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Diets cannot be sustainable without ensuring the well-being of communities, workers and animals in food value chains

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The social dimension of sustainable diets, which addresses the impacts of food value chains on people, animals and communities, is under-represented in the food systems field. We present a definition of the social dimension of sustainable diets, clarify its boundaries and propose corresponding outcomes. Three case studies highlight the connectivity of social outcomes with the health, environment and economic dimensions of sustainable diets. The continued development of social metrics, data and methods and the implementation of integrated solutions co-developed with affected communities are needed to transform systems and structures that perpetuate unjust and inequitable food systems outcomes.

Current diets are unsustainable and poor diets remain one of the main contributors to the global burden of disease, yet 3.1 billion people in the world cannot afford a healthy diet[1]. The environmental impacts of dietary patterns are already transgressing several planetary boundaries, with the impacts of climate and natural resource use projected to increase by 50–92% by 2050 in the absence of rapid, large-scale mitigation[2]. A substantial share of the global population farms, fishes or labours in food value chains[3], performing low-wage and often dangerous work to bring food to our tables.

Governments, businesses and consumers have been slow to appreciate the full extent of these problems and their interlinkages. Shifts in policies and investment strategies that aim to make diets both sustainable and healthy must be evidence-based and consider social realities on the ground. Research on sustainable diets—the growing body of literature focused on the sustainability implications of dietary patterns and shifts (for example, estimating the carbon footprint of a diet or change in diet)—has proliferated in recent years, aiming to address these issues. This research is an important and distinctive subset of the larger sustainable food systems literature, which includes, for example, research on changing production practices, benchmarking food items and marketing of sustainable products.

Despite recent advances in sustainable diets research[4,5], major gaps remain. Our recent global scoping review, which focused on sustainable diets research that analysed outcomes corresponding to at least two of the four dimensions of sustainability (health, environment, economic and social), found that the social dimension is under-represented among these studies[6]. Indeed, only six papers (out of 42 meeting the criteria for inclusion in our review) included social outcomes, with most focused on measuring consumer preferences. While consumer considerations are important social aspects in the transition to sustainable diets[7], the social dimension of sustainable diets is much larger, encompassing the well-being of human and non-human animal populations along the whole food value chain.

Social aspects remain under-represented in the sustainable diets literature in part due to a dearth of metrics and data, and also reflect a conceptual gap. A recent review of dietary guidelines globally found that no extant guidelines included labour rights or animal welfare[8]. Furthermore, one of the most widely used definitions of 'sustainable

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healthy diets' in food research from the UN Food and Agriculture Organization includes social aspects for consumers, but has no explicit mention of social issues upstream in the value chain: "Sustainable Healthy Diets are dietary patterns that promote all dimensions of individuals' health and wellbeing; have low environmental pressure and impact; are accessible, affordable, safe and equitable; and are culturally acceptable"[9]. This definition reflects a persistent disconnect between how environmental outcomes and social outcomes embedded in food consumption are conceptualized. Namely, the environmental pressures and impact that are the result of activities upstream in food value chains are included, but the communities, people and animals whose well-being is bound up with—and in many cases, determined by—the same activities are noticeably absent.

To address this gap, we developed a definition of the social dimension of sustainable diets[6].

> "[Sustainable diets include] the underlying conditions within, and the impacts of food supply chains on, stakeholders who are directly or indirectly affected by food system functions. Stakeholder groups include workers, value chain actors, local communities, consumers, society, and children … While the wellbeing of people is most focused-on, the wellbeing of animals is also a concern."

Socially sustainable diets are products of socially sustainable food systems. Table 1 provides outcomes that we believe lie within the social dimension of food system sustainability, segmented by whether the outcomes have corresponding measurement methods at the product (food) or diet level. For example, access to material resources can be measured within individual product (food) supply chains using social life cycle assessment (S-LCA) methods[10,11] and cultural acceptability can be operationalized at the level of diets by introducing cultural constraints within diet optimization models[12]. This list synthesizes key outcomes from numerous sources, including international guidelines and measurement guidance. Our operationalization integrates and builds on existing frameworks for sustainable dietary guidelines[13–15] and S-LCA[10,11], providing a value-chain orientation that is unique to social sustainability in food systems and diets.

