ON "BROKEN" FOOD SYSTEMS
AND OTHER NARRATIVES

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Editor: Eugenio Diaz-Bonilla
Proofreader: Catalina Saraceno
Layout: Nadia Cassullo
Cover design: Nadia Cassullo

On Broken Food Systems and Other Narratives / Eugenio Díaz-Bonilla, Eduardo Trigo, and Rosario Campos. San José, C.R. : IICA, 2024
32 p.; 21x16 cm.

ISBN: 978-92-9273-107-6
Published also in Spanish

1. Food systems 2. Agrifood systems
3. Food economics4. Food supply 5. International trade
6. World markets 7. Environmental impact I. IICA II. Title

AGRIS
E50

DEWEY
338.19

San José, Costa Rica
2024

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01 Foreword

Manuel Otero
DIRECTOR GENERAL, IICA

Without a doubt, agri-food systems represent a crucial, if not the most important component of human activities. For starters, they provide the basic elements of the food we need for our diet. Regardless of discussions that may exist about nutritional issues, the fact that agri-food systems are essential is indisputable. On the other hand, according to the United Nations, the various food system activities account for almost half of global employment, and I do not think I am far off in suggesting that this figure may be higher in some regions of the world. Let us also not forget the great cultural value of these systems in many instances.

Therefore, it is impossible to approach the debate on how to tackle the global challenges of food and environmental security, and climate change, without considering the role of food systems in future strategies to resolve them.

Mindful of this importance, Secretary-General of the United Nations, Antonio Guterres, convened the Food Systems Summit in 2021, with the aim of analyzing the functioning of food

systems at a global level and beginning to design strategies to address the aforementioned challenges.

IICA shared these concerns and actively joined the Summit process, on the basis of three basic principles: i) agricultural producers must be duly represented; ii) decisions and policies must be science-based; and iii) agriculture is part of the solution to the challenges. With this in mind, the Institute prepared the document "Food Systems: An Outlook from the Perspective of Agriculture in the Americas" and organized various dialogues for action, which enjoyed the participation and involvement of key stakeholders.[1] They agreed on a series of messages, which were finally shared by the ministers of Agriculture of the Americas during the Summit process, on the occasion of the Pre-Summit in Rome in 202.[2]

The messages conveyed by the countries of the Americas recognize that challenges persist and that there is room for improvement in the various dimensions of food systems: production; health and safety; and nutritional quality; as well as in the three pillars of sustainability (the environmental, economic and social). At the same time, the messages highlight the fact that, despite the challenges mentioned, the global food system has been efficient in feeding the world. They also recognize the central role that agriculture has played, having proven itself to be resilient and fundamental for animal, plant, human, and soil health, as well as the interconnections between all of them.

1 Reference: "Food Systems: An Outlook from the Perspective of Agriculture in the Americas"

2 Reference: "On The Road to the UN Food Systems Summit: Key Messages from the Perspective of Agriculture In The Americas"

The messages of the ministers of the Americas also address consumer demands, nutritional aspects, production strategies, environmental issues and finally the role of the Americas in global food security and the provision of ecosystem services.

In line with the thinking underlying these messages, this document delves into some central aspects of food systems, aiming to provide a better understanding of their operating logic. On that basis, it proposes approaches that will contribute to ensuring the best design and implementation of strategies for the strengthening and improvement of agrifood systems.

02 Introduction

The start of civilizations about 13,000 to 15,000 years ago, happened along geographical lines, depending on the availability of wild animals and plants that could be adapted for consumption and utilization by human beings, who were shifting from hunter-gatherers to settled producers (Diamond, 1999). Before and since those years, humans have been understandably concerned about the availability and access to food, suffering periodic famines related to natural disasters and man-made catastrophes, such as wars.

A different but related concern was that the growth of production would not keep up with the increase in population, most famously articulated by Malthus (1803), and repeated many years later by people like Paul Ehrlich: he argued in the late sixties that the world was running out of food and that "in fact, the battle to feed humanity is already lost, in the sense that we will not be able to prevent large-scale famines in the next decade or so" (Ehrlich 1968:36). **Technological change and human ingenuity avoided the predicted doom.** Yet, during the last half a century there have been global scares about world hunger during the price spikes of the mid 1970s, of 2008 and 2011, and, more recently, after the Russian invasion of Ukraine in February 2022.[3]

In the last decade, concerns have broadened from potential lack of food to the operation of food systems, recognizing their multiple impacts on employment and livelihoods, nutrition and health, climate change, environmental sustainability and biodiversity, and even social peace and stable governance (von Braun, Afsana, Fresco, Hassan, and Torero, 2022).

Food systems have become an important focus of the global efforts to reach the Sustainable Development Goals of the Agenda 2030.

Given that range of influences, food systems have become an important focus of the global efforts to reach the Sustainable Development Goals of the Agenda 2030 approved in 2015, and the objectives of the Paris Agreement (which entered into force on 4 November 2016). In fact, the 2019 Sustainable Development Goals Summit identified food systems as one of the six systemic and cross-cutting areas to accelerate progress towards achieving the 2030 Agenda and led to the UN Food Systems Summit of 2021. With regards to the Paris Agreement, the idea of considering food systems in the negotiations (expanding from the current focus only on agriculture) was floated in COP27,[4] and that conversation continued in COP28.[5]

The importance of the topic and the understandable sense of urgency to move humanity towards the desired objectives for "people, planet, and prosperity"[6] have led to a narrative that argues that food systems are "broken."[7] Even more, in some articulations of the argument, the "true costs" of the current operation of food systems (in terms of poverty, health and the environment) outweigh the monetary value of globally marketed food, thus "subtracting value" for society.

3 The front page of The Economist on May 19, 2022, announced "The coming food catastrophe." https://www.economist.com/leaders/2022/05/19/the-coming-food-catastrophe

3 See UN Climate Change Conference COP27 Presidential declaration.

5 I"In fact, the Presidency of COP28 presented for consideration of the member countries the "Emirates Declaration on Sustainable Agriculture, Resilient Food Systems, and Climate Action", which was signed by more than 150 countries.

6 https://social.desa.un.org/2030agenda-sdgs

This line of argumentation notes, correctly, several worrisome global indicators:

- Close to **one in ten people suffer hunger; 1 in 3 people are overweight;** more than 40% of the population lacks enough income to afford healthy diets.

- **Many of the world's poor work in food systems,** as small producers, low-paid workers, and informal operators in different parts of the food value chains.

- **Food systems represent about a third of global GHG emissions**, while at the same time they remain **vulnerable to extreme weather** events and climate change.

- During the last 20 years there has been an **annual loss of 5.1 million hectares of forests per year,** in part related to the expansion of agriculture. **These losses, along with inadequate agricultural practices, degrade soils, contaminate water sources, and reduce biodiversity.**

7 For instance, the front page of the UNFSS website reads "…too many of the world's food systems are fragile, …. and vulnerable to collapse, as millions of people around the globe have experienced first-hand during the COVID-19 crisis…" Source: https://www.un.org/en/food-systems-summit/about

The fact that about 735 million people go hungry daily is a humanitarian tragedy, but it is well known[9] that the main problems of food insecurity are related to poverty and economic access and much less to production deficiencies.

Acknowledging the problems mentioned, in this brief note we ask ourselves whether the narrative of "broken food systems" offers the most effective way to engage the crucial actors (particularly farmers worldwide and important agricultural producers among developing countries) needed to achieve the desired objectives of the 2030 Agenda and of the Paris Agreement; and whether the notion of the "true cost of food" provides the best approach for diagnosing what needs to be done.[8]

We argue that, as a matter of diagnostics, it is necessary to be clear about the costs but also about the benefits of the current operation of food systems to better understand the synergies and trade-offs. In that sense, it would be more appropriate to talk about the "true value of food." Further, when looking at costs, rather than focusing on a single value for a notional "true cost" of food, it is better to analyze in detail the nature of each one (such as pure externalities, general equilibrium effects or "pecuniary externalities", basic inefficiencies, equity or justice considerations, and others) and the origin of the problem (whether it is related to foods systems and which of its components, or is driven by more structural or systemic considerations beyond food systems). This detailed analysis should then guide the selection of policy interventions[9] and the levels of application.

For example, the fact that about 735 million people go hungry daily is a humanitarian tragedy, but it is well known[10] that the main problems of food insecurity are related to poverty and economic access and much less

8 It is worth clarifying that this document was completed before the very recent FAO publication, which deals with the same topic (FAO, 2023).

9 "Policy interventions" is used in general to cover a variety of plans, programs, policies, investments, laws, regulations, institutional arrangements, and similar aspects.

10 The closing document of the United Nations Conference on Food and Agriculture in 1943, in Hot Springs, Virginia (which eventually led in 1945 to the creation of FAO) declared that "the first cause of hunger and undernutrition is poverty."

to production deficiencies. In this regard, as shown below, food systems, in aggregate terms, seem to have performed well. Certainly, as argued later, they need adjustments, but the positive effects should be strengthened and not interrupted. This is especially the case with the food systems of the Americas, which are crucial for the supply-side of global food security.

It is also necessary to better understand the structural factors and incentives that guide food systems (some of them internal, while others have a broader scope) that have led to the present situation. Taking those structural factors and incentives into account is crucial for the design of policy interventions that can help food systems to achieve the objectives of producing enough quantity and diversity of food to meet the evolving demand, with products that are safe and nutritious, while maintaining overall social, economic, and environmental sustainability.

