24 Global economic benefits of eating better

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Overconsumption, diets low in fruits, vegetables, wholegrains, pulses, fibre, calcium, iron and beneficial fatty acids and diets high in processed meats, sugar and salt are responsible for approximately 33% of preventable disease and death in adults globally (Afshin et al. 2019), as discussed in the chapter by Shireen Kassam. Other chapters highlight that current diets high in animal products also have a large environmental footprint, with livestock responsible for approximately 18% of global CO_2-equivalent annual greenhouse gas (GHG) emissions (Steinfeld et al. 2006; Xu et al. 2021), 50% of annual tropical deforestation (Pendrill et al. 2019) and 33% of global reactive nitrogen pollution to air, soil and water (Uwizeye et al. 2020).

Human and natural capital, viewed in classical economics as labour and natural resources, underpin the human economy (TEEB 2018). The disease burden from current diets degrades human capital over the near and medium terms. GHG emissions, nitrogen pollution and habitat loss pose a risk to productivity through heat stress, air pollution and damaging the natural resource base in the near to long term. From the scale of the impact of current food system activities on human and natural capital in the near and long term, it is natural to ask what economic damages and risks are posed by current diets and their production. The United Nations (UN) system of national accounts does not subtract the future liability of damage to human and natural capital from the value-add of sectors and gross product (Dasgupta 2015). Any future losses to the national economy, or the economy of other nations, from this year's food system activities are unaccounted for. If the trends of current diets and production methods continue, then the future losses accumulate year on year as a hidden deficit. This potential puts at risk global economic development and sustainable growth.

Economic reports of the future and unaccounted costs of climate change such as the Stern report (Stern 2007) mainstreamed carbon taxes, emissions trading and other policy instruments. However, there have been few similar, or similarly influential, investigations across the damages associated to food production and consumption. In this chapter we discuss the results of recent studies by the Food and Agriculture Organization of the UN (FAO) to estimate the unaccounted global and regional costs of current diets and by the Food System Economic Commission (FSEC) to estimate the potential economic benefits from avoiding these costs under dietary change.

Costs included in the studies and comparing them across economies

Central to making sense of monetary amounts is the scope of costs to what, to whom and when. Productivity losses (damage to future gross domestic product as total value-add) and welfare losses (reduction of the value provided by consumption of good and services and intangibles such as human rights) are not the same measure (Sandelin, Trautwein, and Wundrak 2014).

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The hidden cost studies concern a mainstream argument about the potential correction to value-add missing from national accounts and the implications for growth and development. Society is the "who" paying the price of hidden costs. Some individuals and sectors might bear greater or disproportionate costs than the total cost to society because other individuals and sectors benefit, for example, water treatment or health services. A complementary study of the welfare potential in dietary change was conducted in the Food System Economic Commission (Ruggeri Laderchi et al. 2024), which found additional social welfare benefits beyond the avoided productivity losses described below.

The "what" and "when" of the hidden costs are the disease burden from current food consumption, GHG emissions, nitrogen pollution (N) and habitat loss from food production. These create impact that is dispersed across national borders, the near- to long-term future and through multiple human and natural capital pathways.

GHG emissions increase radiative forcing, warming the planet and changing climate variables such as temperature and precipitation (IPCC 2023). The increase in extreme events in the short term, and changes in ecosystems and water cycles in the medium term, directly affect human capital through heat stress, increase in diseases and lost agricultural production. Ultimately, a mismatch between the shifted natural base and built capital and labour, for example in agricultural production shifting latitudes, can create significant socio-economic damage through lost industries, mass migration and conflict over resources. The most prominent GHG are well mixing gases, meaning that the emission in one country can create costs globally.

Nitrogen pollution includes ammonia and nitrogen oxides that volatilise to air, as well as leaching and run-off of reactive nitrogen from manure and fertiliser application. Ammonia and nitrogen oxides create productivity loss from air pollution in the near- and mid-term and also contribute to crop losses in the near term through terrestrial acidification and ozone production (Fowler et al. 2013). Redeposited volatilised nitrogen, leaching and run-off to waterways create ecosystem service losses downwind and downstream (Erisman et al. 2013). Nitrogen load accumulates in terrestrial ecosystems fed by the water sources and then reach coastal ecosystems (Camargo and Alonso 2006). Acidification and eutrophication are primary drivers of ecosystem impacts (Krupa 2003; Sutton et al. 2013). The effects of nitrogen pollution on waterways and ecosystem occur relatively quickly (Billen et al. 2013) and are mostly near term. However, sustained nutrient loading can cause permanent alteration of ecosystems and nitrogen impacts can be delayed by storage in long-term reservoirs such as groundwater reservoirs (Van Drecht et al. 2003). Nitrogen damages can cross national boundaries from the site of emissions, either through air plumes of particulate matter, deposition or in shared water catchments.

