



The Scientific Group for the  
UN Food Systems Summit  
<https://sc-fss2021.org/>

**A paper from the Scientific Group of the UN Food Systems Summit**  
*March 2021*

# **ADVANCE EQUITABLE LIVELIHOODS**

A PAPER ON ACTION TRACK 4

**by**

**Lynnette M. Neufeld, Jikun Huang, Ousmane Badiane,  
Patrick Caron, Lisa Sennerby Forse**

**The Scientific Group for the UN Food Systems Summit is an independent group of leading researchers and scientists from around the world. Its members are responsible for ensuring the robustness, breadth and independence of the science that underpins the Summit and its outcomes.**

- Joachim von Braun** (Germany) Chair of the Scientific Group. Director of the Center for Development Research (ZEF), Bonn University, and Professor for economic and technological change.
- Kaosar Afsana** (Bangladesh) Vice Chair of the Scientific Group. Professor Public Health, BRAC University.
- Louise Fresco** (Netherlands) Vice Chair of the Scientific Group. President of the Executive Board, Wageningen University & Research.
- Mohamed Hassan** (Sudan) Vice Chair of the Scientific Group. President of The World Academy of Sciences for the advancement of science in developing countries (TWAS).
- Mario Herrero Acosta** (Costa Rica) Chief Research Scientist of Agriculture and Food, The Commonwealth Scientific and Industrial Research Organisation (CSIRO).
- Ousmane Badiane** (Senegal) Chairperson of Akademiya2063, former Africa Director for the International Food Policy Research Institute (IFPRI).
- Patrick Caron** (France) Vice President of the University of Montpellier, President of Agropolis International and Director of the Montpellier Advanced Knowledge Institute on Transitions
- Martin Cole** (Australia) is Professor for Agriculture and Food within the Commonwealth Science and Industrial Research Organisation (CSIRO). Chairperson of the HLPE Steering Committee of CFS.
- Ismahane Elouafi** (Morocco) Chief Scientist, Food and Agriculture Organization of the United Nations (FAO).
- Frank A. Ewert** (Germany) Scientific Director, Leibniz Centre for Agricultural Landscape Research (ZALF).
- Sheryl L. Hendriks** (South Africa) Professor of Food Security & Director, Institute for Food, Nutrition and Well-being, University of Pretoria.
- Thomas W. Hertel** (USA) Professor of Agricultural Economics at Purdue University and Executive Director of the Global Trade Analysis Project (GTAP).
- Jikun Huang** (China) Professor at School of Advanced Agricultural Sciences and Director of China Center for Agricultural Policy (CCAP), Peking University.
- Marta Hugas** (Spain) Chief Scientist at European Food Safety Authority (EFSA).
- Elizabeth Hodson de Jaramillo** (Colombia) Professor Em. School of Sciences of the Pontificia Universidad Javeriana, and member of Inter American Network of Academies of Sciences (IANAS).
- Andrew Kambugu** (Uganda) Executive Director Infectious Diseases Institute (IDI), College of Health Sciences, Makerere University. Co-founder of the Researchers for Global Health (R4GH) initiative.
- Kaoru Kitajima** (Japan) Professor at Kyoto University Graduate School of Agriculture; a forest ecologist, especially in tropical America and Asia.
- Rattan Lal** (India) Professor of Soil Science, Director of the Carbon Management and Sequestration Center at Ohio State University. World Food Prize Laureate 2020.
- Hoesung Lee** (South Korea) Chair, Intergovernmental Panel on Climate Change (IPCC), Professor at Korea University Graduate School of Energy and Environment, Seoul.
- Uma Lele** (India) is President of the International Association of Agricultural Economists (IAAE).
- Lynnette M. Neufeld** (Canada) incoming President of the International Union of Nutrition Scientists (IUNS), Director Knowledge Leadership, Global Alliance for Improved Nutrition (GAIN).
- Urs Niggli** (Switzerland) Scientist focusing on sustainable farming systems, from 1990 to 2020 he led the Research Institute of Organic Agriculture (FiBL)
- Claudia Sadoff** (USA) Executive Management Team Convener and Managing Director, Research Delivery and Impact, of the Consultative Group on International Agricultural Research
- Lisa Sennerby Forsse** (Sweden) past President, Royal Swedish Academy of Agriculture and Forestry (KSLA) and was the vice-chancellor of the Swedish University of Agricultural Sciences 2006-2015.
- Jean-François Soussana** (France) is Vice-President for international at the French national research institute for agriculture, food and environment (INRAE).
- Morakot Tanticharoen** (Thailand) Professor and Senior Advisor to the President of the National Science and Technology Development Agency (NSTDA), research in microbiology and biotechnology.
- Maximo Torero** (Peru) ex-officio Member Chief Economist, Food and Agriculture Organization of the United Nations (FAO).
- Aman Wirakartakusumah** (Indonesia) Professor Em. at Department of Food Science and Technology and Senior Scientist at SEAFast Center, Bogor Agricultural University (IPB), President-Elect, International Union of Food Science and Technology.
- David Zilberman** (Israel, USA) Professor in the Department of Agricultural and Resource Economics, University of California at Berkeley. One of the Founders of the International Consortium of Applied Bio-economy Research (ICABR).

## ABSTRACT

Food systems transformation provides the opportunity to shift current trends in all forms of malnutrition, prioritizing nutritious food availability and affordability for all – from shifting priorities in agricultural production, to improved food systems that favour nutrition and sustainability. The task of Action Track 4 is to explore approaches to doing so that will ensure equitable livelihoods for producers, businesses, workers across the food system and consumers, with particular emphasis on addressing inequalities and power imbalances. As the Science Group for AT 4, we explore the nature of these issues, using the drivers of food systems as articulated by the High Level Panel of Experts of the UN Committee on World Food Security<sup>1</sup> as framing. Small and medium sized producers and people living on the food system in rural and urban areas are disproportionately affected by all **biophysical and environmental drivers** including soil and water resources, and climate change. Unequal opportunity in access to all types of resources reduces overall production, resilience, rural transformation. Advances in **innovation, technology and infrastructure** have had important impacts on food production and sustainability, transportation and processing along food value chains, marketing, and ultimately diets, including consumption of both nutritious and unhealthy foods. But achievement of equitable livelihoods in food systems will require that issues of access to contextually suitable innovation and technology be substantially enhanced, and that such advances better build on and learn from indigenous knowledge. Many **economic and political factors** are essential causes of inequality and power imbalances at household, community, national and global levels, which constrain the ability of food systems transformation to deliver poverty reduction and sustainable, equitable livelihoods. Finally, vast evidence illustrates that several **socio-cultural and demographic drivers** underpin inequalities among and within societies and constrain the potential for some to benefit from actions to improve livelihoods, particularly women, youth, disabled, elderly, and indigenous peoples. These issues are exacerbated by the COVID-19 pandemic. The pandemic is having a significant impact on the global commodity markets and trading systems, economic growth, incomes, and poverty levels, with likely disproportionate burden on the vulnerable communities in both urban and rural areas. This is likely to worsen inequalities and undernutrition including child wasting. To address these issues, we must transform not only food systems, but the structures and systems that continue to enable and exacerbate inequities. Drivers of food systems inequities are highly interconnected and progress to address one will likely require change across several. For example, globalization and trade interact with other powerful drivers, especially technology resource mobilization, and demographic trends, which shape food production, distribution, and consumption. Drawing of this evidence review, in the final section we reflect on several factors that should be part of effective solutions, including grounding in rights-based approaches. We then share a series of recommendations aimed to enhance inclusive decision making, protect the livelihoods of those living in situations of vulnerability while creating opportunities, adapting institutions and policies to favour equitable food systems livelihoods, and increasing investment to realize the potential of improved institutional and policy actions. We invite governments, businesses, and organizations to hold themselves and others to account for ensuring equitable livelihoods, and open avenues to realize the potential of science, innovation, technology, and evidence to favour equitable livelihoods.

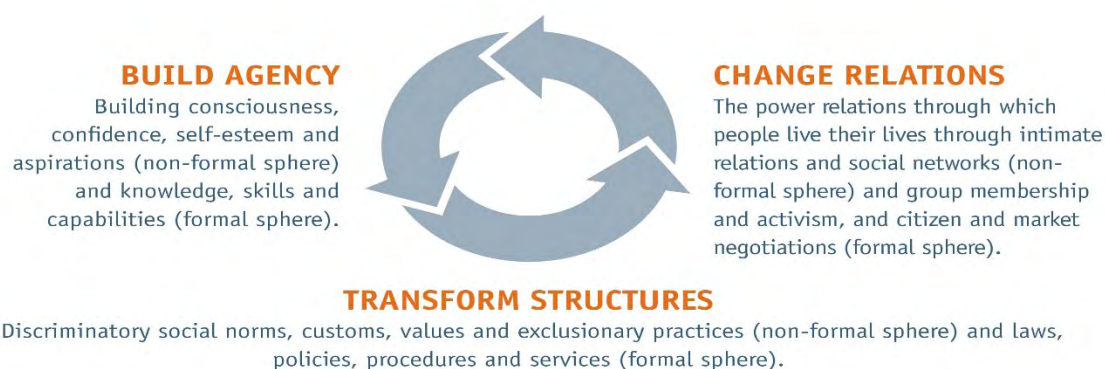
## INTRODUCTION

Food systems transformation provides the opportunity to shift current trends in all forms of malnutrition, prioritizing nutritious food availability and affordability for all – from shifting priorities in agricultural production, to improved food systems that favour nutrition and sustainability.