It is also necessary to better understand the structural factors and incentives that guide food systems that have led to the present situation.

In summary, a correct diagnosis of these topics is fundamental for the design of an effective strategy that, at the same time, elicits the interest and commitment of all the relevant actors operating "from farm to fork" to solve the very real and pressing current problems while expanding the existing benefits as well.

The following sections present some considerations on different indicators, in an attempt to provide a balanced view of the strengths and weaknesses of food systems at the global level and in relation to Latin America and the Caribbean (LAC). They also analyze in some detail the notion

of the "true cost of food," and suggest ways in which it can be better utilized as a basis for the urgent and vital task of strengthening and improving the operation of food systems to achieve the objectives of the Agenda 2030 and of the Paris Agreement.

03 RECENT HISTORICAL PERFORMANCE OF THE GLOBAL FOOD SYSTEM

Since the 1960s, when Paul Ehrlich was forecasting widespread famines due to population growth outstripping production, the supply of calories and proteins per capita has clearly increased (Table 1).

TABLE 1. FOOD SUPPLY. CALORIES AND PROTEINS PER CAPITA.

	QUANTITY				INCREASE 1961-1965 TO 2016-2021	
	Food supply (kcal/capita/day)		Protein supply quantity (g/capita/day)		Food supply (kcal/capita/day)	Protein supply quantity (g/capita/day)
	early 1960s	last 2000s	early 1960s	last 2000s	%	%
Caribbean	2117	2807	49	69	32.6	39.7
Mexico and Central America	2244	3038	60	86	35.4	42.2
South America	2386	3068	64	88	28.6	37.7
Least Developed Countries	1997	2420	49	61	21.2	25.0
Low Income Food Deficit Countries	2007	2527	52	65	25.9	24.9
World	2263	2958	62	84	30.7	34.1

Source: authors with data from FAOSTAT

Even though the world population jumped from about 3,000 million in 1960 to about 7,950 million in 2022, an increase of close to 5,000 million people, total world production increased even more. This also happened in the UN-designated Least Developed Countries (LDCs), and for the category of Low-Income Food Deficit Countries (LIFDC) defined by FAO.

As a result, in the period 2020-2022 only 29 countries out of 189 in the world with available data (or some 15% of the total) showed an average dietary energy supply adequacy below the required level. In the case of LAC,[11] from the early 1960s to the present, despite the fact that the population tripled from about 220 million to almost 660 million, the supply of calories per capita grew between 28.6% and 35.4% and that of proteins between 37.7% and 42.2%. This increase in production means that currently, of the 28 countries with data, only one (Haiti) has less than the adequate level of energy in its diet (on average for the country).

Considering LAC as a whole (not shown in Table 1), the region also has the highest levels of per capita calorie intake compared to other developing regions, with a smaller percentage coming from cereals and tubers (which is an indicator of a more diversified diet).[12] In the case of proteins per capita, the increase has been larger than the world average, and a higher percentage of that protein is coming from animal sources, also indicating a higher quality diet compared with other developing regions (see Díaz-Bonilla, 2023 for more details on the data on both indicators).

Considering LAC as a whole, the region also has the highest levels of per capita calorie intake compared to other developing regions.

Besides calories and proteins, global food production also expanded for other products. Table 2 shows the increase in gross production per capita of primary vegetables and fruits for the period 2017-2021 compared to 1961-1965.

11 FAOSTAT database presents the three LAC regions separately (Caribbean, Mexico and Central America, and South America).

12 A lower percentage of calories coming from cereals and tubers would indicate a more diversified (and therefore, better) diet and it is correlated with healthier anthropometric nutrition indicators (Headey and Ecker, 2013).

TABLE 2. INDEX OF GROSS PRODUCTION OF FRUITS AND VEGETABLES (2014-2016=100).

	% change between 1961-1965 and 2017-2021
Africa	15.0
Asia	260.0
Oceania	24.8
Caribbean	52.2
Mexico and Central America	157.8
South America	38.3
Least Developed Countries	24.2
Low Income Food Deficit Countries	96.5
World	91.1

Source: FAOSTAT

The increase in total production took place with a relatively limited expansion of global agricultural land:[13] from about 4,440 million hectares in 1960 to almost 4,820 million hectares in 2021 (or about 380 million hectares more, an increase of 8.6% from the start of the estimates; FAOSTAT database). In the case of LAC, the agricultural area increased from almost 569 million hectares in 1961 to about 662 million hectares in 2021 (an increase of 93 million hectares, or 16.3%).

Overall, agriculture and food production in LAC have outpaced global growth in those categories during the past 5-6 decades. As a consequence, the region increased

13 Includes land dedicated to temporary and permanent crops, fallow, and livestock activities.

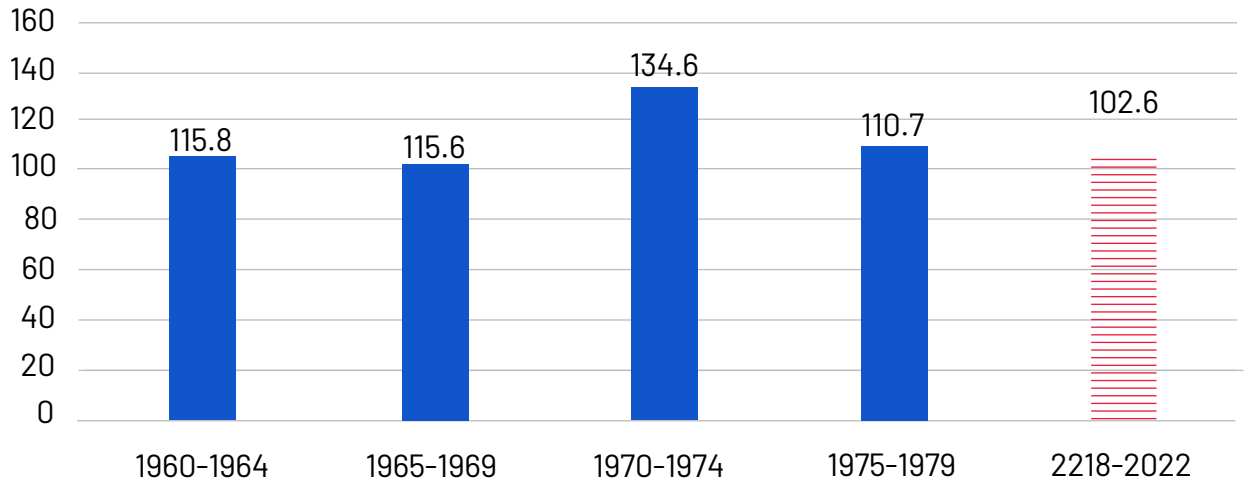
its participation in the world total agricultural and food production from approximately 10% of total value (at constant prices in purchasing power parity) in the 1960s to around 13% today. During the 2000s, the region also became the main net[14] food exporting region of the world (more than the sum of the net exports of the United States, Canada, Australia, New Zealand and, in different years, the European Union). In consequence, LAC has become important for global food security, helping to stabilize world prices and supplies.

Another aspect to consider in terms of the performance of world food systems since the 1960s is that the price of food, adjusted by inflation, has been declining (Figure 1 compares the index of real[15] food prices during the last 5 year-period with that of the 1960s and 1970s).

14 Exports minus imports.

15 "Real prices" means adjusted by inflation, as opposed to "nominal prices" that are not adjusted.

FIGURE 1. INDEX OF REAL FOOD PRICES (2010=100).



Source: World Bank, Commodity Prices.

Food prices adjusted by inflation during the last quinquennia (2018-2022) have been between 7-24% lower than any of the 5-year periods in the 1960s and 1970s (about 14% less comparing 2018-2022 to the total average for the 1960s and 1970s). It is true that the index of real prices in 2022 stood at 130.1, but it is still less than in 1973 (162.0) and 1974 (182.3), and it has been declining in 2023.[16]

In summary, the world's food system has expanded from producing food in a planet of 3 billion people in the 1960s to producing some 30% more in availability of calories and almost 35% of proteins per capita for a population of almost 8 billion, with primary food prices that, in real terms in 2020-2022, have been 14% below the levels of the 1960s and 1970s. This was all achieved with an increase of global agricultural land of less than 9% between 1960 and 2021.

16 Average nominal prices for food until August 2023 in the World Bank database was about 7% lower than the average for 2022. The food index of the World Bank is somewhat different from the one that FAO calculates. But the trends are largely similar.

04
ENVIRONMENTAL IMPACTS

A second set of issues to consider related to the performance of agriculture and food systems is the environmental impact in the world and in LAC.[17] The increase in production shown before has been largely driven by productivity improvements linked to science and technology, starting with the advance of the Green Revolution, particularly since the 1960s. Gains in productivity allowed to increase production with limited expansion of agricultural land (as noted). At the same time, those technological innovations were developed in a context where the price of energy was low: the average price of oil for the 1960s and 1970s before the price shocks of the 1970s, was about US$7 per barrel in constant 2010 dollars and, even after the shocks, the average for the rest of 1970s, the 1980s and the 1990s was US$30 per barrel. In comparison, in 2022 oil prices have been close to US$90 per barrel in constant 2010 dollars. Not only was the price of energy relatively low in constant dollars for several decades,

but also climate change was not yet an important concern in the 1960s and 1970s. At that time, the main problem was the specter of hunger (particularly in countries like India). Therefore, the focus was on the production of calories, with new technologies that were energy-intensive and led to more emissions of greenhouse gasses (GHGs).

