

Do not transform food systems on the backs of the rural poor

by
Benjamin Davis
Leslie Lipper
Paul Winters

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ISBN 978-92-9266-215-8

Printed February 2022



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This paper was originally commissioned as a background paper for the 2021 Rural Development Report: *Transforming food systems for rural prosperity*.
www.ifad.org/en/rural-development-report

Acknowledgements

The authors take full responsibility for the contents of this paper, the production of which has benefited from helpful comments from a committee of experts led by Bart de Steenhuijsen Piters, Joost Guijt, Romina Cavatassi, Leslie Lipper, Ruerd Ruben, Eric Smaling and Siemen Van Berkum, and other members of the IFAD Rural Development Report working group. This work was made possible through the financial support of IFAD in close collaboration with Wageningen University and Research Centre. This background paper was prepared for the Rural Development Report 2021 *Transforming Food Systems for Rural Prosperity*. Its publication in this original draft form is intended to stimulate broader discussion around the topics treated in the report itself. The views and opinions expressed in this paper are those of the author(s) and should not be attributed to IFAD, its Member States or their representatives to its Executive Board. IFAD does not guarantee the accuracy of the data included in this work. For further information, please contact: ifadknowledge@ifad.org.

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Abstract

Even prior to COVID-19, there was a considerable push for food system transformation to achieve better nutritional and health – as well as environmental and climate change – outcomes. In 2019, several major publications focusing on transforming agricultural and food systems to achieve nutritional and climate change objectives argued for major changes in agricultural land use, production systems and dietary choices. They placed an emphasis on increasing resource use efficiency, reducing agricultural extensification and reducing consumption of meat-based products while increasing nutritionally dense foods. However, these reports fail to fully consider the impact of these measures on the livelihoods of the approximately 2.7 billion rural people who depend on small-scale food production and to propose specific measures to ensure the rural poor participate in – and benefit equitably from – food system transformation. Although the importance of inclusion in food system transformation is gaining traction, including in a recent Cornell Atkinson Center for Sustainability – Nature Sustainability Expert Panel Report on food system transformation, in this paper we argue that recent research, modelling and discourse on food system transformation is insufficient and that specific actions are needed to ensure that food system transformation does not take place on the backs of the rural poor.

Keywords: food system transformation; rural poor; small-scale producers; food system modelling

1. Introduction

Over the past year the COVID-19 virus has caused huge disruptions to economies, health systems and people's day-to-day lives around the world. The virus is raising concerns about the resilience of food systems as food supply chains are disrupted and the purchasing power of consumers is greatly reduced. It has also given rise to discussions of what the world will look like in its wake – will we go back to the old “normal” or does this disruption offer the potential to make major transformations that address the problems of the old “normal”?

The issue of food system transformation is certainly one area where in pre-COVID-19 times there was already a considerable push for transformation to achieve better nutritional and health, as well as environmental and climate change, outcomes. In 2019, we saw several major publications focusing on the need for transforming agricultural and food systems to achieve nutritional and climate change objectives including from the EAT–Lancet Commission (Willet et al., 2019), the Intergovernmental Panel on Climate Change (Shukla et al., 2019), the World Resources Institute (Searchinger et al., 2019) and the Food and Land Use Coalition (FOLU, 2019). These come from different points of view, modelling approaches and key objectives focused upon, and their recommendations vary in terms of priorities. However, they are all fairly consistent in arguing for major changes in agricultural land use, production systems and dietary choices, with an emphasis on increasing resource use efficiency, reducing agricultural extensification and reducing consumption of meat-based products while increasing nutritionally dense foods.

To varying degrees, they also all fail to fully consider the potential impact of measures to improve the environmental and nutritional performance of food systems on the livelihoods of the approximately 2.7 billion rural people who engage in small-scale food production, much less include specific measures to ensure the rural poor are included and benefit from food system transformation. These include the currently over 1.1 billion people in moderate to extreme poverty living and working in agriculture (Woodhill, Hasnain and Griffith, 2020; Castañeda et al., 2018), a number that is expected to increase with the continued effects of COVID-19. These numbers are set to increase even further because of high population growth rates in many of the areas with a high proportion of rural poor, particularly in sub-Saharan Africa and South Asia. The primary focus of the aforementioned reports is on major changes in global food production, value chains and consumption, and less on the people whose livelihoods drive and depend on that system. In many cases, producers are not even considered in the underlying models.

The importance of inclusion in food system transformation is gaining traction, as seen in the recent Cornell Atkinson Center for Sustainability – Nature Sustainability Expert Panel Report on food system transformation, which focuses on healthy and nutritious diets and climate and environmental sustainability, but also on equitable and inclusive value chains and resilience to shocks and stressors (Barrett et al., 2020). The overall objectives of the report are summarized using healthy, equitable, resilient, sustainable (HERS) food systems. While the report has a strong emphasis on the importance of inclusivity, rural livelihoods and social justice, it does not provide specific policy recommendations about these aside from social protection. The report also does not raise the problems with models that do not incorporate rural livelihoods and the policy implications that follow from the failure to consider inclusivity and social justice issues.

In this paper, we argue that specific actions are needed to ensure that food system transformation will be equitable, and more specifically that the barriers to including the rural poor are inadequately addressed in the recent research, modelling and discourse on food system transformation. Instead, much of the current focus is on reducing the negative environmental and nutritional externalities that have been an unintended consequence of recent experiences with food system transformation. Without an explicit focus on equity and inclusion, however, we run the risk of generating another unintended consequence in the form of harming the well-being of poor people, particularly the rural poor. To avoid solving planetary problems on the backs of poor rural men and women who play a central role in the production, processing and marketing of food around the world, explicit consideration of how food systems transformations affect the potential for inclusive growth is needed. This lack of analytical attention threatens the success of food system transformation itself, as it fundamentally depends on the decisions of hundreds of millions of poor female and male producers.

Figure 1 presents a widely accepted conceptual framework for food systems from the High Level Panel of Experts on Food Security and Nutrition (2017). We focus on the food supply chains portion of the food system, specifically production systems, looking at how changes in external drivers associated with current calls for food system transformation may impact rural livelihoods and ultimately the inclusiveness of the food system.