The purpose of the Action Track 4 science group is to provide the scientific basis for the work of the Action Track (AT). Our task as the science group encompasses reviewing the evidence that studies the nature of the issues and the evidence that underpins potential solutions. It also helps identifying uncertainty and gaps in knowledge. The central issue identified by the AT 4 team has been stated as:

*Inequality and power imbalances – at household, community, national and global levels – are consistently constraining the ability of food systems to deliver poverty reduction and sustainable, equitable livelihoods.*

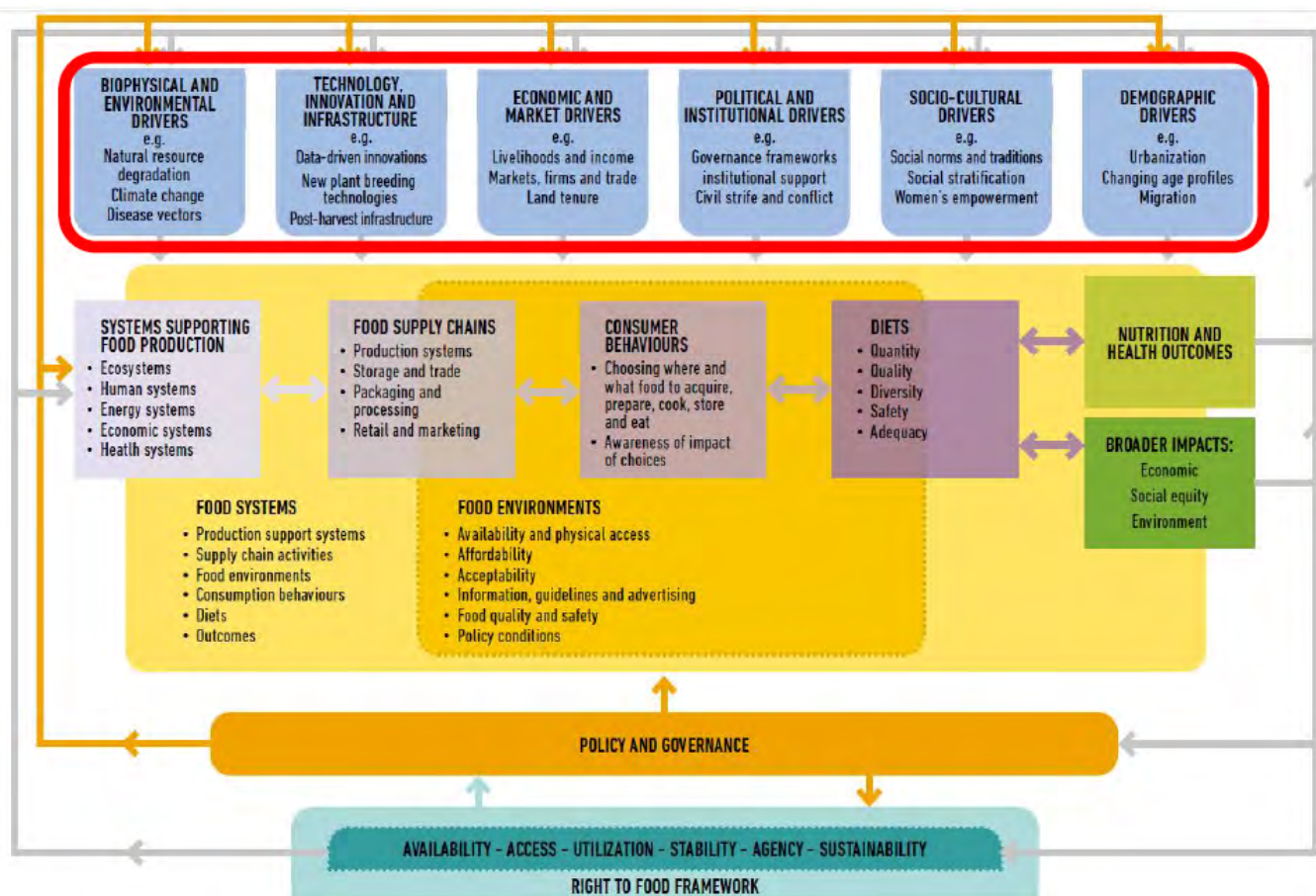
In developing solutions, AT 4 explicitly calls out inequities related to gender, youth, elderly, minority, migrant, and indigenous peoples. They focus on small and medium size enterprises (SMEs) across the food value chain, but also equitable access to employment and livelihoods for wage earners, extending the concerns of inequality to rural/ urban and other social and geographic divides. Efforts to address inequality and power imbalances must build agency, change relations, and transform the structures that underpin this imbalance of power and result in inequalities, as illustrated in the following figure (Figure credit: Action Track 4 Discussion Starter, October 2020):



The most effective way to sustainably eradicate poverty and inequality is to boost the opportunities and capacities of the poor and those living in situations of vulnerability, through redistributing resources more equitably (e.g., land, incomes, social protection), ensuing quality education, progressive and not regressive taxation, state infrastructure investments among other approaches. There is no linear relationship between productivity, production and income, food security, or reduced inequalities.<sup>2</sup> Decision-making must also become more equitable and accountable to those who are most negatively affected by our current food system and their outcomes. Progress in advancing equitable livelihoods and value distribution therefore involve several key areas ranging from expanding access to assets, infrastructure, and services as well as other required measures to enhance quality of living spaces. Interventions to produce real change on the ground need to empower the poor and those living situations of vulnerability.

To fulfil our task as the science group, we need to step back and consider the evidence related to the drivers of inequality and power imbalances as they relate to livelihoods *across* the food system. We use the conceptual framework of food systems developed by the High-Level Panel of Experts of the UN Committee on world Food Security in 2017,<sup>3</sup> and updated in 2020,<sup>1</sup> and structure this review around the six drivers of food systems (as highlighted in the red box of Figure 1).

**Figure 1.** Conceptual framework of sustainable food systems (reduced from HLPE1)



Framed around the drivers of sustainable food systems (combining them where the nature of the evidence warrants), the following sections provide an overview of the nature of the issue as it relates to drivers of inequality and power imbalances. Our intent is to explore these drivers as they relate to livelihoods among those living in situations of vulnerability, including consumers and producers and all types of workers across all food systems types and contexts (see<sup>4</sup> for definitions and concepts related to food systems). In the final section, we provide examples from the literature that can inform potential solutions to address the issues.

## 1. OPHYSICAL AND ENVIRONMENTAL DRIVERS, PARTICULARLY SOIL, WATER, AND CLIMATE CHANGE

In rural areas of many low- and middle-income countries (LMIC), natural resources are an important source of food, both through direct consumption and through providing the basis for income generating activities (e.g., food and non-food cash crops, forest, and fishery products). Access to natural resources like land, water, forests, and fisheries is a key element of livelihood strategies (“natural capital”), together with other elements such as access to employment and/or credit (“financial capital”). Because of this, measures to improve access to resources are an important element of strategies for the realization of the right to food (see conclusion section below for further discussion).<sup>5</sup> Small and medium sized producers and people living on the food system in rural and urban areas are disproportionately affected by all biophysical and environmental drivers including soil and water resources. Inequal opportunities to access all types of resources defers overall production, resilience, rural transformation, thus directly affecting the livelihoods of all actors across food value chains via diverse pathways.