At the same time, while those technologies allowed increases in production with a relatively limited expansion of land, part of the expansion of the agricultural area took place at the expense of forest area: at the global level FAOSTAT database shows a decline of forests by about 183 million hectares between 1990, when the series starts, and 2021. LAC, which has contributed a third of the global increase in agricultural land (crops and pastures) since the 1960s, also accounted for around 80% of global deforestation from 1990 to 2015.[18]

Therefore, a current concern is the level of GHG emissions from agriculture[19] (related both to production and land use changes), and, more generally, from food systems. Also worrisome is the pressure on biodiversity reservoirs, particularly in LAC, which are of great global importance, considering that of the top ten countries rich in biodiversity, six (and the top two) are in LAC (Díaz-Bonilla, 2019). Therefore, land use and land use change has risen as an area of policy concern. In this regard, developments in the region have planetary implications because, in addition to its biodiversity wealth, LAC possesses 23% of the planet's forest area, 31% of its fresh water, and its forests hold 36% of CO2 reserves. Therefore, the region

17 Here we focus mainly on environmental issues related to climate change. There are other more localized environmental concerns not discussed here, such as water pollution, soil erosion, and similar, part of which could also be related to agricultural production.

18 Globally, forest areas declined not only because of increases in agricultural land, but also due to other reasons, such as urbanization, construction of different types of infrastructure, natural disasters, and so on.

19 Including crops and livestock.

plays a central role as a carbon sink, in the planetary cycle of water and oxygen, in the preservation of biodiversity, and in the achievement of the adaptation, resilience and mitigation objectives of the Paris Agreement. It will be very difficult to further expand LAC's agricultural area without negatively affecting climate change and biodiversity. Any increase in agricultural production will have to come from greater productivity based on science and technology. Improved technologies can not only reduce current GHG emissions but also expand the capability of agriculture as a carbon sink. In fact, agriculture is the only sector that can help simultaneously with mitigation, adaptation, and resilience, making it a significant part of the solution to climate change (more on this later).

Agriculture is the only sector that can help simultaneously with mitigation, adaptation, and resilience, making it a significant part of the solution to climate change.

Using the estimated emission levels from LAC's food systems and its components in Crippa et al 2021 (Table 5 in said document; see also the estimates in FAOSTAT), Table 3 below shows the GHG emissions in Gigatons of CO2eq, and as percentage of the GHG emissions of global food systems and world total, comparing 1990 and 2015.

TABLE 3. EMISSIONS FROM AGRIFOOD SYSTEMS (GIGATONS CO2EQ).

	1990	2015
Agrifood systems (AFS)		
LAC	3.2	3.0
World	16.1	18.0
As % of World's Food Systems	20.2	16.8
TOTAL		
LAC	3.8	4.5
World	36.5	52.0
As % of World Total	10.4	8.7
LAC AFS/LAC Total	85.5	67.2
World AFS/World Total	44.1	34.6

Source: Crippa et al, 2021. Table 5.

Total GHG emissions in LAC and the world, and in global agrifood systems (AFS) are estimated to have increased between 1990 and 2015. In LAC, however, emissions from AFS are marginally smaller in 2015.[20] Still, in 2015 about two-thirds of all GHG emissions in LAC came from AFS. Even though LAC only represents somewhat less than 9 percent of total global emissions, it is responsible for

20 The estimates include land use change for agricultural uses affecting forests. It should be noted that forests in general, not included in the estimates in the text, are net absorbers of GHG emissions at the world level and in LAC: FAOSTAT estimates the absorption of all forests at about 2.6 Gigatons CO2eq in 2020, of which 0.4 Gt CO2eq (or about 15% of the world total) occurred in LAC.

almost 17 percent of emissions originating in AFS (and almost 21 percent of the emissions originating in agriculture and land use; not shown).

LAC only represents somewhat less than 9 percent of total global emissions, but it is responsible for almost 17 percent of emissions originating in global agrifood systems.

There are two-way impacts between agriculture and climate change. Phenomena such as droughts, high temperatures, and floods generate lower agricultural yields and crop losses. In turn, agriculture, like the rest of the productive sectors, faces the challenge of contributing to the objectives of reducing greenhouse gas (GHG) emissions. Agriculture, while being a source of GHG, can also capture carbon through photosynthesis in crops, pastures, and forestry. For instance, LAC countries have been pioneers in the extensive adoption of no-till agriculture (a conservation practice that implies less use of fossil fuels and a higher rate of carbon sequestered in the soil) and in sustainable livestock farming (see Box), among other good agricultural practices that provide ecosystem services (Chacón, and Gutman (eds), 2022).

BOX | DIFFERENT ASPECTS OF LIVESTOCK PRODUCTION

Criticism of livestock lumps together different production systems, without considering the differences between confined intensive systems and extensive grazing systems, such as those in LAC, which also capture significant volumes of carbon. Therefore, it is necessary to consider the balance between GHG emissions and capture (Ricard and Viglizzo, 2019; Viglizzo, Ricard, Taboada, and Vazquez Amabile, 2019).

Furthermore, the meat and dairy sectors play a critical role in the economic and social sustainability of the countries of the Americas, and also for global food security (Delgado and Gauna, 2021). Nutrient-dense animal-based foods like meat, poultry, dairy and eggs are essential to ending hunger and other forms of malnutrition. Filling the "protein gap" is particularly important for women, children, and older adults experiencing hunger. Efficiency and innovation produce nutrient-dense, high-quality foods that nourish people and support farmers' livelihoods (FAO, GDP and IFCN, 2020).

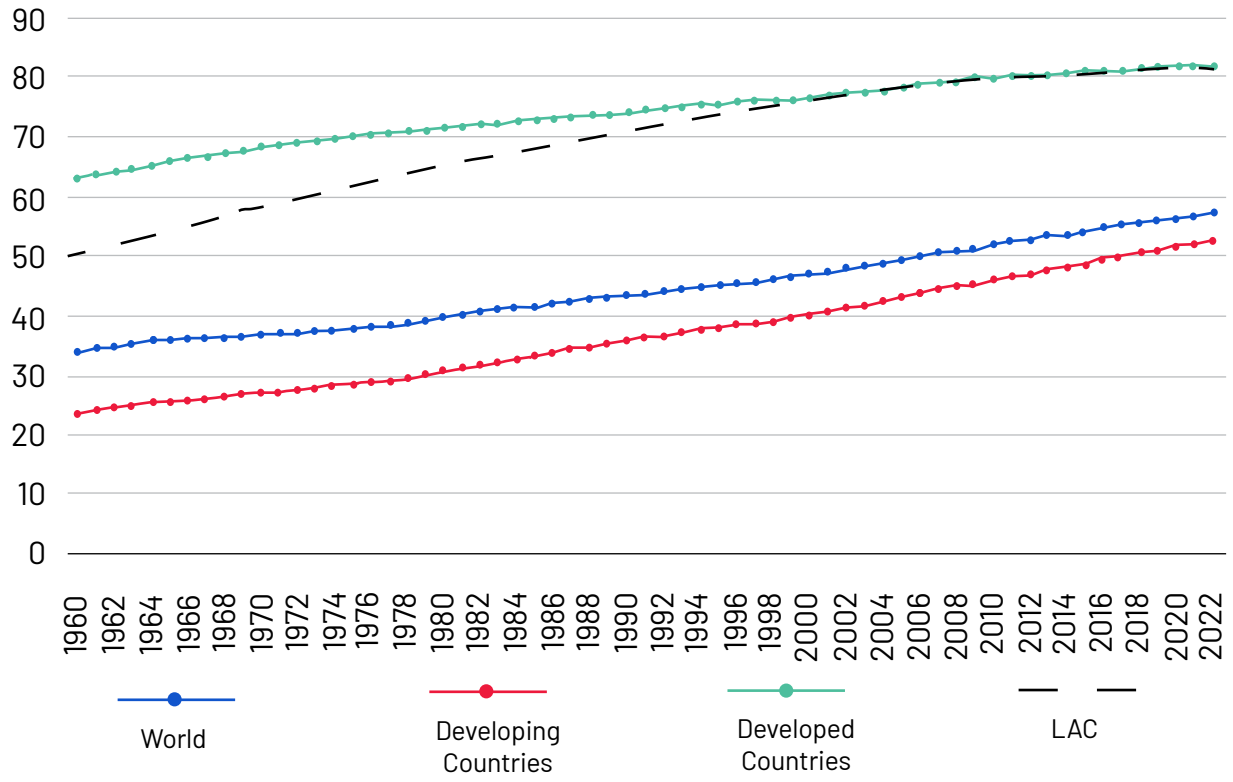
05

CHANGES IN SYSTEM STRUCTURE AND CONSUMER BEHAVIOR

Other aspects of the current operation of food systems are the result of broader societal drivers, and therefore, policy interventions at the level of food systems would not necessarily address what is considered "broken," if these larger forces are not taken into account. For instance, it is well documented that along with increases in population, food systems in the last decades have responded to significant changes in the geography of population and different social trends, which over this period have significantly changed the way we produce, commercialize, and consume our food (Reardon and Timmer, 2012).

Urbanization has been a dominant trend both globally and in LAC (Figure 2) leading to a significant transformation of food systems. What for centuries used to be the norm (that communities largely consumed the agricultural and food products that were produced locally), was no longer the case.

FIGURE 2. URBAN POPULATION (% OF TOTAL POPULATION).



Source: World Bank

Along with urbanization, there were also major changes in labor markets, particularly the increased participation of women in the workforce (Table 4) (Reardon and Timmer, 2012).

