

THE CHALLENGE OF UNSUSTAINABLE LAND-USE AND FOOD SYSTEMS

FABLE CONSORTIUM

1.1 THE ENVIRONMENT CRISIS

Food production and the farming of cotton, biofuels, and other non-food products from agriculture and forestry are the biggest drivers of environmental degradation in developed and developing countries. Half the world's tropical forests have been cleared, and we continue to lose about 18 million hectares per year – an area the size of England and Wales. Biodiversity loss now occurs at 1000 times the normal background rate (De Vos et al., 2015), and populations of major species have fallen by some 60 percent since 1970 (WWF, 2018). Rising per capita demand for meat and dairy products increases human demand for land further, yet as the world population increases from 7.6 billion to an estimated 11 billion by the end of the century, there is little room to expand agriculture further without undermining critical environmental and climate objectives. Intensive farming methods, including the growing reliance on chemicals, are key drivers of the loss of some 80 percent of insects in Germany since the late 1980s (Vogel, 2017).

Similar trends have been reported around the world (Sánchez-Bayo and Wyckhuys, 2019). Agriculture, food processing, and the resulting land-use change are responsible for just under a third of global greenhouse emissions (Poore and Nemecek, 2018). Humans also catch unsustainable volumes of wild fish, with a third of commercial fisheries classified as over-fished. In little over half a century, humans have wiped out 90 percent of the populations of top predator fish, such as tuna, swordfish, and sharks. And destructive fishing techniques, such as bottom trawling, cause massive damage to coastal and marine ecosystems (McCauley et al., 2015). Half the world's population is expected to experience high water stress by 2030, and agriculture accounts for two thirds of water use (FAOSTAT, 2019).

Since irrigation is particularly common in water scarce regions, the sector is responsible for 90-95 percent of scarcity-weighted water use (Poore and Nemecek, 2018). Finally, the food system drives at least three quarters of nitrogen release that drives algae blooms and dead zones in freshwater ecosystems and the ocean. It has been estimated that the release of reactive nitrogen is already twice the maximum sustainable level (Steffen et al., 2015), and similar concerns apply to phosphorous. Increased nutrient concentration in the oceans combined with other water pollution and rising temperatures from climate change put high stress on marine ecosystems. During a heat wave in 2016-2017, some 90 percent of the Great Barrier Reef was affected, and half the corals died (Ortiz et al., 2018).

1.2 TODAY'S FOOD MAKES PEOPLE SICK

Today's food systems do not provide adequate and healthy nutrition to many people. Dietary risks account for 20 percent of premature mortality globally, and more than 820 million people are undernourished (FAO, IFAD, UNICEF, WFP and WHO, 2019). Over 160 million children under the age of five are stunted and suffer from permanent cognitive underdevelopment. Inadequate food has become the leading cause of human mortality through increased obesity, cardiovascular diseases, cancer, Type II diabetes, and other health conditions. Some 2 billion people suffer from micronutrient deficiencies, and an estimated 41 million children under the age of five are now overweight (Afshin et al., 2019; (FAO, IFAD, UNICEF, WFP and WHO, 2019). The contrast between the food we produce globally with what humans ought to be eating is stark. For example, we produce almost five times too much red meat and about 50 percent too much starch, compared with the Planetary Health Diet (Willett et al., 2019). While patterns of over and under consumption of meat are highly regional, there is a nearly universal underconsumption of protective foods, including whole grain, nuts and seeds, fruits, and vegetables. The discrepancies between healthy and actual diets are even more extreme in some regions and countries.