The number of people whose livelihoods depends on degraded lands has been estimated to be about 1.5 billion worldwide.<sup>6</sup> In India for example, 146.8 out of the estimated 329 million hectares of total geographical area is reported as degraded.<sup>7</sup> People living in degraded areas depend directly on natural resources for subsistence, food security, and income. Women and youth often have limited options and are especially vulnerable to land degradation and climate change. Land degradation reduces productivity and increases the workload of managing the land, disproportionately affecting women in some regions.<sup>8</sup> Land degradation and climate change act as threat multipliers for already precarious livelihoods, with consequences for increased risks of poverty, food insecurity, and in some cases migration, conflict and loss of cultural heritage.<sup>9</sup> The major anthropogenic drivers of erosion are land use and climate change, in particular through a more intense hydrological cycle.<sup>10</sup> While much research attention has focused on arable agriculture,<sup>11</sup> seminatural systems, such water may account for nearly half of global soil erosion.<sup>12</sup> There are many indications that water is becoming an increasingly scarce resource, a point often made over the last 10 years.<sup>13,14</sup> Access to water is now recognised as a prerequisite for poverty reduction.<sup>15</sup> Competition for water from many different sectors however, can divert attention from its role in the improvement of human livelihoods.<sup>16</sup>

Climate change is the defining issue of our time and we are at a defining moment. From shifting weather patterns that threaten food production, to rising sea levels that increase the risk of catastrophic flooding, the impacts of climate change are global in scope and unprecedented in scale. The adverse effect of climate change and variability has become an environmental and socio-economic problem which is increasingly causing climate-driven hazards to people around the world.<sup>17</sup> The effects of climate change are likely to be more serious among countries with less capacities to respond and adapt and, within these countries, among the poorest and most vulnerable. Climate change serves as a serious inhibitor to the attainment of food security and also to the fulfilment of major development agendas in the majority of global economies. Climate change could undermine social welfare, equity, and the sustainability of future development. It is generally believed that LMICs, and disadvantaged groups within all countries are more vulnerable to the impacts of climate change as a result of limited resources and low adaptive capacity.<sup>18</sup>

## 2. TECHNOLOGY, INNOVATION, AND INFRASTRUCTURE DRIVERS

For both short and long distances value chains, infrastructure strongly influences the way food is produced, processed, transported, distributed, sold, conserved, and ultimately consumed. Infrastructure is required for food to move long distances and to increase food security in areas of shortages, to stabilize food prices, to minimize food-borne disease and food waste. Roads, railroads, shipping, or cold chain facilities play an essential role. Poorly developed infrastructure impacts all dimensions of livelihoods for urban and rural populations. It affects the quality and safety of nutritious foods particularly, limits access to nutritious foods, and exacerbates issues of food loss and waste.<sup>19</sup> In South Sudan and Somalia for example, poor road infrastructure is a major barrier to food access.<sup>20</sup> Infrastructure improvements, technological advances and mechanization in the food value chain may generate positive and negative externalities for production, trading and consumption with potential to generate off-farm employment in rural, and potentially in urban areas. Examples may include factories located near the farm where the technology will be used, technicians and mechanics to operate and repair machinery and devices, other business-related employment, such as bookkeepers, sales staff, and so on.

Innovation, technology and infrastructure improvements have been and will be major drivers for food system transformation.<sup>3</sup> Advances in all three have had important impacts on food production and sustainability, transportation and processing along food value chains, marketing, and ultimately diets, including consumption of both nutritious and unhealthy foods.<sup>21,22</sup> They can also generate risks to human and environmental health and may not yield equitable benefits for farmers or other food systems workers.<sup>3</sup> This raises the questions of targeting technology policies and interventions according to their

impact on improving livelihoods among the poor and those living in situations of vulnerability. The need to produce healthier and accessible food and to address SDDG 2 and other SDGs through food systems transformation will thus require innovative, responsible, and targeted efforts by the actors in the world's food supply chains. Yet many breakthrough technologies spark disputes and sociotechnical controversies,<sup>23</sup> that more and more generate dual oppositions and polarized polemics. For example, the livelihood and equity impacts generated using modern biotechnology vary considerably according to socio-ecological context.<sup>24</sup> In some contexts such technology may result in market concentration in the industries that provide inputs to agriculture, reduced farmer participation in breeding and higher seed prices. The technology may also favour larger farm economic units with likely displacement of smallholder farmers.<sup>25–28</sup> These socio-economic trends then directly affect livelihoods, equity, knowledge, and culture. Whatever the controversial issue, evidence highlights how institutional environments are essential to direct technology and innovation impact. Ultimately, the potential for impact depends not only on characteristics of the technological advancement itself, but on access patterns, arrangements, and governance about who controls it.<sup>24</sup>

Innovations in breeding methods, chemical synthetic inputs, and food processing have changed the way food is produced, stored, distributed, consumed. Many agricultural innovations have prioritized yield and productivity, with many disproportionately favouring high income country food systems, but some notable exceptions exist. Since 2004, HarvestPlus in collaboration with CGIAR Centres, have facilitated the release of 211 crop varieties in 30 countries that have been bred with increased content of one or more nutrients. An estimated 7.6 million farming households are now growing these crops, estimated to be benefiting some 38 million rural consumers.<sup>29</sup> This number will be enhanced as crops are sold purchased in urban markets, and used in various processed or pre-prepared foods. Another example promotes the better incorporation of fruit into local food systems, meeting the challenge of seasonal availability. McMullin et al<sup>30</sup> however, the production and consumption of fruits are inadequate on average and in particular so in specific seasons. To better incorporate fruits into local food systems while addressing the challenge of seasonal availability, World Agroforestry (ICRAF) developed a methodology based on 'fruit-tree portfolios', which selects in partnership with farmers, the fruit-tree species for production that both socio-ecologically suitable, and nutrient-rich. Both examples have the dual advantage of potentially improving livelihoods and favouring nutrition outcomes through enhanced production and access to nutritious foods. Modern biotechnology can also improve livelihoods through increased crop production for smallholder farmers. Millions of small farmers in many LMIC (e.g., China and India) have benefited from adoption of Bt cotton after this technology has been approved for commercialization since the late 1990s.<sup>31–34</sup> Yet, the impact of such technology on livelihoods, particularly for farmers in situations of vulnerability is disputed and has been shown to depend on differentiated practices.<sup>35</sup> Among the issues to resolve in this regard is the on-going debate related to access to seeds, and mechanisms to ensure that commercial interests in seed-line access do not negatively affects producers and consumers livelihood.<sup>36,37</sup>

According to the CGIAR Research Program on Climate Change, Agriculture and Food Security<sup>38</sup>, some of the most promising innovations in rural agriculture are technology- and service-based. With access to data, markets, and financial services, farmers can plant, fertilize, harvest, and sell products more effectively. These approaches are gradually gaining favour as more people in emerging economies connect to mobile networks,<sup>39</sup> and applications designed to collect and share agricultural information become increasingly accessible.<sup>40</sup> Of course, the mere existence of this technology will not generate better livelihoods. Access to such technology has been highly constrained and must be resolved, before this potential can be realized.<sup>41–44</sup> Similarly, tools must meet the needs of the farmers who use them and expectations towards improving livelihood, including addressing power asymmetries. This demands that mobile technologies take into account differences in gender, education, and resource levels among farmers and consumers,<sup>45</sup> and are responsive to changing circumstances. The impact and success of these tools and programs should be monitored and evaluated,<sup>46</sup> with ineffective approaches being improved or re-

placed.<sup>47</sup> Capacitated endogenous institutions are vital to achieving an inclusive approach.

### 3. ECONOMIC AND POLITICAL DRIVERS

Many economic and political factors are essential causes of inequality and power imbalances at household, community, national and global levels, which constrain the ability of food systems transformation to deliver poverty reduction and sustainable, equitable livelihoods.<sup>48,49</sup> Improving education and literacy levels, access to public services and infrastructure and among others helps to address the issue.<sup>50,51</sup>

**Social protection** is a menu of policy instruments to address poverty and vulnerability, through social assistance, social insurance and efforts at social inclusion, with a role to address both long standing and crisis-induced poverty.<sup>52</sup> The precarity of the food system in most countries, and particularly food systems workers living in situations of vulnerability is illustrated by the current COVID-19 crisis (Box 1). The lessons and experience from global efforts fighting the COVID-19 pandemic show the importance of developing a strong social network in coping with fragility of food system.

**Conflicts and crises**, usually resulting from an unstable political system and uncertain property right arrangements, damage trust and social cohesion among the stakeholders throughout the food systems, discourage public and private investment and cause slowdown in economic growth and less inclusive rural and structural transformations.<sup>53,54</sup> This does harm to vulnerable smallholder farmers, consumers and to those engaged in micro and SMEs along food value chains, and particularly those run by and employing youth, women, disabled, and indigenous peoples.

Inclusive development of food systems is also constrained by lack of representative **leadership**, reflected in inequality in access to productive resources, working opportunities, market participation rights and public services. Studies in almost all LMIC contexts, except Latin America and the Caribbean, indicate a large proportion of total farmland belongs to small holders (less than 2 ha),<sup>55</sup> and that here and for all food systems workers, resources and public services are unequally allocated.<sup>56</sup> Barriers to active participation in leadership and decision-making must be broken down.<sup>57</sup>

Livelihood inequalities across the food system, including among smallholder farmers, small business, and workers across the food value chain can be reduced only if inequalities in **access to land, water, employment**, financial services, infrastructure, technology, markets, and other economic opportunities are resolved. Food system transformation that does not address these inequalities and specific vulnerabilities runs the risk of reinforcing and deepening inequalities into the future and undermining the resilience of food systems. Inequitable economic opportunities are usually caused by rigid institutional arrangements in land, water, credit, and labour markets, lack of information, market segregation/ monopoly, discriminative treatment, and distorted policies, among others.<sup>57</sup> Subdivision among siblings make it harder for rural youth to obtain as much land as their parents had; in many contexts youth have historically marginalized economically, socially and politically.<sup>58</sup> Research shows that respecting/upholding collective forms of land ownership and customary property regimes has important positive implications for livelihood equity<sup>59,60</sup> The nature of public goods such as water resources however, makes fair allocation difficult. Removing barriers to employment and other economic opportunities in addition to various actions to reduce discrimination towards migrant workers also work to increase income and improve livelihoods.<sup>87</sup>

As pointed out by the HLPE,<sup>3</sup> **globalization and trade** have a critical role to play in ensuring food security and nutrition (FSN) and reducing inequalities. Trade can positively and negatively affect all four pillars of FSN (availability, access, utilization, stability). Evidence suggests that globalization and international trade may help to extend the value chain and generate opportunities to create wealth and equitable livelihoods among countries.<sup>50,61,62</sup> International trade and financial flows are also associated with changes in production and consumption patterns that require taking into account the way livelihood



is affected, in particular through employment access, incomes and wealth distribution. Measures are needed to avoid unwanted outcomes, including increases in income inequality.<sup>63,64</sup> While some farmers can improve their livelihoods by tapping into exportable agricultural production, considerable research shows that becoming part of export markets can make farmers, particularly small-scale farmers more vulnerable to shocks in global commodity markets.<sup>65,66</sup> These risks can be mitigated through collective action and policy support to soften the impact of such shocks among smallholders and other actors in the food system that lack the capacity to respond adequately.