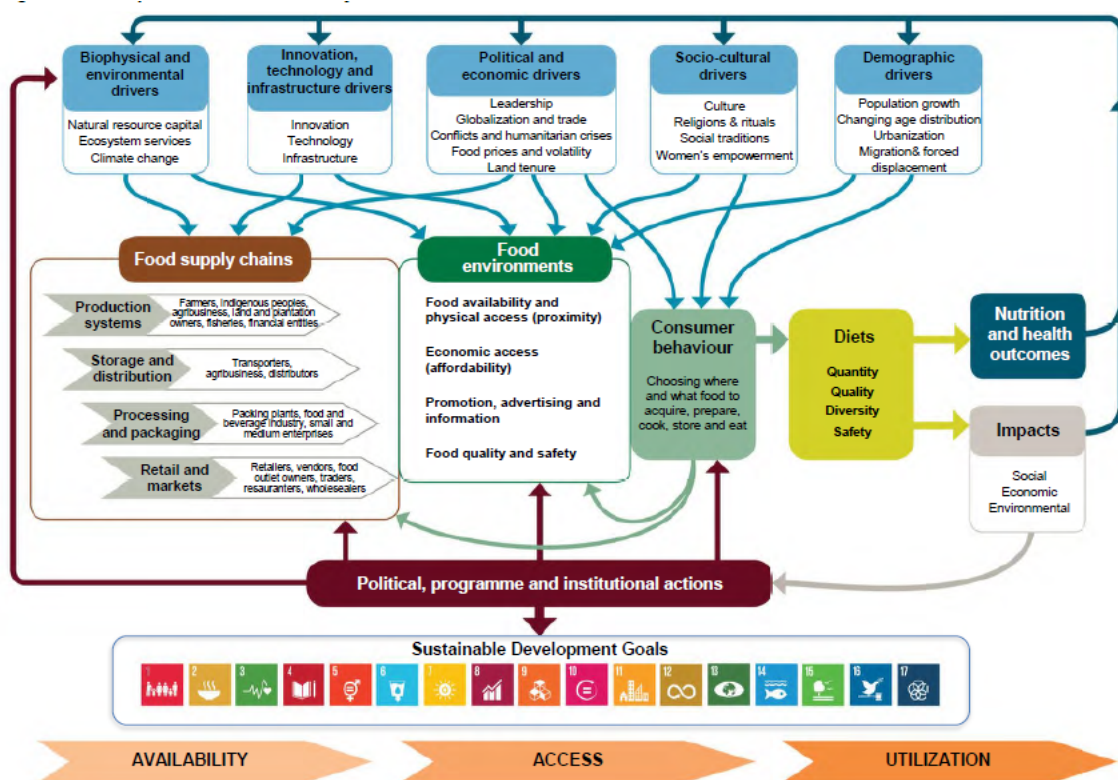


Figure 1: Conceptual framework for food systems
 Source: High Level Panel of Experts on Food Security and Nutrition, (2017)

This article reviews the literature, considering the following questions: what are the potential implications of food system transformation aimed at improving environmental and nutritional outcomes on the livelihoods of the rural poor and what measures are needed to ensure improvements in these livelihoods as a fundamental component of food system transformation? Our primary focus is on small-scale food producers and how food system transformation changes the incentives in land use and food production, and how this may play out in the livelihoods of the rural poor. But it is also important to keep in mind the broader picture. As the process of economic transformation moves forward, poverty reduction and increases in welfare will increasingly depend on generating higher-value wage employment for many current day small-scale producers and their families off-farm and along the food system value chains.

To do so, we first look at what is being called for in the transformation of food systems using key recent reports as the basis for summarizing the emerging view. We then take a close look at the quantitative models underlying the major analyses of food system transformation and the way in which they do, or do not, address the relevant issues to understand the impact on the livelihoods of the rural poor. This is followed by a consideration of the thinking on poverty reduction and rural livelihoods including the role that agricultural and rural transformation plays in this evolution. A characterization of rural livelihoods is also included to understand the state of the world in terms of the livelihoods of the rural poor. In the final two sections of the paper, we identify three major categories of actions needed to ensure that food system transformation is equitable and benefits the livelihoods of the rural poor, as well as a set of strategic leverage points to achieve them. We conclude with reflections on what is needed to ensure that the rural poor do not bear the burden of food system transformation.

2. Transforming food systems: what is being called for?

There is strong consensus emerging that the current food system is failing to deliver healthy outcomes for humans and a sustainable future for the planet. Although the literature on the subject is vast, recent attempts to summarize the literature provide compelling evidence of these failures.

The food system globally generates up to 37 per cent of global greenhouse gas emissions (Shukla et al., 2019). Food systems are a primary source of methane and nitrous oxide emissions, which have 56 times and 280 times the global warming potential (over 20 years) of carbon dioxide, respectively (Willett et al., 2019). If the world continues along the current trajectory of emissions growth from agriculture, by 2050 the sector would generate 70 per cent of the total allowable emissions to keep warming below 1.5° C (Searchinger et al., 2019).

The food system is also failing in terms of delivering human health and nutritional outcomes. The latest pre-COVID-19 figures indicate that, globally, 690 million people (8.9 per cent) are hungry, nearly 2 billion (25 per cent) experience moderate or severe food insecurity, 144 million children (21 per cent) are stunted and 47 million (7 per cent) are wasted (FAO et al., 2020). On the other hand, in 2016 more than 1.9 billion adults aged 18 years and older were overweight, and of these, over 650 million adults were obese (WHO, 2020). Poor diets are a major cause of non-communicable diseases, which are now the leading cause of mortality worldwide (Branca et al., 2019). Malnutrition and undernutrition exist alongside the increasing prevalence of obesity associated with diabetes and hypertension. In fact, a lower rate of undernourishment is accompanied by higher prevalence of overweight across numerous countries (FAO and IFPRI, 2020).

In short, the global food system is a behemoth consuming massive resources, which is negatively affecting the planet, while failing to lead to sufficient improvements in human well-being today and into the future. The way we produce, distribute and consume food is generating significant and growing negative environmental and nutritional externalities, albeit with major differences across different food system types. The actions needed for sustainable transformation include both demand- and supply-side interventions aimed at reducing these externalities: changing consumption patterns to a healthier diet and changing agricultural production systems to reduce environmental damage and increase the supply of diverse and nutrient-dense foods.