TABLE 4. FEMALE PARTICIPATION IN THE WORKFORCE (1960-2010)

	Ratio of female to male labor force participation rate (%)	
	1960s	2010s
Developed Countries	39.2	83.2
Developing Countries	29.9	70.7
World	33.5	76.1

Source: WDI/WB. Median for 110 countries with data; 24 developed countries; national estimates.

All those changes triggered significant organizational, institutional, and technological changes in agrifood systems, particularly in the expansion of packaged, ready to serve food, and meals outside home (Reardon T; Timmer P; Berdegué J. 2004). They also led to a significant increase in the food transformation and distribution segment of food systems, and a significant reduction of the farmer's share in the food bill (Schnepf, 2015).[21]

The expansion of supermarkets, a distinctive element of this process, has led to visible changes in the commercialization and retail of food, with positive impacts on better quality and safety (hygiene) of food products and reductions in transaction costs and prices to consumers. While the expansion of supermarkets developed faster in the category of processed, dry, and packaged foods, subsequently they have also increased the share of fresh products, including vegetables, fruits, and different types

21 Since 1950, the average farm participation in the US has been declining as a share of total consumer food expenditures, falling from about 41% in 1950 to 17.4% in 2013 (Schnepf, 2015). With different intensity, this trend is also present in other countries, including the LAC region.

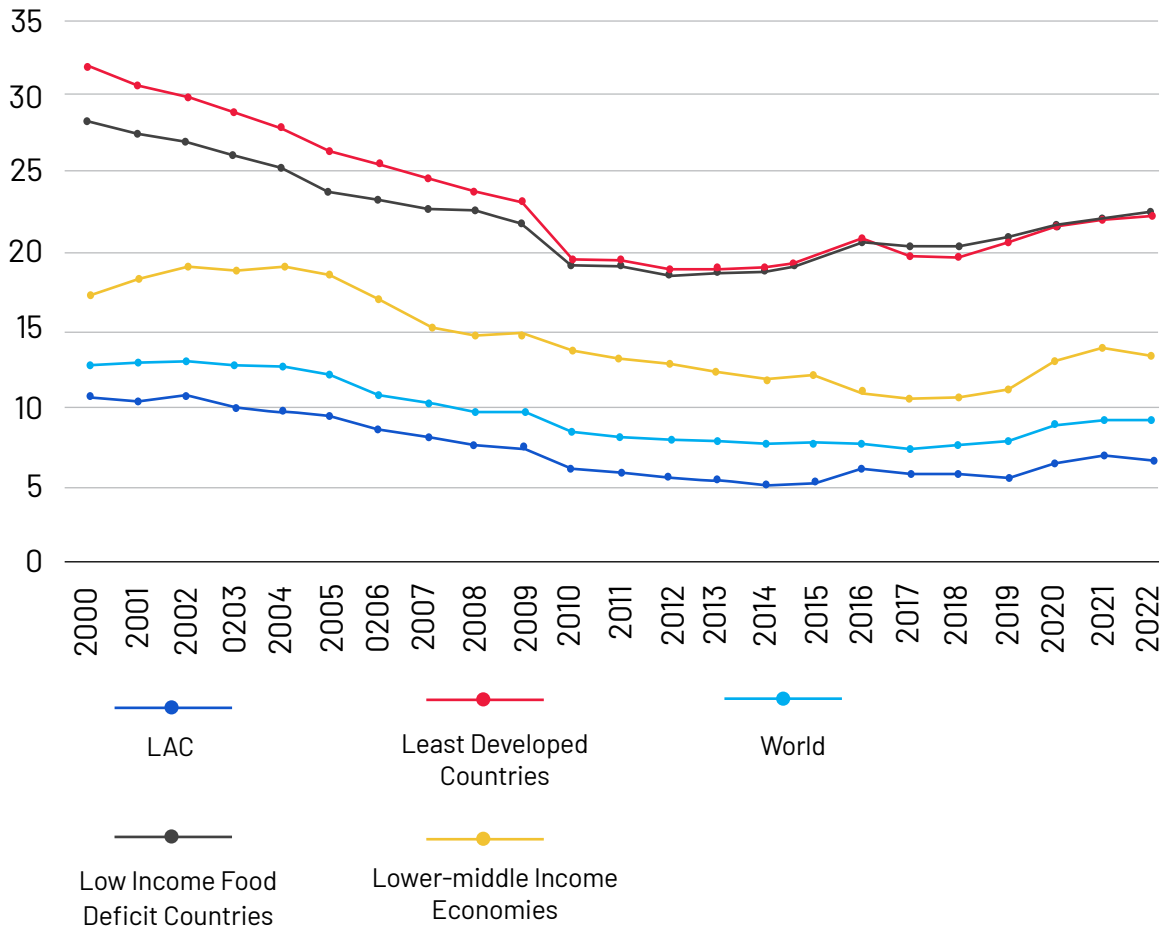
of meats (Reardon and Timmer, 2012). However, it has not necessarily integrated asset-poor farmers and has displaced other small operators in the value chains (Berdegué and Reardon, 2016).

These developments reduced the time devoted to food preparation within households, which facilitated time for work outside the house, or for care for children and vulnerable members of the family, or for leisure. They also led to longer shelf lives for food, inactivation of food-borne pathogens, and better palatability of diets. However, at the same time, the quality of the diet has declined in other dimensions by becoming high calorie and nutrient-poor (considering the addition of salt, sugar and fats to enhance shelf life and palatability; more on this below) (Chong et al, 2023).

06 NUTRITION AND HEALTH TENDENCIES

The increases in production mentioned in Section 1 refer to country averages and, therefore, there may be people below the minimum level of calories (i.e., who suffer from hunger). FAO calculates the percentage of people experiencing hunger (called the "prevalence of undernourishment," which is the official indicator 2.1.1. of SDG2: "Zero Hunger."[22]). It is widely used to provide an overview of the current situation and trends regarding hunger, at global and national levels (Figure 3).

FIGURE 3. PREVALENCE OF UNDERNUTRITION (HUNGER) IN PERCENTAGES.



Source: Authors, based on information from FAOSTAT database (2022).

The world and all the developing regions included in Figure 3 show **percentages** of hunger in 2022 lower than at the beginning of the series (year 2000), even considering the impact of COVID in 2020-2021 and the invasion of Ukraine in 2022. The **number** of people suffering hunger is also smaller for the world (about 93 million less in 2022 compared to 2002, the previous peak) and in LAC (15

22 Hunger (calorie deficiency) and undernourishment (which may include calorie deficiency or lack of other basic nutrients) are not the same. The indicator calculated by the FAO, based on estimates of calorie consumption (hunger), has the official label of "prevalence of undernourishment." In what follows we will generally use the word "hunger."

million less in 2022 compared to 2002, also the previous maximum). In Lower-middle-income economies the peak was in 2004, and since then it has declined from about 507 million to some 464, or 43 million less for that period. However, for Least Developed Countries and Low-Income Food Deficit Countries, although the percentage of hungry people went down, the number increased in 2022 compared to the average of the peaks in 2002-2004 (by about 43 and 76 million persons, respectively).

Another indicator related to hunger is the percentage of stunted children (low height by age), reflecting chronic lack of calories (compared to wasting, or low weight by height, which reflects acute hunger) (Figure 4). LAC presents the lowest incidence of this indicator among developing regions (11.5% or about half the world level). This harmful condition has declined since the year 2000; more than 16 percentage points (pps) in Least Developed Countries; about 12 pps for all developing countries ("low and middle income" in the World Bank Category used in Figure 4); 10.7 pps for the world; and more than 6 pps for LAC. Those declines are important in terms of improvements in human lives, but also have other general consequences (for example on economic growth). This will be discussed later, when describing the costs and benefits of food systems.

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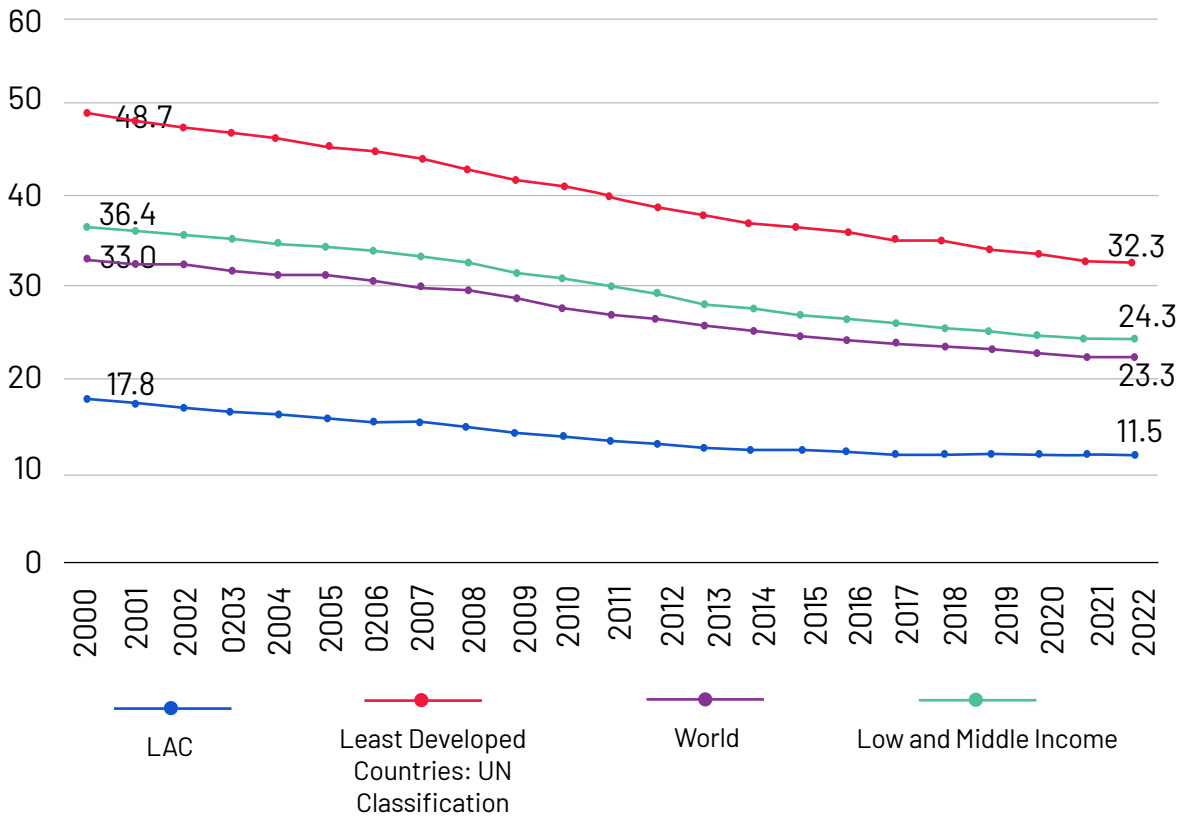
AND OTHER NARRATIVES

