems approach to quantifying impacts across all four capitals, TCA is already enhancing ESG reporting.

Many, though not all, of the ESG practices promoted by agrifood businesses are implemented at the primary production level, but the benefits of the changes are enjoyed by other actors in the supply chain. For example, there is growing evidence that such changes are good for business, suggesting an early-adopter advantage. Products in the United States of America with ESG-related claims in relation to animal welfare, environmental sustainability or social responsibility, for example, have seen an average 28 percent cumulative sales increase over the past five years, compared with 20 percent for products that make no such claims.[63] Brands with more ESG-related claims enjoy greater customer loyalty, suggesting that ESG is here to stay.

Businesses enjoying the premium associated with ESG claims have a moral imperative to move towards more inclusive and sustainable practices all along the supply chain, but it is also their responsibility to incentivize and reward ambitious action by farmers.[64] In particular, firms in global value chains that extend beyond national jurisdictions can drive sustainable transformation by improving the awareness, motivation and capability of their small-scale suppliers in various ways.[4] For example, they can – and, increasingly, many do – sign offtake agreements to establish and guarantee demand for sustainably produced commodities; offer premium prices and better contract terms for those commodities; adapt current business models, for instance, by locating processing facilities nearer to production hotspots (where environmentally appropriate); and offer financing to producers to support small-scale producers that cannot afford the frequently long payback periods of sustainable investments. Partnerships with both public and private financing institutions are essential.

Beyond company-level reporting, coordination among supply chain actors – and other agrifood systems stakeholders – is key to enabling TCA, internalizing externalities and, ultimately, achieving sustainability and ethics goals.

BOX 17 RETAILERS CALL FOR LIVING WAGES IN THE BANANA SECTOR

In the banana sector in March 2023, nine retailers in the United Kingdom of Great Britain and Northern Ireland joined together in a commitment to promote living wages, coordinated by the Sustainable Trade Initiative (IDH).[70] The retailers have been working closely with their supply chain partners and supporting organizations to ensure that workers in their banana supply chains receive a living wage by the end of 2027. In the inaugural year of the initiative, retailers focused on engaging with their supply chain partners, aligning with other European banana living wage commitments and collecting wage data.

An essential aspect of meeting the commitment involves gathering data to assess the living wage disparity and monitoring advancements on an annual basis. To this end, the IDH Salary Matrix served as a tool for evaluating the actual living wage gaps of 84 672 workers on 554 farms in 12 countries in 2023: Belize, Cameroon, Colombia, Costa Rica, Côte d'Ivoire, Dominican Republic, Ecuador, Ghana, Guatemala, Nicaragua, Panama and Peru. The initial study covered 84 percent of the total volumes sourced by the participating retailers from farms using hired labour.

The findings reveal that 30.8 percent of hired workers are not earning a living wage, with an average gap of 17.41 percent. On average, women suffer slightly larger living wage disparities (19.68 percent) than men (17.06 percent). In addition, a greater proportion of women than men experience a wage gap (34.1 percent compared with 30.2 percent, respectively). In terms of workforce composition, men constitute a significantly larger share (84.4 percent) of the banana workforce than women (15.6 percent).

Similar commitments have been made in the Belgium and the Kingdom of the Netherlands (also coordinated by IDH) and in Germany (coordinated by the German Agency for International Cooperation [GIZ]). In response to the need for collaborative learning, to reduce redundancy and prevent unintended repercussions for producers and workers, IDH and GIZ facilitated a series of "Better Together" learning spaces and workshops on various banana commitments for 21 retailers. A notable achievement was the implementation of a synchronized timeline for wage data collection across all initiatives. This harmonization ensured that producers were not burdened with submitting data at different intervals throughout the year for various retail customers. Moreover, it facilitates the consolidation of training and auditing activities into the logical phases of annual data collection and reporting.

SOURCE: Authors' own elaboration.

Living wages in global supply chains, for example, require agreements among multiple supply chain actors. Important innovations are underway for the advancement of living wages in the banana sector. The World Banana Forum (WBF), a neutral, permanent platform convening participants from diverse backgrounds, has a dedicated Commission on Living Wages and Income to ensure comprehensive and inclusive discussions and decisions. Box 16 discusses the establishment of the WBF commission and the Action Plan on Living Wages created in 2024. Box 17 shows how retailers in the United Kingdom of Great Britain and Northern Ireland are joining forces to close the living wage gap for the bananas they sell. Other examples of facilitating multistakeholder collaboration include the Livestock Environmental Assessment and Performance Partnership and the Global Soil Partnership.[65, 66]

International organizations can play a pivotal role in addressing the challenge of geographical dispersion in global value chains, where policies tend to be national or subnational. For example, the Organisation for Economic Co-operation and Development (OECD)–FAO Guidance for Responsible Agricultural Supply Chains is the leading international standard for due diligence on ESG risks in agrifood supply chains.[67] With a proposed model policy on responsible business conduct and a practical framework

for undertaking risk-based due diligence on ESG impacts, the guidance can help producers and businesses reduce the hidden costs and internalize externalities by identifying, assessing and reducing their negative environmental and social impacts. Corporate uptake of the guidance can play an important role in facilitating the shift towards TCA within food supply chains.

The proliferation of reporting standards has created a complex web of requirements, which can sometimes create unnecessary trade costs and act as non-tariff trade barriers with adverse impacts – specifically for small-scale producers in low- and middle-income countries. The role of international organizations is critical in efforts to harmonize reporting platforms to avoid such risks.[68]

Incorporating hidden costs into business decisions and prices

True cost accounting can be applied at the business level to identify business impacts and dependencies on the capitals and identify risks. Unlike ESG reporting, TCA offers the option to monetize impacts so that they can be integrated into business balance sheets, management strategies and decisions, rather than exist as a stand-alone initiative.[71] The TEEBAgriFood Operational Guidelines for Business, developed in conjunction with a business carrying out its own pilot TCA assessments, support this approach.[72] For instance, Brazilian food retailer Liv Up used the evidence acquired from a TCA assessment to justify allocating more resources to its sustainability department.[50]

In addition to TCA, some businesses are experimenting with "true prices", where the hidden costs of products are incorporated into transactions to improve transparency and decision-making.[73] In the Kingdom of the Netherlands, the true price supermarket, De Aanzet, permanently charges true prices, fostering a positive bond between farmers and consumers.[74] Similarly, the Van Vessem bakery uses true price information to demonstrate that its bread is twice as sustainable as the average bread.[75] The goal of true pricing is to eliminate or reduce hidden costs as much as possible and ensure that affordable and healthy food is accessible to people, aligning with the right to food. By broadening its implementation, unsustainable products could become more expensive, while sustainable alternatives could become more affordable. This shift would encourage consumers and businesses alike to prioritize sustainability in their purchasing decisions.

A bold experiment on customer commitment to socially and environmentally responsible products was conducted by the PENNY discount grocery store in Germany. For one week in August 2023, PENNY's True Cost campaign, in partnership with the University of Greifswald and the Nuremberg Institute of Technology, raised the price of nine food products to their true price across more than 2 000 stores. Box 18 explores how the experiment garnered a lot of media attention, but also highlights the constraints that retailers face in achieving customer buy-in. While customers already committed to organic products continued to demonstrate their loyalty despite the price increases, many consumers felt priced out by the true-cost surcharge.

The food service industry is also experimenting with true pricing, particularly in the Kingdom of the Netherlands, where the canteen of the Ministry of Infrastructure and Water Management has piloted true pricing for 15 products.[76] Vermaat, one of the country's largest catering companies, has used true price information to adapt recipes, used remediation to improve the egg value chain, and now has true pricing in its Food Vision 2027.[77] In partnership with Netherlands universities, it applied true prices to meat, increasing prices by an average of 40 percent, while vegetables, fruits and vegetarian meals became 9 percent cheaper. This resulted in greater customer satisfaction and people buying 20 percent less meat and seven times more vegetarian options, vegetables and fruits.[78]

This demonstrates that companies' interest in moving towards healthier, more sustainable and justly produced goods needs to be backed by financial investment. The next section explores how and why financial institutions are increasingly prioritizing activities that advance agrifood systems transformation. ■

BOX 18 INTRODUCING TRUE COSTS AT THE SUPERMARKET CHECKOUT: PENNY'S INITIATIVE

A true cost campaign that took place in August 2023 at German food retailer PENNY provided interesting insights into the opportunities and challenges of closing the gap between the market and true prices of food items.[79]

Across more than 2 000 stores, customers were given information on the true cost of nine different food products for one week, which they had to pay if they chose to buy those products. Surcharges totalled between 5 and 95 percent of the sale price. The true prices were calculated by researchers from the University of Greifswald and the Nuremberg Institute of Technology. They included climate, soil, water and health damage for the whole production process, expressed in monetary terms using a true cost accounting (TCA) method developed by Michalke *et al.* (2023).[80] The additional revenue (the sum of the surcharges) was donated to improve the energy efficiency of the farms of selected PENNY suppliers through the Future Farmer (Zukunftsbauer) project.

The pricing of true costs naturally had a strong impact on product sales. However, the decline in sales was not as big as predicted based on past price changes. In contrast to dairy and meat products, the plant-based product – which had the lowest price mark-up – saw a slight increase in sales. A survey of 2 250 customers showed that more than 60 percent of participants were aware of the campaign. Survey questions asked before and after the campaign week revealed insights into the level of support for TCA measures and policies, as well as behaviour when confronted with the true price of foods. Indeed, the primary motivations for purchasing campaign products included customer loyalty and a strong interest in sustainability issues. The consumers surveyed were divided in their perception of its effectiveness. Four out of five participants who shopped at PENNY but did not buy a campaign product said the main reason was excessively high true-cost surcharges, while around half said they did not care about environmental issues.

The campaign faced many challenges. From the retailer's point of view, the choice by a discount supermarket to participate in such an experiment was a bold move in a highly competitive market. The campaign received extensive media coverage nationally and internationally, sparking greater political discourse and public awareness. Policy backing is crucial for such initiatives,[81] as demonstrated by the campaign's media outreach in Germany, which prompted discussions on the mandatory reporting of true costs, highlighting the need for political regulation over voluntary compliance.

The campaign highlights the importance of increasing the awareness and purchasing power of consumers to incentivize supply chain actors to participate in true pricing. The costs to producers of mitigating the hidden costs along the food supply chain would need to be balanced with benefits they can count on, which can be achieved in part by redistributing the additional returns generated by true pricing. Nevertheless, given the public-good characteristics of most of the benefits of addressing the hidden costs of supply chains, government actions (such as taxes,[82] subsidies and regulations) are an important piece of the puzzle in incentivizing supply chain actors to transform agrifood systems.

SOURCE: Semken, C., Michalke, A., Stein, L., Gaugler, T., Allcott, H. (forthcoming). *Optimal Green Retailing: Theory and Evidence*. Under review at the National Bureau of Economic Research.

THE STRATEGIC ROLE OF FINANCIAL INSTITUTIONS

The investment community – national and multilateral development banks (NDBs and MDBs), international financial institutions, local and national commercial banks and insurance companies, impact investors, microfinance institutions, mobile money providers, fund managers, public donors and philanthropic organizations – is facing increasing pressure from investors and stakeholders to incorporate environmental and social responsibility into its operations. It is becoming increasingly clear that any investment in agrifood systems must become future-proofed in the face of a changing climate. The notion that "business as usual is a high-risk proposition" is resonating.[83, 84]

The financing of national agricultural development strategies, including national

BOX 19 INVESTING IN SUSTAINABLE AGRIFOOD SYSTEMS IN THE KINGDOM OF THE NETHERLANDS

Rabobank is a cooperative and socially engaged bank in the Kingdom of the Netherlands that specializes in providing financial services to the food and agribusiness sectors, both domestically and internationally. Its approach focuses on five key transitions: sustainable and regenerative agricultural practices, diversification of protein supply, reduction of food loss and waste, strengthening rural livelihoods, and producing nutritious foods for all in a sustainable way.

Rabobank espouses a true value approach as a financial model, suggesting that maintaining competitive agrifood systems requires accounting for the true value of food, which includes environmental, climate, health and animal welfare costs and benefits.[87] It advocates for government implementation of target-based policies, providing incentives for farmers to achieve sustainability goals set out in national regulatory frameworks and environmental policies.[88]

In the Kingdom of the Netherlands, Rabobank has developed a systemic change scenario up to 2040, which aims to benefit businesses, stakeholders and society while meeting growing consumer demands for better production conditions and reduced environmental impacts.[89] Specifically, the bank mobilizes financial resources towards sustainable entrepreneurial activities using a true value approach to help manage long-term risks more effectively. Ensuring such initiatives contribute to sustainability at scale requires the combined effort of all stakeholders, including government, consumers and farmers.

SOURCE: Authors' own elaboration.

agrifood systems pathways, relies heavily on NDBs and MDBs, which have complementary strengths that can be harnessed for global agrifood systems transformation. While NDBs wield much greater financial and institutional power in financing supply chain investments in local agrifood systems, MDBs have broader expertise, international networks and resource mobilization capacity. Increased collaboration between MDBs and NDBs to foster localized investment, innovative finance, climate innovation and advanced risk assessment tools, while enhancing NDBs' engagement in policy discourse, is already taking hold as an important step in addressing the financing challenges faced by supply chain actors.[85]

In response to the increasing pressure, other actors in the investment community are also spurring change. Investors representing USD 18 trillion in assets and coordinated by the Farm Animal Investment Risk and Return Initiative have called for a roadmap for a resilient sector that can deliver global food security while striving to mitigate climate change and biodiversity loss:

> As investors, we recognize the financially material risks to which the food system is exposed, from climate change, biodiversity loss, malnutrition and antimicrobial resistance, as well as the material impacts that food system activities have on the environment.[86]

In addition, over 30 financial institutions with more than USD 8 trillion in assets under management have joined forces to launch the Finance Sector Deforestation Action initiative, outlining their commitment to eliminating deforestation driven by agricultural commodities. Another example is Rabobank, a leading private financial institution, which is proactively demonstrating how financial institutions can drive positive environmental and social outcomes in agrifood systems. Box 19 discusses Rabobank's true value approach to supporting sustainable agrifood systems investments in the Kingdom of the Netherlands.

Other initiatives, such as Transformational Investing in Food Systems (TIFS), have created a network of actors interested in investing in agrifood systems transformation, offering applied

BOX 20 INVESTING IN AGROECOLOGICAL BUSINESSES IN EAST AFRICA

Agricultural producers and agribusinesses that use agroecological, organic and traditional practices are integral to food supply chains in countries in East Africa. However, they encounter significant challenges in attracting investment.

A predominant factor is the modest scale of their operations, with data showing that around 59 percent have annual revenues of less than USD 50 000 and 83 percent bring in less than USD 200 000. These entrepreneurs often grapple with a financial void, commonly referred to as the "missing middle" or "innovator's gap", which spans revenues from USD 50 000 to USD 200 000.[96] Another challenge is that donations and grants, while supportive, do not allow businesses to demonstrate their ability to repay investments, a key step in securing future funding.

From the perspective of impact investors, the companies' small ticket size can be a deterrent, especially when the businesses operate in unfamiliar markets and have business models and motivations that may be considered unconventional. Smaller funds may be best positioned to finance such businesses. For larger investment funds, in particular, organizing financing vehicles large enough to manage big investments while deploying small tickets is a key operational challenge. One remediating pathway is for funds to work through local intermediaries.

An important challenge for all funds, as noted in a 2023 Transformational Investing in Food Systems report, is that investors do not differentiate between agribusinesses that are agroecological and those that are not.[91] Investors and fund managers can use an impact investment fund assessment tool and an enterprise-level assessment tool to consider multidimensional measures of success early on in the investment process. These tools help investors move beyond oversimplified key performance indicators of yield or income increases to bring a more holistic set of metrics into the investment equation.

SOURCE: Transformational Investing in Food Systems. 2023. *Food systems investing in East Africa: The roles of funds in financing food systems transformation*. https://www.tifsinitiative.org/wp-content/uploads/TIFS_Investing-in-East-Africa-Food-Systems-Aug2023-Final.pdf

learning through investor labs and the sharing of due diligence and investment challenges and opportunities.[90] Box 20 features findings from a TIFS report covering the experiences of 23 funds financing food and agriculture companies in East Africa.[91] Despite many such initiatives, the agriculture sector is still receiving less than 1 percent of concessional blended finance in low-income countries with weak enabling environments, limited institutional capacities and a lack of well-designed projects, where financing costs can be up to seven times higher.[85] Government action to improve the enabling environment and institutional capacities needs to be complemented with a TCA approach to analyse the holistic costs and benefits of investment opportunities.

Sustainable investing according to ESG principles is about materiality, to narrow the focus of investors amid a plethora of potential goals. According to the Sustainability Accounting Standards Board, the material issues for companies in food retail and distribution include GHG emissions, energy management, access and affordability, fair labour practices, and fair marketing and advertising.[92] In cases where natural capital – such as land use and deforestation, water and biodiversity – is material to long-term corporate strategy, large institutional investors such as Blackrock are requesting corporate disclosures that include assessments of risk, risk oversight and understanding of how dependencies and impacts on nature are managed.[93, 94] Despite the momentum behind ESG investing, one of the main barriers to sustainability reporting by companies is that it tends to be aimed not at investors but at other stakeholders, such as non-governmental organizations, so is of little use to investors. Efforts are underway, however, to plug this gap.[92] The coming into force of the Global Reporting Initiative standards for the agriculture sector (GRI 13) in January 2024

is expected to increase the completeness and comparability of sustainability information for all businesses involved in crop cultivation, animal production, aquaculture and fishing.[95]

By facilitating the comparison of externalities with other financial indicators, TCA can provide a holistic picture of long-term sustainability, which can help investors make more informed decisions. True cost accounting has been pitched as an approach that can inform and broaden the scope of conventional ESG investment criteria.[71] After participating in training on applying the TEEBAgriFood Evaluation Framework to the business context, Yunnan Astral ESG Investment Co., Ltd., an investment company actively engaged with local farmers and Indigenous Peoples in Yunnan, China, reported that TCA complemented ESG investment guidelines and helped identify quality projects contributing to its key goal of biodiversity conservation.[50]

Both ESG and TCA communities are calling for the standardization of indicators and reporting to advance sustainability in agrifood systems. By collaborating, they can improve risk assessments and demonstrate value from transformation to spur progress on credit and insurance conditions for sustainable businesses. ■

CONCLUSIONS

Transforming food supply chains for greater inclusivity, sustainability and resilience requires not only an understanding of the actors and their activities at the individual stages, but also of the knock-on effects that generate hidden benefits and costs along the chain. A fundamental challenge is garnering interest from private agrifood actors, who weigh the costs of action today against the benefits of tomorrow, including the perception that most of the benefits may be reaped by someone else. Targeted TCA assessments can provide evidence that transformative actions need not be a zero-sum game for agrifood systems actors.

The inclusive engagement of agrifood systems actors in assessing the environmental, social and health hidden costs of activities can highlight risks and opportunities, thereby strengthening the viability of the chain. Food supply chains have a significant amount of leverage to drive change: when one business partner signals to another how value can be enhanced, there is a vested interest in seeing that change comes to fruition. Agribusinesses and financial institutions with more leverage have roles to play beyond exerting their influence over other actors, by investing in better practices, be it through finance, contract arrangements, technical assistance or overall skills and awareness building, so that all are best fit to contribute to the required transformation. Meanwhile, forums such as the World Banana Forum, foster collaboration across the different levels of food supply chains and can be a key means of ensuring a just transition.

Governments have a role to play in ensuring social inclusion during the transition. In addition to incentivizing the private sector to modify its business practices, they can signal future business risks through regulations and effective enforcement to motivate early adopters. And because of the global reach of food supply chains, which distribute the benefits and costs of transformation across national boundaries, international collaboration is essential to equip supply chain actors with the awareness, motivation and capability to address the hidden costs of their activities. Political economy challenges to ensuring that the burden of paying for change does not fall disproportionately on any one actor or population group locally and globally – both today and in the future – may be significant, yet food supply chain actors seem to be making progress in the right direction. ■

GUATEMALA
School feeding programmes: nutritious local foods prepared by trained volunteers for a healthy diet.

CHAPTER 4
HARNESSING THE ROLE OF CONSUMERS TO TRANSFORM AGRIFOOD SYSTEMS

KEY MESSAGES

➔ Many consumers have untapped potential to drive agrifood systems transformation by incentivizing food supply chain actors to increase the value of food by changing the way it is produced, processed and delivered.

➔ Reducing inequalities and increasing agency, especially among those who cannot afford a healthy diet, is important, so that all consumers can leverage their influence on agrifood systems.

➔ Consumption patterns are driven by access, as well as economic and behavioural factors, so a mix of monetary and non-monetary interventions is needed to reshape consumer demand.

➔ Institutional procurement can be channelled for significant influence over agrifood systems transformation to advance environmental, social and health goals while raising consumer awareness.

➔ In agrifood systems where consumer purchasing power is limited, social safety nets and institutional procurement can be designed to advance agrifood systems transformation.

Consumers are the largest group of agrifood actors globally, even though they may lack political clout and visibility. When in a position of agency, consumers can drive the transformative change needed in agrifood systems through their buying power. Harnessing the purchasing power of consumers – and raising it for those who lack such agency – can be a strategic means of spurring change across food supply chains. In addition, from a health perspective, a widespread shift towards healthy diets will address not only the quantified health hidden costs associated with a higher risk of NCDs – amounting to 70 percent of the quantified hidden costs of global agrifood systems – but also those unquantified costs associated with other forms of malnutrition. Consequently, widespread changes in demand can serve as a catalyst for systemic transformation.

Marked changes in behaviour in even a small group of consumers can lead to significant changes in agrifood systems. This is evidenced by the large and varied offering of food products modified to have desirable health properties (such as low-fat, low-sugar and high-protein), especially in industrial agrifood systems. The power wielded by consumers through their purchasing behaviour also extends to transformative action to reduce environmental and social hidden costs. On the environmental side, for instance, harmful fishing practices damaging dolphins prompted some consumers in the United States of America to boycott tuna. Though the impact on sales was unclear, the boycott caused a substantial reaction among producers.[1] Similarly, boycotts targeted at certain companies have prompted them to impose higher worker welfare standards on their supply chains, reducing social hidden costs.[2, 3] The proliferation of organic, fair trade and similar sustainability standards, or environmental, social and governance reporting initiatives among agribusinesses, discussed in **Chapter 3**, attest to this power.

Nonetheless, the strength of consumers' purchasing power in driving agrifood systems transformation depends on both their ability and their willingness to pay for a different basket of

food products, which may come at a higher price (Box 18 in **Chapter 3**). Already, more than one-third of the world's population – about 2.8 billion – was unable to afford a healthy diet in 2022.[4] However, economic constraints do not explain all consumption behaviour. Food preferences, stemming from taste and required preparation time and skills, for instance, as well as food access and environments, are also pertinent. Consequently, it is important to understand consumers' motivations and constraints in changing their food purchasing and consumption behaviours for more climate-sensitive, health-conscious and socially responsible products. Governments' role in addressing these constraints and shaping food environments is a key factor in achieving this behavioural change.

This chapter explores key questions regarding the extent to which consumer and institutional purchasing power can drive transformation. It also examines the various levers that public and private decision-makers can use to leverage this purchasing power and motivate behavioural change by consumers. This includes a holistic approach to public-sector procurement that channels institutional purchasing power into reducing not only the health, but also the environmental and social, hidden costs of agrifood systems. ■

FACTORS SHAPING CONSUMER FOOD DEMAND

Numerous factors determine food demand, including access, income, relative prices, preferences, marketing and information, culture, tradition, and food environment. At the individual level, the hidden costs of unhealthy diets fall on each consumer in the future (as years of life either lived with disability or lost) as well as on society (as environmental, social and health hidden costs). These costs may be hidden from consumers due to lack of awareness or a tendency to ignore potentially bad events in the future. Therefore, building awareness, motivation and capabilities among consumers can change food demand and address hidden costs.