**Stabilizing food prices** will help to reduce the risk of all stakeholders along the food supply chains and will bring benefits to the small holders who are more vulnerable in the production system and consumers in rural and urban. In general, food supply is much more stable at the regional and global levels than it is within a given country.<sup>67</sup> This is because an efficient market provides the opportunity to supplement supplies in cases of domestic production shortfall or rapidly expanding demand and thereby help prevent sharp price increases that would affect access to food negatively. Inversely, in cases where rising domestic supplies threaten to depress local prices, an appropriate political regulation and management of stocks (at both national and international dimension), plus a transparent trade mechanism, calling for an appropriate political regulation and management of stocks, for which a regional and/or global dimension is appropriate.

The informal food processing sector has grown significantly over the last decade, thanks to rapid urbanization and growing middle class, and has become one of the most dynamic segments of food staples value chains.<sup>68</sup> In Africa, it is currently the fastest growing export sector, both to regional and outside markets.<sup>69</sup> It is estimated that upward of two thirds of staples food consumed in Africa by 2040 will be in processed form.<sup>70</sup> The emerging staples food processing sector is currently characterized by a large and growing number of primarily female headed small enterprises. Future strategies to promote equitable livelihoods and value distribution in domestic food systems will need to reverse the current formality and size bias in order to tap into the employment and income opportunities resulting from the rapidly transforming staples value chains for the benefits of farmers, unskilled workers, and consumers in urban centres and rural towns.

These political and economic factors may cause inequality and imbalances through a complex mechanism but may also be the consequence of such inequality and imbalance. On one hand, both political instability and poor economic performance are believed contributing to rural poverty and inequality of livelihood in rural sectors of many LMICs in all regions.<sup>71,72</sup> On the other hand, a burgeoning literature illustrates that rapid economic growth is not a sufficient condition for inclusive development.<sup>53,54,73</sup> In addition, the political and economic drivers may also interact with innovation, technology and infrastructure to influence food systems as well as inequality and power imbalances related to gender, youth, smallholders and indigenous people. Consequently, the question is not only *whether* but also *how* economic growth and institutional/policy arrangements may affect inequality in access to production, employment and fair share opportunity.<sup>8,74-76</sup> This calls for considering the way agency conditions or prevents the development of inclusive, equitable livelihoods,<sup>77</sup> in particular through access to the public services, before proper decision making and agenda setting could be made.

The pace of future improvement in livelihoods will depend on the ability of governments to find ways to maximize the impact of economic growth and investments in social sectors, such as health, education, social protection on enhancing capacities among the poor and vulnerable. This not only calls for better coordination of interventions across government but also recognition and effective exploitation of that fact that differences in services and how they are bundled produce different impact on livelihood of the poor and those living in vulnerable situations. For instance, the impact of a given dollar amount spent on education services on smallholder and low skilled off-farm and urban labour productivity will depend on the extent to which it targets vocational training and other efforts to upgrade and develop skills in the relevant sectors.<sup>78</sup> Against the background of the current COVID-19 pandemic, the same

concept can be illustrated using the example of health services (Box 1). Furthermore, there is evidence that morbidity has a bigger impact on productivity of the poor and vulnerable than among better off segments of the population.<sup>79</sup> It has also been shown that different types of health services have different impact on disease prevalence and morbidity.<sup>80</sup> It is therefore possible to allocate public investment in health services such as to target diseases that have the largest effects on the productivity of smallholders and low skilled laborers and excluded communities. Allen and co-authors<sup>81</sup> show that morbidity does not only affect labour availability and productivity, it also affects the choice of technologies and returns to use of fertilizers and mechanization. More importantly, different health services have different impact on disease prevalence which affects efficiency and thus livelihoods differently even among the poor, those living in vulnerable situations, and across gender.<sup>79,82</sup> The current COVID-19 pandemic illustrates the need and opportunity to rethink the delivery of social services in order to maximize their benefit and impact among the poor and vulnerable (Box 1). This applies equally to social protection policies where the experience of productive safety nets in Ethiopia offers valuable lessons in designing programs that work for the poor and vulnerable.<sup>83</sup>

#### 4. SOCIO-CULTURAL AND DEMOGRAPHIC DRIVERS:

Vast evidence illustrates that several socio-cultural drivers underpin inequalities among and within societies and constrain the potential for some to benefit from actions to improve livelihoods, particularly women, youth, disabled, elderly, and indigenous peoples.<sup>57,84,85</sup> For example, there are approximately 185 million indigenous women in the world, belonging to more than 5000 different indigenous peoples. Despite the broad international consensus about the important role indigenous women play in eradicating hunger and malnutrition, there are still limitations in the recognition and exercise of their rights.<sup>86</sup> Due to the long-term and ongoing impacts of colonialism and environmental degradation, many Indigenous peoples, regardless of their geographic location, face high levels of obesity and chronic disease and are disproportionately affected by poverty and food insecurity.<sup>87-90</sup> Past and present social and environmental injustices have led to the loss of food sovereignty, through dispossessing Indigenous peoples from their traditional territories and undermining intergenerational knowledge transmission of cultural practices related to their food systems<sup>91,92</sup> and have been linked, as in the case of the experience of hunger in residential schools in Canada, to the rise of diabetes in these populations.<sup>93</sup>

Socio-cultural drivers also impact and set the norms for the dynamics of the other drivers, including political and economic drivers, demography, innovation/technology, among others. As such, structural barriers for several groups particularly women and youth include land rights, access to financial services, among others. In addition, inequality of opportunity is an important constraint. Social protection has an important role to play in protecting those living in vulnerable situations, and depending on the nature of that action, seeking to address the underlying causes of poverty and exclusion.<sup>94</sup> Programs that direct resources to women, have shown greater impact on food security and other household-linked benefits.<sup>52</sup> However, social and structural barriers may limit women's access to several types of social protection programs, including public works and agricultural input and support.<sup>52</sup> In addition to these considerations, language, culture and tradition may influence willingness to participate and potential to benefit from social protection programs, unless national programs are adequately adapted to such sub-national contexts.<sup>95</sup>

Few, if any, economic or social transformations over the past decades can be brought into focus without explicit attention being paid to the demographic transition, inextricably linked to several socio-cultural drivers. The growth of the urban sector, driven by both natural increase (fertility exceeding mortality) and rural-to-urban migration,<sup>96,97</sup> helps to fuel agricultural transformation. The proportion of the population living in rural areas is declining in many countries, yet numbers are increasing in some, particularly in sub-Saharan Africa. Both fertility and mortality have been falling in rural areas, converging from levels higher than urban areas towards urban levels. Pressure and opportunity lead parts of

growing rural cohorts to migrate to cities or to seek diversified livelihoods within the rural sector. This raises concerns, particularly in sub-Saharan Africa where urban growth and the economic sectors are not in a position to cope with such a rapid transition and offer employment to rural dwellers as has occurred historically in other continents.<sup>74</sup>

Predominantly male migration among youths and young adults over the course of the urban transition may have additional impacts on the gendered nature of economic roles and overall status of women.<sup>98,99</sup> Increased urbanization means a growing gap between the location of food production and food consumption. It may also mean a change in lifestyle including dietary changes. As a result, there is a growing need for food processing, transportation, and transformation beyond the farm level, providing opportunities for jobs and entrepreneurship. In Ethiopia, Malawi, Mozambique, Tanzania, Uganda and Zambia, the transformation of the food system is forecast to add more jobs than any other sector of the economy by 2025.<sup>100</sup> This is an opportunity to see that these jobs are accessible also to rural women and youth who may disproportionately live in vulnerable situations. Yet evidence suggests that women entrepreneurs face many additional barriers compared to their male counterparts including lack of mobility, access to finance, access to business networks and mentors, limited leadership experience, lower literacy and numeracy, discriminatory gender norms and stereotypes.<sup>101</sup> Experience from other regions, also illustrates the risks to nutrition as dietary traditions are lost, and reliance on processed – often highly unhealthy food increases.<sup>102</sup>

Today there are significant knowledge gaps on rural outmigration trends, which need to be tackled. This is particularly the case for migration driven by distress, when people do not perceive there is any other viable livelihood option except to migrate. Reliable data, disaggregated by sex, age, origin and destination are necessary to understand socio-economic conditions associated with migration. At the moment, these data are scarce.<sup>103</sup>

**Box 1: The unprecedented range of COVID-19 disruptions to the food system and livelihoods**

The breadth and reach of the complex ramifications and disruptions from the COVID-19 pandemic are unprecedented.<sup>104</sup> The impact from the pandemic parallels or exceeds the impact of major shocks over the past few decades, whether caused by natural disasters, disruption of financial and commodity markets, or conflict and civil strife. More challenging is the fact that, under Covid-19, all of these various shocks happen concurrently and engulf the entire globe, with no regions left untouched and thus poised to help fuel a possible recovery.<sup>105</sup> There are therefore important lessons to be learned from the current pandemic to help shape more effective strategies to managing future shocks and their impact on the livelihood of the excluded and marginalised.