Central to equitably achieving well-being for stakeholders along food value chains is the concept of 'agency'. Agency is defined as "the capacity of individuals and groups to exercise a degree of control over their own circumstances and to provide meaningful input into governance processes"[16]. Several outcomes listed in Table 1 are indicators of agency at different levels; increased agency is needed at individual and collective levels to restructure inequitable power dynamics and transform food systems[16].

Fully articulating the scope of the social dimension of sustainable diets matters because linking social outcomes to food consumption is a powerful tool to influence decision-making of individuals, industry, institutions and governments. It demonstrates the globalized nature of food systems and the responsibility of a consuming entity for social impacts realized across value chains and geographies. For example, our recent research on the risk of forced labour in the US food supply demonstrated that foods sourced from three countries (the United States, China and Mexico) accounted for over 80% of embedded risk[17]. This illustrates how linking social outcomes to food consumption can inform government (for example, through domestic regulation and import controls) and industry (for example, through comprehensive human rights due diligence) strategies that advance sustainability.

Table 1 | Outcomes within the social dimension of sustainable food systems

Domain	Outcomes with measurement methods for products or diets	Outcomes without measurement methods for products or diets
Workers	Decent work[69] • Employment opportunities • Adequate earnings and productive work • Decent hours • Combining work and family life • Combining work and family life • Work that should be abolished (for example, forced labour, child labour) • Stability and security of work • Equal opportunities and treatment in employment • Safe working environment • Social security • Social dialogue and workers' and employers' representation • Economic and social context to support decent work	******
	Living wages[54]	
Society	Public commitments on sustainability issues[10,11]	Food sovereignty[14]
	Prevention and mitigation of armed conflicts[10,11]	Social protection[45,70]
	Contribution to economic development[10,11]	
	Technology development and transfer[10,11]	
Livelihoods and communities in the value chain	Access to material resources[10,11]	Gender equality
	Access to immaterial resources[10,11]	
	Cultural heritage[10,11]	
	Safe and healthy living conditions[10,11]	
	Secure living conditions[10,11]	
	Respect of Indigenous rights[10,11]	
	Animal welfare[10,11,14]	
	Community engagement[10,11]	
	Delocalization and migration[10,11]	
Value-chain dynamics	Fair competition[10,11]	
	Supplier relationships[10,11]	
	Wealth distribution[10,11]	
Consumers and the food environment	Marketing and transparency[10,11,71]	Food availability[71,72]
	Cultural acceptability[12,71]	Convenience[71]
	Desirability[71,73]	

This list synthesizes key outcomes from numerous sources, including international guidelines and measurement guidance, highlighting those that have measurement methods at the product or diet level, with the corresponding citations.

Why the social dimension matters

It is critical to identify and address trade-offs when developing policy and programmes that encompass not just the social dimension, but all four dimensions of food system sustainability (economic, environmental, health and social)[6,18]. This will increase the likelihood that action leads to positive food systems transformation. We describe and visualize (Fig. 1) a set of these multifaceted and multidirectional linkages using case examples, with a focus on connections between social conditions upstream from food consumption in value chains and health, environmental and economic outcomes from dietary patterns. Within Fig. 1, it is important to note that there are no single points of entry into the relationships described, and the links and trade-offs are numerous, multifaceted and incompletely represented to showcase the primary relationships described in our narrative; we have interpreted