FIGURE 4. PREVALENCE OF STUNTING, HEIGHT FOR AGE (MODELED ESTIMATE, % OF CHILDREN UNDER 5).



Source: Authors based on the World Development Indicators of the World Bank

The estimates of undernutrition and stunting start in the year 2000, and therefore it is not possible to evaluate the evolution over the last half century or so. A reasonable assumption is that current improvements would have been even larger compared to the 1960s or 1970s, for example. [23] An approximation, but only since the 1980s, is to consider the World Bank's lowest poverty line ($2.15 per person/day in 2017 PPP dollars, which is the updated value of the old $1 per person/day of the 1990s) as a lower bound for

23 There are estimates of the prevalence of hunger for 1978-1981, 1990-1992, and 1996-98 in FAO, 2001, but they are not necessarily comparable with the current estimates. Still, they also show declines in all Developing Countries from 29% (1978-1981) to 18% (1996-98); Asia and the Pacific, from 32% to 17%; Latin America and the Caribbean from 13% to 11% and Sub-Saharan Africa, from 38% to 34%. Only in the Near East and North Africa is it estimated that it marginally increased from 9% to 10% (Table 4 in FAO 2001).

the people with hunger, and the highest ($6.85 per person/day in 2017 PPP dollars) as an upper bound for those unable to access a healthy diet (Table 5; see Díaz-Bonilla, 2023 for an explanation of the correlation between these poverty lines and the indicators of undernourishment and access to healthy diets, respectively).

TABLE 5. POVERTY HEADCOUNT RATIO (% OF POPULATION) AND NUMBER (MILLIONS)

	At $2.15 person/day (2017 PPP)		At $6.85 person/day (2017 PPP)	
	1980-1985	2019-2021	1980-1985	2019-2021
	Percentage			
LAC	17.0	4.3	56.1	28.4
Low and Middle Income	53.2	10.0	85.5	55.6
World	42.0	8.5	68.6	46.9
	Number of people			
LAC	64.9	28.0	213.8	184.7
Low and Middle Income	1942.6	654.9	3123.1	3641.1
World	1951.7	664.5	3188.0	3666.3

Source: authors with data from World Bank/World Development Indicators

The percentage of people suffering from poverty at both lines declined, and dramatically in the case of the lower benchmark of $2.15 per person/day. [24] The number of people also declined significantly in all regions considering

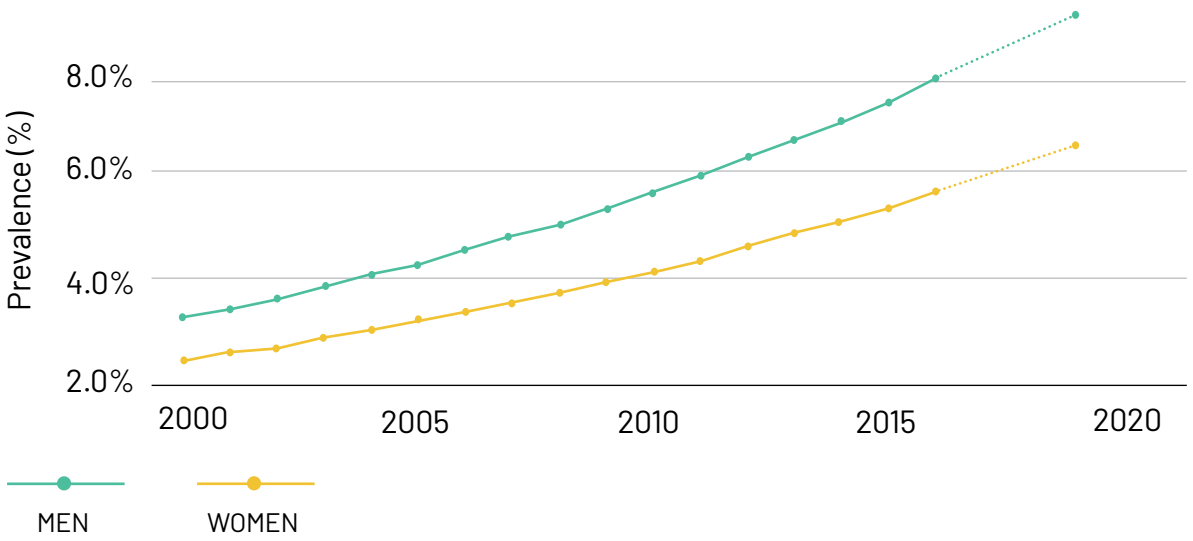
24 It is not only because of China: poverty at $2.15 per day in South Asia came down from 55.8% in the 1980s to 8.6% in 2019-2021. And in Sub-Saharan Africa from 57.1% in the early 1990s (there is no previous data) to 34.9%, although it is still a very high and concerning level.

the lower poverty line. But when using the higher poverty line (as a proxy to estimate how many cannot afford a healthy diet), the number of people only declined in LAC. However, it was mentioned that the poverty line of $6.85 per person/day is only an upper bound for that estimate; in fact, the numbers in FAOSTAT of people not able to afford a healthy diet in the period 2019-2021 are lower than the poverty incidence at $6.85 per person/day: 125.1 million in LAC (21.5% of the population during that period); 3095.8 million in low- and middle-income countries (47.3% of the population in that group); and 3112.3 million at the world level (42.3%).

Notwithstanding the improvements of the last decades, the levels of poverty, hunger and of people that cannot afford healthy diets are still worryingly high. Further, the problem of obesity has become more relevant lately, with its impact on the increase in non-communicable diseases, such as diabetes, cardiovascular problems, and certain types of cancer.

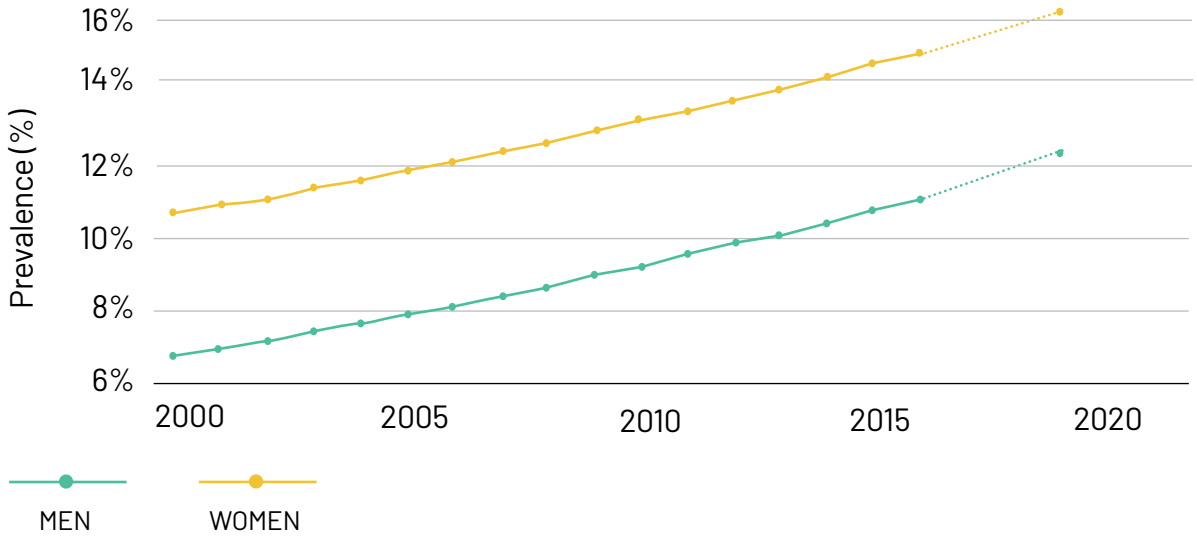
Figure 5 shows the global estimates of the percentage of obesity in children and adolescents and Figure 6 in the case of adults.