Focusing on four recent global reports noted in the introduction, table 1 shows there is a consensus at the global level in the recommendations for improving the nutritional and environmental objectives of food systems. In a nutshell (literally!), these include reducing meat consumption in conjunction with enhancing the consumption of fruits, vegetables, pulses and nuts, while reducing/stopping the conversion of land to agricultural production, and reducing plus improving the management of inputs to agricultural production systems. As the EAT-Lancet commission notes: “A large body of work has emerged on the environmental impacts of various diets, with most studies concluding that a diet rich in plant-based foods and with fewer animal source foods confers both improved health and environmental benefits.” (Willett et al., 2019, p. 449). The consistency between the nutritional and environmental perspectives indicates a high potential for “win-win” on health and environmental outcomes in food system transformation.

To varying degrees, the reports do take into consideration the need to improve incomes of poor people in transforming food systems and outline how these are aligned with measures that will improve environmental and nutritional outcomes. However, the specifics on how measures to address environmental and nutritional externalities can benefit the rural poor are largely lacking. It is by no means certain that actions to attain the consensual environmental and nutritional objectives of food system transformation will generate a “win” in terms of improving the livelihoods of poor rural people. The recommendations are highly disruptive, as is needed for transformative change; however, rural poor people who lack agency and means are not in a position to gain from such disruptions without deliberate efforts to ensure inclusion.

Table 1
Consensus on nutritional and environmental outcomes in food system transformation.

	<i>EAT-Lancet</i>	<i>IPCC Land report</i>	<i>WRI</i>	<i>FOLU</i>
Dietary recommendations	<ul style="list-style-type: none"> • diversity of plant-based foods • low amounts of animal sourced foods and saturated fats • small amounts of refined grains and highly processed foods 	<ul style="list-style-type: none"> • High in coarse grains, pulses, fruits, vegetables nuts and seed • low in energy intensive animal sources • apply a carbohydrate threshold 	<ul style="list-style-type: none"> • moderate ruminant meat consumption • Shift towards healthier sustainable diets including pulses, soy, vegetables and fruit • reduce food waste 	<ul style="list-style-type: none"> • Predominantly plant-based diets, vegetables, whole grains, legumes and nuts • limited consumption of salt, sugar and saturated fats • little consumption of ultra-processed foods
Environmental management recommendations	<ul style="list-style-type: none"> • use no additional land • safeguard existing biodiversity • reduce consumptive water use • substantially reduce nitrogen and phosphorus pollution • produce zero carbon dioxide emissions • no further increase of methane and nitrous oxide emissions 	<ul style="list-style-type: none"> • increase soil organic matter by increasing no-till, perennial crops, erosion control, agroforestry • reduction of nitrous oxide emissions from fertilizer use • reduction of methane emissions from paddy rice • reduce deforestation • Controlled grazing and rangeland management 	<ul style="list-style-type: none"> • limit cropland expansion • reforest abandoned, unused lands • conserve/restore peatlands • improve wild fisheries management • improve manure/fertilizer management • adopt emission-reducing rice • focus on realistic options to sequester carbon in soils 	<ul style="list-style-type: none"> • practices that regenerate soil • reduce synthetic fertilizers and pesticides • increase agrobiodiversity • reduce negative impacts on freshwater and the ocean

3. Addressing rural livelihoods: reports and models of food system transformation for nutrition and climate change objectives

To delve more deeply into discussions of food system transformation and the incorporation of rural livelihoods, in this section we explore the four recent reports and their treatment of rural producers. Table 2 presents a brief summary of the reports.

The starting point for considering these reports is their stated objectives. The EAT-Lancet report provides a clear indication that its focus is on diet and sustainability, with little reference to inclusion. The other three reports do note the importance of food security (Intergovernmental Panel on Climate Change and Food and Land Use Coalition [FOLU]) and poverty/inclusion (World Resources Report [WRR] and FOLU). Of course, while these objectives are stated, the treatment of food security and poverty varies significantly. When incorporated, food security is principally seen as an issue of consumption rather than of production, even though the majority of the food insecure are in rural areas and their livelihoods are linked to agricultural production. Further, even in focusing on consumption, the emphasis is on the availability of calories or a diverse diet. It is not on the ability of poor and food-insecure households and individuals to generate the incomes to access that diet.

Table 2
Producers in reports linked to food system transformation

<i>Paper</i>	<i>Stated objectives</i>	<i>Methods</i>	<i>Treatment of producers</i>	<i>Treatment of consumers</i>
EAT-Lancet Commission, <i>Food in the Anthropocene: The Eat-Lancet Commission on healthy diets and sustainable food systems.</i>	Scientific based targets for a healthy reference diet and six earth system processes (climate change, nitrogen cycling, phosphorous cycling, freshwater use, biodiversity loss, land-system change).	Diverse models. IFPRI IMPACT model primary food system model with production incorporated.	Producers not included in the analysis or discussed	Considered through overall dietary requirements and implications. No distributional considerations.
IPCC, <i>Climate change and land</i>	Addresses greenhouse gas fluxes in land-based ecosystems, land use and sustainable land management in relation to climate change adaptation and mitigation, desertification, land degradation and food security.	Literature review with level of confidence on evidence and agreement on conclusions noted as relevant.	Producer livelihoods discussed in light of climate change considerations with links between production and climate change impacts and the potential for adaptation and mitigation highlighted. Importance of productivity gains noted.	Consumer demand for food commodities and link to climate change noted. Reduction in food security resulting from climate change impact on production noted.
World Resources Report, <i>Creating a Sustainable Food Future</i>	Achieving a sustainable food future by meeting growing demands for food, avoiding deforestation, and reforesting or restoring abandoned and unproductive land—and in ways that help stabilize the climate, promote economic development, and reduce poverty.	GlobalAgri-WRR model complemented with literature review.	Producers not included with model, which is based on farming systems.	Diets of consumers are including but no distributional consequences. Argue that poverty impacts are mostly through keeping food prices low.
The Food and Land Use Coalition, <i>Growing Better: Ten Critical Transitions to Transform Food and Land Use.</i>	A reform agenda for food and land use that results in better environmental outcomes, better human health, more inclusive development and significantly improved food security.	IIASA GLOBIOM model with Shockwaves and Hidden costs models and complementary analysis	Producers are not considered in GLOBIOM but results fed into Shockwave which includes producers but no behavioural response to policy changes.	Dietary factors considered as are broader effects on consumers through Hidden Cost model fed through other models.