*The Effects of Covid on marginalized communities: Income, poverty, and nutrition*

Policies of social distancing and other measures adopted by governments to contain the spread of the pandemic have drastically affected food supply chains, with serious repercussions for the poor and vulnerable, particularly in LMICs.<sup>106–110</sup> There is evidence that disruptions are more serious for the operation of informal market networks which dominate supply chains for traditional food staples that people living in poverty and situations of vulnerability depend on more heavily.<sup>111</sup> Prices in these markets have reacted sharply to measures undertaken to control the pandemic.<sup>112,113</sup> Moreover, higher food prices, the closing of informal markets and other disruptions to staple foods supply chains have been shown to impact on micronutrient intake and nutritional status of the poor.<sup>114</sup> Finally, the effects of the pandemic on global commodity markets and trading systems are shown to have significant impact on economic growth and thus incomes and poverty levels, with likely disproportionate burden on the same vulnerable communities in both urban and rural areas.<sup>115</sup> This is likely to worsen inequalities, food insecurity, and undernutrition including child wasting.<sup>116</sup> COVID-19 therefore will likely have substantial implications for the achievement of the Sustainable Development Goals in LMICs, in particular SDG 2 (End Hunger) and SDG 12 (Ensure sustainable consumption and production patterns).<sup>117</sup>

*Equity and policy responses to Covid and similar shocks*

The Covid-19 crisis has particularly impacted already-marginalised segments of the population such as indigenous peoples, migrant workers, and informal sector employees.<sup>118–120</sup> High vulnerability to changing economic conditions linked partly to a host of pre-existing barriers ranging from weak legal status, racism and lack of access to health, social security and education services all lead to disproportional impacts of the pandemic among the poor and disadvantaged.

Persistent and chronic vulnerability, a major manifestation of marginalization and exclusion, does not only exacerbate the human cost of shocks, it also complicates the search for effective responses. Resistance to confinement, curfews and other mitigation measures reported in the media across the world arise often from the considerable threat to livelihoods among the poorest and those living in situations of vulnerability.<sup>111</sup> Successful strategies to deal with future shocks require having a better handle on equity and vulnerability before shocks strike.

*Lessons for managing future shocks to protect livelihoods*

Just like pre-existing conditions among humans raise the risk of serious consequences, chronic vulnerability patterns also raise the risk of exposure and extent of damage among excluded and marginalized communities in case of shocks such as Covid-19. Community vulnerability is determined by factors ranging from pre-existing levels of poverty, food insecurity, malnutrition, disease prevalence, poor health and education services to high population density.<sup>121</sup> Investment in the capacity for good understanding of the patterns of vulnerability across various communities is therefore a major need for future preparedness, especially among LMIC.

For example, a report from the Indigenous Navigator,<sup>122</sup> highlights the impact of Covid-19 on indigenous communities in 11 countries (Africa and Asia). On the one hand, the report identifies how pre-existing barriers in access to health, social security and education are fuelling disproportional impacts of the pandemic on indigenous peoples. It also indicates a rise in food insecurity, related to loss of livelihoods and lack of access to land and natural resources. On the other hand, it underlines the central role played by communities in building the response and recovery to the global crisis resulting from the pandemic. The emphasis on Covid-19 response and recovery measures is that it needs to be respectful of the rights of indigenous peoples and support their livelihoods, economies, and resilience.

Equally important is a good understanding of the nature of operation of local food systems. Control measures that are not aligned with the basic features of food systems along complete value chains are certain to create second generation disruptions, with more serious impacts on livelihoods.<sup>123</sup>

Finally, boosting preparedness capacities will require investment in a minimum infrastructure for real time data access and management. New development in remote sensing and machine learning offer real opportunities for better targeting and tracking in order to raise the effectiveness of response and mitigation measures to protect the poor and vulnerable.<sup>124</sup>

## 5. CONCLUSIONS AND IMPLICATIONS FOR THE DEVELOPMENT OF GAME-CHANGING SOLUTIONS TO ENHANCE EQUITABLE LIVELIHOODS IN FOOD SYSTEMS

The growth of the food systems presents enormous employment opportunities,<sup>100</sup> but achievement of equitable livelihoods in food systems and resulting from changes in food systems will require that substantial progress be made to address the drivers of inequality. Food system transformation must also find the balance of food systems that favour and support healthy diets (i.e., those that minimize risk of both undernutrition and overweight and obesity),<sup>125</sup> and do so in ways that are sustainable for the planet. We must transform not only the food system, but the structures and systems that continue to enable and exacerbate inequities. While we have reviewed and discussed the evidence related to drivers of inequitable livelihoods in relation with food system transformation within their respective categories, they are interconnected and progress to address one driver will likely require change across several. For example, globalization and trade interact with other powerful drivers, especially technology resource mobilization, and demographic trends, which shape food production, distribution and consumption.<sup>3</sup>

We believe therefore, that enhancing equitable livelihoods will require solutions that:

1. **Are rights-based:** Solutions must recognize and hold stakeholders to account for human rights including living wage and the right to food,<sup>126</sup> and advance the agenda toward the *right to a healthy diet*. Implications include not only a shift in policy and programmatic action, but increasing public pressure, and creating monitoring and accountability mechanisms that hold governments, businesses, and all stakeholders to account to uphold rights.
2. **Ensure long-term investment for structural changes:** Dismantling inequitable systems and structures that enable and exacerbate inequalities for food systems workers and consumers requires long-term investment, while achieving short term gains. Long-term vision should inform investment priorities in needed structural changes across the food system including those that will result in:
  - Dismantling barriers to expanded access to resources, technology, infrastructure and productive services among smallholders and other less powerful actors along the food system,
  - Policies and institutions that make sure that markets and trading regimes work for producers and consumers, including raising agricultural incomes and improving food access,
  - Regulatory and administrative arrangements and other instruments to ensure equitable access to productive assets.
3. **Directly inform local and national policy and programmes:** Transformational change towards healthy, sustainable, and equitable food systems will require a breaking down of current policy silos in favour of coordinated policy agendas that permit the mapping and balancing of trade-off, benefits, and harms to human and planetary health. Including but not limited to agriculture, trade and food policies that simultaneously foster healthy diets, equitable opportunity and fair pay, and protect the environment, complemented with strengthened and well-targeted social protection.
4. **Enhance the development of and equitable deployment of contextually relevant innovation and technology:** The potential of innovation and technology to do good to human and planetary health is vast, but systems must be strengthened to ensure it does not exacerbate inequalities, and to ensure that the balance of potential benefits and harms can be assessed. Research, development, and deployment of innovation and technology must meet the needs of smallholder producers and small businesses across the food value chains and of vulnerable consumers. Doing so requires enhanced processes and investments to develop such innovations and technologies drawing on all forms of scientific evidence and indigenous, local, and contextual knowledge.

In the following section we provide several general and more specific recommendations that can



inform priorities for the game-changing solutions, bearing in mind the four criteria above. This list is not intended to be comprehensive, but rather to focus priorities that surface from the evidence review. Where feasible, we have included specific examples that illustrate the potential gains and pitfalls.