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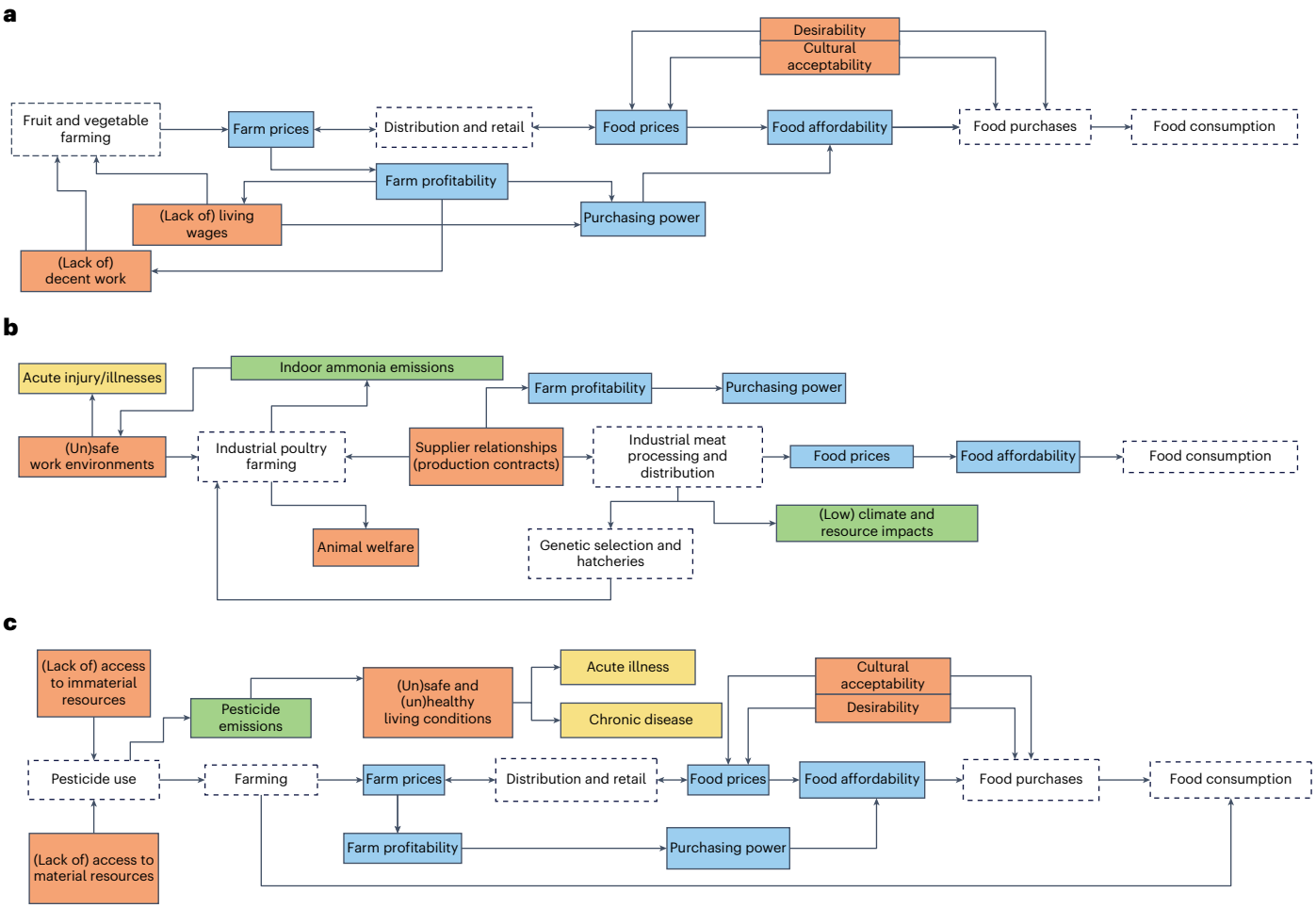

Fig. 1 | Linkages between the social, health, environmental and economic outcomes of dietary patterns in the case examples. a, Healthy, affordable food produced under exploitative working conditions. **b**, Industrialization, animal welfare and farmer and worker well-being. **c**, Rural livelihoods, resource access and local community health. The boxes correspond to food system activities (dotted lines) and the four dimensions of food system sustainability: economic (blue), social (orange), health (yellow) and environment (green).

and named the outcomes to align with constructs in Table 1 and elucidated select linkages.

By describing examples of major tensions, we seek to demonstrate the critical importance of including social sustainability in the transition to healthy, sustainable diets.