Further, explicitly or implicitly, even when inclusion is highlighted, there remains a hierarchy of objectives. The reports generally prioritize climate change as the driving objective, particularly around keeping within a 1.5-2° C global temperature change, and health and nutrition tend to be secondary objectives. When food security and poverty are assessed, it is a tertiary concern. This is critical, as it ends up being reflected in the modelling and, ultimately, in the policy advice. If the primary objective is to remain within 1.5-2° C degrees of global temperature change, this becomes the binding constraint and any action to achieve other objectives must adjust accordingly. Although there is a scientific basis for this objective, its prioritization reflects a view of its policy importance. The questions answered become, for example, how can poverty and food security be addressed while staying within planetary boundaries? An alternative view could be that the primary objective is to end food insecurity. If this is the key objective, the question might be rephrased to ask, what is the minimum level of global temperature increase for a world free of food insecurity or poverty?

Of course, in food system transformation, there are multiple objectives and we want to identify, based on the best scientific evidence, win-win-win scenarios where we can have sustainability, nutrition and inclusion. To start this, however, it is necessary to recognize, and note clearly, underlying assumptions in scientific research and push a research agenda that adequately encompasses each objective. Answering the questions formulated above, for example, of how poverty and food security can be addressed while staying within planetary boundaries, or what is the minimum level of global temperature increase for a world free of poverty and food insecurity, allows consideration of where there might be trade-offs and what solutions can win on all fronts. Failing to consider the multiple objectives equally is implicitly judging planetary boundaries or nutrition as more important than inclusion.

These issues come through clearly in the methodological approaches used in creating the reports. Three of the reports (EAT-Lancet, World Resources Institute and FOLU) use simulation models to draw many of their conclusions. Given the need to predict the future, such models can be quite useful. Yet, in none of the models (IMPACT, GlobalAgri-WRR and GLOBIOM) are producers incorporated. They all rely on crop systems without farmers as the basis for the model. As such, it is not possible to observe effects on livelihoods, in general, and the impact of policy proposal on small-scale, poorer producers in particular. WRR tries to overcome this limitation by augmenting the modelling with a careful literature review. FOLU goes further and uses the World Bank's Shock Wave model to address inclusion as measured by estimated poverty impacts of climate change and the Hidden Cost model to look at health impacts of climate change. The Intergovernmental Panel on Climate Change does not have an underlying model, but addresses food security through a literature review.

Careful review of each approach shows that climate change consideration is the driver of the analysis and the primary objective function, dietary considerations through consumers are a secondary concern, and the effects on livelihoods and producer well-being the final consideration. There is a clear hierarchy of priorities, and producers are last.

When the models do include people, the focus tends to be on consumers rather than producers, much less female and male producers, who may face a myriad of constraints and market failures. Including consumers is critical to analyse food security as well as nutrition, and access requires that safe and nutritious food be available and affordable for poorer segments of society. But consumers need to generate income to eat the nutritious diets. And producers are key to the success of any attempt to transform food systems. The reports and their underlying models often come up with dramatic conclusions about what must happen in agriculture – for example, zero additional deforestation combined with substantial and sustainable gains in productivity. This must be done in a context in which female and male small-scale producers, as individuals and in communities, who often face a variety of constraints and multiple market failures, are responsible for a significant portion of food and agricultural production – as well as for managing a large share of the world's natural resources. It also must be done in a dynamic context of rural, agricultural and structural transformation, where increasing numbers of rural people will rely on off-farm sources of income.

Given that poverty and food insecurity remain primarily rural, the livelihoods of these producers and those linked to agriculture in general are critical for achieving the objectives of zero hunger and the end of poverty. In these reports, there is limited discussion on how productivity and livelihood objectives can be achieved under the changes food system transformation would entail and the constraints they would imply for the rural poor. The Intergovernmental Panel on Climate Change report does look at this literature to a

degree but focuses mostly, for obvious reasons, on climate adaptation and mitigation. The FOLU study is the most specific in terms of measures to ensure resilience of rural populations under food system transformation. These include increasing productivity investments in rural areas and expanding safety nets to generate new and more productive employment opportunities and safeguarding food security. Although this analysis addresses the issue of rural livelihoods in the process of transformation, it fails to fully articulate the specificities that arise in dealing with the livelihoods of the rural poor and how these may interact with major dynamic processes initiated by food system transformation.

The success of food system transformation based on scientific analysis requires a broader perspective that incorporates producers of different sizes, facing a heterogeneous set of constraints that may vary by social and economic dimensions, including gender and ethnicity, and the importance of the food system as a source of livelihoods for the majority of the world's poor. Recent papers note the importance of inclusivity, rural livelihoods and social justice in food system transformation (Barrett et al., 2020; Woodhill, Hasnain and Griffith, 2020). But until the scientific analysis and food system models fully incorporate rural producers and the distributional effects on rural livelihoods in any analysis, these models will continue to draw policy implications that may be harmful to the poorest producers.

Finally, much of the research, modelling and discourse on food system transformation, including in these four reports, is taking place at a global level, based on global-level analyses. However, while the process of globalization increasingly links global, regional and local markets, the drivers and impacts of food system transformation are often quite context-specific, thus moving from global to national or local analyses is needed. Likewise, the nature of the trade-offs that will arise between inclusivity, environment and nutrition are very much dependent on local context. In a recent study, Kim et al. (2020) found huge differences in the impacts of greenhouse gas (GHG) emissions from changing diets across different countries. A country-specific analysis revealed that adopting either a low or no red meat diet reduced GHG and water footprints in 47 and 57 per cent of the countries studied, respectively – although the average net effect was an increase. They found that, of the 140 individual countries examined in the study, most – including those identified as having the most GHG – and water-intensive diets – have been vastly underrepresented in the literature. We can expect similar variation across countries in the potential trade-offs between inclusivity and environmental or nutritional benefits.