FIGURE 5. CHILD AND ADOLESCENT NUTRITION STATUS. PREVALENCE OF OBESITY IN CHILDREN AND ADOLESCENTS AGED 5-19 YEARS. WORLD LEVEL.



Source: Global Nutrition Report, 2022

FIGURE 6. ADULT NUTRITION STATUS AND DISEASE. PREVALENCE OF OBESITY IN ADULTS AGED 18 YEARS AND OVER. WORLD LEVEL.



Source: Global Nutrition Report, 2022

The problem has been increasing globally and even more in LAC, where about 24% of the adult population in 2016 was considered obese (almost 12% for children and adolescents). The problem of obesity is affecting more people, even in the poorer segments, and is related to the proliferation of cheap diets with empty calories and lacking in the necessary nutrients, on the one hand, as well as to more sedentary lives, all of which results in an increase in noncommunicable diseases. Therefore, the world and LAC countries must deal with both hunger and obesity, with the differentiated economic and social costs associated with these two problems. It should be noted that the number of people affected by obesity is now estimated to be larger than those affected by hunger for the world as a whole and LAC as well (in other developing countries in Africa and Asia hunger is still the greatest problem).

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The negative impacts on nutrition and health associated with obesity are certainly very concerning. At the same time, it should be recognized that, as discussed in Section 3, the problem emerged from structural changes in urbanization and labor markets, and from societal priorities and decisions made under a quite different context than today. As noted, back in the 1950s and 1960s, the priority was to produce enough calories to feed a rapidly growing population, and the other links between nutrition and health were less well understood and/or not considered the more pressing concerns at the time. As shown before, food systems were successful in terms of production of calories and proteins, the main priorities at the

time. At the same time, now, with better understanding of the interactions between nutrition and health (which is nonetheless still evolving), priorities have changed, and they must shape the policies and performance of food systems going forward.

07 SOME REFLECTIONS ON THE DISCUSSION ABOUT THE "TRUE COST OF FOOD"

The still stubbornly high levels of hunger, the increase in obesity and GHG emissions, the fact that somewhat more than 3,100 billion people worldwide would not be able to afford a healthy diet (about 133 million in LAC in 2021, according to the latest estimate in FAO et al, 2023), and the grim livelihood conditions of several vulnerable groups operating in food systems, along with diverse concerns about "industrial agriculture" and the operation of multinational corporations in different parts of the food value chains, have led to the narrative of "broken food systems," and a related discussion on the "true cost of food."

As mentioned, another reason for this narrative and these concerns has been the understandable sense of urgency needed to accelerate the work towards the SDGs and the objectives of the Paris Agreement and the key role food systems play in that regard. Our question here is whether a more balanced narrative would be better both as a diagnostic and framework for policy design, and as a motivating factor for the crucial actors needed to confront the significant task ahead.

A much-cited number from the narrative of "broken food systems" is the 12 trillion USD of "hidden costs" from food systems at the global level estimated by FOLU (2019).

A much-cited number from the narrative of "broken food systems" is the 12 trillion USD of "hidden costs" from food systems at the global level estimated by FOLU (2019). Based on that, and given that the total amount of food sold at the global level has been estimated at around 10 trillion USD, it has been argued that food systems "subtract value". In order to evaluate whether that comparison is correct several things must be considered. First, as FOLU (2019) notes in an especially useful methodological appendix, the estimates of 12 trillion dollars do not include only pure externalities.[25] Therefore, the total value of "hidden costs" cannot be subtracted from the market value. Second, the "hidden costs" are estimated in PPP dollars, while the market value of food is in market dollars, which are of a different magnitude and cannot be compared without further adjustments in valuations.

Third, and more relevant for the analytical work, both costs and benefits need to be considered to estimate the social value of food systems. This is recognized in Kennedy et al 2023 where the "true cost accounting" (TCA) is

25 The Technical Annex in Folu (2019) has a detailed explanation of the calculations. On page 14 it is clarified that "this analysis does not adopt a strict economic definition of externalities, but instead includes more broadly the top sources of lost value or of human and social costs related to global food and land use systems..." For instance, general equilibrium effects that operate through prices in market exchanges (sometimes called "pecuniary externalities") are already included in the market value of food and cannot not be subtracted again.

defined as "a method that accounts for all costs and **benefits** of a product, including externalities that harm or **help** other people through the environmental, social, and health consequences of production and consumption" (the emphasis in bold was added here).[26] The consideration of both aspects is necessary to better understand potential trade-offs and synergies. In that sense, as mentioned, perhaps it would be more adequate to talk about the "true value of food."

Furthermore, it is important to clarify the nature of the "hidden costs" (and benefits): whether it is a pure externality; another type of "market failure" (such as imperfect competition, information asymmetry, coordination problems, public goods, etc.); a type of "pecuniary externality" (operating through changes in market prices in general equilibrium, which are not pure externalities); different types of inefficiencies (mostly internalized by producers and/or consumers in the price of food); problems of justice and equity; or some other type of positive or negative results. Each one of these issues needs to be considered separately as they may have different policy implications, and may not be useful to lump them together in search of an overall number of "hidden costs." On the other hand, a clear identification of the separate negative impact ("costs") of each individual problem that needs to be solved, can help to prioritize interventions.[27]

A separate discussion involves what part of the "hidden costs" (and benefits) attributed to food systems is indeed

26 A previous analysis considering both costs and benefits is presented in IOM (Institute of Medicine) and NRC (National Research Council). 2015. Also, The Rockefeller Foundation, 2021 analysis of the cost of food in the United States includes a Box with benefits where it mentions that "the U.S. has the most affordable food in the world…" "U.S. consumers can purchase a great variety of food throughout the year…"; food systems support local economies and "in 2019, 22.2 million full- and part-time jobs were related to the agricultural and food sectors.." (page 8). However, the report clarifies that those benefits are not quantified in the analysis presented, and concludes that the costs are three times the value of marketed food in the United States. The analysis in Global Alliance for the Future of Food, 2021, is a rare case of a study using the "true-cost-of-food" approach but focusing only on benefits.

27 In that sense, the "cost" of a problem to be solved, is the "benefit" of solving such a problem.

related to their operation, or whether they may be caused by other factors which are separate from them.

Table 6 combines the two dimensions of analysis, focusing on costs: their nature and whether they originate within or outside of food systems. It includes just some potential and non-exhaustive examples.

TABLE 6.

		Origin	
		Within food systems (and which component)	**Outside food systems**
Nature/type	*Pure externalities	Deforestation	Use of fossil fuels in transportation and processing
	*Other market failures	Imperfect competition in food processing and marketing Inadequate/asymmetric information about food quality	Lack of public goods in infrastructure
	*General equilibrium effects through market exchange and prices ("pecuniary externalities")	Employment problems in food systems	Employment problems outside food systems
	*Different types of inefficiencies	Overuse of water	Waste in general
	*Equity/justice effects	Exploitation of farmers	Labor exploitation in general
	*Other problems?		

Source: authors

In summary, we argue that a "true cost accounting" approach should go beyond trying to come up with an aggregate number of "hidden costs"[28] and ensure a) that benefits are also counted, considering that these should be preserved and that there may be potential trade-offs and synergies between costs and benefits;[29] and b) that the nature and origin (internal or external) of the costs or benefits are clearly identified. In this way, it will be possible to design more adequate programs and policy interventions to achieve the SDGs and the objectives of the Paris Agreement.

In what follows, we will further discuss these ideas, focusing on the nutritional dimension. In a subsequent section we will briefly comment on other economic and environmental dimensions.

01 Nutritional dimension

There is extensive literature on the benefits of improved nutrition. For instance, Nobel Prize winners Robert Fogel and Angus Deaton, in different studies, have shown the historical significance of better nutrition for human health and economic growth. Fogel argued that "the increase in the amount of calories available for work over the past 200 years must have made a significant contribution to the growth rate of the per capita income of countries such as France and Great Britain..", which he estimates at "about

28 As mentioned, the negative impacts attributed to individual problems can be useful to prioritize interventions.

29 An argument for not highlighting benefits explicitly is that they are already embedded in the current valuation of the GDP. We will come back to this point.

30% of the British growth in per capita income over the past two centuries." (Fogel, 2004, pages 652-653).

Further, Deaton (2013) argued that "Better nutrition enabled people to grow bigger and stronger, which further enabled productivity to increase, setting up a positive synergy between improvements in incomes and improvements in health, each feeding off the other…. these larger, better-off people may also have been smarter, further adding to economic growth and speeding up the virtuous circle. Taller, bigger people lived longer, and better nourished children were less likely to die and better able to ward off disease" (Deaton 2013, pp 91–92).

Similar arguments can be made regarding the situation in many developing countries in recent decades. In fact, there have been different studies focusing on the economic gains of improvements in nutrition (particularly declines in stunting), on reductions of mortality and increases in overall productivity, or, vice versa, the costs of not addressing those problems (Alderman, Behrman, and Puett, 2017, and Galasso and Wagstaff et al, 2016). For instance, Mary (2018) has estimated that a percentage point increase in child stunting prevalence decreases current GDP per capita by 0.4%.[30] Therefore, having reduced stunting by 10.7 percentage points at the global level since 2000 (Figure 4), that decline could have led to a cumulative world GDP per capita about 4.3% higher than it would have been otherwise the case. This increase applied to the values of 2022 would mean about 7 trillion PPP dollars in additional total GDP for the world, just because of that nutritional improvement".

30 The study focuses on the links from growth to stunting, but the estimates include the econometric analysis of the reverse causality, which is the one referenced in the text.