***Alter power structures to enhance inclusive decision-making:***

- At global and regional level, strengthen and enhance the existing institutional architecture to generate recommendations, good practice models, and technical support guidance for enhanced inclusive decision-making processes related to food systems within governments and organizations. Examples of key international organizations include FAO, IFAD, WFP, the World Bank Group, CGIAR, among others.
- Engage a coalition of local, regional, and international research institutions to generate and test a framework and parsimonious set of indicators that can be used to track progress towards inclusive decision-making processes and to monitor livelihood improvements within international, national, regional, and local governments and organizations.
- Create or build on an existing accountability mechanism with mandate and resources to track progress towards and hold to account inclusive decision-making related to food systems transformations and their impacts within governments and organizations.
- Strengthen producer, vender, market and consumers organizations and other forms of collection action across the food system to enhance effective, non-tokenistic participation in decision-making processes related to rural and food systems transformation.
- Through all of these processes explore demographic, social, and cultural aspects that may influence participation in decision-making<sup>100</sup> (e.g., gender, indigenous peoples, age), and ensure mechanisms are developed to address and track progress responsive to these unique contextual factors.
  - Dimitra Clubs seek to transform gender relations bringing women and men together to become more aware of gender inequalities in households and communities and working together to transform gender relations. Over 3400 clubs existing reaching an estimated 2 million rural people. Examples of success include fighting malnutrition by challenging dietary taboos, reconciling long-standing political disputes, mobilizing to meet environmental challenges and establishing a credit cooperative to avoid debt.<sup>127</sup>
  - The model of mutual accountability developed by the African Union as part of its Comprehensive African Agriculture Development Programme (CAADP) is an innovative and effective approach to promoting transparency, participation, and accountability for results. It involves two main components:
    - ◆ Country level Joint Sector Reviews (JSR) that allow government, farmer organizations, private sector, civil society organizations and development partner organizations, at least once a year, to collectively review policy and program implementation performance as well as progress towards outcomes for the agricultural sector. The outcome is an action plan to deal with any major issues that emerge.
    - ◆ The continental level Biennial Review (BR) based on formally agreed target commitments related to agricultural sector investment, hunger and poverty, gender, youth, intra-African trade, and climate smart agriculture. Every two years, a report is prepared by each member state and submitted to the African Union Commission which uses it to rate each country on each of the target commitments. The report is submitted to Heads of State at their January Summit to debate the findings.<sup>128</sup>

***Protect the livelihoods of those living in situations of vulnerability, while creating opportunities:***

- Expand the effective coverage of well-targeted social protection systems that uphold the livelihoods of those living in situations of vulnerability, using social protection instruments that can alleviate short term crises, but go beyond sheer poverty reduction to enhance opportunities to build assets and create wealth.
  - A promising model of boosting productivity and improving livelihoods through skills development, advisory services financial transfer is the FOMENTO model from Brazil. Research looking into the impact of its transfer to the African setting have provided solid evidence on its effectiveness to raise assets and increase earning potential of beneficiary farmers. This approach holds promise as a scalable approach to empowering and equipping the poor and those living in situations of vulnerability to integrate into the higher value segments of the food system value chains.<sup>129</sup>
- Using existing or enhanced technology, develop and deploy better models to predict climate and other agricultural risks and use this data effectively to pre-empt and mitigate the impact of such risks on the production and livelihoods of small-scale agriculture and other producers in situations of vulnerability.
  - Climate Information Services (CIS) involve the production, translation (e.g., advisories, decision support), and communication and use of climate information. Appropriate information enables farmers to understand the role of climate vs. other drivers in perceived productivity changes and to manage climate-related risks throughout the agricultural calendar. Econometric studies highlight CIS as one of the most important factors influencing adaptation and transformation of farming systems. For example, an analysis across more than 5000 households in East and West Africa, South Asia, and Central America found access to CIS is a positive determinant of adaptation through agricultural diversification, and of agricultural intensification in Bangladesh and India.<sup>130</sup>

***Adapt institutions and policies to favour equitable food systems livelihoods:***

- At global, national, sub-national and local level, develop and implement a cohesive set of policy actions that will enable sequential food systems transformations that favour the production, distribution, and consumption of nutritious over unhealthy foods, produced with territorial approaches that favour planetary health, and ensure equitable livelihoods for producers and wage-earners across the food system.<sup>131</sup>
  - Africa's Regional Economic Communities (RECs) are key actors working in collaboration with the African Union (AU), in ensuring peace and stability in their regions.<sup>132</sup> The RECs have been central to various transformative programs of the continent, including the New Partnership for Africa's Development (NEPAD) adopted in 2001. RECs have the immense challenge of working with governments, civil society, and the AU Commission in raising the standard of living of the people of Africa and contributing towards the progress and development of the continent through economic growth and social development.<sup>133</sup>
- Adapt institutions and adopt policies that eliminate barriers in access to the fundamental services needed to enable those living in situations of vulnerability to take advantage of opportunities, ensuring for example the right to food, shelter, and health. Enhance more and better education investments that enable and empower youth as part of the productive rural and urban labour force.<sup>134,135</sup>
  - The German dual training system for agricultural and horticultural professions is a good model for an institutional infrastructure that creates a path to good paying jobs and better livelihoods. It is a country wide system that offers a mixture of practical, multi-year on the

job training of apprentices by “master-farmers”, ongoing theoretical training for active and aspiring farmers, as well as modular, usually short term courses on specific skills and good practices.<sup>136</sup>

- Adapt institutions and adopt policies that eliminate barriers in access to the natural (e.g., land,<sup>137</sup> water, forests), economic (e.g., credit, business planning), and technological resources (e.g., digital, appropriate modern biotechnology) needed to enhance and ensure equitable livelihoods for producers and SMEs across the food value chain. Such policy and institutional arrangements should explicitly favour those who have been traditionally excluded, particularly women, youth, and indigenous peoples.
  - The Land Matrix Initiative<sup>138</sup> is an independent global land monitoring initiative made up of a number of global and regional partners, originally established in 2009 to address the lack of robust data on large scale land acquisitions and investments. The initiative now covers almost 100 countries. It captures intended and failed attempts to acquire land through purchase, lease or concession and demonstrates the complexity and political dimension of land acquisition.
- Enhance the effectiveness of international organizations to facilitate global trade arrangements that promote and protect livelihoods and the right to food. An enhanced role of the World Trade Organization is particularly salient.

***Increase investment to realize the potential of improved institutional and policy actions:***

- More coordination among government entities would internalize externalities across sectors and address trade-offs such as to deliver the most impactful and site adapted interventions for the poor and those living in vulnerable situations.<sup>139–141</sup> Increasing investment in public infrastructure (e.g., roads, markets, irrigation etc.) also helps to enhance the liveability of communities, while favouring the production, sale, and consumption of nutritious food.
- Expand and use innovative financial mechanisms (e.g., impact investment) for small and medium-sized farmers and businesses along the food value chains to expand and intensify their production, and improve safety, quality, and sustainability, prioritizing nutritious over unhealthy foods.
  - Two models to nurture and support the development of the emerging processing processor and other segments of food system value chain to boost profits and employment for low skilled workers. The first, with well-documented impact,<sup>142</sup> is the model of Cluster based industrialization which provide a critical mass of infrastructure, services, and networking opportunities. The second is the Kaizen model from Japan, which has been recently tested in Africa with promising results.<sup>143</sup>

***Hold governments, businesses, and organizations to account for ensuring equitable livelihoods:***

- Engage a coalition of local, regional, and international research institutions to generate and test a framework and parsimonious set of indicators and metrics that can be used to track progress towards equitable livelihoods within business, international, national, regional, and local governments, and organizations.
- Create or build on an existing accountability mechanism with mandate and resources to track progress towards and hold to account equitable livelihoods in food systems across all businesses, governments, and organizations, ensuring data can and are presented disaggregated for women, youth, indigenous peoples, migrant workers, and others as appropriate.

***Realize the potential of science, innovation, technology, and evidence to favour equitable livelihoods:***

- Develop and use creative approaches to learn, build on, and document indigenous knowledge related to food production, processing, consumption, and natural resource management in ways that such knowledge can be shared, adapted, and adopted and tested in new contexts if appropriate, and drawn on in the establishment of recommendations, guidance, and good practice.<sup>144–146</sup> New approaches are instrumental to revitalize Indigenous food systems and to produce, process, and consume food in culturally relevant<sup>147</sup> and ecologically sustainable ways.<sup>148</sup>
  - Several examples exist illustrating the potential and power of mobilizing available indigenous knowledge for the establishment of policy recommendations,<sup>149–152</sup> guidance,<sup>153</sup> and good practice.<sup>154,155</sup>
  - With the threat of climate change and the need to adapt to its adverse effects, indigenous peoples' communities are proving to be an important source of climate history and baseline data and are already playing a valuable role by providing local-scale expertise, monitoring impacts, and implementing adaptive responses at the local level. For example, on-farm conservation of crops is a dynamic process, in which varieties managed by indigenous farmers continue to evolve in response to natural and human selection, leading to crops with better adaptive potential. For instance, “kreb” is a mixture of wild and cultivated species (such as *Digitaria exilis* or “fonio”) which is traditionally used in the Sahel by pastoralists. The latter harvest these seeds from the open grasslands and manage the wild species to ensure sustainable seed production for human consumption and fodder.<sup>156</sup>
  - Rapid dietary change of indigenous peoples worldwide is posing threats to the use of traditional food and the traditional knowledge required for the traditional food system maintenance.<sup>157</sup> Several foods and combinations have illustrated potential to decrease risk of micronutrient deficiencies.<sup>158</sup> Such traditions may be fundamental for slowing the nutrition transition and accompanying increasing preventable diet-related non-communicable diseases
- Assess deployment pathways (e.g., extension services, farmer schools, etc.), and potential for those traditionally excluded (e.g., women, youth, small-holders, indigenous peoples) to benefit when setting priorities for and making investment decisions related to the development of innovations and new technologies for food systems.
  - For example, new technologies are being used to very positive effect to ensure that nutrition does not “exit” the food supply chain.<sup>159</sup> Improving traditional products and processes by re-engineering the unit operations can be an efficient way both to generate rural employment in SMEs and incomes for family farmers, and to increase the safety and nutritional quality of foods while maintaining or improving the organoleptic characteristics of traditional products.<sup>160,161</sup> vending, and consumption of kenkey, a sour dumpling in Ghana. Information was obtained on the socio-cultural profile of the actors, processing technologies, practices which adversely affected product quality, shelf life, and quality attributes important to consumers. Kenkey production and retailing was the domain of women, and carried out mainly as a family business in home-based operations. Three types of kenkey were encountered: Ga-, Fanti-, and nsiho-kenkey. Production was dominated by the Ga and Fanti socio-cultural groups but consumption cut across all socio-cultural groups. The majority of producers processed 10-100 kg of maize per week but frequency of production varied from 1 to 10 times in a week. Unit operations in kenkey production were labour intensive and manually carried out apart from milling. The texture of kenkey was more critical to most consumers than taste and depended on a procedure called aflatalization yielding a product with a semi-sticky, elastic consistency. (Résumé d’auteur Yet, evaluation has also shown that several “good ideas” may have harmful side effects when a comprehensive approach to understanding all different pathways leading from agricultural interventions towards nutrition of individuals are insuffi-