4. Improving livelihoods of the rural poor

Historically, improvements in the well-being of rural people, in general, and the rural poor, in particular, have been linked to a process of economic development. Virtually no higher-income country has gone through structural transformation – where manufacturing and services become relatively more important in the overall economy – without a simultaneous process of agricultural and rural transformation (Johnston and Mellor, 1961; Timmer, 1988; IFAD, 2016; FAO, 2017). Successful productivity growth in agriculture was the source of early development and subsequent structural transformation and industrialization in most of today's developed countries, including the most recent cases (see historical review in de Janvry and Sadoulet, 2020; World Bank, 2007). At earlier stages of development, agriculture remains the primary expected engine of growth and the sector with the greatest potential for improved rural livelihoods and poverty reduction for those countries with high contribution of agriculture to GDP growth and a high share of poor in rural sector (World Bank, 2007; Christiansen and Martin, 2018; de Janvry and Sadoulet, 2020).

The key features of poverty-reducing agricultural and rural transformation involve increasing access to productive assets and the returns to these assets for small-scale and poor producers (Gill et al., 2016). This process involves enhancing the productive assets of the rural poor, such as land and human capital, as well as the broad-scale dissemination of productivity-enhancing technologies for staple crops (such as Green Revolution style improved seeds, fertilizer and irrigation) followed by an eventual diversification of the agricultural sector as well as value chains, and eventually major shifts of population and labour out of agriculture into manufacturing and services sectors and urban spaces (de Janvry and Sadoulet, 2020).

This successful reduction of poverty through agricultural and rural transformation over the past 40 years has been uneven, however, and has been concentrated primarily in East Asia (particularly China) and, to a lesser extent, South Asia. The progress in poverty reduction in these regions contrasts sharply with the

much slower pace of poverty reduction in sub-Saharan Africa. While the number of extreme poor in East Asia dropped from 977 million in 1990 to just 25 million in 2018; and in South Asia from 552 million in 1990 to 262 million in 2014, numbers in sub-Saharan Africa increased from 284 million in 1990 to 433 million in 2018 (World Bank, 2020). In sub-Saharan Africa, the total number of people in poverty is increasing, now accounts for most of the world's poor and by 2030 is expected (prior to COVID-19) to account for the vast majority of the world's poor (Sanchez-Paramo, 2020).

In short, the experience with agricultural and rural transformation for poverty reduction indicates that agricultural and rural transformation have been and are likely to remain a primary driver of economic growth and poverty reduction for a majority of the world's poor people. However, this experience also indicates the need to transform agricultural and rural transformation – that is, to make radical changes in the approach to transformation for poverty reduction so as to move away from the past approaches that focused primarily on agricultural productivity growth of a few key crops and generated high levels of negative environmental and nutritional externalities, as well as insufficient inclusion of marginalized groups (FAO, 2019; Pretty, 2018). This suggests that the starting point for food system transformation is to build synergies between social inclusion and environmental and nutritional objectives into the process, with direct and deliberate actions.

4.1 Rural livelihoods, agriculture and poverty: where do we stand today?

To model and consider social inclusion along with environmental and nutritional objectives in research on food system transformation requires an understanding of rural livelihoods, agriculture and poverty. There is a vast literature in this area, from which we draw key facts and insights below.

Poverty has a rural face. As of 2017, more than 689 million people still lived in extreme poverty, about 9.2 per cent of the global population, using the US\$1.90 a day poverty line. Using the US\$3.20 a day line results in 24 per cent of the world's population living in poverty (World Bank, 2020). About 80 per cent of the extreme poor, and 75 per cent of the moderate poor, live in rural areas. Of these, 76 per cent and 60 per cent of rural workers, respectively, are in agriculture (Castañeda et al., 2018). The World Bank estimates that COVID-19 could push an additional 119-124 million people into extreme poverty in 2020 and 143-163 million in 2021 (Lakner et al., 2021), worsening income inequality (Lakner et al., 2020).

The rural poor depend on food systems for livelihoods. Up to 4.5 billion people globally depend on food systems for their household livelihoods, at least in part, including employment in food value chains, the self-employed and family labour, and those in informal, migrant and seasonal wage labour (United Nations, 2020). For example, in West Africa, the food system accounts for 66 per cent of total employment, almost 80 per cent in agriculture itself, 15 per cent in food marketing and 5 per cent in food processing (Allen et al., 2018). Over a third of global food systems-related employment is at risk because of COVID-19 (United Nations, 2020). There is considerable diversity in agriculture production-based livelihoods, ranging from pastoralists to mixed livestock and crop producers, and small-scale fishing operations. About 40 per cent of the rural extreme poor live in forests and savannahs (FAO, 2018). About 85 per cent of pastoralists and 75 per cent of agro-pastoralists live below the extreme poverty line (De Haan, 2016).

Small-scale agricultural producers form a major component of food systems and livelihoods of the rural poor. Farming systems, farms and farmers are incredibly diverse (Giller et al., 2021). Of the 608 million farms worldwide, 43 per cent are located in East Asia and the Pacific and 30 per cent in South Asia. China alone represents 34 per cent and India 24 per cent of all farms, while 12 per cent of the farms are located in sub-Saharan Africa. Small farms of fewer than 2 hectares account for 84 per cent of all farms worldwide (Lowder, Sánchez and Bertini, 2019).

Poor, small-scale agricultural producers share several common characteristics across a wide range of food systems. Despite the heterogeneity of livelihoods of the rural poor, there are some common characteristics. These households have generally low levels of agricultural productivity (IFAD, 2016). They have diversified income sources including non-farm activities (Barrett et al., 2001; Reardon et al., 2007; Davis et al., 2010; Davis et al., 2017); high exposure to risks to production as well as household income and consumption (FAO, 2016); low levels of access to information, services and productive assets (FAO, 2014; Zezza et al., 2011); face pervasive multiple market failure (Arslan et al., 2020); and increasing dependence on markets

for household food consumption (Zezza et al., 2011; AGRA, 2019; Reardon, 2015; Frelat et al., 2016; Barrett et al., 2019).