Healthy and affordable food produced under exploitative working conditions

Agricultural work is well known to be precarious, difficult and, in many cases, dangerous[19,20]. The production of health-promoting foods, such as fruits and vegetables, often relies on hand harvest and a migrant labour force (Fig. 1a). These workers are particularly vulnerable to forced labour and other forms of labour exploitation, which are often multiplied through additional vulnerability factors such as gender, race and immigration status[19,21,22]. In some cases, this exploitation is legal due to widespread exemptions in national legislation for agricultural workers (for example, for minimum wage, excessive overtime and collective bargaining rights). While fair wages are only one facet of decent work, keeping food affordable to consumers is an oft-cited reason for not raising food system workers' wages[23,24]. That increased wages for workers could increase their purchasing power (all else equal), thus improving food affordability for large subpopulations who experience disproportionately high levels of food insecurity[25], is rarely discussed. Furthermore, some evidence from US research suggests that wage increases at the agricultural stage would result in only small changes in food retail prices[23]. In addition to consumer affordability, the interplay between the cost of farm labour, the profitability of farming operations, decent work and farmer livelihoods are important considerations for sustainability that underscore the need to study the drivers of inequitable work and livelihoods across the value chain[26].

Industrialization, animal welfare and farmer and worker well-being

Economies of scale in agri-food systems can reduce prices for consumers, but can also create challenges for supply chain resilience and well-being along the value chain. One example of this can be seen in the industrialization of poultry production, which has helped meet the increased global demand for poultry and eggs (Fig. 1b). The increased availability of these products has benefits across three dimensions of sustainability for consumers, as they are often low cost and recommended as an environmentally friendly and healthier protein alternative to red and processed meat[27,28]. Beyond the grocery store shelf, however, there are serious welfare concerns for the animals, workers and farmers in these production systems. Genetic selection for high meat yields, high stocking densities, poor housing conditions and poor management contribute to adverse welfare outcomes for the chickens[29,30]. Poultry workers experience high occupational health and safety risks (for example, ammonia exposure)[31], high rates of workplace

injuries[32] and otherwise exploitative working conditions (for example, exclusion from federal minimum wage and collective bargaining protections in the United States). In addition to shouldering many of the same workplace risks, poultry farmers are increasingly growing birds under production contracts with corporate integrators (for example, Tyson, JBS), as vertical integration of the poultry industry accelerates. These arrangements leave farmers with little power, high financial risks and often high levels of debt[33,34]. Government regulation of contract terms, corporate integrator behaviour and production methods, as well as transition assistance for producers and workers, could improve farmer, worker and animal welfare alike.

Rural livelihoods, resource access and local community health

Agriculture is often the primary source of livelihoods in rural communities and farmers rationally focus on protecting their crops to maximize yields and sustain their families (Fig. 1c). Thus, vulnerable communities need to produce food for household food security. This, in combination with a lack of material (for example, availability and affordability of alternative methods) and immaterial resources (for example, knowledge regarding personal protection during application and incorrect disposal[35]), as well as weak regulations, may lead farmers to rely on higher-toxicity pesticides[36]. Additional drivers exist for commercially oriented production: market demands and high expectations regarding crop appearance— particularly for healthy foods such as fresh fruits and vegetables—can increase pressures to intensively use pesticides, exposing local communities to food and drinking water that are contaminated with pesticide residues. In Mexico's Yucatan Peninsula, high levels of pesticides have been detected in groundwater (the only source of freshwater[37]) including restricted organochlorine pesticides. This has been associated with increased health risks, especially in children[38], persistent levels of organochlorine pesticides in breast milk in Indigenous areas[39] and bioaccumulation of organochlorine pesticides in women with cancer[40]. Technical training regarding good agricultural practices could increase the level of health and safety literacy[41], but, to be effective, it needs to be co-designed with local entities to adapt the training to the context (such as cultural/language barriers and economic and social circumstances)[42].

Towards approaches that integrate social sustainability

Much work remains to be done to advance integrated approaches that include social sustainability.