ciently considered.<sup>162</sup>

- Improve the availability, quality, accessibility, and use of data that can map and inform actions to reduce inequalities in the food systems.
  - The newly developed food systems dashboard<sup>163</sup> is an important advance in this regard. The dashboard consolidates existing data from multiple sources, provides useful tools to visualize and understand the data, and are developing a set of diagnostics that will permit the identification of potential policy and program priorities. That said many data gaps, particularly at national and sub-national level and the full potential of such tools will be realized only once such data gaps are filled.<sup>164</sup>



## REFERENCES

- 1 HLPE. Food security and nutrition: building a global narrative towards 2030. A report by the High Level Panel of Experts on Food Security and Nutrition of the committee on World Food Security. 2020.
- 2 Dury S, Bocoum I. Le « paradoxe » de Sikasso (Mali) : pourquoi « produire plus » ne suffit-il pas pour bien nourrir les enfants des familles d'agriculteurs ? *1* 2012; **21**: 324-336 (1).
- 3 HLPE. Nutrition and Food Systems. A report by the High-Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security. Rome, 2017.
- 4 von Braun J, Afsana K, Fresco L, Hassan M, Terero M. Food systems - Definition, Concept and Application for the UN Food Systems Summit. A paper from the Scientific Group of the UN Food Systems Summit. 2021 [https://sc-fss2021.org/wp-content/uploads/2021/03/ScGroup\\_Food\\_Systems\\_paper\\_March-5-2021.pdf](https://sc-fss2021.org/wp-content/uploads/2021/03/ScGroup_Food_Systems_paper_March-5-2021.pdf) (accessed March 9, 2021).
- 5 Cotula L, Food and Agriculture Organization of the United Nations. The right to food and access to natural resources using human rights arguments and mechanisms to improve resource access for the rural poor. Rome: FAO, 2008.
- 6 IPCC. Special Report on Climate Change and Land. An IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems. Intergovernmental Panel on Climate Change, 2020.
- 7 Sandrasekaran M, Kasthuri T, Singh Kholi O. Soil and water conservation in India: Strategies and research challenges-Indian Journals. *Journal of Soil and Water Conservation* 2017; **16**: 312–9.
- 8 OECD. Rural Well-being: Geography of Opportunities. Paris: OECD Publishing, 2020 <https://doi.org/10.1787/d25cef80-en>.
- 9 IPCC. Sixth Assessment Report — IPCC. <https://www.ipcc.ch/assessment-report/ar6/> (accessed March 14, 2021).
- 10 O'Neal M, Nearing M, Vining R, Southworth J, Pfeifer R. Climate change impacts on soil erosion in Midwest United States with changes in crop management. *CATENA* 2005; **61**: 165–84.
- 11 Boardman J, Poesen J. Soil Erosion in Europe: Major Processes, Causes and Consequences. In: *Soil Erosion in Europe*. John Wiley & Sons, Ltd, 2006: 477–87.
- 12 Borrelli P, Robinson DA, Fleischer LR, *et al.* An assessment of the global impact of 21st century land use change on soil erosion. *Nat Commun* 2017; **8**: 1–13.
- 13 Molden D, Burton M, Bos MG. Performance assessment, irrigation service delivery and poverty reduction: benefits of improved system management. *Irrigation and Drainage* 2007; **56**: 307–20.
- 14 Falkenmark M. Meeting water requirements of an expanding world population. *Philosophical Transactions of the Royal Society of London Series B: Biological Sciences* 1997; published online July 29. DOI:10.1098/rstb.1997.0072.
- 15 Sullivan C, Meigh J. Considering the Water Poverty Index in the context of poverty alleviation. *Water Policy* 2003; **5**: 513–28.
- 16 Rogers V, Meara P, Barnett-Legh T, Curry C, Davie E. Examining the LLAMA aptitude tests. *Journal of the European Second Language Association* 2017; **1**: 49–60.
- 17 Scholze M, Knorr W, Arnell NW, Prentice IC. A climate-change risk analysis for world ecosystems. *PNAS* 2006; **103**: 13116–20.

- 18 Munasinghe M. Development, Equity and Sustainability (DES) in the Context of Climate Change. In: Pichs R, Swart R, Leary N, Ormond F, eds. *Development, Sustainability and Equity*. Geneva: Intergovernmental Panel on Climate Change, 2020.
- 19 HLPE. Food losses and waste in the context of sustainable food systems. A report by the High Level panel of Experts on Food Security and Nutrition of the Committee on World Food Security. Rome, 2014.
- 20 ACAPS. Famine: Northeast Nigeria, Somalia, South Sudan, and Yemen. 2017 [https://reliefweb.int/sites/reliefweb.int/files/resources/20170522\\_acaps\\_famine\\_theme\\_final\\_report.pdf](https://reliefweb.int/sites/reliefweb.int/files/resources/20170522_acaps_famine_theme_final_report.pdf) (accessed Nov 29, 2020).
- 21 Pingali PL. Green Revolution: Impacts, limits, and the path ahead. *Proceedings of the National Academy of Sciences of the United States of America* 2012; **109**: 12302.
- 22 Hueston W, McLeod A. Overview of the global food system: Changes over time/space and lessons for future food security. In: *Improving Food Safety Through a One Health Approach: Workshop Summary*. Washington, DC: National Academies Press (US), 2012.
- 23 Latour B. *Science in Action: How to Follow Scientists and Engineers Through Society*. Boston: Harvard University Press, 1987.
- 24 HLPE. Agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security. Rome, 2019.
- 25 Mascarenhas M, Busch L. Seeds of Change: Intellectual Property Rights, Genetically Modified Soybeans and Seed Saving in the United States. *Sociologia Ruralis* 2006; **46**: 122–38.
- 26 World Bank. *World Development Report 2008*. Washington, DC, 2007 DOI:10.1596/978-0-8213-6807-7.
- 27 Glenna LL, Cahoy DR. Agribusiness Concentration, Intellectual Property, and the Prospects for Rural Economic Benefits from the Emerging Biofuel Economy. *Southern Rural Sociology* 2009; **24**: 111–29.
- 28 Heinemann JA, Massaro M, Coray DS, Agapito-Tenfen SZ, Wen JD. Sustainability and innovation in staple crop production in the US Midwest. *International Journal of Agricultural Sustainability* 2014; **12**: 71–88.
- 29 HarvestPlus. *Catalyzing Biofortified Food Systems: 2018 Annual Report*. Washington, DC: HarvestPlus, 2018 [https://www.harvestplus.org/sites/default/files/publications/153613\\_HarvestPlus\\_AR\\_2018\\_Proof.pdf](https://www.harvestplus.org/sites/default/files/publications/153613_HarvestPlus_AR_2018_Proof.pdf) (accessed March 9, 2021).
- 30 McMullin S, Njogu K, Wekesa B, *et al.* Developing fruit tree portfolios that link agriculture more effectively with nutrition and health: a new approach for providing year-round micronutrients to smallholder farmers. *Food Sec* 2019; **11**: 1355–72.
- 31 Areal FJ, Riesgo L, Rodríguez-Cerezo E. Economic and agronomic impact of commercialized GM crops: a meta-analysis. *The Journal of Agricultural Science* 2013; **151**: 7–33.
- 32 Huang J, Rozelle S, Pray C, Wang Q. Plant Biotechnology in China. *Science* 2002; **295**: 674–6.
- 33 Kathage J, Qaim M. Economic impacts and impact dynamics of Bt (*Bacillus thuringiensis*) cotton in India. *PNAS* 2012; **109**: 11652–6.
- 34 Qiao F, Huang J, Wang X. Fifteen Years of Bt Cotton in China: Results from Household Surveys. *World Development* 2017; **98**: 351–9.
- 35 Vognan G, Fok M. Performance différenciée du coton Bt en début de diffusion : cas du Burkina Faso. *Cah Agric* 2019; **28**: 26.