Globally, women in agriculture are constrained in their access to productive resources and services and have limited agency, hindering their decision-making power. Women make up about 37 per cent of the world's agricultural labour force, with considerable range between regions and countries (ILO, 2020). Women face gender-specific constraints in accessing productive resources, particularly in terms of asset ownership and land rights (Deere and Doss, 2006; Doss et al., 2014) and access to inputs, technology and services (Peterman, Behrman and Quisumbing, 2014; Waddington et al., 2014; Doss and Morris, 2000; Doss, 2001), as well as higher time commitments to tasks that are essential for family survival, such as gathering wood and water, and childcare, but which are invisible in productivity estimates. These factors lead to significantly lower productivity levels compared with men (O'Sullivan et al., 2014) and worse outcomes in food security (Brown, Ravallion and van de Walle, 2019) and poverty (World Bank, 2018).

Almost three quarters of the global population of 476 million indigenous peoples live in rural areas, and are primarily engaged in agricultural-related activities. In rural areas globally, indigenous peoples are more than twice as likely to be in extreme poverty compared with their non-indigenous counterparts (ILO, 2020). While making up around 6 per cent of the global population, indigenous peoples manage or have tenure rights over a quarter of the world's land surface and about 40 per cent of all terrestrial protected areas and ecologically intact landscapes (Garnett et al., 2018). Over 20 per cent of carbon stored in tropical forests lies within indigenous territories (Environmental Defense Fund & Woods Hole Research Center, 2015).

Vulnerability to climate change and depletion/degradation of natural resources by small-scale producers is widespread. Albeit with considerable variation between locations, climate change increases risks to agricultural production through its effect on increasing the frequency and magnitude of extreme events. Degradation and depletion of land and water resources is making the achievement of agricultural productivity increases much more difficult (Barbier and Hochard, 2018).

Growth in agricultural productivity and returns are a pathway out of poverty for only a limited share of small-scale producers. Woodhill, Hasnain and Griffith (2020) find that the 558 million small-scale producers under 20 hectares produced 70 per cent of food in low- and middle-income countries. Most of this is produced by farms between 1 and 20 hectares, which represent 26 per cent of all producers and have the potential for viable commercial agricultural activity. Farms with less than 1 hectare make up 72 per cent of all farms and provide only a marginal contribution. While the production from these microproducers may be important for their own food security and income diversification, it is very unlikely to represent a viable commercial agricultural activity in the long run (see review in Giller et al., 2021). Many remain net buyers of food. This raises questions about how to improve the well-being of these very small-scale producers and how to take advantage of non-farm opportunities within transforming food systems.

Even for small-scale producers with potential, gaining and maintaining access to markets is increasingly difficult within modernizing food systems. While transition to more formalized markets with large-scale players can bring better prices and increased access to insurance, inputs and credit, it can also lead to excessive consolidation and market power (Sitko, Burke and Jayne, 2018). Rural producers are not necessarily the main beneficiaries of increased demand in either urban or rural areas. Lengthening and consolidating food chains, including globalized food chains are increasingly emerging and these can displace domestic rural suppliers.

Employment in food value chains provides livelihoods for the majority of the rural poor, who may be left behind under business-as-usual development. Employment in food value chains ranges from agricultural wage workers to small food processing and trading entrepreneurs and wage work in large-scale and commercialized operations. Food chains in developing countries are currently undergoing major changes, with a large increase of non-staple food and processed foods. While these changes imply the growth of employment in agricultural value chain activities in initial stages, a process whereby capital investments in labour-saving technologies in the storage, processing, packing and transport sectors is also being observed in several locations, particularly Asia (FAO, 2017). The future well-being of many of today's rural poor resides ultimately on creation of higher value jobs within this sector.

5. Improving rural livelihoods in transforming food systems: what will it take?

With the emerging concerns around nutritional and environmental considerations and the calls for broader food system transformation, as articulated in the four highlighted reports, the question is: will transforming food systems to improve their nutritional and environmental performance lead to improving rural livelihoods? Or will the processes put in place to transform food systems delivery of nutritional and environmental benefits bypass or actually harm rural livelihoods? As poor nutrition and environmental degradation are major problems for the rural poor, improvements in these two aspects potentially could be a positive force in improving the livelihoods of the rural poor, along with the overall performance of the food system, but this is not guaranteed.

In this section, building on the literature, we propose three main actions needed to ensure that food system transformations are inclusive and equitable.

5.1 Integrate social inclusion and distributional impacts into design of measures to address negative externalities on food systems

Reducing the negative environmental and nutritional externalities from current food systems operations requires changes in policies, regulations and institutions – all of which have distributional impacts, creating winners and losers. Many of the losers of current policy proposals coming out of the analysis of food system transformation to achieve sustainability and nutritional objectives are likely to be small-scale, poor female and male producers. For this reason, addressing the negative environmental and nutritional externalities with explicit concerns for equity is essential to achieve inclusive food system transformation.

For example, reducing and even reversing land use change for expansion of agricultural production is a high priority for reducing GHG emissions to meet a 1.5° C or even 2° C maximum level of global warming. Reducing deforestation could be quite beneficial to the approximately 1-2 billion people (depending on the definition) who are dependent on forests for some part of their livelihoods, many of whom are among the extreme poor (FAO and UNEP, 2020). However, it could also be quite detrimental to the livelihoods of rural poor people who depend on clearing new lands for their livelihoods – an estimated 33 per cent of deforestation comes from local subsistence agriculture (Hosonuma et al., 2012). Miyamoto (2020) found that poverty was a major driver of deforestation in Malaysia and Indonesia, and that conversion to agricultural lands could be a viable poverty-reduction strategy. However, he also notes that restricting or prohibiting forest use could negatively impact the livelihoods of forest-based communities. Without secure tenure rights to forests, these communities could lose safe access to forest resources. Thus, the impact of limiting deforestation could have negative impacts on the poor, depending on how it is achieved.

Integrating social inclusion and distributional impacts in the design of measures to address negative externalities on food systems must start with rethinking assumptions – particularly in food system modelling – to incorporate a range of agricultural producers while distinguishing the types of farming systems, household livelihood strategies on and off farm, and transformational paths to address distributional consequences. It requires highlighting the implications of food system transformation on the livelihoods of the rural poor in analysis and messaging of reports on food system transformation, including potential impacts on poverty and hunger, but also on how livelihoods will need to transform to meet objectives around poverty and hunger elimination. While this should build on existing research and evidence on agricultural and rural transformation and targeted support to rural livelihoods promotion, it will be necessary to develop analytical tools to identify equitable approaches to applying constraints and identification of who would bear the costs associated with alternative paths of food system transformation.