1.3 THE LIVELIHOODS CRISIS

An estimated 767 million people continue to live on less than US\$1.90 per day (World Bank, 2016). Most of the world's extreme poor and vulnerable live in rural areas (Olinto et al., 2013), where many depend on food production and the harvesting of natural resources for their livelihoods. Poverty tends to be particularly high among smallholder farmers and the landless. Low productivity of smallholder agriculture, limited access to markets, and high vulnerability to extreme weather events make it impossible for many rural poor to escape extreme poverty – a problem that has not markedly improved with increasingly international agricultural value chains. If unsustainable land-use and food systems are a big part of the rural livelihoods crisis, they can also be a big part of the solution. Many examples exist of large-scale improvements in rural livelihoods through more productive, more diverse, and more ecological approaches to farming. Examples are the Zero Budget Natural Farming program in Andhra Pradesh (India) and the work of the One Acre Fund across much of sub-Saharan Africa. Some companies, such as Unilever and Olam, have also started to integrate smallholder farmers into their supply chains. A critical question therefore is whether and how such efforts can be replicated and scaled up to improve rural livelihoods.

1.4 HIGHLY VULNERABLE FOOD SYSTEM

The food system is also uniquely vulnerable to global warming and other environmental change. Every decade, global warming pushes climate zones towards the poles by over 50km (Masson-Delmotte et al., 2018). The changing climate will disrupt pollination and pest regulation services provided by biodiversity. This may have severe health implications, since increasing the production of the protective foods, fruits, nuts, and vegetables, called for by the public health community, is particularly sensitive to pollination services (Chaplin-Kramer, Dombeck et al. 2014). Increased droughts, storms, and floods threaten food production in many parts of the world.

Average yields, particularly in warmer climates, are expected to fall sharply under a business-as usual scenario, though it is difficult to predict the magnitude (Masson-Delmotte et al., 2018). A different form of vulnerability derives from decarbonizing energy systems. Many pathways towards net-zero greenhouse gas emissions from energy presented by the Intergovernmental Panel on Climate Change (Masson-Delmotte et al., 2018) recommend a

massive expansion of power generation from biofuels – sometimes in conjunction with carbon capture and storage – and other mitigation strategies that demand land. Such strategies threaten to add to the pressures on land-use and food systems by increasing demand for agricultural land, irrigation water, and chemical pollution (Obersteiner et al., 2018).

1.5 HOW FABLE IS ADDRESSING EACH CRISIS

Over time the FABLE Consortium aims to address all four crises. Owing to the long-term focus of our initial analysis, we have for now concentrated on the environmental and the health/nutrition crisis. Curbing greenhouse gas emissions from agriculture and land-use change, and increasing carbon sequestration through nature-based solutions, will make a major contribution towards reducing the vulnerability of the food system. Additional measures will be needed, which FABLE country teams will consider in the future, as well as more granular analyses of their countries' food and landuse systems. Finally, the livelihood crisis is the result of poor policy choices and insufficient investments in landuse and food systems, but it is also driven by the lack of urban-based jobs and global oversupply for certain agricultural commodities. The challenges are highly diverse across countries, and countries vary in their objectives. Depending on the value chains and geographies which are prioritized, the transformation of the agricultural sector might rely on smallholder farms, larger landholdings or both, and will require different types of investment (Caron et al., 2018). Agriculture accounts for a large share of the economy in many developing countries, yet in other countries it accounts for a very small share of employment, and in some cases these jobs are heavily subsidized. For these reasons, it is difficult to agree on global targets for livelihoods, and analytical tools need to differ from one country to the next. In future iterations of the FABLE work, we aim to strengthen analytical tools that investigate the relationship between rural livelihoods and the biophysical land-use systems, so that interested countries can more clearly understand options for improving livelihoods."

ABOUT THE FABLE CONSORTIUM

The Food, Agriculture, Biodiversity, Land-Use, and Energy (FABLE) Consortium is convened as part of the Food and Land-Use Coalition (FOLU). It aims to understand how countries can transition towards sustainable land-use and food systems. In particular, we ask how countries can collectively meet associated Sustainable Development Goals (SDGs) and the objectives of the Paris Agreement. FABLE comprises 19 country teams, which develop data and modelling infrastructure to promote ambitious, integrated strategies towards sustainable land-use and food systems. A summary of FABLE can be downloaded [here](#).

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