While consumers have significant value to gain from more inclusive, sustainable and resilient agrifood systems, the extent to which individual purchasing power can be leveraged for transformation varies across agrifood systems, as well as within countries, due to inequality and poverty. Food security – a situation in which all people at all times have physical and economic access to sufficient, safe and nutritious foods that meet their dietary needs and food preferences for an active and healthy life – remains the primary objective of many countries in which affordability is a major constraint. Box 21 explores the inequalities in economic access to the most basic energy-sufficient diets compared with healthy diets that cost five times more, on average, across agrifood systems types.[5] It documents the limits on consumers' purchasing power among the most vulnerable segments of society and underlines the need to combine social safety nets to address capability for change with other interventions that focus on awareness and motivation to reshape food demand. The right to feed oneself in dignity and to be free from hunger is a legal obligation anchored in international law, guaranteed by the International Covenant on Economic, Social and Cultural Rights.[6] Box 22 discusses how the true cost accounting approach incorporates the right to food as part of social hidden costs.

Healthy and sustainable diets need not be more expensive than current diets, especially if measured on a per day or per serving basis (as opposed to a per calorie basis).[7–9] For example, one recent study compared the current Italian diet to a healthy and sustainable diet and found the latter to be 5 percent cheaper.[10] The results also showed that a sustainable and healthy diet had a carbon footprint that was 47 percent lower and a water footprint that was 25 percent lower.

Whether consumers choose to channel their purchasing power into healthy and/or sustainable diets depends on their awareness and motivation, and these are strongly shaped by food environments. As discussed in **Chapter 3**, customers are increasingly demonstrating their preference for products making environmental and social responsibility claims.[11–14] A meta-analysis on consumers' willingness to pay for products claiming corporate social responsibility (CSR) based on seven decades of »

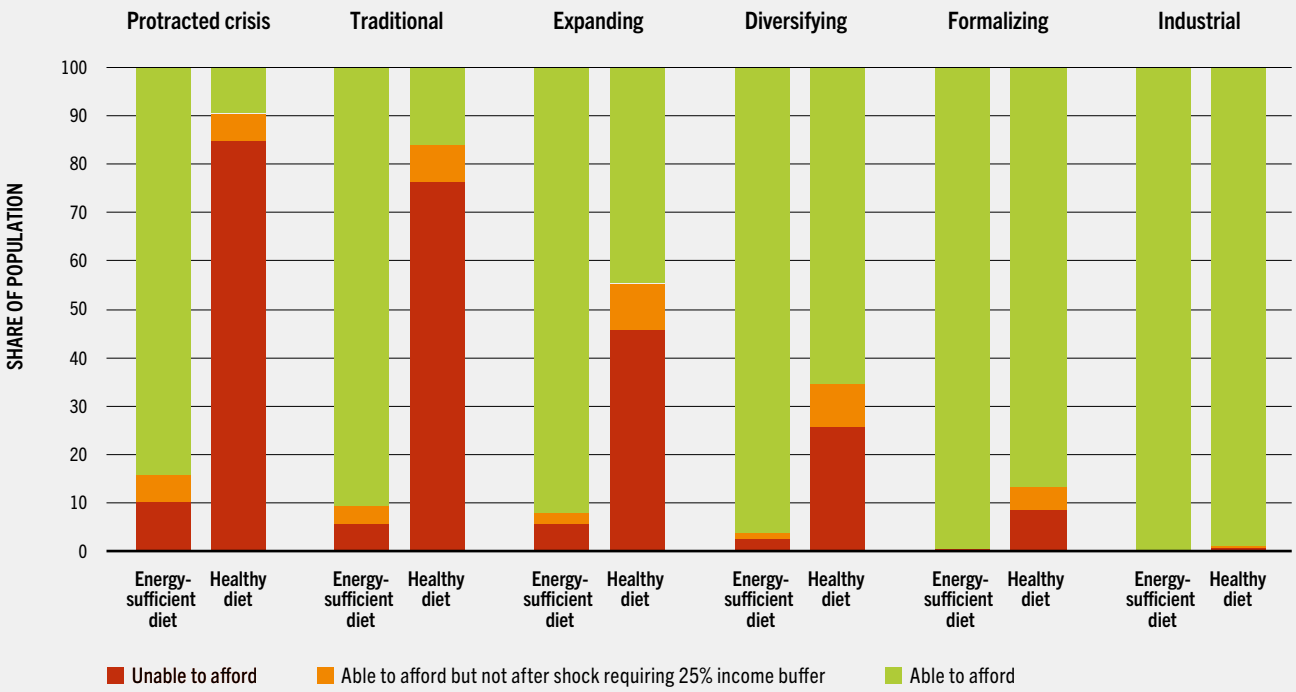
BOX 21 ECONOMIC ACCESS TO ENERGY-SUFFICIENT VERSUS HEALTHY DIETS

Having economic access to food is an issue related to price and income, and is therefore shaped by poverty, income inequality and the cost of food relative to disposable income. The poorer a person is, the larger the proportion of income spent on food. Therefore, even small increases in the cost of a diet or small reductions in the level of income can have a significant impact on accessibility to diets by the poorest. Not having a reliable and substantial income buffer limits consumers' options in periods of shock, such as price spikes, crop failures or loss of assets. Therefore, a measure of economic access to estimate the extent to which populations have access to different diets provides some insights into the high incidence of either undernutrition or unhealthy dietary patterns across the different types of agrifood systems.

The figure shows the spectrum of diet affordability and vulnerability to shocks in populations across the agrifood systems categories in 2019. It compares the affordability of an energy-sufficient diet, which only meets caloric needs, with that of a healthy diet, which protects against malnutrition in all its forms through balanced and diverse nutritious foods. The affordability spectrum ranges from unable to afford the given diet (red) to able to afford (green), with orange showing the populations that would lose economic access to the diet in the event of a shock that reduces real incomes by one-quarter (through either a price increase or an income shortfall).

The spectrum of diet affordability provides a sense of whether a healthy diet is within everyone's reach. Not being able to afford the lowest cost possible energy-sufficient diet indicates that a more expensive healthy diet is clearly not within reach without targeted support. This gap is felt most strongly by populations in protracted crisis and traditional agrifood systems, where 5–10 percent of the population cannot afford an energy-sufficient diet. Furthermore, in these two categories, over 75 percent of the population cannot afford a healthy diet, and within this group situations span from those for whom this diet is within reach to those for whom it is not. In expanding agrifood systems, the affordability of an energy-sufficient diet mirrors that in traditional agrifood systems with 50 percent of the population unable to access a healthy diet. Access to a healthy diet increases across the diversifying, formalizing and industrial agrifood systems. Vulnerability to shocks remains persistent in all agrifood systems except industrial, with 5–10 percent of the population facing the risk of losing access to a healthy diet after an income shock. The findings highlight that low incomes and high food prices constrain consumers' ability to change their consumption patterns in ways that significantly differ across agrifood systems categories.

FIGURE AFFORDABILITY OF DIETS BY AGRIFOOD SYSTEMS CATEGORY, 2019



SOURCE: Cattaneo, A., Sadiddin, A., Vaz, S., Conti, V., Holleman, C., Sánchez, M.V. & Torero, M. 2023. Viewpoint: Ensuring affordability of diets in the face of shocks. *Food Policy*, 117: 102470. https://doi.org/10.1016/j.foodpol.2023.102470

https://doi.org/10.4060/cd2616en-figB21

BOX 22 ADDRESSING THE SOCIAL HIDDEN COSTS OF AGRIFOOD SYSTEMS THROUGH THE RIGHT TO FOOD

The **right to food** is a fundamental human right and legal obligation for countries anchored in international law. FAO is the lead intergovernmental actor advocating for and supporting the realization of the right to food. Actions to advance the right to food include efforts in boosting social protection, promoting gender equality and decent work, and ensuring inclusive climate action and tenure policies. These make up integral components of the broader commitment to inclusive rural transformation, which would address the market, institutional and policy failures that lead to the hidden costs of agrifood systems.

Addressing the social hidden costs discussed in this report (including poverty, undernourishment, gender pay gaps, living income gaps and child labour) would significantly contribute to the realization of the right to food. This would complement FAO's ongoing efforts in promoting the right to food through technical assistance on policy and legislation, strengthening governance and monitoring mechanisms, capacity development and policy dialogue using inclusive stakeholder participation.

SOURCE: Authors' own elaboration.

» publications finds that CSR acts as a product feature that helps consumers gain self-esteem and increases the overall value of the product.[15] The findings vary by income and age, with youth demonstrating a keener interest and greater willingness to pay for CSR. While this study covers countries in all agrifood systems categories, except for protracted crisis, more than half of the country coverage is in countries with industrial agrifood systems, highlighting the need to better understand the scope for demand-side change across different agrifood systems contexts.

While agrifood businesses, particularly those connected to global value chains, are increasingly responding to these signals from consumers, greater consumer awareness and motivation to demand diets that internalize hidden costs are needed to serve as the tipping point for change beyond niche products. Box 18 in **Chapter 3** explores how consumers reacted to the True Cost campaign by PENNY supermarkets in Germany, underlining that even in high-income settings, affordability can be a constraint on subpopulations, and behavioural change is difficult to achieve, requiring longer-term interventions.

Policymakers have long experimented with price incentives (taxes and subsidies) to change consumption patterns.[16] The effectiveness of these measures depends on the price responsiveness of consumers, which varies by food group, income, socioeconomic variable and region.[17] Price responsiveness may be higher for some food groups (such as meat) than for others (such as staples, oils and fats) and it tends to decrease with higher incomes.[17, 18] While taxes on food can be financially regressive, disproportionately burdening vulnerable populations, the revenue generated can be strategically allocated to programmes and services that ultimately benefit and uplift these communities in the long term. Therefore, while demand-side change can be catalytic, systems-wide actions for dietary improvements and nutritional outcomes need to follow a structured framework influencing demand, supply and enabling factors.[19] Policy and programmatic actions within this framework can be geared towards improving the capability, motivation and opportunity of consumers to make food purchase and consumption decisions, as well as increasing the availability and affordability of nutritious foods. ■

IMPACTS OF CONSUMPTION PATTERNS

Consumption patterns create hidden costs: i) the health pathway, where unhealthy dietary patterns contribute to undernutrition and NCDs, leading to productive and healthy years of life lost; and ii) the social pathway, where distributional failures in food supply and insufficient revenues for agrifood workers lead to undernourishment, as discussed in **Chapter 1**. The resulting hidden costs permeate all impact

domains – environmental, socioeconomic and health – creating an interconnected web of effects. In addition, each of these impact domains is also affected by other non-diet-related pathways, such as the inappropriate use of pesticides in primary production, leading to biodiversity loss, occupational hazards and poor health outcomes. This chapter, however, focuses on how shifts in consumption patterns can drive agrifood systems transformation by exploring the links between diets and these interconnected impacts.

From an environmental perspective, researchers agree that achieving sustainability in agrifood systems requires more than just transforming production methods.[20] A report by the EAT-Lancet Commission highlights diets as pivotal in transforming agrifood systems beyond their health impacts,[21] and the conclusions linking diets and the environment are shared by other research.[22–25] While the study acknowledges other agricultural measures to lessen adverse effects, it argues that sustainable agrifood systems cannot be achieved solely through improvements on the production side. Research shows that dietary shifts, such as reducing animal product consumption in countries where it is excessively high, can significantly lower GHG emissions and mitigate other environmental harms, such as biodiversity loss, land-use change and nutrient runoff.[25–33]

Such discussions tend to be mired in controversy, as they are based on historical consumption patterns in industrialized or transition countries that have led to significant environmental damage globally due to the interconnected nature of agrifood systems. This raises questions about fairness with regard to distributional issues among cost producers and cost bearers. Consequently, it is important to recognize the heterogeneity of dietary quality around the world; moreover, in some places, the consumption of animal products needs to increase to achieve a nutrient-adequate diet and the burden of countering the current environmental damage cannot be equally distributed.

In Bangladesh, a country with traditional agrifood systems, a study on the potential transition to healthier diets reveals trade-offs between environmental, socioeconomic and health indicators.[34] The study compared the transition from current diets (high in animal products and sugars and low in vegetables, fruits, legumes and nuts) to the EAT-Lancet diet or a diet based on the food-based dietary guidelines between 2022 and 2050. A diet with more plant-based protein and fewer staples was found to have positive health effects, as well as positive impacts on most of the environmental footprint indicators. However, there are environmental trade-offs between the EAT-Lancet and FBDG diets, with the former leading to higher land and phosphorus use and the latter to a greater rise in GHG emissions. In socioeconomic terms, the FBDG diet scenario scored best on national self-sufficiency objectives, cereal affordability and low-skilled wages, underlining the importance of customizing global guidelines to local needs and national priorities.

The various socioeconomic and health impacts associated with consumption speak to the multifaceted nature of malnutrition, which encompasses both insufficient and excessive intake of nutrients, a lack of balance in essential nutrient levels, and hindrances to nutrient utilization due to repeated instances of disease.[4, 35] Malnutrition manifests itself as undernutrition – being underweight for one's age, too short for one's age (stunted), dangerously thin for one's height (wasted), or deficient in vitamins and minerals (suffering from micronutrient deficiency) – as well as overweight and obesity.[4] Many countries are facing a double burden of malnutrition, where undernutrition coexists with overweight, obesity or diet-related NCDs.[36, 37] While the prevalence of the double burden of malnutrition decreases across agrifood systems types (from 70 percent in countries with protracted crisis and traditional agrifood systems to 27 percent for expanding agrifood systems, and zero for formalizing and industrial agrifood systems), that of adult obesity and overweight increases (from 30 percent to around 60 percent).[37]

Unhealthy diets are ubiquitous across all weight categories. Individuals with a healthy weight may consume diets that are low in healthy foods and high in unhealthy foods or nutrients (for example, high in sodium). Meanwhile, individuals with overweight and obesity may consume a healthy diet. As a result, their weight may be more responsive to other factors (such as changes in

lifestyle habits). Using 24-hour dietary recall data from Ethiopia, Mexico and the Philippines – countries with different types of agrifood systems – Box 23 presents a case study on how the dietary quality of these populations is associated with NCD risk and weight.

The social hidden costs of undernourishment – the condition in which an individual's habitual food consumption is insufficient to provide the amount of dietary energy required to maintain a normal, active, healthy life[42] – are significant. The 2024 edition of *The State of Food Security and Nutrition in the World* estimates that between 713 million and 757 million people in the world may have faced hunger in 2023.[4] While the measurement of undernourishment pertains to the total population, special consideration needs to be given to the nutritional status of children. Children that suffer from undernutrition, particularly before the age of five, face profound and lasting impacts on their physical and cognitive development.[43, 44] Worldwide, in 2022, an estimated 148.1 million children under five years of age (22.3 percent) were stunted, 45 million (6.8 percent) were wasted and 37 million (5.6 percent) were overweight.[o, 4]

A methodology applied by the World Food Programme, known as "Cost of Hunger", estimates the social and economic impacts of child undernutrition, focusing on the health, education and labour sectors.[45, 46] While the approach includes a wider range of costs than those hidden from market transactions, as outlined in *The State of Food and Agriculture 2023*, the results highlight the cross-sectoral need for early childhood nutrition interventions. Box 24 summarizes results from several African and Latin American countries, underlining how they complement the estimates on the hidden costs of undernutrition in this report.

o Stunting in children under five years of age, reflecting a past episode or episodes of sustained undernutrition, denotes low height for age, while wasting, attributed to a recent period of inadequate dietary energy intake and/or disease, indicates low weight for height, with both conditions defined as measurements falling below –2 standard deviations from the World Health Organization (WHO) Child Growth Standards median. Overweight in children under five years of age is defined as weight for height greater than 2 standard deviations above the WHO Child Growth Standards median.[4]

While unhealthy diets are a common cause of all forms of malnutrition,[47–49] many other direct (health and care) and indirect (for example, poverty, and health and education services) causes exist simultaneously. Actions to address all forms of malnutrition must address these in parallel. Box 25 draws on evidence from Ethiopia and the Philippines on how public nutrition and health interventions play a vital role, complementary to interventions to enable healthy diets, while Box 26 explores the role of agrifood systems in creating an enabling environment to support breastfeeding for better infant and young child outcomes. Governments have a role to play in inspiring and empowering consumers by creating an enabling environment for change and raising awareness on the role of healthy diets in driving broader societal goals. These complement governments' role in shaping food environments by setting incentive structures in food supply chains within a systems approach, as discussed in **Chapter 3**. ■

RESHAPING AND REDIRECTING CONSUMER DEMAND

By making appropriate changes to their purchasing behaviours, consumers can both reduce the hidden costs they would otherwise bear themselves in the future and generate incentives for other agrifood systems actors to reduce the hidden costs of their activities. Institutions that procure food are a special brand of "consumer" with more influence because of their large-scale purchases, often using public funds. The purchasing power of both individuals and institutions can be enhanced through various interventions that influence different factors in consumer purchasing decisions to maximize the social value of agrifood systems and address various hidden costs.

Food purchases can be influenced by economic and non-economic levers, as shown in Table 2. Economic levers can affect household consumption patterns by varying either relative prices or the incomes available for food purchases. Price measures include taxes and subsidies on food products, with the objective of increasing the prices of overconsumed products »

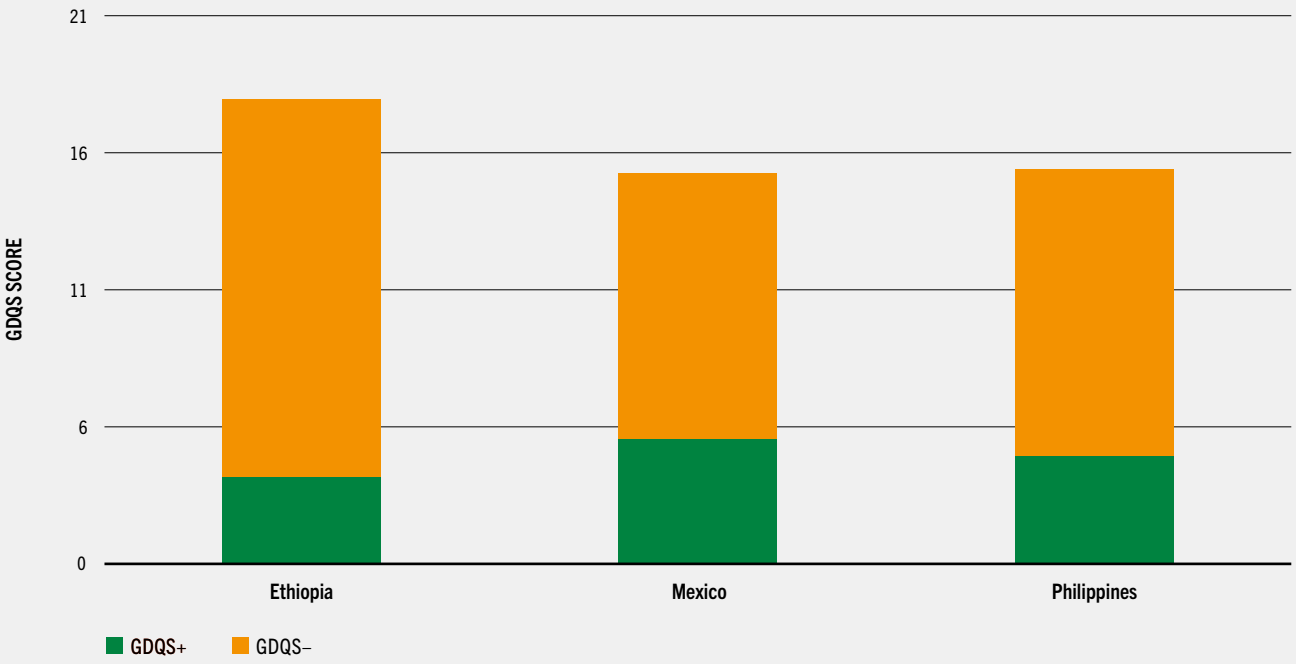
BOX 23 ASSESSING DIET QUALITY THROUGH 24-HOUR RECALLS AND ASSOCIATIONS WITH OVERWEIGHT AND OBESITY AND DIET-RELATED NON-COMMUNICABLE DISEASE RISK FACTORS

While the Global Burden of Disease data provide an appropriate approach for estimating global trends based on disability-adjusted life year (DALY) estimates, there are some limitations to the included dietary data, which draw on several national and household sources as noted in Box 4. Where data exist, hidden costs can be estimated based on individual dietary risk factors using robust data of dietary intake. The Global Diet Quality Score (GDQS) is a comprehensive measure of diet quality, validated against nutrient inadequacy and selected diet-related non-communicable disease (NCD) risks using nationally representative surveys.[38] Such national surveys are particularly appropriate for the use of true cost accounting to inform policy options in specific targeted contexts. The case study presented here provides a detailed analysis of the associations between diets, overweight and obesity and diet-related NCD risk factors* by constructing the GDQS using individual 24-hour dietary intake data for adults over the age of 20 from nationally representative nutrition surveys for Ethiopia, Mexico and the Philippines.[39–41]

The results indicate that most of the adult population in all three surveys have medium and high NCD risks, largely due to very limited consumption of healthy food groups protective against NCD risks (Figure A). Ethiopia, in the protracted crisis agrifood systems category, has a smaller share in the high-risk category than the other two countries; however, forthcoming results from a 2021/22 survey indicate that there has been a significant increase since the 2011 survey. As shown in Figure A, Ethiopia has overall the highest score on the GDQS, largely due to very low consumption of unhealthy food groups (GDQS–), despite a very limited variety of healthy food groups consumed (GDQS+). As agrifood systems develop, the variety and quantity of healthy food groups consumed may increase, but this is often offset by greater increases in variety and quantity of unhealthy food groups. This is consistent with low rates of overweight and obesity in Ethiopia (7.2 percent in 2011), and higher rates in Mexico (71 percent in 2012) and the Philippines (31.1 percent in 2013) – the latter having agrifood systems categorized as expanding and the former as diversifying.

The analysis shows some limitations of using overweight and obesity and diet-related NCD risk factors as proxies when calculating health hidden costs. First, within countries, groups of individuals who are overweight or obese do not have lower quality diets than those with healthy weights (as demonstrated by patterns of diet-related NCD risk factors in Figure B). Second, using national survey

FIGURE A THE GLOBAL DIET QUALITY SCORE AND ITS SUBMETRICS BY COUNTRY



NOTES: The Global Diet Quality Score (GDQS) is from 0 to 49, based on 25 food groups, 16 of which are considered healthy, seven unhealthy, and two unhealthy if consumed in excess. Additional points are awarded for consuming more of a healthy food group and less (or none) of an unhealthy food group. Cut-points on the GDQS scale have been validated – scores ≥23 are associated with low risk of both nutrient inadequacy and NCD-related outcomes, scores ≥15 and <23 indicate moderate risk, and scores <15 indicate high risk.