Potential approaches to supporting rural livelihoods must be clear in terms of how these can be institutionalized, coordinated and taken to scale. Reform of agricultural subsidies will play a key role in this change, and will need to consider incentive and distributional implications for rural poor producers. Innovation and research should focus on the constraints faced by, and preferences of, female and male

small-scale producers, including indigenous peoples, with limited asset bases and facing a variety of constraints and market failures.

5.2 Ensure that improving livelihoods of the rural poor is integrated into proposed approaches for food system transformation

Including poor, rural people as active participants and beneficiaries in transformed food systems will require explicit and targeted support. The literature on the barriers faced by smaller, poorer producers to participation in the agricultural activities required to achieve environmental and healthy diet goals of sustainable food system transformation, points to the required measures. Many, if not most, of the barriers are not new, but take on new relevance in the push for sustainable and nutritious food system transformation.

Small-scale producers face considerable barriers to adoption of sustainable agricultural intensification (Arslan et al., 2020; Arslan, Belotti and Lipper, 2017; Asfaw et al., 2016). These barriers come in the form of constraints related to lack of access to land, water rights and finance, as well as to information and new technologies, which are often along gender lines and limit women producers' productivity. The delayed returns to investments needed for shifting into sustainable agricultural production systems that build ecosystem services, particularly in moving towards perennial crops, is another major barrier for poor producers, exacerbated by lack of access to appropriate financing (ISF Advisors, 2018; Arslan, Belotti and Lipper, 2017; Lipper et al., 2014; Asfaw et al., 2012). Over 70 per cent of demand for smallholder finance goes unmet – the equivalent of US\$170 billion per year (ISF Advisors and Mastercard Foundation, 2019). For agroforestry, Arslan et al. (2020) find that access to information, security of land tenure, distance to market and participation in social networks are key determinants of adoption. Assessing determinants of agroforestry adoption in the Terai of Nepal, Dhakal and Rai (2020) find that small farm size is a key constraint for adoption and that male-headed households and households with access to off-farm income were more likely to adopt. Based on experimental data from Ghana, Karlan et al. (2014) find that uninsured risk is the binding constraint to smallholder farmer investment.

Given the large share of forests worldwide managed by indigenous and local communities, for decades, community forestry management has been proposed as an approach to combine the goals of environmental conservation with economic development and natural resource rights. Based on a global meta-analysis, Hajjar et al. (2020) find substantial socio-economic and environmental trade-offs in the impact of community forestry management, particularly characterized by improving environmental conditions and a reduction in local forest access and resource rights. Moreover, half of the studies that indicated increases in income also indicated that benefit-sharing within communities had become less equitable. While biophysical conditions, local institutions (particularly de facto rights) and intervention and user group characteristics (particularly smaller groups) were associated with better outcomes, where resource rights were increased, both environmental and incomes tended to improve as well, suggesting the importance of a rights-based approach.

Small-scale producers can potentially help meet the demand for fruits and vegetables in a transformed food system. According to the Global Panel on Agriculture and Food Systems for Nutrition (2020) report, small-scale producers have an important role to play as “specialised producers of nutrient-rich foods, particularly through horticulture (for which huge scale-economies matter relatively less)” (p. 79). Small-scale producers may have a comparative advantage in production of certain types of fruits and vegetable, particularly where there are high labour use and low capital requirements. Linking small-scale producers to emerging high-value markets in fruits and vegetables (Ogutu, Ochieng and Qaim, 2019) and to sustainable certification (Meemken, 2020), has had some success in raising incomes and improving farmer well-being.

However, the ability of small-scale producers to take advantage of the increased emphasis on fruits and vegetables depends on the nature of the relevant international, urban or local markets and quality standards, and marketing arrangements (such as contracts versus spot markets). Fruits and vegetables are generally perishable and highly knowledge-intensive and high-risk. They often require start-up capital to enter and the ability to withstand major price swings. An analysis from Ethiopia indicated that access to adequate capital, poor infrastructure and lack of training are key barriers to participation of the poor in the

benefits of value chain transformation (Amogne et al., 2017). Using data from Zambia, Hichaambwa, Chamberlin and Sitko (2015) find that proximity to markets, lagged farm assets, land size and access to household labour are all determinants of participation in horticulture markets.

Significantly more understanding is required about which farmers in what contexts are meeting this demand or could potentially meet the demand with the right combination of policies and investment (Woodhill, Hasnain and Griffith, 2020), and whether these actions would be sufficient to eventually translate into inclusive food systems.

The approach needs to be broad, addressing the multiple market failures and structural inequalities faced by small-scale male and female producers. Policies need to address the specific barriers to participation of small-scale female and male producers in diversification of farming systems to improve nutritional content, including financing, risk management, information, technology and access to markets. Enhanced and expanded institutions are needed to support the capacity of small-scale female and male producers to adopt sustainable agricultural techniques, including extension, risk management, technology and input supply systems that support efficient use. As part of a dynamic process of transformation, technologies and approaches to food processing and marketing that enhance labour value and create employment are required. A process of sustainable and inclusive food systems transformation must address historic inequalities in access to, and secure tenure of, land and water. Similarly, the process must ensure investment in, and access to, the underlying basics for inclusive development: rural infrastructure (roads, electricity, connectivity, water and sanitation) and human capital development, including universal access to education, health, social protection and skills development.

5.3 Make explicit the prominent differences between countries and food systems in generating negative externalities and the impacts of reducing them

Much of the literature on food system transformation is focused at a global level and proposes measures to reduce negative externalities using global measures of impact, for example, the amount of GHG emissions that can be eliminated through changes in diets or land use. This approach can be somewhat misleading as the sources of negative externalities are radically different across different food systems. Even when the reports do include differentiated analysis, often the main message is the need to impose a constraint on current food system operations that will have significantly different impacts between rich and poor countries and people.

Take the case of inorganic nitrogen fertilizer: there are calls for a major reduction in its use to reduce GHG emissions and pollution of waterways. The use of nitrogen fertilizer is highly uneven across regions, with very low rates in sub-Saharan Africa and very high rates in China, India and the United States. Increasing the effective use of nitrogen fertilizer is important in both of these situations; however, in the case of sub-Saharan Africa, use of fertilizer and rates applied need to increase, whereas these need to decrease in the three countries with high levels of overuse.