Looking specifically at the analysis in FOLU (2019), the costs are calculated for obesity and hunger. The impact of obesity is estimated using the number of disability-adjusted life years (DALYs), which represents the loss of the equivalent of one year of full health.[31] The DALYs associated with the risk factor of high-body mass index (HBMI), as estimated by IHME Global Burden of Disease[32], amount to 148 million DALYs for the year selected. The DALYs are then multiplied by the GDP per capita of $17,971 (in 2018 PPP dollars), for a total cost of obesity of 2659 billion PPP dollars. In the case of hunger, the loss of productive life is also measured by DALYs associated with the nutrition risk of child growth failure (including child stunting, wasting, and underweight), as estimated by IHME Global Burden of Disease as well. The loss amounts to 101 million DALYs, also multiplied by the same GDP per capita, for a total cost of 1815 billion PPP dollars. Both obesity and hunger then add up to a cost of 4474 billion PPP USD (or 38% of the 12 trillion hidden costs estimated).

However, looking at benefits, it could be asked, for instance, how many DALYs have been avoided by the operation of food systems, due to the number of people that are reasonably well-fed and with food produced under better standards of hygiene. A way to consider this is the change in DALYs from 1990 using the same data from IHME Global Burden of Disease (Table 6).

31 DALY is "a time-based measure that combines years of life lost due to premature mortality (YLLs) and years of life lost due to time lived in states of less than full health, or years of healthy life lost due to disability (YLDs)" https://www.who.int/data/gho/indicator-metadata-registry/imr-details/158

32 Institute for Health Metrics and Evaluation (IHME). Data available from https://vizhub.healthdata.org/gbd-results/

TABLE 7. IHME GLOBAL BURDEN OF DISEASE. 1990-2019.

		1990	2019	Difference in DALYs
Child growth failure	Number (million DALYs)	336.2	89.8	-246.5
High body-mass index	Number (million DALYs)	67.3	160.3	93.0
Child growth failure	Rate per 100,000 (age standardized)	5274.6	1347.8	n.a.
High body-mass index	Rate per 100,000 (age standardized)	1637.6	1932.5	n.a.

Source: Global Burden of Disease Collaborative Network. Global Burden of Disease Study 2019 (GBD 2019) Results. Seattle, United States: Institute for Health Metrics and Evaluation (IHME), 2020. Available from https://vizhub.healthdata.org/gbd-results/.

Therefore, the balance between improvements related to child growth and deterioration regarding HBMI (using the two indicators in FOLU, 2019) would have been a net decline of 153.5 million DALYS (-246.5 plus 93 million DALYs), with a net value gain for the society of about 2.8 trillion PPP dollars using the FOLU valuation. The benefits of having cut DALYs in net terms appears important for health and productivity.

The previous analysis considered the evolution over time, but another comparison is between the levels of people suffering from malnutrition of different types, and those that appear with adequate levels of nutrition at a point in time. Before, the number of people that lack

the income to be able to access a "healthy diet" was discussed. To analyze the nutritional impact, we look at the number of people that cannot afford "nutrient-adequate diets," which are defined as those that "provide not only adequate calories but also adequate levels of all essential nutrients – namely, carbohydrates, protein, fat, vitamins and minerals, within the upper and lower bounds needed to prevent deficiencies and avoid toxicity" (using a representative person within upper and lower bounds for 23 essential macro- and micronutrients and an energy intake of 2330 kcal/day) (Herforth et al, 2022).[33]

The only estimate for that diet corresponds to 2017, when it was calculated that about 2280 million people would not be able to afford the "nutrient adequate diet." In 2016, WHO estimated that about 1,029 million people worldwide were obese (650 million adults, 340 million adolescents and 39 million children).[34] Making the reasonable assumption that those suffering hunger are within the almost 2.3 billion people in the category of not being able to pay for a "nutrient adequate diet," and adding the total number of obese people (although some, perhaps many, would also be within those that cannot afford a nutrient adequate diet), that number is about 3.3 billion people, against a total population that in 2016-2017 was somewhat more than 7.5 billion. That would imply that the number of people that benefit from the diets provided by food systems (4.2 billion) is larger than those affected by lack of food or bad diets.

33 The authors estimate three diets, the "nutrient adequate," the "healthy diet" and an "energy sufficient" diet. The "nutrient adequate" diet (which we refer to in the text above) and the category of "healthy diets," both meet "calorie and nutrient needs (defined by a specific standard for specific populations)" (Herforth et al, 2022). The "energy sufficient" diet, in turn, only provides adequate calories for energy balance at a given level of physical activity and body size, using only the least-cost starchy staple in each country (Herforth et al, 2022).

34 https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight

However, the number of overweight and obese people continues to increase, which, in the near future, can change the balance between those with bad diets and those with good ones. For instance, Chong et al 2023 showed that while malnutrition[35] and the DALYs and mortality rates associated with it have declined between 2000 and 2019, obesity-related mortality and DALY rates have trended in the opposite direction. The authors attributed the last trend mainly to rapid transitions in diets globally, which included larger retail availability of highly processed foods, leading to relatively inexpensive but energy-dense options. They project that on current trends, in 2030 there will be an even larger gap between the benefits of having reduced the aspects of malnutrition considered by the authors and the increasing costs of obesity (Chong et al, 2023). Therefore, while food systems may still have a positive global impact in terms of nutrition, the trends seem to be moving in the wrong direction, and they need to be rectified.

The number of overweight and obese people continues to increase, which, in the near future, can change the balance between those with bad diets and those with good ones.

So far, the discussion has considered both costs and benefits. As noted, an argument that is sometimes used for not highlighting benefits explicitly in the "true cost" literature is that those benefits are already embedded in the current monetary value of the GDP, and therefore the focus should be on the hidden costs of the problems that need to be solved. While the focus on solving actual problems is crucial, there are at least three considerations why the benefits should also be highlighted. One is that not all the benefits may have been embedded in the valuation of the GDP. Second, there may be trade-offs and synergies across

35 The concept of malnutrition in Chong et al, 2023 includes protein-energy malnutrition, iodine deficiencies, vitamin A deficiencies, dietary iron deficiencies (D50-D50.9), and other nutritional deficiencies such as vitamin deficiency anaemias, thiamine, niacin, vitamin D, vitamin C, calcium, selenium, and folate deficiency.

costs and benefits that need to be recognized, particularly if a possible policy implication of the "true cost" approach is that at least some of them may have to be internalized in a higher price of food.[36] Finally, from a political economy point of view, focusing only on costs may not help elicit the collaboration needed from the crucial economic agents whose participation is key to solve the problems identified.

Besides considering costs and benefits, a separate topic is whether they can indeed be related to the internal operation of food systems, or whether they may be caused by separate factors, and therefore, policy interventions for food systems alone would not solve the problems identified. For instance, in the case of the increasing levels of overweight and obesity, the basic reason is the imbalance between energy intake and energy use, given some genetic conditions and metabolic factors. But there are several economic, behavioral, and lifestyle factors that affect both ends of the imbalances differently, that is, the intake and the utilization of energy. Some of those factors include urbanization, and the shift to work in services leading to lower use of energy (Popkin, 1999). In addition, as noted, greater participation by women in the labor force and consumer preferences for convenience have also changed dietary habits, emphasizing the convenience of ready-made meals. The food industry has also been criticized, in several instances accurately, because of the unhealthy nutritional composition of some products (including snacks, sugar-sweetened beverages, and/or fast-food items). The argument is that companies design products with high

36 Solving the problem of interest may imply a higher but also a lower price for food, or no changes, depending on the nature of such problem and the type of policy intervention.

palatability, even making them addictive, with an excess of sugar, salt, and bad fat. They then advertise and promote them aggressively through intense publicity campaigns and marketing strategies, creating and expanding demand for those unhealthy products (Rivera Dommarco et al., 2008; Monteiro et al., 2013). But there is also a demand side, and the consumers' behavior must also be considered. They may consume an excess of calories (which although in part is promoted by advertising and the design of addictive foods, it is in the end the consumer's decision) and do not exercise enough. Some of the policies needed to address obesity (such as regulations on composition of products, labeling and advertising; taxes on certain unhealthy products;[37] and information/education) indeed focus on food systems. But others, such as infrastructure for sports and exercise, alternative transportation methods, or behavioral nudges to avoid sedentary lifestyles exceed the scope of food systems.

Some of the policies needed to address obesity (such as regulations on composition of products, labeling and advertising; taxes on certain unhealthy products;36 and information/education) indeed focus on food systems. But others, such as infrastructure for sports and exercise, alternative transportation methods, or behavioral nudges to avoid sedentary lifestyles exceed the scope of food systems.

With respect to hunger, most of the problems are related not to food systems per se but to poverty resulting from the operation of the entire economic and social system,[38] and/or are caused by wars or extreme weather events, which can be only partially attributed to the operation of food systems. Policy interventions focusing only on food systems would not solve those more general problems.

As argued before, a detailed analysis of the individual costs and benefits and their origin is necessary to design adequate plans and programs for food systems that con-

37 See for instance, Alvarez-Sánchez C et al, 2018; Colchero, et al, 2018; Hernández et al (2018); and Taillie et al, 2017 on taxes in Mexico; and Caro et al, 2018; and Caro et al, 2020 on taxes in Chile).

38 As noted, this point was already made in the 1943 declaration that led to the creation of the UN Food and Agriculture Organization (FAO) (Díaz-Bonilla, 2023).

tribute positively to health and nutrition, and also to the rest of the objectives of the Agenda 2030 and the Paris Agreement.