SOURCE: Authors' own elaboration.

https://doi.org/10.4060/cd2616en-figB23-A

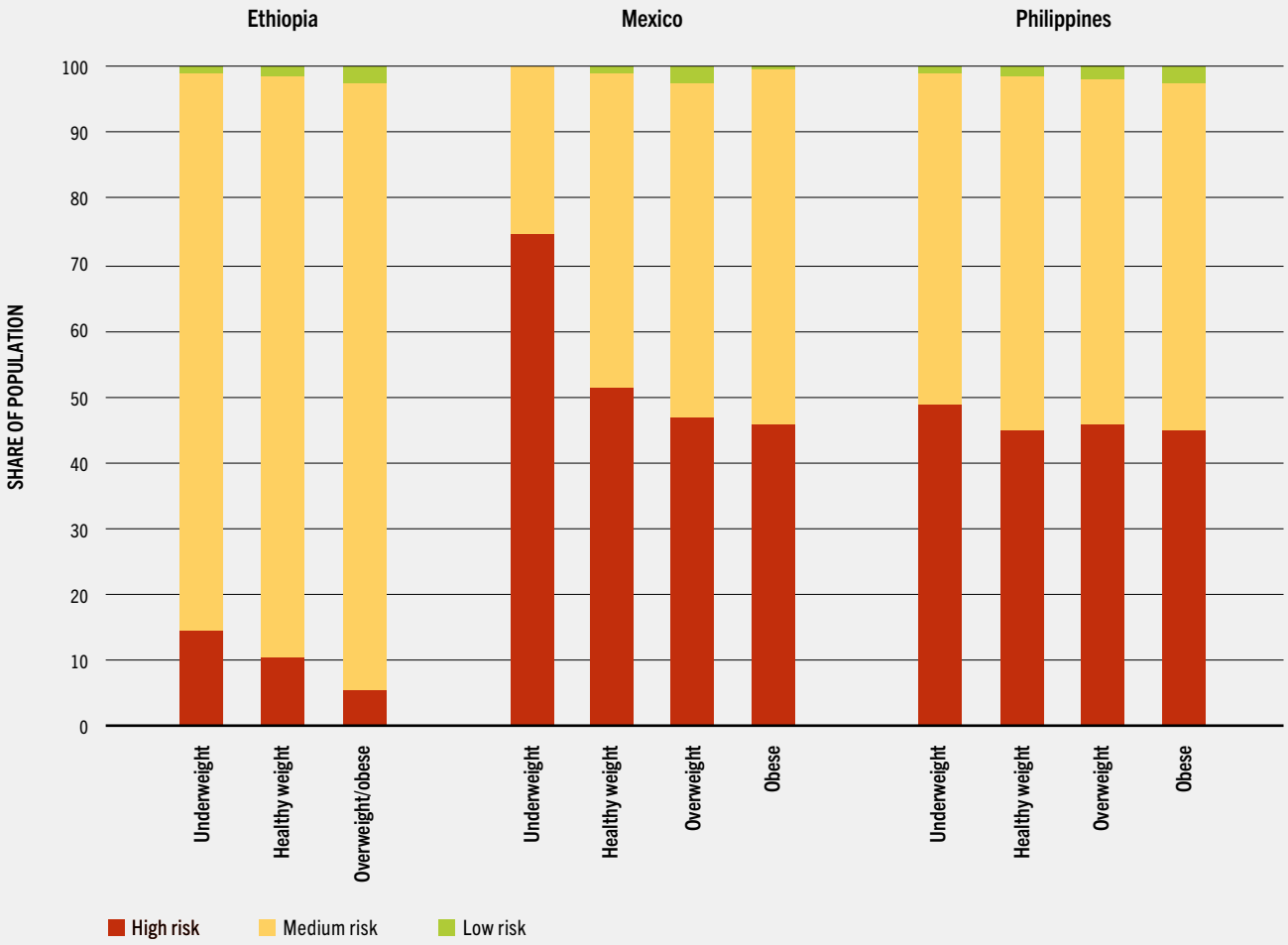
data from the Philippines, regressions of fasting blood glucose and of blood pressure as dependent variables on diet quality (controlling for body mass index and sociodemographic variables) indicated that the effects of GDQS were generally small and not significant, potentially due to the use of cross-sectional data (that is, reverse causality) and single-day dietary intake assessment (which may limit the potential to understand the direction of causal relationships).

Estimating the cost implications of unhealthy diets highlights the urgency of addressing diet quality. Already in Ethiopia, overweight or obesity in adults aged 20–49 years rose from 7.2 percent in 2011 to 12.0 percent in 2023, and according to the results of the 2021/22 survey, diet quality has worsened (as measured by overall GDQS).

To guide agrifood systems policies that enable access to and consumption of healthy diets, nationally representative surveys provide critical insights into the causal relationships between dietary patterns and health outcomes and their related hidden costs. To improve these estimates and their potential to inform policy options, better evidence is needed on the impacts of measures to increase the production of and access to healthy diets, as well as those measures aimed at regulating food intake so as to moderate or avoid foods high in sugars, salt and fats and foods high in energy but low in nutrients such as fibres and micronutrients.

NOTE: * In addition to capturing consumption patterns, national nutrition surveys can provide data on the existence of diet-related NCD risk factors; specifically, the surveys in Mexico and the Philippines include measures of blood pressure and fasting blood glucose, while Ethiopia is in the process of collecting them in their approach to risk factor NCD surveillance.

FIGURE B NUTRIENT INADEQUACY AND DIET-RELATED NON-COMMUNICABLE DISEASE RISK USING GLOBAL DIET QUALITY SCORE BY BODY MASS INDEX CATEGORY, FOR ETHIOPIA, MEXICO AND THE PHILIPPINES



SOURCE: Authors' own elaboration.

https://doi.org/10.4060/cd2616en-figB23-B

BOX 24 THE COST OF HUNGER METHODOLOGY FOR AFRICA AND LATIN AMERICA

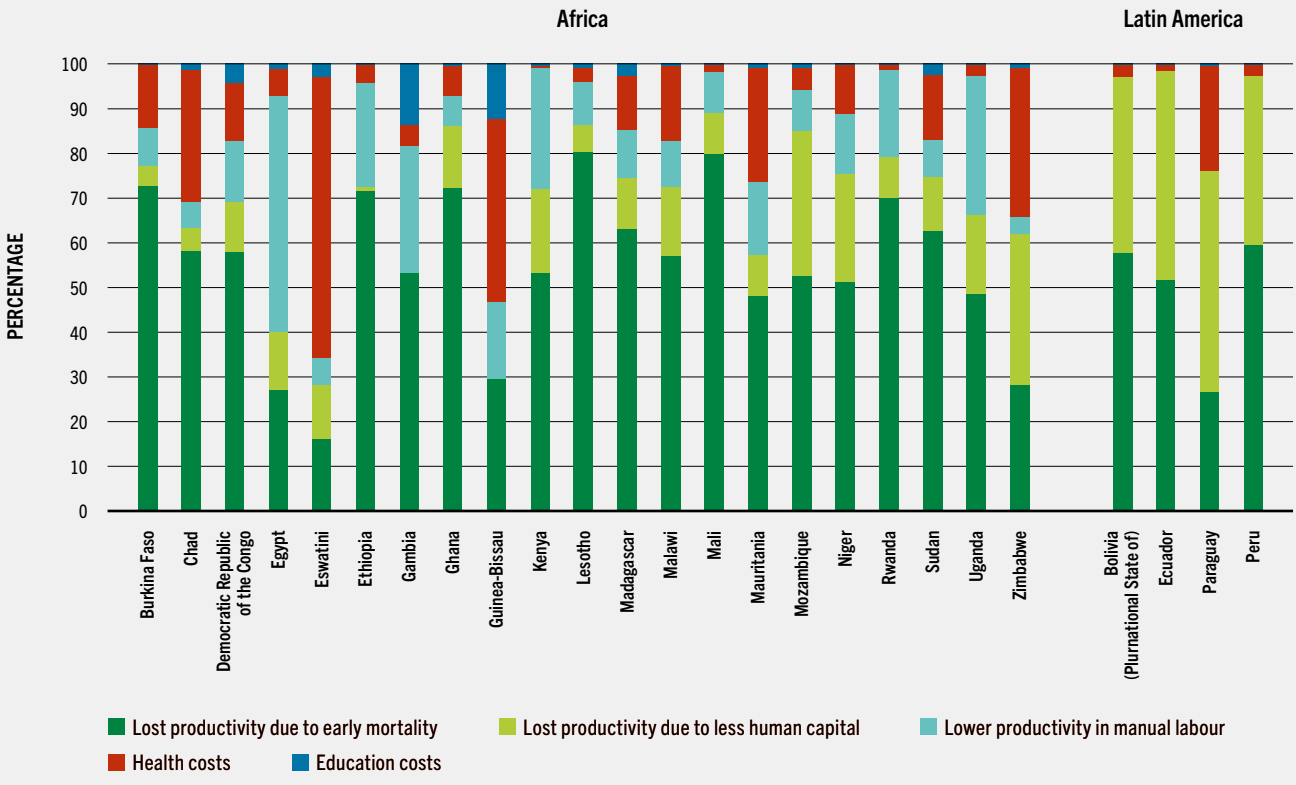
A number of studies reveal the extensive economic toll of child malnutrition in Africa and Latin America. Spanning 21 African nations from 2013 to 2018, the Cost of Hunger in Africa research by the African Union and the World Food Programme (WFP) delves into the profound health consequences of stunting and underweight in pre-school-age children, shedding light on the cascading losses in terms of education, health care and workforce productivity.[45] The same methodology, but considering low birth weight and underweight, was also applied in some Latin American countries in a parallel study by the Economic Commission for Latin America and the Caribbean and WFP in 2009.[46] It is crucial to recognize that the methodology diverges significantly from the methodology used in this and the 2023 edition of *The State of Food and Agriculture*, so findings should not be compared with the hidden costs of *undernourishment,* but serve as complementary insights.

The first major difference is the type of undernutrition and the populations considered. Whereas the hidden costs of undernourishment in both the 2023 and the 2024 edition of this report refer to the total population experiencing insufficient food intake, the Cost of Hunger methodology examines the incidence of underweight and stunting before the age of five. The Cost of Hunger includes an "incidental retrospective dimension" for assessing current-year economic burdens of undernutrition for people who were underweight before the age of five.

The Cost of Hunger approach results in cost estimates that are significantly higher than those quantified in this report (on average, around ten times greater), mainly because its analysis of the hidden costs of undernutrition consider the additional negative effects of undernutrition. These negative effects include increased risk of pathology (for example, respiratory disease and malaria), impact of reduced education attainment on productivity, and lower productivity in manual labour. The figure provides an overview of these results across the studies in Africa and Latin America. It also includes health care costs – unlike *The State of Food and Agriculture*, which focuses on *hidden* costs. The monetization of the hidden costs is another difference: while *The State of Food and Agriculture* monetizes lost productivity using average gross domestic product per worker, the Cost of Hunger research tends to use average wages or the minimum wage.

The Cost of Hunger studies highlight that, while the most direct consequence of undernutrition is the morbidity and mortality caused, accounting for the indirect effects on the health, education and productivity of workers can yield much higher estimates of the economic costs of undernutrition. This is a relevant insight for future researchers aiming to motivate policy action.

FIGURE PROPORTION OF COST CATEGORY BY COUNTRY



SOURCE: Authors' own elaboration.

https://doi.org/10.4060/cd2616en-figB24

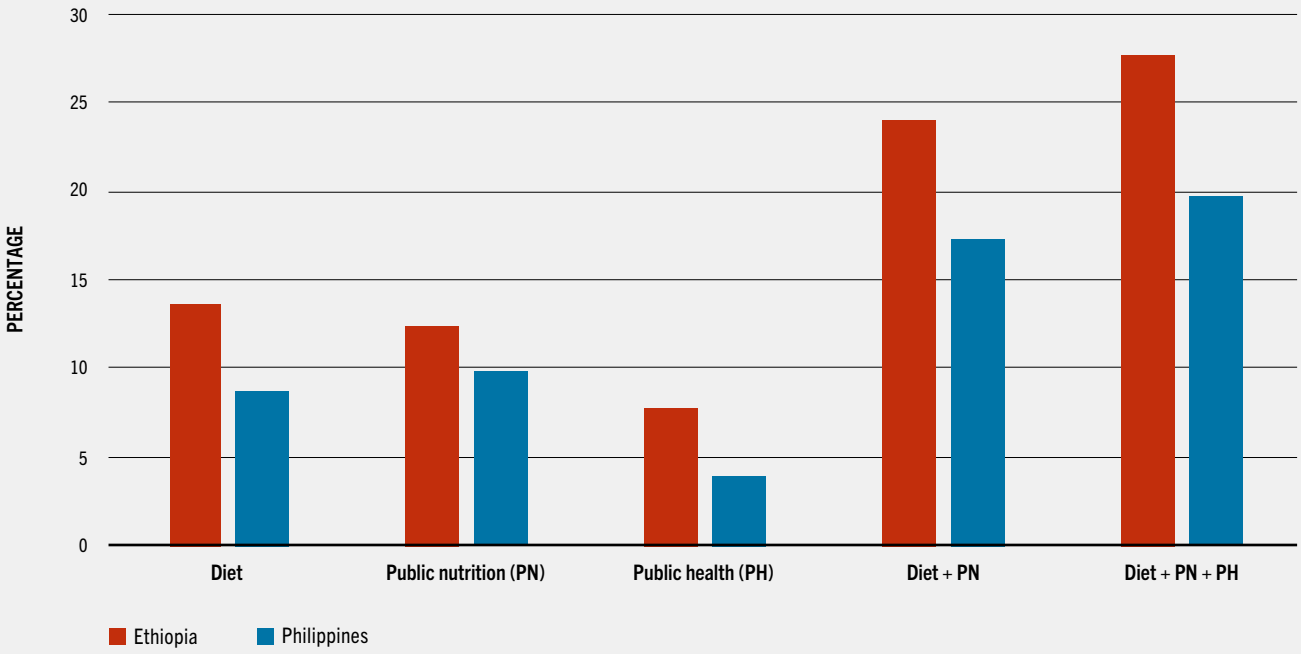
BOX 25 HEALTHY DIETS ARE ESSENTIAL, BUT NOT SUFFICIENT TO ELIMINATE STUNTING

A study using the Lives Saved Tool assessed the potential impact of dietary, public nutrition and health interventions on significant rates of child stunting in Ethiopia and the Philippines from 2024 to 2030.[50]

The findings reveal that while a healthy diet could avert an estimated 14 percent of child stunting in Ethiopia and 9 percent in the Philippines, it is not enough in and of itself (see the figure). When combined with full population coverage of essential public nutrition interventions, these percentages increase to 24 and 17 percent, respectively. A further reduction in stunting can be achieved by scaling up public health interventions in areas such as water, sanitation and hygiene practices, antenatal care and immunization. Notably, the impact varies due to differences in coverage of existing public health interventions, which are much higher in the Philippines.

The simulations underscore the critical importance of the first 1 000 days from conception to age two years in preventing stunting, emphasizing the necessity of early food systems to ensure access to a healthy diet. However, the study highlights that a healthy diet alone cannot fully address child stunting; essential public nutrition and health interventions are essential complements.

FIGURE POTENTIAL FOR AVERTING STUNTING THROUGH FULL POPULATION COVERAGE BY INTERVENTION TYPE IN ETHIOPIA AND THE PHILIPPINES



NOTES: Dietary interventions included periconceptual folic acid and iron fortification, balanced energy–protein supplementation during pregnancy, exclusive breastfeeding for infants aged 0–5 months, and appropriate complementary feeding for children aged 6–23 months. Public nutrition strategies comprised periconceptual folic acid and iron fortification, iron and calcium supplementation during pregnancy, and vitamin A and zinc supplementation for children aged 6–59 months and 12–59 months, respectively. Public health interventions encompassed syphilis detection and treatment, progesterone administration for high-risk births, low-dose aspirin usage during pregnancy, and efforts to improve water quality, sanitation, handwashing practices, hygienic disposal of children's stools and rotavirus vaccination initiatives.

SOURCES: Black, R.E., Victora, C.G., Walker, S.P., Bhutta, Z.A., Christian, P., de Onis, M., Ezzati, M. *et al.* 2013. Maternal and child undernutrition and overweight in low-income and middle-income countries. *The Lancet*, 382(9890): 427–451. https://doi.org/10.1016/S0140-6736(13)60937-X; Johns Hopkins & Bill & Melinda Gates Foundation. 2024. The Lives Saved Tool (LiST). In: *The Lives Saved Tool*. [Cited 21 March 2024]. https://www.livessavedtool.org

https://doi.org/10.4060/cd2616en-figB25

BOX 26 THE HIDDEN HEALTH, ENVIRONMENTAL AND SOCIAL VALUE OF SUPPORTING BREASTFEEDING

Breastfeeding is a natural first food system, offering optimal nutrition and food security with long-term benefits,[36, 37] but many of these are hidden and often overlooked by policymakers. The World Health Organization, based on evidence that highlights the benefits of breastfeeding in warding off infections during early childhood, reducing the risk of obesity and chronic diseases in later life, and promoting normal cognitive and neurological development,[51] recommends that infants should be breastfed exclusively for the first six months. This should then be followed by a combination of breastfeeding and complementary foods up to the age of two years.

Despite the numerous benefits of breastfeeding, the decision to breastfeed is a personal one influenced by a variety of factors, including time, energy, skills, knowledge, biology and the need for a supportive environment. Consequently, breastfeeding is not always the chosen method of infant feeding and, in recent years, there has been an increase in the use of commercial milk formula (CMF), especially in East and Southeast Asia.[53] This trend can be attributed to global trade, marketing, urbanization and the absence of supportive government policies for breastfeeding, among other factors.[54–57] Not all aspects of supporting breastfeeding fall within the purview of agrifood systems. However, to the extent that stakeholders in a given agrifood system have a role in influencing the incentives for breastfeeding, the associated hidden costs can be attributed to the agrifood system.

Societies underinvest in the necessary policies and institutional arrangements that encourage breastfeeding as recommended, including regulating the marketing of breastmilk substitutes and advancing paid family leave and workplace breastfeeding policies.[58] One reason is because breastmilk is excluded from global and national food balance sheets, so is left unaccounted for in agrifood systems. Only Norway has recognized the importance of "mother's milk" and included it in food surveillance systems since the 1990s.[59]

Moreover, the benefits to society are hidden. Four innovative global tools highlight the value of breastfeeding and the benefits of facilitating it:

- The Cost of Not Breastfeeding Tool calculates that, globally, cognitive losses from not exclusively breastfeeding infants under six months leads to more than USD 100 billion in annual global economic losses, amounting to over 6 percent of gross domestic product in some countries.[60, 61] However, the tool does not account for the cost of time spent, often by women, on caring for sick children.[62]
- The Green Feeding Tool highlights the role that breastfeeding can play in addressing climate change mitigation, adaptation and resilience.[63] Greenhouse gas (GHG) emissions from CMF could be reduced from around 6.7 billion kg CO_2 e to around 3.7. billion kg CO_2 e a year if global nutrition targets for breastfeeding infants aged 0–6 months were met.[64] In addition to calculating countries' CMF carbon and water footprints, the tool can estimate the impact of policy scenarios.[65–67] One such simulation, for example, concluded that if infant feeding practices in India mimicked those of France, Ireland or the United Kingdom of Great Britain and Northern Ireland, GHG emissions would increase by 3.5 million tonnes and water use would increase by more than 1.3 billion litres, annually.
- The Mothers' Milk Tool aims to make up for the data gap on mothers' milk in food balance sheets by quantifying breastfeeding among women's economic contributions to society.[59] Estimates show that around 60 percent of the potential amount of human milk is currently lost due to the displacement of breastfeeding.[59]
- The World Breastfeeding Trends Initiative Costing Tool estimates the financing needs for investment to enable breastfeeding at national, subnational and project level.[68] Currently, fewer than one in ten countries receive the USD 5 per birth needed to reach the World Health Assembly's global target for exclusive breastfeeding.[58] Additional government investment of USD 5.7 billion is needed to meet this target by 2025.[69]

Globally, such tools suffer from insufficient data on breastfeeding practices, especially in high-income countries. The integration of breastfeeding and breastmilk production into global and national food balance sheets, following the leadership of Norway, would be a first step in addressing the data issues to ensure progress in increasing the visibility of the role of breastfeeding in agrifood systems thinking and action.

SOURCE: Authors' own elaboration.

TABLE 2 LEVERS FOR CHANNELLING PURCHASING POWER TO HEALTHIER AND MORE SUSTAINABLE DIETS

Target actors	Lever (sub)category	Lever	Examples
Consumers	Economic	Taxes and subsidies	Taxes on sugar-sweetened beverages, animal source foods or foods with a high environmental footprint Subsidies for fruits and vegetables
		True pricing	Reflecting the true prices of food items at points of sale
		Cash transfers and vouchers	Food stamps, cash transfers to poor and vulnerable households
	Non-economic	Labels and certifications	Fair trade or organic certificates Labels indicating environmental footprint Labels discouraging consumption by children
		Marketing	Restrictions on marketing for unhealthy foods and beverages, including restrictions on marketing to children Campaigns for marketing healthy foods
		Education	School programming on health, nutrition and sustainability
		Nudges	Strategic product placement in shelves and aisles Portion limitations Rules on default food options for kids' meals
Institutions	Economic	Food procurement	Purchasing standards for sourcing food School feeding programmes
	Non-economic	Food service	Awareness and health campaigns Strategic menu design

SOURCE: Authors' own elaboration.

» and reducing the prices of underconsumed ones. The measures that target income primarily include social safety nets that try to cover basic food needs, either through cash transfers or vouchers that supplement income or with in-kind food assistance.

Consumers are also influenced by non-economic levers. These involve raising awareness and understanding the sustainability, social and health implications of food, as well as increasing the transparency of the production process through labels, certifications and marketing. These can affect consumption patterns, particularly when poor food choices stem from misinformation. However, enhanced information alone may not change deep-seated unhealthy consumption patterns tied to strong beliefs and cultural traditions.[20, 70] Care needs to be taken so that marketing informs rather than misinforms consumer choices. Because consumers often face too much, sometimes contradictory, information, educational programmes on nutrition, health and sustainability can help them make the best purchasing decisions. The education system can also be a potential tool for reshaping this and future generations. Lastly, nudging – a newer approach that homes in on consumers' practical decision-making strategies – is considered a valuable option for enhancing the food retail environment. Although price adjustments are a straightforward way of influencing consumer behaviour, their effectiveness can be limited if consumption habits are deeply entrenched in strong preferences. Thus, there is a need for complementary policy approaches that combine monetary and non-monetary levers to greatest effect.[14]

The same is true for policy levers to influence institutional procurement, where decisions about food purchases are made by intermediaries, such as government agencies (for example, schools or hospitals) or private institutions, rather than by consumers directly. Unlike individual consumers, institutions have the capacity to conduct thorough analyses of the impacts of their food sources and to optimize purchasing decisions systematically. Their strong purchasing power can be an important force for change in transforming agrifood systems. The levers discussed here are examples of interventions that public and private

decision-makers have in their toolbox and of how targeted TCA assessments can help illuminate which ones to deploy to achieve agrifood systems transformation goals.

Economic levers

Taxes and subsidies

Taxes and subsidies affect the pricing of various goods, thereby influencing consumer choice. The impact of a given tax or subsidy varies for different food items due to the price elasticity (or responsiveness) of demand. For instance, many food items demonstrate inelastic demand, meaning a price increase leads to a less than proportional decrease in demand (for example, a 10 percent price hike results in a less than 10 percent drop in demand). Designing effective taxes and subsidies, therefore, needs to consider how demand for a food item is likely to respond to changes in its own price and in the prices of other items.

Notably, taxes on sugar-sweetened beverages (SSBs) are among the most widely used economic levers for reducing health hidden costs and have been introduced in more than 100 countries and territories.[71] These beverages are associated with obesity and chronic diseases such as type 2 diabetes.[72] Many countries have implemented taxes to make these items pricier, effectively reducing their sale. Research generally shows these taxes to decrease sales by more than the price increases, with elasticities slightly above 1.[73, 74] The impact is notably more pronounced on lower-income households, which often suffer the most from related health issues.[73, 75] Interestingly, much of these taxes' effectiveness may stem from increased consumer awareness about the health implications, rather than the price hike itself.[76] Similarly, positive results from subsidizing the consumption of fruits and vegetables have been reported in places where demand is more elastic.[77] This insight supports the combination of food taxes and subsidies with labelling measures, as discussed later.