Agricultural land expansion such as deforestation and mangrove clearing changes the basic functioning of ecosystems (habitat loss, disruption of biophysical inputs, disruption of biological cycles and food chains, etc.). This results in a loss of services provided by ecosystems to the human economy. In several countries abandoned agricultural land provides a potential hidden benefit. However, compared to abrupt loss of an established ecosystem, biodiversity and ecosystem services can take decades to recover on abandoned cropland and pasture (Jung et al. 2019; Le Provost et al. 2020). Most land-clearing for agriculture has effectively been permanent with near- to long-term effects depending on economic adaptation (Gomes et al. 2020).

Poverty and undernutrition are associated with distributional failures. An inability to distribute incomes to provide minimum or living wages, and distribute globally the sufficient calories produced each year, results in an underutilisation of human capital. Poverty and undernutrition have lifelong and potentially generational productivity effects (Victora et al. 2008; Hoddinott et al. 2013).

Unhealthy diets have been associated with preventable morbidity and mortality in national populations from neoplasms (cancers), cardiovascular disease and type II diabetes (Afshin et al. 2019; Dai et al. 2020). Labour productivity losses from illness or informal care occur in the near term from intake of exacerbating existing co-morbidities and in the longer term from the onset of morbidities from dietary patterns.

These last sentences describe the "what" and "when" of external economic damages from GHG emissions, nitrogen emissions, land-use change (collectively labelled E costs below), productivity losses from the preventable burden of disease due to unhealthy diets (collectively labelled H costs) and distributional failures (collectively labelled S costs). Altogether they were called hidden food system costs by the FSEC (Gaupp et al. 2021). A primary reason for the lack of accounting for these costs alongside the value-add of food system activities is the difficulty in calculating and rectifying costs that are dispersed across economic sectors, national borders, the near- to long-term future and multiple human and natural capital pathways of impact.

The dispersion also means that aggregating and making sense of the costs requires comparing economies of different countries and at different times. Placing parity and discounting, which are technicalities in economic measurement, at the forefront of debates on appropriate taxes or mitigation of GHG emissions, N pollution and biodiversity loss. In the FAO and FSEC studies, the damages to GDP across countries is measured in purchasing power parity (PPP) (Shapiro 1983). This accounts for the value of consumption in a country, for example, China and India have the first and third highest GDP in PPP terms because of the relatively lower costs of basic items. Damages to lower-income countries are higher in purchasing power than in market exchange rates. Damages across time are turned into present purchasing power using a social discount rate (Moore et al. 2004; Drupp et al. 2018). Present value allows the liabilities from cost bearing to be compared to the value-add in the year of cost production. The monetary measure in the following results is 2020 PPP, which means damages in the equivalent purchasing power in 2020.

Hidden costs of current diets

The FAO State of Food and Agriculture (SOFA) 2023 put the unaccounted liabilities of agri-food systems from GHG emissions, nitrogen emissions, land-use change, productivity losses from the preventable burden of disease due to unhealthy diets and distributional failures at >10 trillion 2020 PPP per year (FAO 2023). In a correction to global gross product for the liabilities of current diets and non-food agricultural production, the subtraction would roughly equal the combined value-add from agriculture, food manufacturing and food service and retail. The result does not indicate that these sectors provide no value, they provide a necessary good, but it does indicate that other sectors in the economy and future agriculture potentially wholly subsidise profits of current activity by absorbing hidden costs.

At a national level, China's hidden costs in the SOFA report at 10.3% of GDP PPP (2.5 trillion 2020 PPP) compare to 7.7% value-add of agriculture, forestry and fishing in 2020 (GVA-AFF), and India's hidden costs at 12.5% of GDP PPP (1.12 trillion 2020 PPP) compare to 18.2% GVA-AFF (Lord 2023b). For the US and the EU, costs are predominately from diets and compare to 6% and 8% of 2020 GDP PPP, respectively. In both regions, the costs exceed estimates for value-add from agriculture, food manufacturing and food service and retail.