Methods, metrics and data

The continued development of social metrics and associated data to support a just transition to sustainable diets is critical. Important work has identified social issues and associated metrics for a small number of specific supply chains such as cocoa and tea, and overall country-level food systems[43–46]. However, data availability and resolution are major challenges, in addition to the time and cost intensity of primary data collection with those most affected, such as workers. For country-level food systems data, such data are, in many cases, not specific to the food system itself (for example, female labour force participation rates[45] and the extent of child labour[44]). In some cases, available metrics measure the presence or absence of a policy or mechanism, such as the predominance of fair trade organizations and producers[47], not its associated outcomes.

While it is vital to understand mechanisms, we must also work towards measuring or estimating outcomes. Returning to the example of fair trade certification as a metric, evidence for the efficacy of agricultural certifications in improving farmer livelihoods and working conditions is mixed[48–51]. Indicators should ideally measure progress against relevant global standards when available (for example, International Labor Organization (ILO) indicators of decent work or forced labour; see Table 1). While advances have been made in measuring forced labour[52], the complexity of the decent work framework has challenged measurement of specific dimensions[53], with measures such as living wages highly operationalized[54] and others, such as social dialogue, lacking nuance. To avoid reductionist analysis, these measures should be informed by the populations they seek to describe. Developing both effective metrics for social outcomes and monitoring and accountability systems will be critical to support food systems transformation. This will require new transdisciplinary partnerships that link existing scholarship and practice from fields such as labour rights, human rights, supply chain management and veterinary science to the fast-growing field of food systems. Additional collaborative research with diverse stakeholder groups is needed to identify priority outcomes within those outlined in Table 1 and beyond.

In the same way that environmental LCA has become a foundational method to estimate environmental impacts in sustainable diets research, S-LCA can serve the same purpose for social outcomes. Defined as "a methodology to assess the social impacts of products and services across their life cycle (for example, from extraction of raw material to the end-of-life phase, for example, disposal)"[10], this method is much newer than environmental LCA—the first international guidelines were created by the UN Environment Programme/Society of Environmental Toxicology and Chemistry Life Cycle Initiative in 2009[55]. In part because of its nascency, S-LCA has found limited applications in the food system so far, with research either focusing on high-resolution case studies[56,57] or lower-resolution assessments[58] that use country and sector data from one of the two available S-LCA databases. The lack and/or proprietary nature of data represents a substantial constraint in S-LCA practice, as does the opacity of global value chains. The fact that many of the phenomena that S-LCA seeks to measure are illegal (for example, forced labour, child labour, occupational health and safety violations) poses further challenges for data transparency and availability. At the same time, there have been promising recent advances in S-LCA methods related to the food system, including new methods to rigorously assess poultry welfare[59] and forced labour risks in food supply chains[17,60]. There is a critical need for continued innovation in methods development, the prioritization of social metrics (that is, impact categories) for food systems, pushes for data development and private-sector transparency in value chains via policy and advocacy.

Integrated solutions

Given the considerable focus on dietary interventions (and the accompanying knowledge and funding) to promote health, adapting these approaches to promote integrated solutions is one strategic pathway forwards. For example, in the United States there is increasing policy and research interest in 'Food is Medicine' initiatives, which include a "spectrum of programs, services, and other interventions that recognize and respond to the critical link between nutrition and health. These services include both the provision of food itself or tailored food assistance (vouchers for produce, etc.) and a nexus to the healthcare system"[61]. Food is Medicine interventions are designed to address outcomes within the health and economic dimensions of sustainability, but there are opportunities to take a four-dimensional approach. Co-developing rigorous procurement standards with affected communities to ensure social equity and environmental sustainability along the value chain could be transformational.