Not all food taxes and subsidies have proved as successful as sugar taxes. In general, both taxes and subsidies affect sales in the direction intended – albeit it on a smaller scale than sugar taxes – while the effects on consumption are somewhat mixed.[77] This probably happens because, given sufficient income, the demand for most food groups is quite inelastic.[18] For instance, a study of food consumption in France found that an environmental tax on animal products would be less effective than expected in reducing emissions associated with these items. In addition, consumers would be more likely to substitute certain animal products (such as meat) with others (such as fish or eggs) when the price of one increased – rather than consume more plant-based products.[78] However, in countries where the demand for the same products is more elastic due to the lower income of consumers, such as in Indonesia, the effect is likely to be far greater.[79]

Introducing a new tax on certain food groups is likely to be unpopular, particularly if it proves to be regressive, affecting basic goods with inelastic demand and accounting for a large portion of lower-income households' spending. A politically more feasible option could be to reform existing tax regimes. A recent paper found that a VAT reform to decrease taxes on fruits and vegetables and increase taxes on animal products would have the potential to address environmental and health hidden costs in Europe without affecting government revenue.[80]

True pricing initiatives to reflect the true cost of food in market prices act like a tax in principle, so their effect on consumer behaviour may be limited for goods with inelastic demand (Box 18 in **Chapter 3**). Notably, unlike taxes, such initiatives provide transparency to consumers about the reasons why true prices are higher and provide options to support sustainable production. Even if no behavioural change is observed in the short run, true pricing may facilitate change in the long run. To be fully effective, however, all food items would need true pricing to prevent consumers from mistaking non-labelled items for products having lower hidden costs – this is discussed further in relation to labelling below.

Overall, a combination of taxes and subsidies with other levers that aim to change diets directly, either through improved information to instigate behavioural change or through regulations to improve the nutrient profile of food during the production stage, is essential.[81]

Social safety nets

The effectiveness of taxes and subsidies in improving suboptimal diets by themselves hinges on the assumption that consumers do not face budgetary constraints to cover basic nutrient needs. Nevertheless, as discussed in Box 23 and confirmed in the 2024 edition of *The State of Food Security and Nutrition in the World*, undernutrition remains a problem not only in protracted crisis and traditional agrifood systems, but also in low-income households of the other agrifood systems categories. Therefore, social safety nets – for example, cash or in-kind transfers and school feeding programmes – are crucial poverty-reducing measures. They act by increasing the budget available for food in these households without affecting the prices of food items, so can alleviate food insecurity while promoting social inclusion, particularly of women, youth, Indigenous Peoples, persons with disabilities, and the rural poor.[86–91]

Cash transfer programmes can be effective interventions to reduce hidden costs linked to undernutrition and poor diet. For instance, a systematic review and meta-analysis of cash transfer programmes to households with children under five years of age in countries with gross domestic product per capita of less than USD 10 000 at baseline found that cash transfers improved linear growth and reduced stunting among young children.[92] Another meta-analysis found that social protection programmes improved both the quantity and the quality of food consumed by beneficiaries.[93] The faster rise in food expenditure compared with caloric intake indicates that households use the transfers to improve their dietary quality, particularly by increasing their consumption of animal source foods. Given the low consumption of animal source foods in these populations and the high nutrient content of many such foods, this is a positive outcome.

Social safety net programmes can be a profitable long-term public investment. For instance, the Supplemental Nutrition Assistance Program in the United States of America, which provides benefits to low-income individuals and families for the purchase of nutritious foods, has been estimated to yield USD 56 of public benefits per dollar invested.[94] The programme helps households to redirect part of their expenditure to additional services such as health care. Indeed, research finds this type of programme to be successful in increasing health care utilization by recipients, with many additional positive outcomes.[95] In addition, school meals, the largest and most widespread global food safety net today, can be instrumental in changing consumption patterns over generations when accompanied by effective food and nutrition education that aims to build competences and skills to empower children to make better dietary choices.[96]

However, the design of social safety net programmes needs to be tailored to the specific context. In countries and territories with protracted crises in particular, programmes need to be able to promptly adapt to the dynamic conditions and multidimensional problems – including conflict and war, political instability, and restrictions on the availability of food – that exacerbate situations of chronic food insecurity and malnutrition.[97, 98] The effectiveness of cash transfers, for example, is limited due to the displacement of many recipients, scarce access to resources, disruption in connectivity, and fluctuating prices.[99] These circumstances and systemic fragilities require specific interventions. To prevent agrifood systems from disintegrating and creating long-term dependency on external funding in these situations, designing and incorporating exit strategies into emergency response interventions is crucial. A well-designed intervention with an exit strategy could also incorporate long-term solutions for the environmental, social and economic sustainability of local agrifood systems.

Therefore, social safety nets that are designed to be nutrition-sensitive are powerful levers for improving diets and addressing the hidden costs associated with agrifood systems. By enhancing food security, promoting social inclusion and boosting diet quality, these programmes offer a comprehensive approach to tackling undernutrition and poor diets, and their broader implications. To fully document their impacts on all agrifood systems transformation objectives, targeted TCA assessments can help identify trade-offs and synergies for improved design and effectiveness.

Non-economic levers

Monetary levers need to be complemented by additional measures in order to fully channel consumer purchasing power to healthier and more sustainable dietary patterns. A set of non-economic levers can increase the responsiveness of consumers to changes in price: labels and certifications, advertising policies, education, and nudges. These policies aim to facilitate behavioural change towards healthier and more sustainable diets and can be effective with or without additional price interventions.

Labels and certifications

Labelling schemes are a tool used to inform consumers about the performance of a product with regard to a range of health, environmental, ethical or social indicators. Such schemes are therefore useful for addressing hidden costs in all domains. In general, labels and certifications are promoted by policy, research and civil society organizations. They mostly have a cumulative effect, meaning they do not trigger an immediate shift in behaviour and are particularly beneficial when deemed credible, either because they are supported by trustworthy third-party verification or because they appear familiar to the consumer in the long run.

The need for governments to encourage behavioural change with a view to sustainability and better health outcomes has led many countries to promote the use of these levers. An interesting study investigated the effectiveness of a carbon label on a dish on a menu and found that repeated exposure to the label shifted regular clients' purchasing habits towards more sustainable dishes, but had a diminishing effect over time.[100] Multicomponent policies, such as those implemented in Chile in 2016, utilize measures such as front-of-package warning labels, restrictions on marketing to children, and limitations on the availability of unhealthy products in schools (Box 26). Studies indicate that such policies lead to decreased purchases of high-calorie, high-sugar, high-sodium and high-saturated-fat products. As not all products have the labels, however, consumers often switch to unlabelled products, sometimes mistakenly perceiving them to be healthier.[83, 101] Such unintended consequences can be prevented by standardizing labelling across all products.[102]

Evidence supporting the benefits of front-of-package warning labels has generated significant momentum, prompting numerous states to implement mandatory policies.[103] Argentina, the Plurinational State of Bolivia, Brazil, Chile, Colombia, Ecuador, the Islamic Republic of Iran, Israel, Mexico, Peru, Singapore, Sri Lanka, Thailand and Uruguay have already enacted mandatory front-of-package labelling. In addition, countries such as the Plurinational State of Bolivia, Canada and the Bolivarian Republic of Venezuela are in the process of developing, or have recently passed, similar legislation.[104] Nonetheless, there are limitations to this approach if labelling schemes are too complex in a context where quick decisions about food choices may limit processing of information, or if competing priorities lead consumers to difficult trade–off choices (for example, between health, environmental or other benefits).[105]

In general, such policies need to be supported by consistency, standardization and information campaigns.[106] Where enforcement by regulatory authorities is lax, a proliferation of misleading dietary labels – for example, "clean" labels in the United States of America – can cause harm by promoting false claims about health benefits. Furthermore, misleading labels may exacerbate cultural trends involving food moralization and a preoccupation with "healthfulness", disproportionately harming vulnerable consumers such as those at increased risk of eating disorders or with chronic health conditions.[107]

On the supply side, firms often reformulate their products and adjust prices to comply with regulations, resulting in healthier, albeit more expensive, production.[101, 108] Additional studies reveal shifts towards healthier eating habits among families, particularly low- and middle-income mothers and their children, attesting to the effectiveness of such policies on consumer behaviour.[109] Sugar-sweetened beverage warnings have also been supported as effective population-level strategies for behavioural change.

Comparisons with other policy instruments, such as sugar taxes, highlight the advantages and disadvantages of food labels. While labels are more progressive and targeted, they may be less effective in addressing non-informational factors, such as lack of self-control. At the same time, the efficacy of SSB taxes in influencing consumer purchases becomes more pronounced when the amount is prominently displayed on price tags.[76] In general, labels can be beneficial, but given the complexity of shifting dietary preferences, for maximum effectiveness, they should be accompanied by policies other than information dissemination, such as financial incentives.[110] Additional interactive digital interventions can encourage consumers to choose more healthful foods when shopping by increasing the personal relevance of nutritional information in food choices.[110] Basket feedback, for example, integrates nutritional information of multiple food choices into an overall indicator which makes it easier for individuals to keep track of their basket's healthfulness.[111, 112]

Similar to dietary labels, **voluntary standards and certifications** (such as organic or fair trade) address information constraints that may prevent the consumption of items more in line with sustainable agrifood systems objectives. As discussed in **Chapter 3**, certifications are increasingly being used by agribusinesses to shift consumer behaviour towards more sustainable or fairly produced items. In general, certifications inform consumers on whether the product meets specific standards or criteria in terms of quality, sustainability or social impact. As certified products tend to apply a quality-based price premium, their impact on purchasing behaviour is subject to consumers meeting their basic consumption needs. Governments can increase their effectiveness by setting certification standards for third-party certifying bodies and incorporating certified products into other levers discussed above, for example, by subsidizing certified products or including them in public procurement, social safety nets or educational campaigns.

Marketing

The significant influence of marketing and advertising in shaping dietary behaviours is undeniable. Unfortunately, when not regulated, it can promote unhealthy food choices, especially by children. World Health Organization recommendations on the marketing of food and non-alcoholic beverages to children clearly state that the policy aim should be to reduce the impact on children of marketing of foods high in saturated fats, trans-fatty acids, free sugars or salt.[113]

In Canada, efforts to monitor the food marketing landscape have revealed that Canadian children are consistently exposed to substantial volumes of persuasive advertising for unhealthy foods and beverages.[114] Evidence suggests that policies limiting food marketing may result in reduced purchases of unhealthy foods and unintended consequences favourable to public health, with positive effects on children's eating preferences, in particular.[115, 116] These findings underscore the pressing need for robust government intervention to address this issue.

To promote healthy diets, governments can implement food marketing restrictions based on evidence-based research, such as TCA assessments. By using frameworks developed through comprehensive monitoring initiatives such as Health Canada's M2K strategy, policymakers can establish effective guidelines to regulate food advertising practices.[114] These regulations could include restrictions on advertising unhealthy food and beverage products to children, and moves to promote the marketing of nutritious food options.

Another leading example is Chile's law on food labelling and advertising, including very stringent restrictions on the promotion of regulated foods to children under 14 years (Box 27). Early evidence indicates that the first phase of Chile's regulations was associated with reductions in child and youth exposure to unhealthy food marketing on television and with declines in the consumption of unhealthy foods.[117]

Education

Education to promote food literacy and understanding of social and environmental responsibility is a critical lever for policymakers aiming to change household consumption patterns. By educating consumers about nutrition, healthy eating and the impact of their »

BOX 27 POLICIES REINFORCING HEALTHY FOOD ENVIRONMENTS: THE CASE OF CHILE

Taxes on sugar-sweetened beverages and highly processed foods have proven effective in reducing the consumption of unhealthy foods while raising revenue for other programmes. However, there are clear practical and political limits to addressing the risks of non-communicable diseases with fiscal policies. This has motivated the design of integrated and reinforcing complementary approaches to guide consumer behaviour. To this end, Chile drafted a Food Labelling and Marketing Law that has been effective in achieving its goals and proved influential throughout Latin America.

The law recognizes the limitations of piecemeal policies, so combines three pillars: i) use of labels on the front of packaging to warn consumers that a food product has high levels of calories, total sugars, saturated fats and/or sodium; ii) limitations on the advertising and marketing of foods with high levels of unhealthy ingredients to children under the age of 14; iii) banning the sale or free distribution of unhealthy foods in schools, including nursery schools.

The policy guidelines considered three years of input from regulatory agencies, academia and civil society, following a ten-year period of discussion for approval of the law. A first, problematic step was deciding how to define unhealthy foods, leading to a proposal based on the nutrient content of natural foods, considering only foods and beverages with ingredients that added sugars, fats or sodium. Negotiations with the food industry led to a plan for implementation over three phases, with increasingly stringent cut-off points for defining unhealthy foods and beverages.[82] It was also recognized that nutrition labels were generally hard to read and overly technical for the average consumer. Hence, the law mandated the placement and size of black octagon warning labels that had to appear on the front of packages informing consumers that a food product had higher levels of calories, sugars, saturated fats and sodium than were deemed healthy. These labels were introduced in the initial phase of the law in 2016, together with strict marketing restrictions on unhealthy products, which included outlawing TV advertisements in programmes directed at children and banning cartoon characters or sports figures on the front of packages. Promotions and free samples were also restricted; two years later, the advertising regulation extended to include all TV advertisements aired between 06.00 and 22.00.

Evidence from the first phase of the law's implementation has confirmed a reduction in purchases of beverages and food items with warning labels and a shift to similar products without such labels.[83, 84] Moreover, manufactures have been incentivized to reformulate products that were initially above the cut-off levels so that they no longer require a warning label.[85] No measurable reduction in employment in the food and beverage manufacturing sectors was found in 2016–2019. Cumulative effects, as well as the potential fading out of labelling impacts, are being assessed. Loopholes are also being observed and responses considered. For example, advertisements may shift to social media, which is currently not well covered in the legislation. Moreover, it is possible to reduce the share of sugars in total calories by adding fats, thereby conforming to the letter of the law, but not the intent.

Chile may be the first country in the region to implement a comprehensive integrated strategy, but it is not the only one that has considered such policies. Virtually every country on the continent has implemented or scheduled front-of-package policies, and countries from Columbia to Mexico and Peru have complementary regulations on marketing. They have been aided in this by nutrient profiles approved by the Pan-American Health Organization, which were not available when Chile was designing its standards for front-of-package warnings. In addition, countries such as Argentina have mandatory limits on trans-fatty acids. Networks and shared knowledge, as well as a true cost accounting approach to capture interactions with social and environmental indicators, can refine the design and implementation of these policies to extend effectiveness.

SOURCE: Authors' own elaboration.

» food choices, they can be empowered to make informed decisions. This education begins during childhood and continues throughout adulthood, benefiting both individuals and society at large.

Through schools, children can expand their food literacy beyond what they learn at home or from their surroundings. School meals have been shown to have positive effects on education outcomes and reduce inequalities,[118–120] while also introducing children to new foods. School-based strategies, such as nutrition education and interactive lessons on gardening, ingredient selection and cooking, show high potential for fostering healthy eating habits including increased consumption of vegetables.[121–123] In addition, the introduction of nutrition assistance and education in schools can be an important strategy for addressing undernutrition.[45] Schools can thus foster a unique food environment if crafted carefully.

For adults, education is key to challenging and replacing misguided beliefs, traditions and habits that limit the effectiveness of other measures such as taxes or labels. Misguided beliefs can lead to significant hidden costs (for instance, the once widespread perception that all fat consumption should be minimized to prevent cardiovascular disease).[124] As the breakdown of dietary risks leading to NCDs shows, some fats are beneficial in appropriate amounts and are underconsumed. Conversely, some fat replacements can lead to worse health outcomes.[124] Education can also help to decrease consumer confusion about food choices by clarifying food claims and underlining the accompanying regulations – particularly important where regulation is lax.[107] Thus, nutrition education programmes can directly alter consumer preferences by countering misconceptions and providing general facts, making them an excellent complement to other policies. When various professions such as teachers, procurement officers, health care professionals and journalists have a holistic understanding of healthy diets, they will be better prepared to foster food environments that enable healthy food choices.

Education can also address hidden costs related to environmental and social factors. In Japan, for instance, the comprehensive *shokuiku* (food education) strategy teaches nutrition alongside broader goals of interdependence, gratitude towards nature, cultural emphasis and awareness of the relationships between production, consumption and sustainability.[125] Some TCA initiatives have led to school seminars and courses on the true cost of food products,[126] highlighting the importance of understanding the environmental, social and health impacts of different dietary patterns. Such initiatives are relevant not only to universities (as in the case of India, as covered in **Chapter 2**, or the United States of America),[126] but also to high schools, as in the case of the Kingdom of the Netherlands.[127]

In sum, educational interventions are powerful complementary levers. They help to prevent or remove misconceptions that preclude taxes, subsidies or labels from reaching their full potential. When focused on all types of hidden costs and exploiting the potential of habit formation, educational interventions can achieve significant transformative household action. While these insights are relevant for policymakers and the public administration, they are also actionable by other actors, such as private firms.

Nudges

Consumer spending decisions are characterized by the use of simple practical strategies (called "heuristics") to reduce the complexity of everyday decisions.[128] Most food purchases are likely to be based on quick decisions made with little deliberate thought, which are influenced by marketing campaigns, hunger or impulse. Therefore, the effectiveness of labelling, which targets deliberate thought processes in order to alter behaviour, can be increased when combined with nudges – including those based on social norms – towards healthier food purchases.[129]

Because of this specific behavioural pattern, supermarkets, as well as hotels, restaurants and catering enterprises, try to exploit these heuristics to increase sales. For example, it is well documented that the placement of products in certain aisles of a supermarket and at specific heights results in significant changes in sales.[130] Moreover, the atmosphere (lighting, smell, colours and so on) surrounding the buyer at the moment of purchase also plays a big role in their final decision.[131]

The literature on the effectiveness of these methods for improving the healthiness of food purchases is growing, confirming the potential of nudging to improve dietary patterns.[129, 132, 133] Given the growing evidence, policymakers can consider potential measures to incorporate behavioural nudges to minimize the hidden costs of consumer purchase decisions. The involvement of retailers and food-service providers is key to success, as they have substantial expertise and knowledge that can aid in the design of the interventions. While such actions would be difficult to regulate or enforce by law, some local policymakers have introduced incentives and rules for private food services regarding provision of healthier food options in their menus, such as adding plant-based foods, or providing fruit juices of a limited size as a default beverage rather than carbonated beverages.[134]

Institutional procurement

While individual consumer decisions can drive change, especially in aggregate, the large purchases made by public and private institutions can have significant influence over the way food is supplied, and their food venues offer an opportunity to raise awareness of the necessary agrifood systems transformation.

Indeed, institutional procurement – for example, school and hospital meals – can have a ripple effect, prompting long-term change. School meals, for instance, are the most widespread global food safety net today and play a pivotal role in the generational change of consumption patterns.[96] Considering the substantial volume of food procured in this manner, institutional procurement emerges as a significant force in reducing the hidden costs of agrifood systems, not only through dietary patterns, but also through production practices and social inclusion.[96] Entities involved in food procurement can have a profound impact by requiring TCA data for the products they buy and shifting their decision-making towards maximizing true value.

Brazil's Food Acquisition Program, a large-scale public procurement programme in place since 2003 and aimed at promoting family farmers and assisting people facing food insecurity, demonstrates the importance of procurement in shaping multiple agrifood systems transformation objectives. The programme resulted in a 13.1 percent increase in the production value of participating Brazilian family farmers, particularly benefiting smaller and lower-income farmers. This increase in productivity potentially explains how the programme contributed to the stabilization of rural incomes and expenditures.[135] As an important source of healthy food for food-insecure children, the programme has been shown to increase school attendance.[136] When guided by criteria for the nutritional content of foods, and accompanied by effective food and nutrition education, such programmes can increase the consumption of healthier foods and improve schooling outcomes as a result of more nutritious foods in school canteens.

Similarly, the Good Food Purchasing (GFP) initiative, aimed at driving a positive change in food spending in New York City, outlines procurement as a critical entry point for assessing the hidden costs of food (Box 28).[137] On an annual basis, the Mayor's Office of Food Policy publishes data on the city's food purchases, the foods and meals provided, and the corresponding GFP value metrics of GHG emissions. The programme's scope is to address health, socioeconomic and environmental dimensions in a holistic way, acknowledging that hidden costs are interconnected and affect various facets of society. Its assessment of New York City's food procurement strategies highlighted significant impacts on multiple dimensions. It revealed considerable GHG emissions, underscoring the need for sustainability measures. It also showcased investments in local businesses, including those owned by minority groups and women, promoting inclusivity and economic growth. The assessment also emphasized the public health implications of procurement choices. Experiences such as this underscore the importance of informed decision-making and implementing sustainable practices to benefit cities and their residents.

With the same goals of leveraging the purchasing power of institutions, studies using TCA or similar methods are making the case for reshaping institutional procurement elsewhere. Another interesting proposal is the Public Distribution System (PDS) in India, one of the largest food support programmes in the world,

BOX 28 NEW YORK CITY'S PROCUREMENT POLICY EXPERIENCE: POLICY ENABLERS AND CHALLENGES

Each year, New York City spends more than USD 500 million on food and meals served in a variety of settings, including schools, hospitals, shelters, older adult centres, detention facilities, pantries and community centres.[139] As part of the city's Good Food Purchasing framework, the Mayor's Office of Food Policy publishes data on the city's food purchases and identifies opportunities to increase purchases of low-carbon, plant-rich, whole foods, as well as purchases from small, New York State and/or minority group- and women-owned business enterprise food vendors.

These procurement shifts are already evident in the purchasing data to date. Between fiscal years 2019 and 2022, animal product purchases decreased 10 percent (from 21.89 million kilograms [kg] to 19.53 million kg), the city's food expenditure increased 62 percent (from 38 percent to 57 percent), and spending on food from minority group- and women-owned food enterprises trebled (from 1.3 percent to 5.3 percent). In addition, city agencies' compliance with nutrition standards reached 95 percent.[140]

The goal of these procurement decisions is to realize the co-benefits of lowering greenhouse gas (GHG) emissions, increasing local economic activity and reducing the risk of diet-related chronic disease among New York City residents. To date, New York City has measured the climate impact of its food purchasing using the World Resources Institute's peer-reviewed methodology, which applies North American regional averages for emissions. Using this data, the GHG emissions of New York City's food purchases were estimated to have decreased by 20 percent between fiscal years 2019 and 2022.[140]

The Mayor's Office of Food Policy is partnering with Colorado State University and Cornell University on the City Food Policy Project (CFPP) to understand more localized and comprehensive trade-offs associated with different food procurement decisions and policies in the New York City region. The CFPP, funded by USD 2.5 million in grants from the Foundation for Food & Agriculture Research, the Rockefeller Foundation and the New York Farm Viability Institute, brings together researchers, policy practitioners and food systems stakeholders (both local and international). The CFPP research team compiles and validates local and regional data from New York State, maps relevant supply chains and analyses the social, economic and environmental costs and benefits of different policy actions.

To do so, the CFPP team analyses how consumers and supply chain stakeholders in the region might respond to different procurement decisions in New York City. For example, if the city were to increase its purchases of beans and decrease its purchases of meat, would consumption and food waste patterns shift? What is the bean production and processing capacity of the region? How would small beef producers in upstate New York respond? What would be the overall impact on the region's economy and environment?

New York City's new approach to food procurement requires investment in staff development, inventory and nutrition software systems, and potentially higher-priced food items. Still, this investment has the potential to reduce GHG emissions, lower diet-related chronic disease and increase economic well-being in the long term. In this way, true cost accounting is playing – and will continue to play – a critical role in understanding the social, environmental and economic trade-offs of values-based procurement and advancing the food policy goals of New York City.