02 Other dimensions of costs and benefits

Cost estimates such as those provided by FOLU (2019) or the Rockefeller Foundation (2021) include other dimensions related to livelihoods (for example, poverty and food insecurity), the environment (GHG emissions, water depletion, soil erosion, pollution, loss of biodiversity), and other aspects of human health, besides hunger and obesity analyzed in the previously section.

Some of the same principles discussed before also apply. For example, it is true that a large percentage of the world's poor work in food systems, but, at the same time, those systems are probably the largest employers at the world level. Some estimates go up to half of world employment once all the jobs directly and indirectly related to food systems are considered (Díaz-Bonilla and Callaway, 2018).[39] In any case, the difficult conditions of the poor that work in food systems need solutions, while also taking into account the employment benefits that offer this vast source of jobs for a variety of entry-level occupations. As in other cases, the costs and benefits of the real

operation of labor markets must be analyzed to properly design the necessary policy interventions.

Also, the impact on poverty, even for those operating in food systems, may be related to more systemic conditions of the economy (such as inadequate minimum wages and labor regulations), which cannot be solved by focusing solely on food systems.

In the case of environmental impacts, those related to agricultural production and land-use change, including deforestation, are linked to food systems (and many of those effects are externalities that can be taxed and regulated). However, other aspects of their operation, such as the energy matrix and the equipment for transportation, processing, and food preparation, are related to conditioning factors broader than food systems. In that regard, for example, it would be inappropriate to apply carbon pricing or carbon taxes for food only, particularly considering the number of people that still cannot pay for healthy diets.

Agriculture is probably the only sector that can help with the needed actions for climate change mitigation, adaptation, and resilience by not only reducing GHG emissions but also acting as carbon sinks.

Furthermore, as argued before, agriculture is probably the only sector that can help with the needed actions for climate change mitigation, adaptation, and resilience by not only reducing GHG emissions but also acting as carbon sinks. For instance, a recent IICA publication (Chacón and Gutman, 2022) shows relevant experiences of sustainable agriculture in the Americas, such as no-till farming or conservation agriculture, the intensive rice cultivation system, natural pastures, the use of coffee by-products, sustainable livestock farming, and good practices in the Caribbean.

39 It is worth noting that employment was considered one of the components of the much-promoted concept of multifunctionality of agriculture, and which supposedly justified that the sector be subsidized. Díaz-Bonilla and Tin (2002) analyzed the argument of positive externalities in agriculture now and in industry in the 1960s that could be used (or not) to justify subsidies for those activities.

Finally, some reports on the "true cost of food" argue that there are other sources of costs that are not considered, suggesting that the negative impact of current food systems would be even higher than those estimated. As an example, the Rockefeller report (2021) mentions "Reduced military readiness due to diet-related health conditions" (p.16).

But on the other hand, there may be benefits as well that have not been considered and that should be included in the analysis. For instance, considering the issue of military readiness, there is a long tradition of linking food problems to war and social violence. Malthus (1803) argued that because food production would not keep pace with population growth, then violent conflict would follow, and war, with the loss of lives, would be a way of returning supply and demand to equilibrium.[40] The World Food Program (2017), in a document aptly titled "Winning the Peace: Hunger and instability," revised more than 3,000 journal articles on the links between food insecurity and social violence, instability, and war, and concluded that "while food-related instability is subject to many individual conditions, the weight of the collective evidence is unmistakable: Food insecurity is linked to instability. Approximately 95% of the peer-reviewed studies examined in this report were able to establish an empirical link between food insecurity and instability" (p. 8). Therefore, the advances in production and the reduction of hunger noted in Section 1 must have contributed to a world that has been more peaceful than what a counterfactual of larger food insecurity would have been.

40 The page of the UNFSS website also argues that "When our food systems fail, the resulting disorder threatens our education, health and economy, as well as human rights, peace and security (emphasis added)" https://www.un.org/en/food-systems-summit/about.

As in the other examples, this does not deny the serious problems of conflict still present and that must be solved; this is only to argue that both costs and benefits should be considered to devise adequate programs for food systems that mobilize the energies of all stakeholders.

08 CONCLUDING COMMENTS

This paper has argued that the narrative of "broken" food systems may not reflect an adequate characterization of the current situation, when considering several specific indicators as to how food systems have performed in the recent past. Available data shows that agri-food systems at the world level and in LAC showed important productive advances, which were also reflected in improved indicators related to hunger, poverty, and affordability of diets.

As noted, the world food system has moved from producing food for a planet of 3 billion people in the 1960s to producing some 30% more in availability of calories and almost 35% of proteins per capita for a population of almost 8 billion now, with primary food prices that in real terms in 2020-2022 have been 14% below the levels of 1960s and 1970s, and with an increase of global agricultural land of less than 9% between 1960 and 2021. In this process, hunger, stunting, wasting and poverty indicators declined significantly in the last decades, even with the recent crises that have stopped, and somewhat reversed, those improvements.

These developments have had positive impacts on human health, productivity, economic growth, and peace and good governance. Certainly, these results, for the world and for the region (which has shown better indicators than the average for developing countries), have not been only because of the performance of the agri-food sector, but were also driven by economic growth, improvements in health and sanitary infrastructure, and the expansion of social safety nets.

At the same time, and notwithstanding these advances, it is also true that there are currently serious concerns about several health, environmental, social, and economic indicators related to the operation of food systems. The world is not on a path to achieving the SDGs and the objectives of the Paris Agreement.

Another point emphasized is that correct characterization of the evolution of food systems must be done in the context of the societal objectives and concerns related to the functioning of food systems in each era, and which guided the policies and institutional frameworks that led them to where they are today. With that foundation, then a further analysis is needed, moving on to the current concerns, objectives and aspirations that are relevant to help shape the future. This would allow us to identify what needs to be improved or transformed, and what the strengths are that could be exploited based on the new objectives.

After World War II the emphasis was placed on cheap calories, without much attention paid to broader nutritional

issues. One example is the creation of CGIAR, with the aim of increasing production and productivity focusing on some key staple products. Concerns regarding the use of resources and environmental impacts were raised in general terms and from very global perspectives (Club of Rome, 1972). Climate change was mostly absent as a consideration.

Urbanization and changes in the organization of the family were also important drivers of food markets. Faced with the social priority of "cheap calories" and "convenience foods," the global food industry has proven to be very effective in taking advantage of the emerging food science to provide alternatives.

Current policies should take advantage of those capabilities while focusing on the objectives that are considered more pressing today. The CGIAR and the "green revolution" are examples of how to harness the transformative power of agriculture and technology. The current discussion should recognize the mitigation capacity of agriculture and how the current scenarios of science and technology can enhance that capacity. How these questions are answered will give rise to very different strategies to solve the concerns, objectives, and aspirations implicit in the indicators mentioned in the previous sections.

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Regarding the more recent emphasis on the "hidden costs" of food systems, it is interesting to note that the analysis in the last years moved, mainly in Europe, from the postulated multifunctionality of agriculture with all the

positive external factors that were supposed to justify its subsidization, to the "true cost of food," with a variety of negative externalities, some of which could now require taxation of food systems. In this regard, several countries have been successfully using taxes on some unhealthy food items (considering the true externalities they may have on communicable diseases) (see evaluations in Alvarez-Sánchez C et al, 2018; Colchero, et al, 2018; Hernandez et al (2018); and Taillie et al, 2017 on Mexico; and Caro et al, 2018; and Caro et al, 2020 on Chile). But some of the language and policy proposals in the literature on "true cost of food" seem to suggest a more general approach to taxing food, which would endanger economic access for poor consumers.

Considering positive and negative aspects facilitates a more adequate analysis of potential synergies and trade-offs.

While calculating the costs of the negative impacts of individual problems (or categories of problems) is useful to help prioritize interventions, the emphasis of some studies on trying to generate an aggregate number of the "hidden costs" of food systems, is less informative, and may not help with the already difficult political economy of the transformation of food systems. In addition, the "true cost accounting" should also recognize advances and benefits, leading to the "true value of food." Considering positive and negative aspects facilitates a more adequate analysis of potential synergies and trade-offs. Furthermore, costs and benefits need to be analyzed individually, by clearly differentiating the nature (whether they are true externalities, other "market failures," inefficiencies and costs that can be internalized, equity problems or other issues), and the origin (the

agricultural producers, other economic agents in the food value chains, the consumers, or actors and activities completely outside food systems). In this way it becomes possible to address each one of those issues in a more systematic way, and devise policy interventions that focus on the specific problem, considering trade-offs and interactions.

We are not arguing that there is no room for improvements, particularly when considering how the agenda has evolved in recent times, and the growing need to analyze food systems in the broader context of the 2030 Agenda and the challenges of climate change. On the contrary, we want to emphasize that, given the complexity of these issues, for interventions to be successful, they need to reflect a complete diagnosis, focusing not only on the weaknesses of current food systems, but also underscoring the existing strengths which could serve as stepping stones for the needed improvements.

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A balanced narrative would note that food systems over time have generated important benefits, many of them captured in higher GDP and human welfare; but that, at the same time, there are still important and growing problems. If not solved, they imply quantifiable costs (as identified in the "true cost accounting") or, viceversa, specific benefits if we solve them. We believe that this approach could not only help to design and implement better plans and programs for improvements in food systems, but it is also more likely to mobilize the relevant actors and stakeholders to address the problems facing humanity while protecting the existing benefits.

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