In the FAO SOFA 2023 report, the distributional and consumption-related future productivity losses are about four times larger than those from GHG emissions, nitrogen surplus and habitat loss from food production (80%–20% split). These proportions are global and in absolute terms. Absolute purchasing power impacts and relative economic burden are different. Figure 8 in SOFA 2023 discusses the unaccounted liabilities of food production and consumption on a

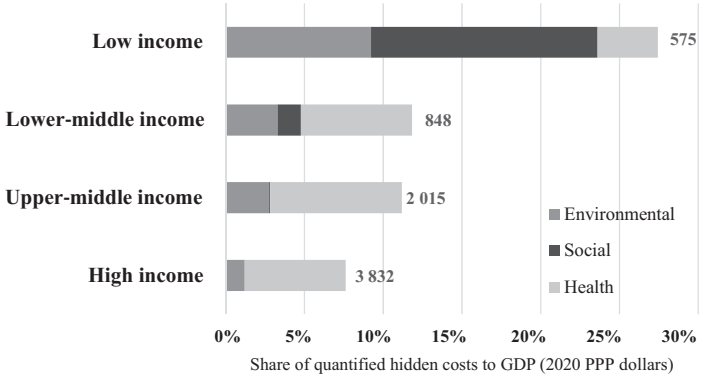

Figure 24.1 Economic burden from hidden costs of current food system activity by World Bank income group. Numbers indicate the per capita burden in 2020 PPP. Costs from greenhouse gas (GHG) emissions, nitrogen emissions, land-use change (collectively Environmental costs), productivity losses from the preventable burden of disease due to unhealthy diets (collectively labelled Health costs) and distributional failures including agrifood worker poverty (collectively labelled Social costs). Source: Figure 8 from FAO (2023).

percentage GDP basis (Figure 24.1). The relative burden for low-income countries (LIC) is 27% of GDP PPP, and for middle-income countries (MIC) is ~12% of GDP PPP, compared to 7.5% for high-income countries (HIC). Priority for the risks the food system poses to economic growth and development is in LIC and MIC. LIC and MIC have significant costs from production, especially MIC where globally the bulk of food is produced. The costs of consumption span income groups.

The SOFA numbers reflect the extent of the harm from diets to human capital. The lost potential for productivity is extensive. Ironically, better diets and less caloric intake might be the greatest benefit to human capital from the food system since the reduction of hunger from the invention of cheap calories. The higher proportion from consumption-related future productivity losses also reflects that mainstream economic management has a historical measurement bias towards labour over natural inputs. Our economic knowledge about ecosystem services is much less, especially the future marginal value of those services under climate change and ecosystem degradation. In many HIC food production is <2% of GDP (it is <1% in the EU bloc). Here, the impact from unhealthy diets, which affect the entire workforce in and outside of agriculture, make up 85% of the hidden costs, whilst production impacts make up 15%. With this lens, even in HIC, the share of unaccounted costs of food production in proportion to its share of value-add, show how expensive the emissions and land-use consequences of production are.

Economic benefits of dietary change

The FAO SOFA does not tell us how much we could reduce hidden costs by transforming the food system. One task of the Food System Economic Commission was to examine whether dietary change could reduce the liabilities (Ruggeri Laderchi et al. 2024). Modelling for the Commission (Bodirsky et al. 2023) had a diets scenario (DIET), where the Planetary Health Diet (Willett et al. 2019), representing a trade-off between improved nutrition and reducing environmental pressures, is gradually adopted over 2020–2050. The Planetary Health Diet increases intake of fruits and vegetables, wholegrains, pulses, nuts and seeds and plant sources of beneficial fatty acids and requires a large reduction in dairy, meat, sugar and salt from current intake.