SOURCE: Authors' own elaboration.

which benefits around 800 million people. A TCA analysis reveals that the cost of producing a kilogram of rice or wheat is, respectively, 2 or 1.8 times that of producing a kilogram of millet, when accounting for the costs associated with GHG emissions, scarce water use, power subsidies and fertilizer subsidies. Nonetheless, because the yield and production of millet are significantly lower, introducing it into the PDS would require significant investments to increase productivity, expand the area under cultivation, develop infrastructure (procurement, storage and processing) and promote it to a population with a strong taste preference for

staple grains.[141] Nonetheless, the analysis helps to weigh the trade-offs of a possible programme implementation change.

School feeding programmes are one of the most important institutional procurement channels. Not only do they have long-term transformational potential, by changing preferences as well as education and health outcomes, they can also have immediate effects. A study on the true cost of school meals in the United States of America highlights that school meals are essential for the health and economic stability of communities.[142] The study stresses that enhancements to school meals, such as maximizing student participation, improve dietary composition and optimize food purchasing policies, producing an additional USD 10 billion worth of net positive health, equity, environmental and economic impacts. In other studies, the Rockefeller Foundation has used TCA to highlight the advantages of substituting refined grains with fortified whole grains in school meal programmes in Ghana, Kenya and Rwanda, which is expected to lead to USD 250 million of reductions in hidden costs.[143] Indeed, shifting consumption from refined grain foods to fortified whole grain and whole blend foods can improve food security and make diets healthier, and school meal programmes and other institutional and safety nets offer great entry points to initiate this necessary shift across various agrifood systems categories.[144] ■

CONCLUSIONS

Dietary shifts are an important lever for addressing the hidden costs of agrifood systems transformation and steering people towards healthier and more sustainable futures. When consumers buy healthier products or goods produced in a more sustainable and socially responsible way, they signal their priorities to food supply chain actors. With enough momentum, agrifood businesses will respond to the best of their ability, by changing their practices to meet consumer needs.

Nonetheless, such dietary shifts are not happening fast enough. Many consumers face economic constraints on their ability to change the make-up of their food basket. Others prefer the status quo of their food consumption patterns or opt to change only a portion of their diets and purchases. Consequently, while there has been a proliferation of food supply chain actors undertaking sustainability and social goals – for example, through environmental, social and governance claims and reporting – the landscape is uneven, leaving consumers to grapple with conflicting and confusing information about their product choices.

Bringing about such dietary shifts to drive agrifood systems transformation, therefore, requires a mix of levers. The combination of several levers allows not only to increase their positive effects, but also to balance their advantages and disadvantages, boosting public support for the intervention.[145] Levers can use economic influences, such as taxes, subsidies and social safety nets; others aim to affect behavioural change by increasing food literacy and raising awareness about the multidimensional impacts of available food choices. Moreover, restrictions on marketing, especially of unhealthy foods to children, are important. Consumer organizations and associations play an important role in ensuring consumer rights and education. Institutions can also play a critical role by facilitating a unique food environment, such as schools that provide meals and involve children in hands-on and skills-building activities to do with food, while also channelling their purchases to the broader benefit of society. True cost accounting assessments are a powerful tool to help analyse trade-offs and synergies to design effective interventions.

Recalling that every agrifood systems actor – from farmers, agribusiness workers and owners to retailers, financiers and politicians – is also a food consumer, consumers create a hugely influential constituent group with the potential to redirect their power in favour of agrifood systems transformation. Policy interventions to intensify efforts to harness this power need to take a systems approach and combine various levers for greatest effect, while ensuring the right to food. ■

GHANA
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CHAPTER 5
NAVIGATING THE CHALLENGES TO SETTING POLICY AND INVESTMENT PRIORITIES FOR GLOBAL AGRIFOOD SYSTEMS TRANSFORMATION

KEY MESSAGES

➔ Policies and investments to transform agrifood systems in an increasingly globalized world need to carefully navigate the distributional issues that arise when trying to address the hidden costs of agrifood systems.

➔ Giving voice to all actors through stakeholder consultation is a fundamental precondition to successful agrifood systems transformation on any scale.

➔ It is no longer a question of what needs to be done to advance transformation, but how to do it, due to the difficulty of bridging the spatial and temporal divide between actors at opposite ends of the distribution spectrum.

➔ By unveiling spatial and temporal trade-offs and synergies between different policy measures, meaningful stakeholder engagement, coupled with a pragmatic approach to true cost accounting assessment, can inform decisions on the most suitable actions.

➔ Political will to transform the governance of global agrifood systems is paramount in addressing the "hidden constraints" of distributional challenges.

There is no doubt that global agrifood systems must be transformed to achieve the SDGs and the goals of the Paris Agreement. Equally, there is no shortage of proposed pathways and actions for reaching the goals.[1–4] Some actions are easier to implement than others, especially if the actors that need to change behaviour are also the beneficiaries. While intrinsic motivation can sometimes move the needle in the required direction, it is not enough to tip the balance and address all distributional challenges.

For example, increasing crop productivity in a sustainable way is one of the main actions needed globally. Farmers will adopt an improved, high-yielding seed if they are not bound by multiple constraints and can afford the upfront costs, as they can see it will benefit them come harvest time. If the same group of farmers needs to use more water and fertilizer to achieve those high yields, creating negative externalities for downstream farmers in other locations and a higher global carbon footprint (affecting current and future generations), the practice becomes unsustainable and they will not have the incentive to address those costs in the absence of regulation. Similarly, agrifood businesses will have no economic incentive to invest in reducing their environmental footprint if it does not yield higher incomes or customer loyalty (in other words, if there is no business case). Consumers, meanwhile, will not change their diets to include more sustainably and fairly produced items to the extent needed unless they benefit directly from a better environment and fairer wages themselves.

These are stylized depictions of the concept of externalities, introduced into economic thinking to guide welfare policy about 100 years ago.[5] With the industrialization of production, combined with the globalization of agrifood systems, the potential for actors to generate externalities for others has grown exponentially due to the complexity of interdependencies over space and time. It is, therefore, not surprising that TCA assessments that aim to address these interdependencies are more mature in the agrifood systems sector, which has more direct and larger impacts and dependencies on nature and people.[6] They provide a more complete

understanding of our existing agrifood systems, in a precursor to identifying levers for agrifood systems transformation to ensure our health and the health of the planet.[7] ■

DISTRIBUTIONAL CHALLENGES, BARRIERS TO CHANGE, AND HOW THESE CAN BE ADDRESSED

The longer the agrifood value chain, the larger the scope of TCA assessments becomes, making it harder to identify all of the actors who produce hidden costs and those who would benefit from transformative action to address them. As discussed in **Chapter 2**, for some countries a system to finance the transformation pathway will be needed, as the costs are beyond their means. The large disparities in the global food sector tend to create hidden costs that affect marginalized groups disproportionately and are exacerbated by climate change and continuing inaction.[8, 9]

Partly in response to consumer demand for sustainability, but mostly driven by the business case for sustainability, there is an increasing trend among global food companies to report their impacts on natural, social and human capital based on global sustainability standards.[10] Although this multicapital accounting is a welcome step towards sustainable agrifood systems transformation, the omission of the distributional implications jeopardizes a just transition on a larger scale.[9]

In the absence of a change in global food value chains to fully internalize the inequitable consequences of their actions, governments and intergovernmental organizations need to take action to incentivize a just transition. Though some progress was made at the COP28 United Nations Climate Change Conference in November 2023, where governments agreed on the operationalization and funding arrangements of the Loss and Damage Fund to support vulnerable nations dealing with the impacts of climate change,[11] progress on fully operationalizing such initiatives is usually slow. On the bright side, the decision to establish such a fund is a critical step closer to achieving climate justice and may serve as a stepping stone in raising the bar and acknowledging the need for a just transition in global agrifood systems – be it due to climate change or not.

A starting point could be the use of TCA approaches to document the connections between the beneficiaries of today's actions (carried out by primary producers, agribusinesses and consumers) and the bearers of the hidden costs of these actions, be they local or global actors of today, tomorrow or generations to come. By spatially and temporally unveiling trade-offs and synergies between different policy measures, open stakeholder discussions can inform decisions on the most suitable development paths.[7]

Table 3 synthesizes the distributional challenges and barriers to change due to these spatial and temporal divides between agrifood systems actors that produce hidden costs today and those that bear those costs now or in the future. For primary producers, the main challenge is that the beneficiaries of hidden costs are spread throughout the value chain, but the burden of addressing these costs falls on the producers. This issue is exacerbated by asymmetric power relations and difficulties in determining who bears the risk and cost of change. Mechanisms to address these challenges include collective action by producers, as well as regulatory and financial frameworks to support and scale up producer and agribusiness initiatives and broader investment in inclusive rural transformation (see **Chapter 3**).

Food supply chain actors may face situations that deviate from good commercial conduct (for example, unfair arbitrage) or situations of power concentration, and may seek to impose downward price pressure on suppliers. These challenges are compounded by difficulties in determining fair contributions along the value chain and the potential to externalize costs through imports or other means. As noted in Table 3, mechanisms to address these issues include voluntary standards, ESG reporting, »

TABLE 3 DISTRIBUTIONAL CHALLENGES AND MECHANISMS TO ADDRESS SPATIAL AND TEMPORAL DIVIDES BETWEEN AGRIFOOD SYSTEMS ACTORS FOR TRANSFORMATION

Potential stakeholders	Distributional challenges	Barriers to addressing challenges	Local versus global	Today versus tomorrow	Mechanisms today for a sustainable and inclusive tomorrow
Primary producers	▸ Beneficiaries of hidden costs are spread throughout the value chain, but the burden of addressing hidden costs falls on producers	▸ Asymmetric power relations ▸ Polluters are not beneficiaries of abatement ▸ Difficulty in assessing who bears the risk and uncertain cost of change	▸ Environmental pollution with local impact versus global impact of GHG emissions ▸ Social hidden costs at primary production level versus cheaper products globally	▸ Hidden costs linked to flows with immediate impact (e.g. water shortages downstream in the same season) versus those linked to stocks (e.g. GHGs in the atmosphere, groundwater depletion)	▸ Collective action (e.g. cooperatives) can provide a greater say on sharing the burden of addressing social and environmental hidden costs ▸ Regulatory and financial frameworks to support the cost of transition ▸ Inclusive rural transformation to address social hidden costs
Food supply chain actors	▸ Unfair arbitrage ▸ Concentration of power and downward price pressure on suppliers ▸ Intertemporal trade-offs	▸ Difficulty in determining who should contribute along the value chain for a fair solution ▸ Vulnerable groups lack access to decision-making processes ▸ Addressing hidden costs of tomorrow affects competitiveness of today	▸ Social hidden costs along value chains are more visible at local than global level ▸ Potential to externalize costs through imports	▸ Value chain actors tend to maximize profits in the short term, but also manage future risks ▸ Shorter time horizons than needed	▸ Voluntary standards ▸ ESG reporting ▸ Compliance with laws and regulations ▸ Labelling and certification ▸ Industry-wide coalitions to address hidden costs
Consumers/ institutions with purchasing power	▸ Dietary patterns lead to the biggest hidden costs of agrifood systems ▸ Impacts of dietary choices span the whole supply chain, mostly not visible beyond the price tag	▸ Behavioural change requires a long time ▸ It is unknown by how much preferences can be shifted, especially in relation to culture and traditions	▸ Health impacts remain local to who is making the dietary decisions, as opposed to global supply chain actors dictating food composition ▸ Environmental and social impacts may be invisible due to trade	▸ Impacts of dietary choices build up over time ▸ Hidden costs for future health and productivity are less visible today	▸ Consumer labels ▸ Health-positive marketing and promotion ▸ Subsidizing healthy products ▸ Institutional procurement guided by TCA ▸ Nutrition-sensitive social protection ▸ Improved education on hidden costs of consumption decisions
Policymakers, financial organizations, civil society and research organizations	▸ Hidden costs are accumulating a deficit that will lead to a major crisis	▸ Political economy of transfers: polluter pays versus beneficiary of abatement pays ▸ Market concentration ▸ Stakeholder engagement including all relevant actors	▸ Institutions at local, national and global level are needed to address the different challenges	▸ Political economy is driven by needs of today's constituencies ▸ Households in the future (beneficiaries of transformation today) may be asked to finance transformation (e.g. through bonds)	▸ Public and private financing for transformation ▸ Repurposing agrifood support ▸ Laws and regulations ▸ Improved information on hidden costs ▸ Taxing dietary risk factors ▸ Addressing food loss and waste ▸ R&D to increase sustainable production

NOTE: ESG = environmental, social and governance; GHG = greenhouse gas; R&D = research and development; TCA = true cost accounting.

SOURCE: Authors' own elaboration.

» compliance with laws and regulations for agrifood systems actors, labelling and certification, and industry-wide coalitions aimed at addressing hidden costs.

Consumers and institutions with purchasing power are the final link in determining the hidden costs that arise through dietary patterns. Changing these behaviours takes time and is influenced by culture and traditions. Mechanisms to shift consumer behaviour are quite diverse, including consumer labels, health-positive marketing, subsidizing healthy products, nutrition-sensitive social protection, and improved education on the hidden costs of consumption decisions (see **Chapter 4**).

The last column in Table 3 lists selected levers (discussed throughout this report) with the potential to address the hidden costs and distributional challenges inherent in transforming global agrifood systems. Given the interconnectedness between stakeholders and the systems approach taken in this report, the measures listed in each row are not limited to those that the stakeholders listed in the first column have the agency or power to implement. They are selected levers requiring stakeholder consultations for effective implementation, as highlighted throughout this report. ■

STAKEHOLDER ENGAGEMENT IS FUNDAMENTAL TO ACHIEVING A TRUE SYSTEMS APPROACH TO TRANSFORMATION

The aforementioned distributional issues should not sound so daunting as to paralyse stakeholders. Much can be achieved through targeted TCA assessment and stakeholder engagement to advance current levers that successfully increase the awareness, motivation and capacity of agrifood systems actors to maximize the value of agrifood systems globally. All case studies commissioned for this report, regardless of their scope, underscore the importance of involving all interdependent actors within agrifood systems in identifying effective levers to address hidden costs. Effective levers can both redistribute value between actors and create new value as public goods, making government action – local and global – critically important.

As hidden costs exist due to market, policy or institutional failures, agrifood systems actors will not be inclined to fully internalize them based solely on true cost information, as long as these failures are not corrected by policy. For example, agribusinesses may meet only those environmental standards required to maintain brand value and fall short of necessary transformative action. Some companies in the value chain may choose to offset their emissions rather than invest in new projects that could achieve a greater reduction in GHG emissions in the long run. By documenting such trade-offs and opportunities, TCA studies are already helping companies to make decisions that move them closer to the optimal functioning of agrifood systems.

Under increasing consumer pressure for sustainability and amid government regulations on health and environment, agrifood businesses have been self-regulating for quite some time. Voluntary sustainability standards, ESG reporting and multicapital accounting are all steps in the right direction. Global agribusinesses are also increasingly committing to contributing to achieving the SDGs, but as the business case motivation is not enough to fully account for the hidden costs, government regulation and action, as well as guidance from international organizations, are essential, as discussed in **Chapter 3**. Box 29 discusses one example of voluntary agribusiness action on product reformulation with the potential to address the hidden costs of high-sodium diets. The example also provides a cautionary tale, as the resulting decrease in sodium intake could have been ten times greater had consumer behaviour not veered towards saltier products. This highlights the importance of complementary actions that can facilitate behavioural change by bringing the most numerous actors – consumers – to the table.

Ongoing efforts to contribute to the SDGs could benefit from collaboration with the

BOX 29 SODIUM INTAKE TRENDS: BALANCING PRODUCT REFORMULATION AND CONSUMER BEHAVIOUR

Over the past two decades, sodium intake in the United States of America has declined, though the reasons are unclear. By examining detailed barcode-level data on nearly all packaged food products, researchers aimed to determine whether this positive development could be attributed to product reformulation or to a change in consumer preference. The study period covered the time immediately before (2007) and after (2015) the implementation of a key effort to reduce sodium intake – the National Salt Reduction Initiative (NSRI) – which prompted large food manufacturers to voluntarily adhere to proposed targets. Understanding these factors is crucial for policymakers to evaluate reformulation interventions against behavioural change policies.

The main findings include a 4.73 percent drop in sodium intake, though intake remains above recommended levels. While these results may seem encouraging, they have more to do with manufacturer than consumer efforts. Consumers actually shifted their purchases to saltier alternatives, significantly limiting the impact of reformulation efforts on total intake. Manufacturers' product reformulation efforts could have resulted in a 53 percent reduction by 2015 had consumer shopping habits remained constant from 2007. However, changes in consumer behaviour negated more than 90 percent of these improvements. If consumer shopping habits in 2015 had remained similar to those in 2007, the sodium intake reduction targets set by the NSRI and the World Health Organization would have been met. In addition, the research reveals growing sodium intake disparities between different population groups, with black, Hispanic and lower-income households seeing less improvement than white and higher-income households.

The study suggests several policy implications when it comes to addressing both food supply and demand. Voluntary agreements among firms have effectively reduced sodium content, indicating that such initiatives can positively influence the supply side. However, consumer behaviour has significantly limited these gains, as evidenced by the shift to saltier products despite reformulation efforts. This suggests a need for policies that encourage healthier diets, especially in vulnerable communities. Nutritional assistance programmes could be used to promote healthier eating by disproportionately covering nutritious, low-sodium foods, fostering long-term behavioural change in vulnerable groups.

That is not to say that more cannot be done on the supply side, as evidence suggests that manufacturers have not done as much as they could in terms of reducing sodium content in products targeted at children (for example, snacks and ketchup) and have perhaps even worsened their nutritional profile. Policymakers should also consider making detailed nutritional databases accessible for academic research to support further studies and evidence-based policy development.

Despite the challenges, US sodium intake has decreased, influenced by both reformulation and consumer behaviour. Effective policies addressing both supply and demand, especially in vulnerable communities, are essential for sustained progress.

SOURCE: Cengiz, E. & Rojas, C. 2024. What drives the reduction in sodium intake? Evidence from scanner data. *Food Policy*, 122: 102568. https://doi.org/10.1016/j.foodpol.2023.102568

TCA community, as standardized indicators for multiple goals are needed to facilitate the quantification of externalities and the design of incentive schemes that address trade-offs on a larger scale. This would also address some of the confusion created by the polarized discourse on healthy diets by bringing science-based indicators into the public domain. ■

PUBLIC POLICY FOR PUBLIC GOODS

The release of the preliminary results of TCA assessments for 154 countries in *The State of Food and Agriculture 2023* garnered the interest of many governments. The 2024 edition of the report refines those preliminary estimates, confirming

the high degree of certainty that they exceed 10 trillion dollars, and provides a more detailed assessment of policy entry points for governments everywhere. Although TCA is increasingly being used on a smaller scale to bring stakeholders together in certain value chains, its applications at national level remain limited.

Governments everywhere use various policy tools (such as cost–benefit analysis, life cycle assessment or similar) to assess the effectiveness of different interventions to guide decision-making. True cost accounting can support administrative processes for developing policy incentives (positive and negative) that orient all stakeholders (smallholder farmers, consumers, private multinationals and ministries) within a systems approach. In particular, it can ensure that, as much as possible, distortions and distributional issues can be resolved once externalities are evaluated and the true cost of various actions is transparent to policymakers (Box 30).[7]

The one national-level TCA assessment in this report that was part of a policy process was conducted in Switzerland. It underscored both challenges and opportunities. The experience was facilitated significantly by the fact that it was part of an ongoing multistakeholder process to create a vision for national agrifood systems. In addition to validating *The State of Food and Agriculture 2023* national numbers as a good starting point for targeted assessments, the study expanded on them with new components using nationally relevant data sources. One of the key practical lessons is that while data quality is important, a pragmatic approach to TCA can facilitate fruitful stakeholder engagement and help identify where past decisions have failed to fully account for their hidden costs. This study also underlines the role of targeted TCA assessments in course correction by concluding that "prioritization" does not necessarily mean taking action on the largest hidden cost components, but includes investing in pre-emptive actions to prevent today's negligible hidden costs from becoming too big to deal with in the future – for example, antimicrobial resistance in Switzerland.

Alternatively, by exposing the difficulties of addressing large hidden costs, decision-makers may decide to prioritize hidden costs that are more easily addressed by policy in light of existing institutional structures. Within this context, the study underscores the importance of scrutinizing existing agricultural policies, including regulations and subsidies, to reset incentive structures.[12] Similar pragmatic approaches are highlighted in this edition of *The State of Food and Agriculture* as potentially "low-hanging fruit" – for example, the reform of existing agricultural support or VAT on agrifood products without the need for additional government funding. Such pragmatic policies, nevertheless, can create social hidden costs if they disproportionately affect certain subpopulations and would need to be complemented with commensurate measures.

Shaping government policy to meet multiple objectives that affect an increasing number of stakeholders over generations is easier said than done – as the last column in Table 3 shows with a long list of potential levers. At the same time, government interventions are central to sustainable agrifood systems transformation, as without them, markets "are blind to sustainability"[12] and voluntary action will remain insufficient. Therefore, governments make many decisions based on imperfect information to meet their national commitments under current agrifood systems structures.

In industrial agrifood systems – where primary production is input-intensive, value chains are long, urbanization is high and unhealthy dietary patterns create the highest hidden costs – interventions to address unhealthy dietary patterns can be prioritized, thus also addressing a substantial share of environmental hidden costs. Upgrading of food-based dietary guidelines to an agrifood systems approach, mandatory nutrient labels and certifications, and information campaigns on health and environmental impacts (including advertisements, regulations on transparency and reporting standards) are all effective levers. However, as health-focused policies aiming to change consumption behaviour may take a long time to act, this lever cannot be implemented at the expense of actions to address environmental hidden costs in the present. True cost accounting can help parse value created by various interventions.

BOX 30 GUIDANCE FOR NATIONAL GOVERNMENTS ON TRUE COST ACCOUNTING

The cost and complexity of agrifood systems interdependencies that true cost accounting (TCA) aims to document may put off national governments. However, the principles of TCA are not a huge departure from cost–benefit analysis (CBA), a tool used by many governments to make decisions. While there are differences in scope (for example, CBA rarely considers all four capitals), CBA and TCA share similar methodologies and goals, both aiming to measure societal value. This relationship extends to other frameworks that estimate non-market social values, such as life cycle assessments (LCAs), environmental, social and governance impact indices, and Sustainable Development Goal reporting. Life cycle assessments originally came up against similar reluctance among rule-makers due to their perceived complexity, but their use has become more widespread over time as more LCAs, as well as tools and harmonized databases, have become available. Integrating TCA into policy and decision-making processes offers a unified and simplified approach, enhancing the coherence of these efforts.

The State of Food and Agriculture 2023 outlines a policy process that integrates TCA for setting policy priorities and CBA for selecting the best alternatives for transforming agrifood systems. This approach employs systems thinking to evaluate trade-offs and synergies, addressing potential inconsistencies caused by the segmentation of public policy into various departments with conflicting goals. It also emphasizes stakeholder engagement, which enhances policy transparency and refinement by balancing interests and garnering support from various stakeholders.

Such a political framework can be readily implemented by governments that already incorporate CBA and stakeholder engagement into their policymaking processes. Policymakers focused on transformation will recognize the benefits of adopting a TCA-driven approach, which consolidates previous efforts and enhances the coherence of existing initiatives. The potential for improved policy outcomes and the significant value of transforming agrifood systems will encourage them to pragmatically overcome challenges such as data scarcity and to refine their decision-making processes iteratively, in line with TCA principles.

SOURCE: Merrigan, K.A., El-Hage Scialabba, N., Mueller, A., Jablonski, B.B.R., Bellon, M., Riemer, O. & Palmieri, S. (forthcoming). *How and when to use true cost accounting: Guidance for national governments – Background Paper for The State of Food and Agriculture 2024*. Rome, FAO.