Gerten et al. (2020) analyse the impacts of imposing restrictions on agricultural production systems to avoid compromising planetary boundaries for four biophysical processes, including nitrogen flows associated with fertilizer use. They find that imposing constraints to stay within planetary boundaries without any change to current production systems would result in a major decrease in global food supplies. However, in a scenario in which agricultural production is redistributed globally to better match environmental constraints and opportunities, and sustainable intensification applied, food production levels do not decline, but actually increase. Figure 2 shows the result of their analysis; it maps areas where nitrogen use from fertilizer would have to be restricted to meet the constraint, and where there are opportunities to expand fertilizer use via increasing nitrogen use efficiency and/or application in areas of limited risk of runoff. It shows how nitrogen fertilization would need to be redistributed globally through either restriction (purple) or expansion (green) to stay within the planetary boundary for nitrogen flows.

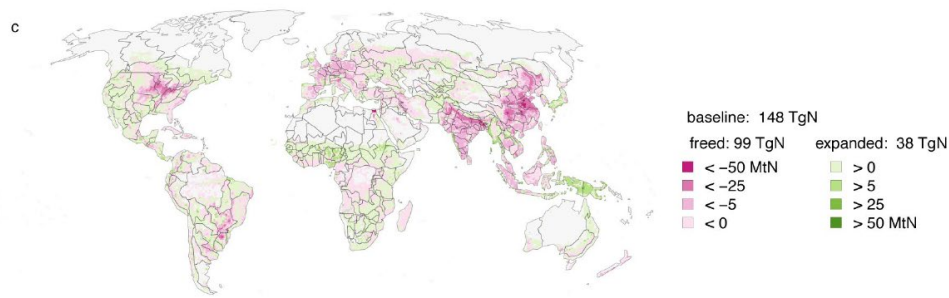


Figure 2: Redistribution of global agriculture to match environmental constraints and opportunities

Source: Gerten *et al.*, 2020)

The main message around nitrogen fertilizer use in the food system transformation discourse is the need to reduce it, whereas, as seen in the analysis by Gerten *et al.* (2020), reducing inequality in access and use of fertilizer while increasing its effective use for everyone is actually the more relevant message for inclusive and equitable food system transformation.

Reducing meat consumption, particularly red meat, is another recommendation in food system transformation, which also has potentially large distributional implications. In general, rural poor people, particularly women and infants, face severe nutritional constraints that can be supplied by animal-sourced food. According to the Global Panel on Agriculture for Food Systems and Nutrition (2016), people in low-income households – especially women and children – will not obtain their nutrient requirements without consumption of foods derived from animals. Though, simultaneously, some groups in low-income households are consuming levels of animal-sourced foods beyond the recommended levels, as are consumers in middle- and high-income countries. Thus, improving food systems performance on nutrition requires increases of animal-sourced foods for rural poor people, particularly women and children, and reductions for higher-income people in poor and rich countries.

Thus, reallocating the effects of constraints from richer to poorer areas is a key factor in determining the overall impact of food system transformation on the rural poor. While this issue is raised in several of the key reports on food system transformation, it is unclear how this redistribution of constraints could actually be operationalized and monitored. Certainly, we cannot expect that such a redistribution would actually occur without stringent measures to ensure it. We need to move from global conceptualization and modelling to national and local, making explicit the challenges of sustainability and nutrition at these levels while considering the implications for livelihoods.

6. Conclusion: bringing it all together

The arguments to transform food systems to achieve better nutritional and environmental outcomes are compelling. Food systems must change if we are to achieve global objectives. The major changes proposed by key reports with respect to agricultural land use, production systems and dietary choices, as well as the emphasis on increasing resource use efficiency, limiting agricultural extensification and reducing consumption of meat-based products are reasonable starting points for discussion.

The analysis presented above suggests that the rural poor could be made worse off from a proposed food system transformation aimed at improving nutritional and environmental outcomes, unless explicit actions are taken to address the constraints they face. Without taking any specific measures to include small-scale producers, or consider the implications for non-farm self-employment and wage labour along the food chain, it is quite possible the changes will have a major negative impact on the process of agricultural and rural transformation for poverty reduction. We could very well end up with a perverse situation where the people who are the least responsible for the problem of climate change are those that bear the biggest cost in terms of foregone opportunities.

But any discussion of food system transformation must consider fully the importance of agricultural and food systems to the approximately 2.7 billion people that depend on small-scale agriculture for their livelihoods (Woodhill, Hasnain and Griffith, 2020). In too many cases, producers and their livelihoods are not even considered in modelling and corresponding discussions. An unintended consequence of transforming food systems could well be a worsening of the well-being of producers and their families, particularly the poorest producers. To avoid solving planetary problems on the backs of the rural poor, explicit consideration of how to make food systems transformations inclusive is needed.

What are the concrete leverage points needed to ensure inclusivity of the rural poor in food system transformation? Overall, the main issue is putting inclusivity front and centre in the agenda on food system transformation. This requires going beyond add-on and secondary efforts in conceptualizing and modelling food systems, but rather a fundamental integration of actions in food system transformation processes to promote inclusion in a manner that enables the rural poor to participate and benefit as equal partners. We cannot rely solely on actions that shield the rural poor from the negative effects of transformative changes, such as social protection measures. We need to build the transformative changes in a way that includes them. Essentially, we need to build pathways out of poverty in the process of food system transformation.

The lack of attention on rural livelihoods threatens the success of food system transformation itself. New objectives will not be met if there is a failure to consider that success depends on a population, and actors who are dependent on natural resources and who face a myriad of constraints and market failures. Addressing these issues requires integration of narratives and practice on improving livelihoods of rural poor, with those of improving food systems for nutrition and environment.

Bringing together these three areas of sustainability, nutrition and inclusion requires a process in which research, investments and policy agendas are coordinated. And in which the variety of disciplines, including economics, nutrition and environment that, until now, have tended to act alone, recognize each other's work and coordinate. As a global community we have increasingly clear vision and big opportunities to transform food systems to address urgent planetary challenges, but success ultimately requires explicitly addressing the challenge of inclusion.

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