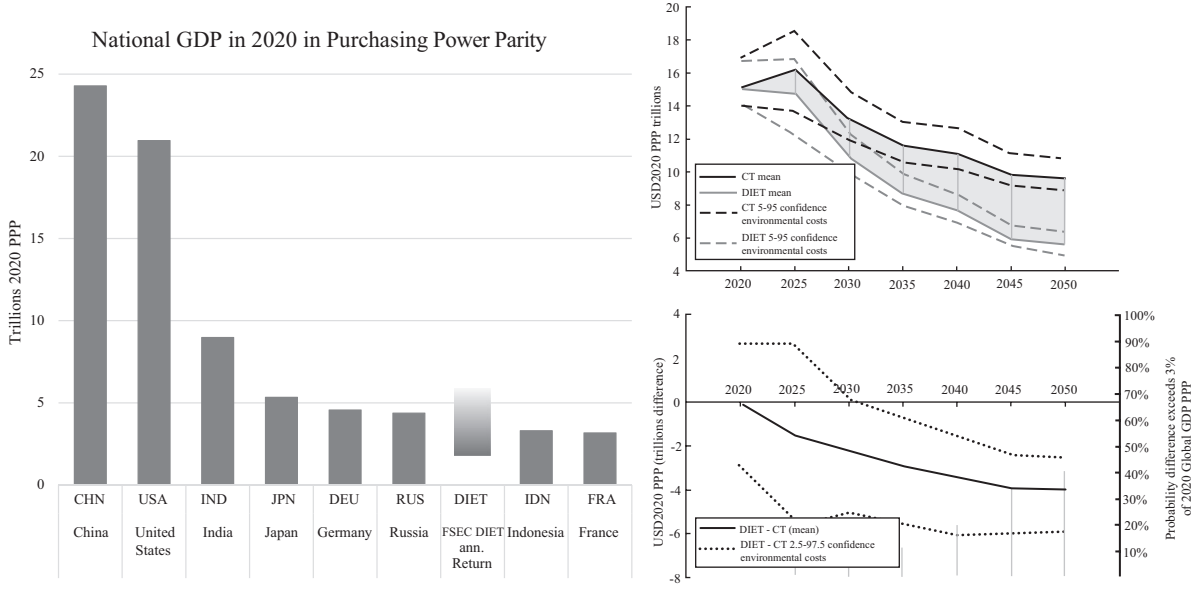

Figure 24.2 Left panel, annuitised return in the FSEC scenario of dietary change in 2020 PPP averaged over three decades, in comparison to the GDP PPP of world economies in 2020. Shading indicates modelled uncertainty. Right upper panel, the trajectory of hidden costs under the currents trends (CT) and dietary change (DIET) scenario, with uncertainty. Avoided costs from annual production and consumption, shown as the area between the CT and DIET hidden cost trajectories in the top right panel and with uncertainty in right lower panel, increase over time.

Table 24.1 Avoided hidden costs under the FSEC scenario of dietary change in 2020 PPP (billions), per capita, and as percentage of 2020 GDP PPP, by World Bank income group. Avoided costs are averaged for each income group and category over the three decades 2020–2050. Costs from greenhouse gas (GHG) emissions, nitrogen emissions, land-use change (collectively E costs), productivity losses from the preventable burden of disease due to unhealthy diets (collectively labelled H costs) and distributional failures including agrifood worker poverty (collectively labelled S costs)

Income group	*Category of hidden cost*	*Avoided cost in DIET 2020 PPP*	*GDP 2020 percentage*	*2020 PPP per capita*
Low income	Total Difference Average	121.5 b	9.4	194
Low income	E Difference Average	96.6 b	7.5	154
Low income	S Difference Average	3.9 b	0.3	6
Low income	H Difference Average	21.0 b	1.6	33
Lower middle income	Total Difference Average	672.6 b	2.8	200
Lower middle income	E Difference Average	256.9 b	1.1	77
Lower middle income	S Difference Average	10.4 b	0.0	3
Lower middle income	H Difference Average	405.3 b	1.7	121
Upper middle income	Total Difference Average	912.5 b	2.0	364
Upper middle income	E Difference Average	266.9 b	0.6	106
Upper middle income	S Difference Average	3.2 b	0.0	1
Upper middle income	H Difference Average	642.4 b	1.4	256
High income	Total Difference Average	953.5 b	1.6	820
High income	E Difference Average	104.8 b	0.2	90
High income	S Difference Average	0.2 b	0.0	0
High income	H Difference Average	848.6 b	1.4	730

Compared to the continuing trend of current food production and consumption, the DIET scenario estimated that the hidden deficit can be reduced by about a third globally (Lord 2023a). This would average 2.66 trillion 2020 PPP or ~2% of global GDP PPP per year over the three decades (Figure 24.2 right panel). For context, this means changing diets would avoid future costs that exceed the cumulative global losses from the 2007–2008 financial crisis. For another comparison, when annuitised, which means we account for the missing growth on the damages, the size of the contribution to future value-add of the avoided costs would make dietary change the seventh largest economy on the planet over the three decades (Figure 24.2 left panel).

Over half of the total savings come from labour productivity gains from healthy diets, across lower-middle-income countries (LMC), upper-middle-income countries (UMC) and HIC classified by World Bank income groups (Figure 24.2, Table 24.1).