In traditional agrifood systems – where primary production is inefficient, value chains are shorter, urbanization is low, and poverty and undernourishment create the highest hidden costs – inclusive rural transformation will remain a priority, including social safety nets as integral policy levers to ensure the food security and nutrition of the most vulnerable. At the same time, the double burden of malnutrition is highest in these agrifood systems, suggesting a need to complement conventional productivity-enhancing interventions with environmental and dietary levers from the outset to avoid the increase in environmental footprint and peak health costs historically observed during agrifood systems transitions.

Transitional agrifood systems (expanding, diversifying and formalizing categories), where urbanization is increasing and food value chains are lengthening as health hidden costs peak, need to invest in redesigning food value chain development to divert the course of nutritional transitions, "leapfrog" certain historical trends in diets and avoid the mistakes of industrial agrifood systems.[13]

Regardless of the agrifood systems context, evidence is building on the effectiveness of bundles of interventions, especially in cases where distributional imbalances create trade-offs between different stakeholder groups.[14, 15] Although most existing evidence is focused on the energy sector, effective strategies identified by this literature can guide agrifood systems policymaking. For example, farmers would be more likely to support a policy regulating nitrogen use if it were bundled with policies

requiring agribusinesses and financial institutions to provide preferential treatment to complying farmers. If a policy package is likely to affect vulnerable populations disproportionately, combining it with compensation measures is likely to increase political support. There is a growing amount of encouraging evidence on the effectiveness of policy mixes that combine traditional economic and behavioural incentives;[14] more research is needed to expand this evidence to cover traditional and transitional agrifood systems.

Health ministries remain largely absent from current discourse on the stakeholder engagement needed for agrifood systems transformation. Though some health ministries have played a central role in instituting notable policies targeting unhealthy food consumption patterns in Latin America, such initiatives are mostly not linked to wider agrifood systems policies. The inclusion of health ministries is an important next step on the global agrifood systems transformation agenda, as even in places where health hidden costs are still relatively low, having them at the table can ensure that food value chains and social safety nets are designed to nip the problem in the bud or avoid the historical peak in unhealthy diets seen in agrifood systems transitions.

In South Africa, the roles of different groups (for example, coalitions on economic growth, food security, agricultural production and health) in the process of designing policy bundles for food security and nutrition were examined.[16] While the economic growth coalition had the most influence, the health coalition had the least, despite the significant health hidden costs generated by the country's agrifood systems (about 9 percent of GDP). This is but one example of the glaring absence of health ministries from the global discourse on advancing agrifood systems transformation objectives. Health policy discourse itself rarely takes an agrifood systems approach, underlining the need for efforts to bridge the gap at both ends.[17] ■

FINANCING LOCAL AND GLOBAL TRANSFORMATION

It is now well established that financial flows to agrifood systems need to increase significantly to pay for the necessary transformation. *The State of Food Security and Nutrition in the World 2024* lists the costs of not bridging the financing gap, including millions of people who will be hungry, food insecure, malnourished and unable to afford a healthy diet, with socioeconomic and health repercussions beyond 2030.[18] Many promising initiatives by the finance sector are increasingly incorporating environmental and social responsibility into their operations (as discussed in **Chapter 3**). Scaling these up sufficiently to achieve global agrifood systems transformation, however, seems to be bound by "hidden constraints". These include the fragmentation of the current food security and nutrition financing architecture and lack of coordination between local and global actors,[18] partly driven by the disconnect between hidden cost producers and cost bearers and the trade-offs between multiple objectives of agrifood systems transformation.

It is feasible to implement some of the levers discussed in this report with national budgets, but this needs to be complemented by private and international financial flows to put global agrifood systems on a sustainable transformation pathway.[18, 19] Where the burden of financing the required actions must fall (on national or international budgets) can be identified using a TCA approach that documents the spatial and temporal separation between the beneficiaries of the status quo and the bearers of hidden costs. This can help scale up successful initiatives, such as the results-based financing achieved through the framework of reducing emissions from deforestation and forest degradation in developing countries (REDD+) in Ecuador and Ghana, highlighted in Box 31. The global cost of transformation is estimated to be within global financial means; however, as its distribution between countries is highly uneven, financing may be necessary. Especially countries affected by multiple drivers of food insecurity and

BOX 31 REDUCING EMISSIONS FROM DEFORESTATION AND FOREST DEGRADATION – REDUCING HIDDEN COSTS BY FINANCING ECONOMICALLY VIABLE AND SUSTAINABLE PRACTICES

Reducing emissions from deforestation and forest degradation in developing countries (REDD+)* is a highly relevant United Nations Framework Convention on Climate Change programme that helps address the hidden costs of agrifood systems.[20] It promotes a paradigm shift in land use, towards sustainable practices that ensure forest protection, enhanced livelihoods and sustainable development. By achieving emission reductions and fulfilling the requirements of the standards, countries or subnational jurisdictions can receive results-based payments that need to be reinvested in further action towards reducing deforestation, contributing to the achievement of the country's nationally determined contributions. Approximately one-third of tropical forest countries making efforts to access REDD+ results-based finance have received payments so far. Some of these countries are using the payment of proceeds to fund direct interventions in sustainable agricultural production models, boosting a virtuous cycle in land use and sustainable development.

A concrete example of REDD+ in action to support transformation to a sustainable agricultural supply chain is the Ghana Cocoa Forest REDD+ Programme (GCFRP). Cocoa farming, crucial to Ghana's economy, has put pressure on forests. Through the GCFRP, Ghana is reducing carbon emissions from cocoa expansion and other agricultural activities by promoting a climate-smart cocoa production system and establishing landscape management that focuses on sustainable farming, forest protection, community governance, and multistakeholder collaboration. The GCFRP also supports other tree crops and nature-based livelihoods within the cocoa forest Hotspot Intervention Areas. In 2023, Ghana received USD 4.8 million from the World Bank for reducing carbon dioxide emissions by 972 000 tonnes, with 69 percent of the payment going directly to cocoa farmers. Furthermore, the private sector recognizes REDD+ as a positive mechanism and vehicle for achieving its sustainable agricultural supply targets.

Another inspiring example comes from Ecuador's PROAmazonía initiative, led by the Ministry of Environment and Water and the Ministry of Agriculture and Livestock. Through efficient management, gender equality, and effective communication among stakeholders, it has successfully led to policies and strategies for natural resource conservation and sustainable commodity production. PROAmazonía has trained local technicians, community leaders and landowners in forest and non-timber forest product management, strengthened the National Forest Monitoring System, and implemented community and protective forest management plans. It has transitioned significant areas to sustainable production, conserved large forest areas, and restored numerous hectares of land, benefiting over 80 000 people.

NOTE: * REDD+ goes beyond deforestation and forest degradation of developing countries (REDD), and includes the role of conservation, sustainable management of forests and enhancement of forest carbon stocks.

SOURCE: FAO. 2022. *Halting deforestation from agricultural value chains: the role of governments*. Rome. https://doi.org/10.4060/cc2262en

malnutrition, climate extremes and conflict have limited access to financing, which calls for innovative and collaborative financing partnerships to ensure a just transition.[18]

Nevertheless, a lot can be achieved within national borders and budgets if there is the political will to bring all stakeholders together to implement incremental steps, such as redirecting agricultural support, reforming tax systems, creating reporting standards for private investors and agribusinesses, and incentivizing consumers to transition to healthier and more sustainable diets. Box 32 showcases a recent manifestation of political will at the European Union level with the adoption of the Corporate Sustainability Due Diligence Directive (CSDDD), which aims to foster sustainable and responsible corporate behaviour »

BOX 32 LEVELLING THE PLAYING FIELD: EUROPEAN UNION CORPORATE SUSTAINABILITY DUE DILIGENCE DIRECTIVE

The Corporate Sustainability Due Diligence Directive (CSDDD) is a new piece of legislation of the European Union aimed at promoting sustainable and responsible business practices across global value chains.[21] Both the European Parliament and the Council of the European Union adopted the directive in 2024 and it came into effect in late July of the same year. It mandates companies to implement robust due diligence processes to identify, prevent and mitigate adverse impacts on human rights and the environment throughout their operations and supply chains. It deters companies from neglecting due diligence to gain competitive advantage. The CSDDD provides a uniformity often lacking in voluntary agreements where only some companies may choose to participate. Notably, the agrifood sector is identified as a high-impact, priority sector.

The directive applies to large companies – both EU companies and non-EU companies with significant business in the European Union – specifically those with more than 1 000 employees and a turnover in excess of EUR 450 million. This focus on the largest companies is designed to ensure significant impact without overburdening smaller enterprises. Companies must continuously identify and assess actual and potential adverse impacts on human rights and the environment. This involves mapping out entire value chains to highlight risk areas and implementing measures to prevent and mitigate those impacts. Regular monitoring and annual reporting on due diligence efforts must additionally be conducted.

Companies are also required to adopt transition plans to align their business models with the Paris Agreement, aiming to limit global warming to 1.5 °C. These plans must be updated regularly to reflect ongoing improvements and adjustments. Meaningful stakeholder engagement is a critical component, ensuring that affected parties, including employees and communities, have their voices heard in the due diligence process. Companies must also establish effective remediation mechanisms to address any adverse impacts that occur.

Each EU Member State appoints authorities to oversee compliance, and companies failing to meet the directive's requirements may face significant fines and civil liabilities. Non-compliant companies may also be excluded from public procurement processes within the European Union. Member States have two years after the CSDDD officially entered into force (on 24 July 2024) to transpose the directive into national law. The directive includes a phased implementation approach, with companies required to start applying the new rules in stages based on their size and risk profile.

The CSDDD is potentially a landmark piece of legislation because it establishes a legally binding framework for corporate accountability and sustainable business practices across global supply chains. However, implementing the CSDDD is likely to present several challenges due to the complexity of global agrifood supply chains. Gathering reliable and verifiable data, conducting comprehensive due diligence and implementing remediation measures associated with the environmental and human rights impacts of suppliers and subcontractors can be a challenging undertaking for companies in terms of resources. At an institutional level, ensuring consistent enforcement across EU Member States and harmonizing the CSDDD with existing national laws and regulations will be crucial to its effective implementation.

Despite these challenges, the CSDDD is a significant step towards promoting sustainable and responsible business practices globally and holding companies accountable for their environmental and social impacts throughout their value chains. As the CSDDD takes effect, it promises to transform corporate accountability by establishing a level playing field in which responsible business practices are the norm.

SOURCE: Authors' own elaboration.

» for a just transition towards a sustainable economy. It aims to go beyond voluntary standards through binding mandates for companies, including those in the agrifood sector, which is among the high-impact priority areas. ■

CONCLUSIONS

Addressing the hidden costs revealed in *The State of Food and Agriculture 2023* and refined in this edition of the report inherently requires the distributional issues entrenched in global and local agrifood systems to be addressed as well. Globally, distributional imbalances occur between populations that enjoy the benefits of the status quo and those that bear the hidden costs – which may be those same populations at some point in the future or future generations separated by space and time. Even within national boundaries, trade-offs between different constituencies arise, as evidenced by the recent farmer protests in many parts of the world.

One of the basic prerequisites to transforming any large system that comprises interconnections between actors with overlapping and conflicting interests is the existence of an effective institutional and regulatory environment. Creating clear rules and standards and instilling trust that they will be fairly applied to all stakeholders, regardless of size or political clout, takes some of the uncertainty out of investments that contribute to sustainability and fuel innovation.[22]

While the global community can always hope for innovation to solve many of the problems of agrifood systems, innovation alone is unlikely to steer agrifood systems towards sustainability under current motivations for innovation (primarily market driven and including the business case) and the accompanying political economy constraints.[12] The governance of global agrifood systems needs to be transformed "through political will and strong accountability at the international level".[23]

In conclusion, the transformation of global agrifood systems requires a multifaceted approach that integrates strong governance, clear regulatory frameworks and inclusive stakeholder engagement. Innovation must be harnessed within a supportive policy environment that addresses both market and non-market failures. The integration of comprehensive TCA assessments is also crucial to understanding the costs and benefits of various actions, ensuring that policy decisions are well informed. By committing to these comprehensive actions, the world can move towards more sustainable and equitable agrifood systems that benefit current and future generations. ■

MOROCCO
Shopping for fruits at a souk.
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ANNEX 1
LIST OF COUNTRIES BY AGRIFOOD SYSTEMS TYPOLOGY CATEGORY

Protracted crisis
Afghanistan
Burundi
Central African Republic
Chad
Democratic People's Republic of Korea
Democratic Republic of the Congo
Eritrea
Ethiopia
Haiti
Liberia
Mali
Mauritania
Niger
Palestine
Sierra Leone
Somalia
South Sudan
Sudan
Syrian Arab Republic
Yemen
Zimbabwe

Traditional
Bangladesh
Benin
Burkina Faso
Cambodia
Cameroon
Comoros
Côte d'Ivoire
Ghana
Guinea
Guinea-Bissau
India
Kenya
Lao People's Democratic Republic
Lesotho
Madagascar
Malawi
Mozambique
Myanmar
Nepal
Nigeria
Pakistan
Papua New Guinea
Rwanda
Senegal
Solomon Islands
Tajikistan
Timor-Leste
Togo
Uganda
United Republic of Tanzania
Zambia

Expanding
Angola
Azerbaijan
Bolivia (Plurinational State of)
Botswana
Cabo Verde
Congo
Djibouti
Egypt
El Salvador
Eswatini
Gambia
Georgia
Guatemala
Honduras
Indonesia
Iraq
Kyrgyzstan
Morocco
Namibia
Nicaragua
Paraguay
Peru
Philippines

Saint Lucia
Samoa
Sri Lanka
Thailand
Uzbekistan
Vanuatu
Viet Nam

Diversifying

Algeria
Armenia
Belize
Bosnia and Herzegovina
China
Cuba
Ecuador
Fiji
Gabon
Guyana
Iran (Islamic Republic of)
Jamaica
Kazakhstan
Lebanon
Maldives
Mauritius
Mexico
Panama
Poland
Republic of Moldova
Romania
Saint Vincent and the Grenadines
Sao Tome and Principe
Serbia
South Africa
Suriname
Trinidad and Tobago
Tunisia
Turkmenistan
Ukraine

Formalizing

Albania
Argentina
Belarus
Brazil
Bulgaria
Chile
Colombia
Costa Rica
Croatia
Cyprus
Dominican Republic
Hungary
Ireland
Jordan
Kuwait
Latvia
Lithuania
Malaysia
Mongolia
Montenegro
North Macedonia
Oman
Portugal
Russian Federation
Saudi Arabia
Slovakia
Slovenia
Türkiye
United Arab Emirates
Venezuela (Bolivarian Republic of)

Industrial

Australia
Austria
Bahamas
Belgium
Canada
China, Hong Kong SAR
Czechia
Denmark
Estonia
Finland
France
Germany
Greece
Iceland
Israel
Italy
Japan
Luxembourg
Malta
Netherlands (Kingdom of the)
New Zealand
Norway
Republic of Korea
Spain
Sweden
Switzerland
United Kingdom of Great Britain and Northern Ireland
United States of America
Uruguay

ANNEX 2
STATISTICAL TABLES

TABLE A2.1 ENVIRONMENTAL, SOCIAL AND HEALTH HIDDEN COSTS (MILLION 2020 PPP DOLLARS)

COUNTRY / TERRITORY	TOTAL HIDDEN COSTS	ENVIRONMENTAL			SOCIAL		HEALTH Dietary risks associated with non-communicable diseases			
		Greenhouse gases	Land -use change	Nitrogen	Agrifood worker poverty	Undernourishment	High in processed foods and additives	Consumption of animal source whole foods	Low in plant whole foods	Low in beneficial fatty acids
WORLD	**11 629 084**	**1 262 977**	**236 996**	**1 451 527**	**505 260**	**60 798**	**2 202 168**	**667 929**	**4 222 404**	**1 019 025**
AFRICA	**1 133 904**	**226 359**	**36 893**	**88 443**	**286 018**	**22 807**	**73 357**	**17 070**	**297 678**	**85 279**
Northern Africa	**332 076**	**26 181**	**5 346**	**30 595**	**11 853**	**2 064**	**40 381**	**7 766**	**148 664**	**59 225**
Algeria (D)	54 881	4 778	–59	5 193	108	277	2 992	841	30 839	9 912
Egypt (E)	158 288	6 905	585	7 789	4 244	798	32 441	4 859	68 155	32 512
Libya (*)	11 598	867	0	643	158	56	675	435	6 980	1 784
Morocco (E)	47 172	3 707	–20	7 771	728	134	2 419	1 033	23 282	8 120
Sudan (PC)	45 526	8 662	4 867	6 052	6 594	768	861	231	12 842	4 649
Tunisia (D)	14 611	1 261	–28	3 147	22	31	994	368	6 566	2 248
Sub-Saharan Africa	**801 828**	**200 178**	**31 548**	**57 848**	**274 165**	**20 744**	**32 976**	**9 304**	**149 013**	**26 054**
Eastern Africa	**298 954**	**64 220**	**8 011**	**22 217**	**136 451**	**9 999**	**9 398**	**2 008**	**39 920**	**6 729**
Burundi (PC)	9 502	580	585	133	7 038	254	136	12	619	144
Djibouti (E)	719	70	6	114	6	33	60	16	349	67
Eritrea (PC)	2 651	437	0	560	877	57	103	19	512	85
Ethiopia (PC)	56 234	14 035	4 695	3 801	24 971	1 361	934	306	5 358	772
Kenya (T)	31 623	5 041	253	4 913	10 759	1 481	1 370	403	6 283	1 121
Madagascar (T)	26 344	2 895	0	1 161	18 107	727	464	19	2 584	388
Malawi (T)	14 338	1 563	911	628	9 756	162	221	19	902	177
Mozambique (T)	31 583	6 727	605	469	20 636	572	433	23	1 946	172
Rwanda (T)	5 232	665	–39	173	3 547	190	158	33	392	113
Somalia (PC)	11 270	3 337	6	1 644	3 983	517	220	20	1 366	178
South Sudan (PC)	14 210	4 807	–185	1 579	4 909	600	441	80	1 627	352
Uganda (T)	22 889	4 129	0	997	14 960	793	404	132	1 252	222
United Republic of Tanzania (T)	33 663	11 377	1 050	4 896	2 207	1 962	2 942	510	7 018	1 700
Zambia (T)	23 999	6 603	124	620	9 725	695	872	192	4 685	481
Zimbabwe (PC)	14 697	1 955	0	529	4 970	595	639	223	5 029	757
Middle Africa	**178 511**	**82 252**	**1 674**	**6 580**	**56 124**	**3 529**	**3 564**	**861**	**20 446**	**3 480**
Angola (E)	24 950	7 449	221	1 209	8 042	706	882	246	5 303	893
Cameroon (T)	14 971	4 300	0	1 081	3 630	171	1 235	149	3 504	901
Central African Republic (PC)	7 199	4 324	2	222	1 672	178	68	25	605	102
Chad (PC)	18 708	8 514	245	3 074	5 053	373	144	8	1 168	128
Congo (E)	5 511	1 147	24	76	1 702	217	232	73	1 813	227

TABLE A2.1 (Continued)

COUNTRY / TERRITORY	TOTAL HIDDEN COSTS	ENVIRONMENTAL			SOCIAL		HEALTH Dietary risks associated with non-communicable diseases			
		Greenhouse gases	Land -use change	Nitrogen	Agrifood worker poverty	Undernourishment	High in processed foods and additives	Consumption of animal source whole foods	Low in plant whole foods	Low in beneficial fatty acids
Democratic Republic of the Congo (PC)	102 902	55 545	1 180	680	35 576	1 770	565	99	6 496	990
Equatorial Guinea (*)	1 522	356	1	21	419	49	122	50	437	66
Gabon (D)	2 749	617	0	216	31	65	316	212	1 120	173
Southern Africa	**93 513**	**13 444**	**–65**	**12 333**	**3 493**	**563**	**8 496**	**4 876**	**44 248**	**6 124**
Botswana (E)	6 767	4 184	–64	267	104	68	197	114	1 629	267
Eswatini (E)	1 530	188	–11	130	195	23	107	54	708	135
Namibia (E)	4 417	1 650	10	937	189	53	137	71	1 197	174
South Africa (D)	80 800	7 422	0	10 999	3 005	419	8 056	4 637	40 713	5 548
Western Africa	**230 851**	**40 261**	**21 928**	**16 717**	**78 097**	**6 652**	**11 517**	**1 558**	**44 400**	**9 720**
Benin (T)	5 587	1 519	0	492	1 127	210	443	35	1 490	271
Burkina Faso (T)	15 404	2 757	3 217	1 161	5 683	266	267	45	1 740	268
Côte d'Ivoire (T)	18 819	3 220	6 634	505	1 430	298	1 124	45	4 576	988
Gambia (E)	1 001	168	–10	74	387	38	41	2	268	33
Ghana (T)	17 527	1 480	969	2 446	4 300	122	2 248	145	5 013	803
Guinea (T)	6 812	2 781	61	740	1 767	152	226	20	842	223
Guinea-Bissau (T)	1 133	320	86	92	355	41	28	1	174	38
Liberia (PC)	2 802	1 251	101	44	827	108	58	4	345	63
Mali (PC)	16 118	3 224	5 545	1 523	3 821	191	326	56	1 277	155
Mauritania (PC)	3 602	931	0	672	229	54	199	31	1 332	154
Niger (PC)	19 000	3 010	3 014	1 660	10 043	257	167	4	698	147
Nigeria (T)	107 270	16 777	979	6 164	43 837	4 550	5 485	1 071	22 396	6 011
Senegal (T)	9 581	1 713	1 331	854	1 180	167	722	84	3 154	374
Sierra Leone (PC)	3 267	647	0	154	1 714	133	89	6	438	86
Togo (T)	2 929	463	0	137	1 397	65	94	9	657	106
AMERICA	**2 535 669**	**329 258**	**30 521**	**412 306**	**11 828**	**4 520**	**559 235**	**233 603**	**802 662**	**151 735**
Latin America and the Caribbean	**999 537**	**224 346**	**4 061**	**312 811**	**11 554**	**4 520**	**113 450**	**59 797**	**212 280**	**56 718**
Caribbean	**47 958**	**4 354**	**3 297**	**7 121**	**1 647**	**828**	**4 980**	**2 372**	**18 244**	**5 115**
Cuba (D)	20 473	1 675	3 313	2 889	153	0	2 263	1 536	6 440	2 204
Dominican Republic (F)	14 355	1 577	347	3 228	41	85	1 713	552	5 468	1 345
Haiti (PC)	11 058	640	–363	673	1 450	733	758	179	5 499	1 488
Jamaica (D)	2 072	461	0	331	3	10	246	104	839	78

TABLE A2.1 (Continued)