Community- and stakeholder-led approaches that address the four dimensions of sustainability, which are carefully co-designed and representative of marginalized populations, are also needed and ought to be prioritized for funding. A new US$6.6 million US National Institutes of Health grant to the Friedman School of Nutrition Science and Policy at Tufts University, in collaboration with the Reuben V. Anderson Institute for Social Justice at Tougaloo College, the Delta Health Center and the Center for Science in the Public Interest, is a promising example of this type of work[62]. This grant is funding the co-development of community-based programmes to sustainably

increase local consumption and production of fruits and vegetables in Mississippi through Black farmer-owned cooperatives[63].

One crucial aspect of effective policy design in shifting consumption is understanding consumer behaviour and values across diverse populations and contexts. Consumers' growing stated interest in purchasing sustainable products in both academic and industry-facing studies[64–66] also suggests that increasing consumer awareness of the implications of their specific food choices can help shift these behaviours towards more sustainable diets. For example, many consumers express concerns with environmental sustainability but do not consistently engage in behaviours that reflect these concerns[66]. Such 'attitude–behaviour gaps'[67] are likely to be even greater for social sustainability, where the true impacts are even less transparent to consumers. The development of social metrics, monitoring and accountability systems may provide an opportunity to better communicate impacts to consumers in ways that may help shift demand to enhance social outcomes. The marketplace for food can also be a marketplace for improving social outcomes if impacts can be effectively communicated to consumers through labelling and other messaging tools. A reliance on 'political consumerism' in food purchasing will not be sufficient to achieve social sustainability on its own—informing and empowering consumers to support these efforts must be considered a necessary component.

Beyond influencing the demand of individual consumers and households, considerable promise lies in shifting procurement for institutions, restaurants and retailers. There are numerous initiatives in this space that aim to drive change, including (for example) Menus of Change and the food procurement standards included in the Sustainability Tracking, Assessment, and Rating System (STARS), a global sustainability rating system for universities used by the Association for the Advancement of Sustainability in Higher Education. For social sustainability, these initiatives rely on certification systems (for example, Fair Trade, Certified Humane Raised and Handled, Organic) or vague guidance to increase transparency that is difficult to act on given the complexity and opacity of modern globalized food supply chains.

Creating and providing access to food-specific data on social risks and impacts could guide prioritization and decision-making for institutions, such as our work on forced labour risk assessment[60]. Going one step further, institutional policies (and national ones, for public procurement) could be developed to require supplier transparency, measurement and accountability on upstream practices[68]. Buyers have an opportunity to co-develop solutions with key stakeholders in their supply chains, such as workers. Entering into agreements with worker-driven social responsibility programmes such as the Fair Food Program, for example, could centre previously marginalized voices and add transparency and accountability to sourcing.

Conclusion

Creating truly sustainable diets requires different structures, dynamics and functions than those operating today. Current globalized food systems rely on complex value chains in which people and animals are often made invisible and/or exploited. Fulfilling the varied, often mercurial demands of (high income) consumers is the primary priority of the private sector, in the pursuit of profit. Policy protections for those embedded in, or directly affected by, value-chain activities are riddled with loopholes and are in many cases absent. The continued development of social metrics and data, robust transparency and accountability systems, and integrated interventions will be needed to support a just transition to sustainable diets. Bringing the people, animals and communities that are integral to food value chains to the same conversations as climate change and dietary contributions to human health is a necessary start. True transformation will require reshaping the social and economic systems that perpetuate current patterns and outcomes—not just what we farm, fish and eat, but how diets are made manifest.

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Author contributions

N.T.B. and P.W. conceptualized the Perspective. N.T.B., K.B., E.R.-H., J.L.D.S. and P.W. wrote the original draft. B.M.B., J.L.D.S., S.B.C., Z.C., A.N., B.J. and J.M. provided feedback and edits. All authors contributed to editing and revising the manuscript. K.B., B.M.B. and N.T.B. created Fig. 1. All authors reviewed and approved the final manuscript.

Competing interests

N.T.B. has independent consulting agreements with a conservation non-profit and a cellular agriculture company to conduct critical reviews of environmental LCAs as outlined in international standards for LCA (ISO 14040, ISO 14044, and ISO 14071). Z.C. receives funding from the National Pork Board for a research project unrelated to the present work. All other authors declare no competing interests.

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