Under dietary change low- and lower-income countries reach adequate caloric intake and alleviate poor nutrition whilst avoiding widespread adoption of unhealthy diets. All income groups have hidden environmental gains from avoiding expansion of agricultural land, lowering carbon dioxide and methane emissions relative to current trends and lowering surplus nitrogen. The caveats in the costing assume an international environment where LIC and LMC are financially rewarded for their emission reductions. In terms of opportunity for growth and development, the avoided damage to future economies compares to the economy being 9% larger on average for the next 30 years across lower-income countries (LIC), 2%–3% across MIC and 1.6% across HIC (Figure 24.3).

Modelling showed small benefits for poverty. The Planetary Health Diet is not presently affordable for many in low-income countries and MIC (Hirvonen et al. 2020). One of the major costs of transformation in the DIET scenario is income support for low-income households.

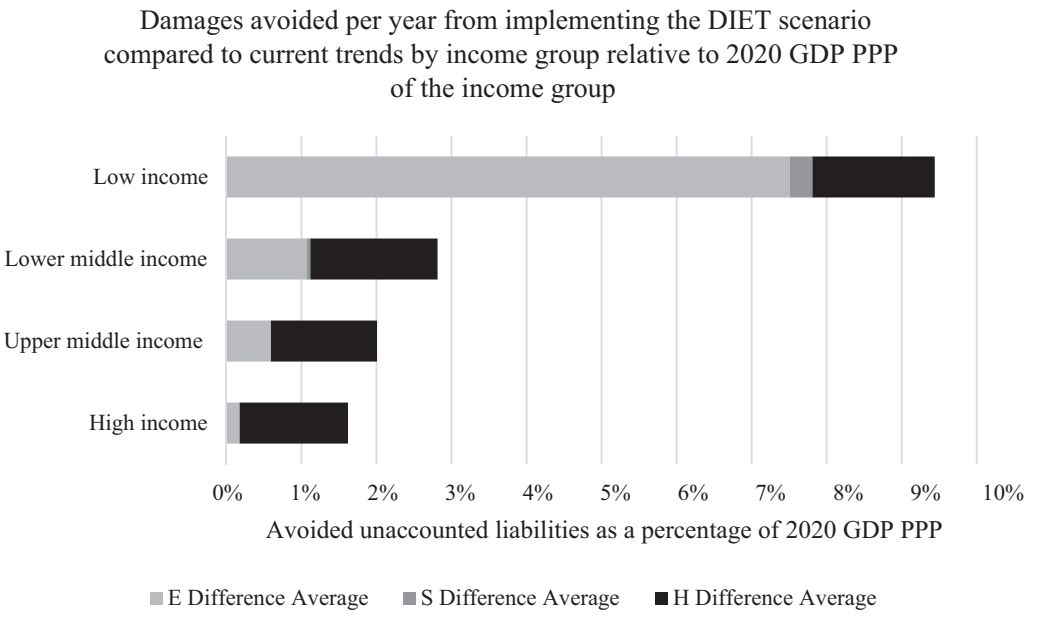

Figure 24.3 Avoided hidden costs under the FSEC scenario of dietary change as percentage of 2020 GDP PPP by World Bank income group. Avoided costs are averaged for each income group and category over the three decades 2020–2050. Costs from greenhouse gas (GHG) emissions, nitrogen emissions, land-use change (collectively E costs), productivity losses from the preventable burden of disease due to unhealthy diets (collectively labelled H costs) and distributional failures including agrifood worker poverty (collectively labelled S costs).

DIET also represents a large and sustained shift in land-use that involves losses to sunk farming infrastructure and requires livelihood transitions including payment for environmental services (Ruggeri Laderchi et al. 2024).

Conclusion

Recent studies of the unaccounted damages from current diets show the potential global economic benefits in dietary change. The benefits compare to avoiding the cumulative losses from the 2007–2008 financial crisis. If we recall the damage of the global financial crisis, the worst economic slowdown since the Great Depression, then we can conceive the brake continuing current diets puts on sustainable growth and development. Joseph Stiglitz, Nobel laureate in economics, said "The war on the climate emergency, if correctly waged, would actually be good for the economy" (Stiglitz 2019). To unlock the economic opportunity in dietary change, it must also be "correctly waged" in terms of progressive and cost-effective actions by governments, civil society, retailers and food manufacturers and institutional actors. More research is required in understanding and managing the transformation costs, livelihood transitions and the role of behavioural and economic incentives for dietary change.

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