COUNTRY / TERRITORY	TOTAL HIDDEN COSTS	ENVIRONMENTAL			SOCIAL		HEALTH Dietary risks associated with non-communicable diseases			
		Greenhouse gases	Land -use change	Nitrogen	Agrifood worker poverty	Undernourishment	High in processed foods and additives	Consumption of animal source whole foods	Low in plant whole foods	Low in beneficial fatty acids
Central America	**226 336**	**26 058**	**437**	**53 843**	**3 265**	**1 681**	**39 334**	**18 982**	**61 846**	**20 890**
Costa Rica (F)	8 074	561	121	3 535	32	22	995	446	1 945	418
El Salvador (E)	4 171	507	–28	942	83	27	658	125	1 355	504
Guatemala (E)	11 974	1 725	1 345	2 837	904	197	1 301	219	2 591	856
Honduras (E)	8 678	1 371	856	1 869	763	134	827	79	2 055	724
Mexico (D)	178 770	18 057	–1 784	40 295	1 259	1 179	34 113	17 524	50 327	17 800
Nicaragua (E)	8 271	2 890	19	2 943	204	74	395	65	1 401	281
Panama (D)	6 397	946	–91	1 423	21	48	1 046	525	2 172	308
South America	**725 243**	**193 934**	**326**	**251 847**	**6 642**	**2 012**	**69 136**	**38 444**	**132 190**	**30 712**
Argentina (F)	79 346	20 450	–6 027	13 485	82	177	11 886	7 907	26 270	5 117
Bolivia (Plurinational State of) (E)	14 981	9 324	286	1 466	175	84	702	348	2 115	483
Brazil (F)	426 615	112 382	7 729	173 541	2 564	700	33 855	21 295	59 832	14 717
Chile (F)	22 250	2 355	0	1 548	58	162	5 907	2 474	8 350	1 396
Colombia (F)	69 209	14 992	–2 126	28 026	1 800	287	7 530	2 690	11 667	4 342
Ecuador (D)	17 332	4 045	–85	5 249	515	142	1 747	654	4 198	867
Guyana (D)	2 770	1 315	1	206	15	2	219	38	853	121
Paraguay (E)	11 357	6 822	12	1 320	29	15	702	495	1 632	331
Peru (E)	38 753	11 130	551	17 562	887	140	1 842	676	5 099	867
Suriname (D)	1 879	877	–13	182	2	7	150	43	560	69
Uruguay (I)	9 229	2 369	0	2 357	1	31	1 080	635	2 381	374
Venezuela (Bolivarian Republic of) (F)	31 524	7 873	0	6 906	515	265	3 517	1 188	9 233	2 027
Northern America	**1 536 132**	**104 912**	**26 460**	**99 496**	**274**	**0**	**445 785**	**173 806**	**590 382**	**95 017**
Canada (I)	93 872	23 566	0	13 115	3	0	16 571	10 447	23 799	6 371
United States of America (I)	1 442 260	81 346	26 460	86 381	271	0	429 214	163 360	566 582	88 646
ASIA	**5 314 583**	**527 983**	**44 413**	**647 549**	**206 578**	**32 208**	**1 053 655**	**178 624**	**2074 633**	**548 940**
Central Asia	**111 136**	**12 472**	**–4 970**	**9 985**	**688**	**254**	**14 199**	**5 081**	**55 319**	**18 108**
Kazakhstan (D)	41 688	4 422	–6 076	3 599	5	103	7 082	2 593	23 251	6 709
Kyrgyzstan (E)	5 272	572	0	343	77	14	567	157	2 610	933
Tajikistan (T)	7 021	705	232	467	294	50	646	54	3 424	1 149
Turkmenistan (D)	16 121	1 616	0	2 416	15	40	1 835	676	7 371	2 151
Uzbekistan (E)	41 034	5 156	873	3 161	298	47	4 069	1 601	18 663	7 166
Eastern Asia	**2 093 400**	**200 279**	**–5 588**	**320 725**	**2 128**	**18**	**673 777**	**120 601**	**638 595**	**142 864**
China (D)	1 821 208	175 351	–3 636	305 948	2 034	0	584 152	84 057	539 322	133 980

TABLE A2.1 (Continued)

COUNTRY / TERRITORY	TOTAL HIDDEN COSTS	ENVIRONMENTAL			SOCIAL		HEALTH Dietary risks associated with non-communicable diseases			
		Greenhouse gases	Land -use change	Nitrogen	Agrifood worker poverty	Undernourishment	High in processed foods and additives	Consumption of animal source whole foods	Low in plant whole foods	Low in beneficial fatty acids
Japan (I)	191 036	12 723	–549	5 815	59	0	62 399	26 391	77 115	7 083
Mongolia (F)	12 135	4 779	–1 058	3 985	12	18	568	54	3 022	755
Republic of Korea (I)	69 021	7 426	–345	4 977	23	0	26 659	10 099	19 136	1 046
South-eastern Asia	**763 756**	**140 002**	**37 681**	**96 127**	**16 858**	**2 469**	**139 514**	**18 731**	**259 213**	**53 161**
Cambodia (T)	14 973	4 880	443	694	223	76	2 004	287	5 768	598
Indonesia (E)	393 032	76 856	24 834	53 486	11 658	978	63 391	5 711	127 832	28 285
Lao People's Democratic Republic (T)	5 651	2 188	–320	194	123	35	956	82	1 959	434
Malaysia (F)	63 681	9 682	370	7 183	0	211	13 642	2 890	24 533	5 170
Myanmar (T)	51 401	14 967	655	4 011	1 478	176	8 881	923	17 434	2 876
Philippines (E)	95 968	7 541	1 177	7 628	2 457	309	21 428	3 422	43 211	8 794
Thailand (E)	73 743	12 423	5 216	12 128	54	448	14 903	4 883	19 887	3 802
Timor-Leste (T)	1 192	131	1	204	96	27	156	9	454	115
Viet Nam (E)	64 115	11 335	5 306	10 599	768	209	14 154	524	18 135	3 086
Southern Asia	**1 835 293**	**145 839**	**15 522**	**149 597**	**181 425**	**25 386**	**181 361**	**16 598**	**866 464**	**253 101**
Afghanistan (PC)	17 057	1 641	49	651	3 628	974	369	149	7 662	1 934
Bangladesh (T)	118 751	10 467	3 675	11 927	12 668	1 194	14 404	670	55 506	8 240
India (T)	1 338 349	97 921	–199	92 485	146 697	16 992	128 955	9 203	650 660	195 634
Iran (Islamic Republic of) (D)	115 794	10 920	10 924	30 097	530	601	10 014	2 708	37 131	12 868
Nepal (T)	20 268	2 736	0	1 056	1 946	144	2 655	258	8 412	3 061
Pakistan (T)	202 329	21 045	123	11 807	15 645	5 354	19 675	3 338	96 219	29 123
Sri Lanka (E)	22 744	1 109	950	1 576	311	126	5 287	272	10 872	2 242
Western Asia	**510 998**	**29 391**	**1 767**	**71 115**	**5 479**	**4 081**	**44 803**	**17 614**	**255 042**	**81 706**
Armenia (D)	7 416	283	–4	826	27	34	876	403	3 595	1 377
Azerbaijan (E)	18 146	1 340	174	1 596	33	23	2 924	490	8 207	3 361
Georgia (E)	8 063	440	–75	374	148	13	1 388	239	4 494	1 042
Iraq (E)	62 890	2 306	1 225	3 199	110	898	3 482	868	38 882	11 921
Israel (I)	10 769	1 011	756	1 371	5	0	2 571	1 515	3 183	356
Jordan (F)	9 944	647	–29	663	2	121	792	468	5 985	1 296
Kuwait (F)	8 282	724	–1	350	0	0	1 092	920	4 136	1 060
Lebanon (D)	4 212	423	25	425	0	53	361	408	1 968	549
Oman (F)	5 119	893	628	462	24	17	272	207	2 067	551
Qatar (*)	4 336	894	68	483	0	0	728	366	1 534	264
Saudi Arabia (F)	163 617	5 333	441	3 492	0	330	14 750	2 801	105 161	31 310

TABLE A2.1 (Continued)

COUNTRY / TERRITORY	TOTAL HIDDEN COSTS	ENVIRONMENTAL			SOCIAL		HEALTH Dietary risks associated with non-communicable diseases			
		Greenhouse gases	Land -use change	Nitrogen	Agrifood worker poverty	Undernourishment	High in processed foods and additives	Consumption of animal source whole foods	Low in plant whole foods	Low in beneficial fatty acids
Syrian Arab Republic (PC)	6 208	1 089	–1	244	1 203	177	192	60	2 113	1 131
Türkiye (F)	176 596	11 493	–1 599	56 070	74	1 711	13 352	7 891	62 976	24 629
United Arab Emirates (F)	13 557	1 486	0	1 022	0	0	1 813	947	6 583	1 707
Yemen (PC)	11 841	1 030	161	540	3 854	704	209	32	4 158	1 153
EUROPE	**2 421 373**	**157 403**	**11 826**	**264 222**	**667**	**942**	**504 470**	**230 285**	**1023 749**	**227 810**
Eastern Europe	**1 203 366**	**71 066**	**4 348**	**117 444**	**206**	**921**	**241 465**	**78 616**	**545 757**	**143 546**
Belarus (F)	39 067	7 196	0	3 230	0	0	3 033	2 658	17 913	5 036
Bulgaria (F)	41 252	1 271	835	2 467	13	31	13 531	2 868	16 308	3 927
Czechia (I)	42 483	1 621	592	3 136	0	0	11 959	4 442	15 656	5 078
Hungary (F)	50 223	2 160	–519	3 950	8	0	14 690	4 139	20 372	5 423
Poland (D)	140 102	10 742	4 904	6 195	10	0	31 007	16 122	56 745	14 378
Republic of Moldova (D)	10 913	434	0	1 692	2	0	1 160	358	5 574	1 694
Romania (D)	94 818	3 102	–1 055	11 491	148	0	30 408	6 366	32 602	11 757
Russian Federation (F)	633 192	35 828	0	64 268	9	732	121 564	34 708	303 878	72 206
Slovakia (F)	20 755	521	0	1 509	9	0	5 618	1 962	8 355	2 781
Ukraine (D)	130 561	8 192	–409	19 507	7	158	8 494	4 991	68 354	21 266
Northern Europe	**287 158**	**26 335**	**4 227**	**35 245**	**133**	**0**	**56 298**	**30 001**	**116 345**	**18 576**
Denmark (I)	17 967	1 709	–50	5 164	1	0	2 987	2 135	5 154	866
Estonia (I)	5 648	790	–7	627	1	0	903	331	2 710	293
Finland (I)	17 632	2 230	0	984	0	0	3 086	1 589	8 361	1 381
Iceland (I)	1 061	196	6	334	0	0	123	86	278	37
Ireland (F)	20 503	3 269	163	4 231	1	0	3 024	2 650	5 838	1 328
Latvia (F)	10 541	900	1 716	717	2	0	1 983	472	4 083	669
Lithuania (F)	16 397	1 903	–15	2 329	2	0	3 431	1 170	6 419	1 158
Norway (I)	13 002	1 229	–1	1 829	1	0	3 127	1 705	4 815	295
Sweden (I)	25 937	3 880	0	2 018	5	0	5 601	2 894	9 877	1 663
United Kingdom of Great Britain and Northern Ireland (I)	158 470	10 227	2 415	17 012	119	0	32 033	16 968	68 809	10 887
Southern Europe	**393 502**	**23 395**	**3 280**	**51 631**	**306**	**21**	**92 335**	**47 114**	**147 362**	**28 058**
Albania (F)	4 064	345	–23	500	4	12	1 310	95	1 231	589
Bosnia and Herzegovina (D)	9 196	426	672	636	2	0	2 858	390	2 888	1 324
Croatia (F)	14 258	670	–53	1 195	4	0	3 865	1 192	5 781	1 604

TABLE A2.1 (Continued)

COUNTRY / TERRITORY	TOTAL HIDDEN COSTS	ENVIRONMENTAL			SOCIAL		HEALTH Dietary risks associated with non-communicable diseases			
		Greenhouse gases	Land -use change	Nitrogen	Agrifood worker poverty	Undernourishment	High in processed foods and additives	Consumption of animal source whole foods	Low in plant whole foods	Low in beneficial fatty acids
Greece (I)	28 298	1 677	–406	5 651	30	0	4 923	3 390	9 736	3 296
Italy (I)	175 419	9 235	–837	19 209	106	0	39 210	22 168	75 797	10 531
Montenegro (F)	2 432	76	192	204	2	0	761	97	769	332
North Macedonia (F)	5 652	255	0	388	23	9	2 029	217	1 974	756
Portugal (F)	24 210	1 457	4 137	3 004	7	0	4 227	3 136	7 263	979
Serbia (D)	25 631	1 650	–15	1 404	50	0	8 265	1 419	9 367	3 492
Slovenia (F)	5 694	405	–6	486	0	0	1 943	602	1 818	447
Spain (I)	98 648	7 200	–382	18 953	79	0	22 945	14 408	30 737	4 708
Western Europe	**537 347**	**36 608**	**–28**	**59 904**	**22**	**0**	**114 373**	**74 554**	**214 286**	**37 629**
Austria (I)	23 921	1 302	–282	2 376	9	0	5 622	3 114	9 106	2 674
Belgium (I)	30 964	1 782	666	5 599	1	0	7 365	4 422	9 759	1 369
France (I)	166 822	12 906	–327	28 145	8	0	28 277	24 074	66 964	6 773
Germany (I)	254 644	14 680	0	17 614	1	0	60 733	33 231	105 060	23 326
Netherlands (Kingdom of the) (I)	39 818	4 876	–52	4 347	2	0	7 946	6 734	14 086	1 879
Switzerland (I)	21 177	1 061	–34	1 821	0	0	4 430	2 981	9 310	1 608
OCEANIA	**223 554**	**21 974**	**113 343**	**39 005**	**170**	**321**	**11 450**	**8 346**	**23 683**	**5 262**
Australia and New Zealand	**211 129**	**18 783**	**113 221**	**38 624**	**19**	**0**	**10 293**	**8 025**	**17 928**	**4 237**
Australia (I)	191 402	14 467	114 626	28 138	19	0	8 702	6 738	15 156	3 556
New Zealand (I)	19 727	4 315	–1 405	10 487	0	0	1 591	1 287	2 772	681
Melanesia	**12 425**	**3 191**	**122**	**381**	**151**	**321**	**1 157**	**321**	**5 755**	**1 025**
Fiji (D)	2 326	64	–1	161	20	5	349	203	1 378	147
Papua New Guinea (T)	9 018	3 070	109	179	68	297	704	100	3 733	758
Solomon Islands (T)	732	29	13	13	33	17	69	7	472	78
Vanuatu (E)	349	28	0	28	30	3	35	12	172	42

NOTES: All values are expected values. Negative values for hidden costs due to land-use change are driven by the return of forest or other natural land on abandoned agricultural land (through afforestation or reforestation) leading to hidden benefits in the form of returned ecosystem services – herein expressed as negative hidden costs. The letters in parentheses refer to the typology to which the country belongs: protracted crisis (PC); traditional (T); expanding (E); diversifying (D); formalizing (F); industrial (I); not applicable (*). For the breakdown of the dietary risks associated with non-communicable diseases, see Table A2.2. For the methodology, refer to FAO. 2023. *The State of Food and Agriculture 2023. Revealing the true cost of food to transform agrifood systems*. Rome. https://doi.org/10.4060/cc7724en; 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. https://doi.org/10.4060/cc8581en; Lord, S. 2024. *Hidden costs of agrifood systems: an update to the methodology for the State of Food and Agriculture 2024*. Rome, FAO.

TABLE A2.2 HEALTH HIDDEN COSTS BY DIETARY PATTERN (MILLION 2020 PPP DOLLARS)

COUNTRY / TERRITORY	HEALTH Dietary risks associated with non-communicable diseases												
	High in processed foods and additives				Consumption of animal source whole foods		Low in plant whole foods					Low in beneficial fatty acids	
	Processed meat	Sugar-sweetened beverages	Sodium	Trans-fatty acids	Low in milk	High in red meat	Whole grains	Legumes	Nuts and seeds	Fruits	Vegetables	Polyunsaturated fatty acids	Seafood omega-3 fatty acids
WORLD	**624 815**	**187 939**	**1 318 915**	**70 498**	**138 738**	**529 191**	**1 479 604**	**326 937**	**483 940**	**1 313 541**	**618 384**	**537 828**	**481 197**
AFRICA	**17 229**	**7 117**	**28 781**	**20 231**	**3 810**	**13 260**	**102 170**	**12 264**	**36 114**	**87 487**	**59 641**	**44 429**	**40 850**
Northern Africa	**5 788**	**3 695**	**10 690**	**20 208**	**2 078**	**5 688**	**76 556**	**6 211**	**28 797**	**26 041**	**11 059**	**31 414**	**27 811**
Algeria (D)	767	678	1 497	49	208	634	13 475	1 406	5 539	5 533	4 886	3 643	6 269
Egypt (E)	3 901	2 235	6 527	19 778	1 191	3 668	36 550	2 464	15 964	12 737	441	20 812	11 700
Libya (*)	172	116	332	56	159	275	3 390	598	812	1 265	916	501	1 284
Morocco (E)	576	324	1 290	228	314	719	14 201	490	3 908	2 366	2 317	3 598	4 522
Sudan (PC)	130	55	581	95	107	124	5 124	868	2 234	2 710	1 906	1 842	2 806
Tunisia (D)	242	287	463	2	100	267	3 816	384	340	1 431	595	1 018	1 231
Sub-Saharan Africa	**11 441**	**3 422**	**18 090**	**23**	**1 732**	**7 572**	**25 615**	**6 053**	**7 317**	**61 446**	**48 583**	**13 015**	**13 039**
Eastern Africa	**1 795**	**422**	**7 174**	**6**	**717**	**1 292**	**5 617**	**1 002**	**1 652**	**16 010**	**15 638**	**3 203**	**3 526**
Burundi (PC)	24	4	108	0	6	6	155	4	95	110	254	57	87
Djibouti (E)	13	2	45	0	6	10	78	13	33	150	74	25	42
Eritrea (PC)	20	4	78	0	8	12	69	12	29	189	213	37	48
Ethiopia (PC)	189	27	718	1	131	176	917	64	370	2 309	1 698	289	483
Kenya (T)	373	99	895	2	126	277	1 043	125	510	2 596	2 009	526	595
Madagascar (T)	56	12	396	0	23	–3	203	106	199	939	1 136	169	219
Malawi (T)	42	12	167	0	3	16	92	20	23	327	440	88	89
Mozambique (T)	73	18	341	0	5	17	220	24	34	854	813	67	105
Rwanda (T)	28	5	125	0	12	21	116	2	33	11	230	44	69
Somalia (PC)	41	6	173	0	15	5	195	53	22	524	572	66	113
South Sudan (PC)	108	42	291	0	34	46	261	33	46	656	632	145	207
Uganda (T)	93	19	291	0	43	89	259	19	12	208	754	150	72
United Republic of Tanzania (T)	432	105	2 403	2	184	326	1 155	166	22	2 698	2 978	1 012	688
Zambia (T)	166	29	677	0	48	145	375	170	61	2 314	1 765	282	200
Zimbabwe (PC)	137	38	464	0	76	148	481	191	162	2 124	2 071	247	510

TABLE A2.2 (Continued)

COUNTRY / TERRITORY	HEALTH Dietary risks associated with non-communicable diseases												
	High in processed foods and additives				Consumption of animal source whole foods		Low in plant whole foods					Low in beneficial fatty acids	
	Processed meat	Sugar-sweetened beverages	Sodium	Trans-fatty acids	Low in milk	High in red meat	Whole grains	Legumes	Nuts and seeds	Fruits	Vegetables	Polyunsaturated fatty acids	Seafood omega-3 fatty acids
Middle Africa	**1 462**	**259**	**1 840**	**3**	**197**	**664**	**3 780**	**896**	**553**	**7 284**	**7 933**	**1 961**	**1 519**
Angola (E)	319	69	493	1	69	176	1 167	243	360	1 970	1 563	484	409
Cameroon (T)	532	43	659	1	43	106	812	125	3	1 413	1 151	504	397
Central African Republic (PC)	25	4	38	0	5	20	103	25	4	204	269	49	53
Chad (PC)	49	2	93	0	6	1	255	26	27	442	417	67	62
Congo (E)	85	17	129	0	15	59	293	87	23	588	822	172	55
Democratic Republic of the Congo (PC)	268	46	250	1	28	71	835	307	128	2 304	2 920	474	517
Equatorial Guinea (*)	52	27	43	0	7	43	95	23	1	119	199	62	4
Gabon (D)	132	49	135	0	23	189	220	60	6	243	591	149	23
Southern Africa	**3 205**	**2 247**	**3 044**	**0**	**919**	**3 957**	**4 846**	**1 871**	**4 690**	**20 615**	**12 227**	**2 372**	**3 752**
Botswana (E)	61	20	117	0	27	87	227	44	172	732	455	105	161
Eswatini (E)	36	14	57	0	14	40	72	30	18	266	323	54	81
Namibia (E)	38	10	89	0	12	59	167	41	143	516	329	90	84
South Africa (D)	3 070	2 204	2 781	0	866	3 771	4 380	1 756	4 357	19 100	11 120	2 122	3 426
Western Africa	**4 978**	**494**	**6 033**	**13**	**–101**	**1 659**	**11 372**	**2 284**	**423**	**17 537**	**12 784**	**5 479**	**4 242**
Benin (T)	175	14	253	0	5	30	252	50	22	765	402	144	126
Burkina Faso (T)	96	7	164	0	11	34	240	29	20	829	620	113	155
Côte d'Ivoire (T)	461	50	612	1	–34	79	1 177	463	17	1 507	1 411	543	445
Gambia (E)	15	1	24	0	1	1	34	17	1	131	84	21	13
Ghana (T)	793	107	1 347	1	13	132	1 608	295	18	1 148	1 944	650	153
Guinea (T)	83	6	137	0	6	14	152	55	12	292	330	105	118
Guinea-Bissau (T)	10	1	17	0	1	0	20	13	1	60	81	14	23
Liberia (PC)	23	1	33	0	0	4	49	20	18	125	133	27	37
Mali (PC)	162	16	147	0	16	40	207	33	43	533	461	91	65
Mauritania (PC)	75	8	115	0	9	22	266	26	131	529	381	71	83

TABLE A2.2 (Continued)

COUNTRY / TERRITORY	HEALTH Dietary risks associated with non-communicable diseases												
	High in processed foods and additives				Consumption of animal source whole foods		Low in plant whole foods					Low in beneficial fatty acids	
	Processed meat	Sugar-sweetened beverages	Sodium	Trans-fatty acids	Low in milk	High in red meat	Whole grains	Legumes	Nuts and seeds	Fruits	Vegetables	Polyunsaturated fatty acids	Seafood omega-3 fatty acids
Niger (PC)	66	5	96	0	8	–4	137	5	1	395	160	60	87
Nigeria (T)	2 631	260	2 585	9	–160	1 230	6 447	1 045	87	9 191	5 626	3 286	2 725
Senegal (T)	326	13	384	1	21	64	614	196	43	1 519	782	248	125
Sierra Leone (PC)	31	1	57	0	1	5	82	19	3	201	133	56	30
Togo (T)	31	2	61	0	2	7	85	18	5	311	237	51	55
AMERICA	**286 727**	**92 366**	**175 847**	**4 295**	**25 969**	**207 635**	**278 207**	**64 368**	**36 922**	**238 614**	**184 550**	**36 701**	**115 034**
Latin America and the Caribbean	**30 066**	**24 305**	**54 784**	**4 295**	**9 318**	**50 479**	**68 991**	**9 420**	**23 449**	**50 847**	**59 573**	**22 862**	**33 856**
Caribbean	**1 105**	**861**	**3 012**	**2**	**735**	**1 637**	**6 634**	**1 021**	**1 019**	**3 816**	**5 754**	**1 788**	**3 327**
Cuba (D)	472	480	1 310	1	492	1 044	2 676	253	447	1 565	1 499	1 087	1 117
Dominican Republic (F)	391	283	1 038	0	154	398	2 302	559	267	585	1 755	168	1 177
Haiti (PC)	175	50	533	0	56	123	1 375	172	294	1 402	2 254	487	1 001
Jamaica (D)	66	48	132	0	33	71	281	38	11	264	245	45	33
Central America	**10 810**	**12 032**	**13 773**	**2 719**	**2 102**	**16 880**	**16 815**	**2 222**	**9 177**	**17 093**	**16 538**	**10 291**	**10 600**
Costa Rica (F)	201	202	566	26	97	349	806	86	217	330	506	175	243
El Salvador (E)	131	104	408	15	40	85	394	61	39	503	357	218	286
Guatemala (E)	350	263	683	4	70	149	773	111	171	947	589	307	549
Honduras (E)	110	84	613	20	28	50	422	115	372	646	500	313	411
Mexico (D)	9 723	11 191	10 571	2 628	1 743	15 781	13 777	1 679	8 114	13 359	13 397	9 069	8 731
Nicaragua (E)	81	56	250	8	22	42	192	24	93	564	528	103	178
Panama (D)	214	132	681	19	102	423	451	145	172	743	660	106	201
South America	**18 151**	**11 411**	**37 999**	**1 574**	**6 481**	**31 963**	**45 542**	**6 176**	**13 253**	**29 938**	**37 281**	**10 783**	**19 929**
Argentina (F)	4 115	2 491	5 251	28	1 645	6 262	9 905	2 330	5 012	3 948	5 075	2 372	2 745
Bolivia (Plurinational State of) (E)	64	127	490	21	79	269	582	99	22	687	725	172	311
Brazil (F)	8 330	5 481	18 971	1 073	2 832	18 464	21 387	1 231	695	15 119	21 399	3 398	11 319
Chile (F)	2 747	935	2 224	0	610	1 864	3 424	413	1 011	2 279	1 223	812	584
Colombia (F)	1 063	965	5 427	74	584	2 106	4 031	518	2 168	2 295	2 655	1 975	2 367
Ecuador (D)	309	410	884	143	121	533	1 199	333	624	566	1 475	319	548

TABLE A2.2 (Continued)

COUNTRY / TERRITORY	HEALTH Dietary risks associated with non-communicable diseases												
	High in processed foods and additives				Consumption of animal source whole foods		Low in plant whole foods					Low in beneficial fatty acids	
	Processed meat	Sugar-sweetened beverages	Sodium	Trans-fatty acids	Low in milk	High in red meat	Whole grains	Legumes	Nuts and seeds	Fruits	Vegetables	Polyunsaturated fatty acids	Seafood omega-3 fatty acids
Guyana (D)	58	48	113	0	15	23	174	34	14	377	254	90	30
Paraguay (E)	165	79	438	20	54	441	476	97	102	412	544	77	254
Peru (E)	161	274	1 299	108	240	436	1 330	271	613	1 542	1 343	616	252
Suriname (D)	41	32	77	0	17	27	137	50	12	194	168	11	59
Uruguay (I)	424	176	479	1	92	544	976	192	302	456	455	135	239
Venezuela (Bolivarian Republic of) (F)	674	393	2 345	105	193	995	1 920	607	2 677	2 064	1 965	807	1 220
Northern America	**256 660**	**68 061**	**121 063**	**0**	**16 651**	**157 155**	**209 216**	**54 948**	**13 473**	**187 767**	**124 977**	**13 838**	**81 178**
Canada (I)	8 943	2 294	5 334	0	1 576	8 871	10 793	1 877	446	6 157	4 526	4 621	1 750
United States of America (I)	247 717	65 768	115 729	0	15 075	148 284	198 423	53 071	13 027	181 610	120 452	9 218	79 429
ASIA	**101 867**	**48 075**	**864 719**	**38 995**	**70 412**	**108 212**	**679 868**	**138 119**	**263 149**	**745 107**	**248 391**	**314 911**	**234 029**
Central Asia	**4 170**	**978**	**9 022**	**29**	**268**	**4 813**	**24 104**	**8 757**	**10 992**	**10 687**	**779**	**7 486**	**10 622**
Kazakhstan (D)	2 036	570	4 475	1	132	2 461	10 605	3 480	3 623	5 127	415	2 806	3 903
Kyrgyzstan (E)	142	24	396	5	9	148	1 021	309	489	686	105	357	575
Tajikistan (T)	156	9	476	6	25	30	1 260	467	641	909	148	420	729
Turkmenistan (D)	519	159	1 141	16	19	658	3 087	1 155	1 968	1 093	69	1 107	1 044
Uzbekistan (E)	1 318	217	2 534	1	85	1 516	8 131	3 346	4 272	2 872	43	2 795	4 371
Eastern Asia	**61 501**	**15 526**	**592 977**	**3 774**	**49 518**	**71 083**	**265 214**	**34 291**	**75 267**	**237 585**	**26 237**	**101 659**	**41 205**
China (D)	26 556	8 715	546 131	2 751	35 264	48 793	229 655	30 878	63 315	198 840	16 634	93 373	40 607
Japan (I)	25 978	4 323	32 037	60	11 409	14 982	28 416	1 818	10 059	30 155	6 668	7 068	15
Mongolia (F)	130	19	415	4	15	39	839	342	458	1 051	332	276	479
Republic of Korea (I)	8 838	2 469	14 393	959	2 830	7 269	6 304	1 254	1 435	7 540	2 604	942	104
South-eastern Asia	**6 958**	**5 219**	**127 169**	**168**	**8 870**	**9 861**	**54 037**	**27 792**	**5 962**	**102 879**	**68 543**	**43 357**	**9 804**
Cambodia (T)	67	41	1 895	1	137	150	470	341	123	2 716	2 119	536	62
Indonesia (E)	1 383	565	61 404	40	3 001	2 710	22 563	15 413	2 806	53 685	33 366	21 197	7 088
Lao People's Democratic Republic (T)	31	22	902	0	49	34	293	253	131	759	523	369	66

TABLE A2.2 (Continued)

COUNTRY / TERRITORY	HEALTH Dietary risks associated with non-communicable diseases												
	High in processed foods and additives				Consumption of animal source whole foods		Low in plant whole foods					Low in beneficial fatty acids	
	Processed meat	Sugar-sweetened beverages	Sodium	Trans-fatty acids	Low in milk	High in red meat	Whole grains	Legumes	Nuts and seeds	Fruits	Vegetables	Polyunsaturated fatty acids	Seafood omega-3 fatty acids
Malaysia (F)	1 642	719	11 164	117	1 120	1 770	9 933	3 242	81	6 409	4 867	5 040	130
Myanmar (T)	404	285	8 188	3	457	466	3 105	788	11	9 727	3 803	2 555	322
Philippines (E)	2 182	1 264	17 976	5	1 063	2 360	8 761	5 061	2 470	14 166	12 754	7 710	1 085
Thailand (E)	934	2 102	11 867	0	2 049	2 833	5 648	1 407	16	5 489	7 327	3 333	469
Timor-Leste (T)	4	1	151	0	5	4	54	21	29	207	143	49	67
Viet Nam (E)	310	219	13 622	3	989	–465	3 211	1 266	294	9 721	3 642	2 569	517
Southern Asia	**17 951**	**10 679**	**119 056**	**33 675**	**7 213**	**9 384**	**200 560**	**51 819**	**138 461**	**346 301**	**129 323**	**120 935**	**132 166**
Afghanistan (PC)	70	18	247	33	62	87	2 185	637	738	1 894	2 208	705	1 228
Bangladesh (T)	4 284	134	8 319	1 667	356	313	5 077	3 469	9 780	22 466	14 715	6 355	1 885
India (T)	4 284	8 793	92 288	23 590	5 124	4 079	129 946	37 360	111 035	283 957	88 363	94 414	101 221
Iran (Islamic Republic of) (D)	1 272	1 003	2 805	4 934	870	1 839	24 633	3 341	2 117	4 202	2 838	4 806	8 061
Nepal (T)	901	37	1 386	331	77	181	1 508	527	1 709	2 960	1 708	1 109	1 952
Pakistan (T)	6 771	242	9 544	3 117	582	2 756	34 804	5 792	12 983	25 726	16 915	11 836	17 286
Sri Lanka (E)	367	451	4 467	2	143	129	2 407	693	100	5 096	2 576	1 709	533
Western Asia	**11 286**	**15 673**	**16 495**	**1 348**	**4 542**	**13 071**	**135 953**	**15 461**	**32 466**	**47 654**	**23 508**	**41 475**	**40 231**
Armenia (D)	202	21	644	9	41	362	1 773	663	831	317	11	571	806
Azerbaijan (E)	653	121	1 405	745	93	397	4 063	1 629	1 311	1 078	125	1 456	1 905
Georgia (E)	338	52	986	13	63	176	1 622	521	460	1 286	606	448	594
Iraq (E)	945	427	1 827	282	321	547	17 086	1 984	9 237	8 576	1 999	4 599	7 322
Israel (I)	1 261	636	672	2	331	1 184	2 582	168	16	351	67	198	158
Jordan (F)	259	221	277	35	122	345	3 034	264	282	1 544	861	448	848
Kuwait (F)	259	377	415	41	89	832	2 191	383	489	915	158	458	602
Lebanon (D)	126	91	125	19	79	329	1 588	102	11	228	39	164	385
Oman (F)	69	49	135	19	14	193	859	169	452	253	334	373	178
Qatar (*)	205	411	97	16	50	315	1 298	68	36	114	17	183	81
Saudi Arabia (F)	2 529	7 436	4 725	61	1 000	1 801	38 746	8 053	16 981	24 635	16 745	16 367	14 944
Syrian Arab Republic (PC)	34	23	113	23	17	43	1 172	170	103	331	336	421	709
Türkiye (F)	3 785	5 085	4 473	9	2 103	5 788	54 581	947	1 519	5 630	299	14 356	10 273

TABLE A2.2 (Continued)

COUNTRY / TERRITORY	HEALTH Dietary risks associated with non-communicable diseases												
	High in processed foods and additives				Consumption of animal source whole foods		Low in plant whole foods					Low in beneficial fatty acids	
	Processed meat	Sugar-sweetened beverages	Sodium	Trans-fatty acids	Low in milk	High in red meat	Whole grains	Legumes	Nuts and seeds	Fruits	Vegetables	Polyunsaturated fatty acids	Seafood omega-3 fatty acids
United Arab Emirates (F)	599	717	444	53	196	751	4 071	96	63	1 258	1 095	962	745
Yemen (PC)	22	5	159	23	23	9	1 286	243	674	1 139	816	471	682
EUROPE	**212 857**	**38 720**	**246 820**	**6 074**	**37 870**	**192 415**	**409 929**	**110 163**	**146 419**	**235 518**	**121 721**	**138 186**	**89 623**
Eastern Europe	**74 018**	**11 041**	**155 550**	**855**	**13 349**	**65 267**	**207 568**	**66 471**	**104 019**	**127 055**	**40 644**	**86 594**	**56 952**
Belarus (F)	1 461	52	1 519	0	213	2 445	7 647	3 668	3 357	2 766	476	2 877	2 159
Bulgaria (F)	2 027	543	10 944	17	575	2 293	5 490	1 077	1 844	6 788	1 110	1 510	2 418
Czechia (I)	2 982	942	7 927	109	897	3 546	4 429	2 347	2 263	4 199	2 416	2 632	2 445
Hungary (F)	2 861	731	11 098	0	926	3 213	7 754	1 337	4 187	5 254	1 840	2 573	2 850
Poland (D)	7 479	3 130	20 305	94	3 409	12 713	21 411	5 225	10 534	16 307	3 268	8 115	6 262
Republic of Moldova (D)	583	19	535	23	115	243	1 527	917	1 127	1 346	657	788	906
Romania (D)	5 433	1 604	23 260	111	550	5 816	11 780	4 144	7 478	8 864	334	5 619	6 138
Russian Federation (F)	47 525	3 665	69 947	427	5 193	29 515	117 213	38 830	57 260	63 269	27 306	49 731	22 475
Slovakia (F)	1 252	203	4 092	71	516	1 446	3 443	870	982	2 151	910	1 278	1 502
Ukraine (D)	2 415	153	5 923	3	956	4 035	26 873	8 057	14 987	16 112	2 326	11 470	9 796
Northern Europe	**35 969**	**5 479**	**13 585**	**1 265**	**5 108**	**24 893**	**44 286**	**10 751**	**16 715**	**27 610**	**16 984**	**13 342**	**5 234**
Denmark (I)	1 757	332	899	0	343	1 792	2 554	657	441	768	734	604	262
Estonia (I)	603	50	221	29	65	266	544	219	257	1 052	638	217	75
Finland (I)	1 437	312	1 304	33	92	1 497	2 547	1 198	1 132	2 117	1 367	1 205	177
Iceland (I)	65	12	46	0	8	78	114	31	30	60	43	36	1
Ireland (F)	1 691	551	770	12	200	2 451	2 012	775	721	1 370	961	1 030	298
Latvia (F)	1 311	47	625	0	69	403	1 431	573	542	1 130	406	432	237
Lithuania (F)	2 332	112	944	43	166	1 004	2 367	882	1 092	1 466	613	997	161
Norway (I)	2 284	273	570	0	262	1 444	2 362	550	475	714	715	202	93
Sweden (I)	3 485	489	1 620	7	321	2 574	4 333	1 010	724	2 074	1 737	1 291	372
United Kingdom of Great Britain and Northern Ireland (I)	21 006	3 301	6 586	1 141	3 583	13 385	26 021	4 857	11 302	16 858	9 771	7 329	3 558

TABLE A2.2 (Continued)

COUNTRY / TERRITORY	HEALTH Dietary risks associated with non-communicable diseases												
	High in processed foods and additives				Consumption of animal source whole foods		Low in plant whole foods					Low in beneficial fatty acids	
	Processed meat	Sugar-sweetened beverages	Sodium	Trans-fatty acids	Low in milk	High in red meat	Whole grains	Legumes	Nuts and seeds	Fruits	Vegetables	Polyunsaturated fatty acids	Seafood omega-3 fatty acids
Southern Europe	**41 021**	**9 750**	**41 422**	**143**	**7 843**	**39 271**	**75 843**	**9 143**	**13 037**	**25 858**	**23 482**	**16 199**	**11 859**
Albania (F)	369	52	885	5	6	89	737	145	213	116	19	269	321
Bosnia and Herzegovina (D)	704	203	1 951	0	97	293	1 074	290	661	638	224	577	747
Croatia (F)	276	372	3 207	10	234	958	2 362	807	802	988	823	682	922
Greece (I)	2 150	514	2 203	56	557	2 832	6 599	888	542	1 210	497	1 879	1 418
Italy (I)	18 632	2 964	17 599	15	4 234	17 934	38 471	3 438	6 124	13 821	13 943	5 832	4 699
Montenegro (F)	163	20	574	3	9	88	440	87	156	75	11	171	161
North Macedonia (F)	397	120	1 509	3	64	153	1 211	167	134	403	58	317	440
Portugal (F)	1 968	646	1 585	28	390	2 747	3 664	481	752	1 639	726	832	147
Serbia (D)	1 332	384	6 532	17	369	1 050	4 589	713	1 375	1 365	1 325	1 572	1 919
Slovenia (F)	674	140	1 128	0	82	520	626	210	167	387	428	200	247
Spain (I)	14 355	4 336	4 248	5	1 800	12 608	16 068	1 916	2 110	5 215	5 428	3 869	839
Western Europe	**61 848**	**12 450**	**36 263**	**3 811**	**11 570**	**62 985**	**82 233**	**23 798**	**12 648**	**54 995**	**40 611**	**22 050**	**15 579**
Austria (I)	2 213	506	2 903	0	356	2758	3 245	1 466	604	1 770	2 021	1 592	1 082
Belgium (I)	3 842	1 028	2 298	198	697	3724	4 755	842	632	2 372	1 158	817	552
France (I)	16 920	2 891	8 015	451	4 534	19 540	29 704	3 917	4 749	17 538	11 056	5 215	1 559
Germany (I)	32 065	6 258	19 769	2 641	4 326	28 904	34 147	15 383	5 688	28 277	21 565	12 317	11 009
Netherlands (Kingdom of the) (I)	4 374	1 193	1 958	421	1 311	5 423	6 513	1 273	656	2 817	2 826	1 113	767
Switzerland (I)	2 434	574	1 320	101	345	2 636	3 869	916	318	2 221	1 985	997	611
OCEANIA	**6 136**	**1 660**	**2 749**	**905**	**677**	**7 669**	**9 429**	**2 023**	**1 336**	**6 814**	**4 080**	**3 601**	**1 660**
Australia and New Zealand	**5 955**	**1 530**	**1 905**	**903**	**653**	**7 372**	**7 407**	**1 674**	**983**	**4 860**	**3 003**	**2 939**	**1 297**
Australia (I)	5 064	1 358	1 469	811	509	6 230	6 083	1 351	829	4 306	2 587	2 482	1 074
New Zealand (I)	891	172	436	92	144	1 142	1 325	324	153	554	416	458	223
Melanesia	**181**	**130**	**844**	**2**	**24**	**297**	**2 022**	**348**	**353**	**1 954**	**1 077**	**662**	**363**
Fiji (D)	73	79	196	0	10	192	533	80	21	554	190	113	33

TABLE A2.2 (Continued)

COUNTRY / TERRITORY	HEALTH Dietary risks associated with non-communicable diseases												
	High in processed foods and additives				Consumption of animal source whole foods		Low in plant whole foods					Low in beneficial fatty acids	
	Processed meat	Sugar-sweetened beverages	Sodium	Trans-fatty acids	Low in milk	High in red meat	Whole grains	Legumes	Nuts and seeds	Fruits	Vegetables	Polyunsaturated fatty acids	Seafood omega-3 fatty acids
Papua New Guinea (T)	96	45	562	1	10	90	1 317	231	285	1 232	668	460	298
Solomon Islands (T)	8	4	57	0	2	4	107	24	36	126	180	57	21
Vanuatu (E)	4	2	28	0	1	11	65	14	11	43	40	31	12

NOTES: The letters in parentheses refer to the typology to which the country belongs: protracted crisis (PC); traditional (T); expanding (E); diversifying (D); formalizing (F); industrial (I); not applicable (*). For the methodology, refer to Lord, S. 2024. *Hidden costs of agrifood systems: an update to the methodology for the State of Food and Agriculture 2024*. Rome, FAO.

ANNEX 3
SUMMARY OF SELECTED GLOBAL STUDIES ON AGRIFOOD SUPPORT POLICY REFORM

TABLE A3 EXISTING GLOBAL STUDIES ON AGRIFOOD SUPPORT POLICY REFORM

	FAO, UNDP and UNEP, 2021	Glauber and Laborde, 2023	Springmann and Freund, 2022	Laborde and Piñeiro, 2023	Lord, 2022
Breakdown of results	Aggregated at global, developed countries, BRIC countries, and non-BRIC developing countries levels	Global, income group and regional levels	OECD countries with agricultural subsidies (OECD), non-OECD countries with agricultural subsidies (non-OECD), countries without agricultural subsidies (wo-SUB), and a combination of all countries (World)	Global level	Global and regional levels
Model used	MIRAGRODEP	MIRAGRODEP	MAGNET	MIRAGRODEP	MIRAGRODEP
Removing subsidies	Total agricultural support* Total subsidies Output subsidies Input subsidies Factors of production subsidies	Total agricultural support Total subsidies	Total subsidies	Total agricultural support Total subsidies	n/a
Repurposing subsidies within national borders	n/a	Producer subsidies redistribution (VoP basis)** Producer subsidies redistribution (dietary recommendation basis)*** Consumer-oriented**** redistribution (VoP basis) Consumer-oriented redistribution (dietary recommendation basis)	Redistribution of subsidies towards low-emission and nutrition-sensitive foods, with variations: one scenario redirects half, preserves half of all subsidies; another redirects all subsidies	n/a	Homogeneous redistribution of existing payments across products Above + increasing support rate for LMICs
Repurposing subsidies globally	n/a	n/a	Global repurposing of subsidy payments for producing nutrition-sensitive and low-emission foods	n/a	Homogeneous redistribution of existing payments across products and countries Above + increasing support rate for LMICs
Removing border measures	Total border measures	Total border measures	n/a	Total border measures	n/a

TABLE A3 (Continued)

	FAO, UNDP and UNEP, 2021	Glauber and Laborde, 2023	Springmann and Freund, 2022	Laborde and Piñeiro, 2023	Lord, 2022
Repurposing border measures	n/a	Reduction of border measures according to recommended dietary levels	n/a	n/a	n/a
Projected year of scenario	2030	2030	2030	n/a	2020
Environmental impacts	GHG emissions Land use Pesticides Biodiversity	GHG emissions Land use	GHG emissions	GHG emissions Land use Nitrogen emissions Water use	
Social impacts	Poverty Undernourishment	Poverty Undernourishment		Poverty Undernourishment	Poverty Undernourishment
Health (dietary patterns) impacts	n/a	n/a	NCDs	n/a	n/a
Economic impact	Cost of diet Production Prices Farm income	Cost of diet Production	Welfare	Cost of diet Production Prices GDP	n/a
Total unified quantified USD impact	n/a	n/a	n/a	n/a	Net global costs of removal of all forms of support are approximately 460 billion 2020 PPP dollars Each scenario is also costed

NOTES: BRIC = Brazil, Russian Federation, India and China; GHG = greenhouse gas; LMIC = lower-middle-income country; NCD = non-communicable disease; OECD = Organisation for Economic Co-operation and Development; VoP = Value of Production; n/a = not available. * Total agricultural support includes subsidies and trade policies (import and export taxes and subsidies). ** Redistribution of subsidies across commodities to ensure comparable support based on VoP. *** Redistribution of subsidies across commodities aligned with recommended dietary levels. **** Redistribution of producer subsidies to consumers.

SOURCES: FAO, UNDP & UNEP. 2021. *A multi-billion-dollar opportunity – Repurposing agricultural support to transform food systems*. Rome, FAO. https://doi.org/10.4060/cb6562en; Glauber, J. & Laborde, D. 2023. *Repurposing food and agricultural policies to deliver affordable healthy diets, sustainably and inclusively: what is at stake? – Background paper for The State of Food Security and Nutrition in the World 2022*. FAO Agricultural Development Economics Working Paper, No. 22-05. Rome, FAO. https://doi.org/10.4060/cc4348en; Laborde, D. & Pineiro, V. 2023. *Repurposing Agricultural Policies Scenarios for FSEC*. Working Paper. Food System Economics Commission. https://foodsystemeconomics.org/wp-content/uploads/Laborde-Pineiro-2023-slides.pdf; Lord, S. 2022. *Incurred and avoided external costs from the removal of agricultural trade barriers and farm sector subsidies*. Background Report for the Food System Economic Commission. Environmental Change Institute, University of Oxford; Springmann, M. & Freund, F. 2022. Options for reforming agricultural subsidies from health, climate, and economic perspectives. *Nature Communications*, 13(1): 82. https://doi.org/10.1038/s41467-021-27645

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CHAPTER 2

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2024
THE STATE OF FOOD AND AGRICULTURE

VALUE-DRIVEN TRANSFORMATION OF AGRIFOOD SYSTEMS

Uncovering the true cost of food is the first step in making agrifood systems more inclusive, resilient and sustainable. As *The State of Food and Agriculture 2023* revealed, agrifood systems activities generate significant benefits for society, but also have negative impacts on economic, social and environmental sustainability. The quantified hidden costs of agrifood systems amount to around 10 percent of global gross domestic product. Therefore, strategic action is necessary, and all agrifood systems actors – from producers and agribusinesses to consumers and governments – have a crucial role to play.

While transforming agrifood systems would yield a net global gain, the benefits and costs would be unevenly distributed among stakeholders and countries over time. *The State of Food and Agriculture 2024* builds on the findings of the 2023 edition, delving deeper into the use of true cost accounting assessments of agrifood systems and identifying policy interventions aimed at transformation. Using updated global datasets, the report confirms previous estimates of the quantified hidden costs of agrifood systems and provides a detailed breakdown of the hidden costs associated with unhealthy dietary patterns and non-communicable diseases for 156 countries. These findings are analysed through the lens of six agrifood systems categories to take into account various outcomes and hidden costs that require different policy interventions. Case studies offering in-depth assessments of country, local and value chain contexts illustrate the economic, social and environmental impacts of current practices to guide policy interventions. Crucial to all contexts is the need for inclusive stakeholder consultations to inform interventions and reconcile power imbalances and trade-offs.

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