- 36 Kloppenburg J. Impeding Dispossession, Enabling Repossession: Biological Open Source and the Recovery of Seed Sovereignty. *Journal of Agrarian Change* 2010; **10**: 367–88.
- 37 Bonny S. Corporate Concentration and Technological Change in the Global Seed Industry. *Sustainability* 2017; **9**: 1632.
- 38 Dinesh D, Campbell BM, Bonilla-Findji O, Richards M. 10 best get innovations for adaptation in agriculture: A supplement to the UNFCCC NAP Technical Guidelines. Wageningen, The Netherlands: CGIAR Research Program on Climate change, Agriculture and Food Security (CCAFS), 2017 [www.ccafs.cgiar.org](http://www.ccafs.cgiar.org).
- 39 Pew Research Center. Smartphone Ownership and Internet Usage Continues to Climb in Emerging Economies. 2016 <https://www.pewresearch.org/global/2016/02/22/smartphone-ownership-and-internet-usage-continues-to-climb-in-emerging-economies/>.
- 40 Qiang CZ, Kuek SC, Dymond A, Esselaar S. Mobile Applications for Agriculture and Rural Development. Washington, DC: ICT Sector Unit, World Bank, 2012.
- 41 World Bank. World Development Report 2016: Digital Dividends | World Development Report. 2016.
- 42 Deichmann U, Goyal A, Mishra D. Will digital technologies transform agriculture in developing countries? *Agricultural Economics* 2016; **47**: 21–33.
- 43 Salemin K, Strijker D, Bosworth G. Rural development in the digital age: A systematic literature review on unequal ICT availability, adoption, and use in rural areas. *Journal of Rural Studies* 2017; **54**: 360–71.
- 44 OECD. Innovation, Productivity and Sustainability in Food and Agriculture: Main Findings from Country Reviews and Policy Lessons, OECD Food and Agricultural Reviews. Paris: OECD Publishing, 2019 <https://doi.org/10.1787/c9c4ec1d-en>.
- 45 Vesper I. Evidence patchy on value of mobile apps for farmers. SciDev.Net. <https://www.scidev.net/global/news/evidence-patchy-on-value-of-mobile-apps-for-farmers/> (accessed March 9, 2021).
- 46 Baumüller H. The Little We Know: An Exploratory Literature Review on the Utility of Mobile Phone-Enabled Services for Smallholder Farmers. *Journal of International Development* 2018; **30**: 134–54.
- 47 Samberg L. How new technology could help to strengthen global food security. World Economic Forum. <https://www.weforum.org/agenda/2018/03/food-security-s-social-network/> (accessed March 15, 2021).
- 48 International Monetary Fund. Fiscal Policy and Income Inequality. *Policy Papers* 2014; **14**. DOI:10.5089/9781498343671.007.
- 49 Rodríguez-Pose A, Ezcurra R. Is fiscal decentralization harmful for economic growth? Evidence from the OECD countries. *J Econ Geogr* 2011; **11**: 619–43.
- 50 OECD. Global value chains in agriculture and food: A synthesis of OECD analysis. OECD Publishing, 2020.
- 51 OECD. Linking Indigenous Communities with Regional Development. Paris: OECD Publishing, 2019 <https://doi.org/10.1787/3203c082-en>.
- 52 HLPE. Social protection for food security. A report of the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security. Rome, 2012.
- 53 Putnam P. *Bowling Alone: The Collapse and Revival of American Community*. New York, NY: Simon & Schuster Paperbacks, 2000.
- 54 Bourguignon F, Dessus S. *Equity and Development: Political Economy Considerations*. 2009.

- 55 Lowder SK, Bertini R, Karfakis P, Croppenstedt A. Transformation in the size and distribution of farmland operated by household and other farms in select countries of sub-Saharan Africa. *2016 Fifth International Conference, September 23-26, 2016, Addis Ababa, Ethiopia* 2016; published online Sept. <https://ideas.repec.org/p/ags/aaae16/246969.html> (accessed Oct 25, 2020).
- 56 Pryck JD de, Termine P. Gender Inequalities in Rural Labor Markets. *Gender in Agriculture* 2014; : 343–70.
- 57 Food and Agriculture Organization of the United Nations, editor. The future of food and agriculture: trends and challenges. Rome: Food and Agriculture Organization of the United Nations, 2017.
- 58 Jayne T, Chamberlin J, Headey D. Land pressures, the evolution of farming systems, and development strategies in Africa: A synthesis. *Food Policy* 2014; **48**: 1–17.
- 59 Vandergeten E, Azadi H, Teklemariam D, Nyssen J, Witlox F, Vanhaute E. Agricultural outsourcing or land grabbing: a meta-analysis. *Landscape Ecol* 2016; **31**: 1395–417.
- 60 King R. Land Reform: A World Survey. Routledge, 1977.
- 61 Greenville J, Kawasaki K, Jouanjean M-A. Dynamic Changes and Effects of Agro-Food GVCS. Paris: OECD Publishing, 2019 DOI:10.1787/43b7bcec-en.
- 62 Greenville J, Kawasaki K, Flaig D, Carrico C. Influencing GVCs through Agro-Food Policy and Reform. Paris: OECD Publishing, 2019 <https://doi.org/10.1787/9ce888e0-en>.
- 63 Feenstra RC, Hanson GH. Globalization, Outsourcing, and Wage Inequality. National Bureau of Economic Research, 1996 DOI:10.3386/w5424.
- 64 Feenstra RC, Hanson GH. Global Production Sharing and Rising Inequality: A Survey of Trade and Wages. In: Handbook of International Trade. John Wiley & Sons, Ltd, 2008: 146–85.
- 65 González H. Specialization on a global scale and agrifood vulnerability: 30 years of export agriculture in Mexico. *Development Studies Research An Open Access Journal* 2014; published online Oct 15. <https://www.tandfonline.com/doi/abs/10.1080/21665095.2014.929973> (accessed March 16, 2021).
- 66 Oya C. Contract Farming in Sub-Saharan Africa: A Survey of Approaches, Debates and Issues. *Journal of Agrarian Change* 2012; **12**: 1–33.
- 67 Badiane O, Odjo S. Regional Trade and Volatility in Staple Food Markets in Africa. In: Food Price Volatility and Its Implications for Food Security and Policy. Springer Open, 2016: 385–412.
- 68 Reardon. Transformation of African Agrifood Systems in the New Era of Rapid Urbanization and the Emergence of a Middle Class. <https://ebrary.ifpri.org/digital/collection/p15738coll2/id/130005> (accessed Oct 25, 2020).
- 69 Bouët A, Odjo SP, Zaki C. Africa agriculture trade monitor 2020. Washington, DC: International Food Policy Research Institute, 2020 DOI:10.2499/9780896293908.
- 70 Tschirley DL, Snyder J, Dolislager M, et al. Africa ' s unfolding diet transformation: implications for agrifood system employment. *Journal of Agribusiness in Developing and Emerging Economies* 2015; **5**: 102–36.
- 71 Dutt P, Mitra D. Inequality and the Instability of Polity and Policy\*. *The Economic Journal* 2008; **118**: 1285–314.
- 72 Alesina. Income distribution, political instability, and investment. *European Economic Review* 1996; **40**: 1203–28.

- 73 Acemoglu D, Robinson JA. The Political Economy of the Kuznets Curve. *Review of Development Economics* 2002; **6**: 183–203.
- 74 Losch B, Freguin-Gresh S, White ET. Structural Transformation and Rural Change Revisited - Challenges for Late Developing Countries in a Globalizing World. Washington, DC: World Bank, 2012.
- 75 Independent Evaluation Group (IEG). The World Bank Group and the Global Food Crisis: An Evaluation of the World Bank Group Response. Washington, DC: The World Bank, 2014 DOI:10.1596/978-1-4648-0091-7.
- 76 IMF. International Monetary Fund Annual Report 2015. Washington, DC: International Monetary Fund, 2015.
- 77 UNDESA World Social Report | DISD. <https://www.un.org/development/desa/dspd/world-social-report.html> (accessed Oct 25, 2020).
- 78 Ulimwengu J, Badiane O. Vocational Training and Agricultural Productivity: Evidence from Rice Production in Vietnam. *Journal of Agricultural Education and Extension* 2010; **16**: 399–411.
- 79 Badiane O, Ulimwengu JM. Malaria incidence and agricultural efficiency in Uganda. 2013. DOI:10.1111/j.1574-0862.2012.00626.x.
- 80 Wouterse F, Badiane O. The role of health, experience, and educational attainment in agricultural production: Evidence from smallholders in Burkina Faso. *Agricultural Economics* 2019; **50**: 421–34.
- 81 Allen S, Badiane O, Sene L, Ulimwengu J. Government Expenditures, Health Outcomes and Marginal Productivity of Agricultural Inputs: The Case of Tanzania. *Journal of Agricultural Economics* 2014; **65**: 637–62.
- 82 Quisumbing AR, Meinzen-Dick RS, Njuki J. 2019 Annual trends and outlook report: Gender equality in rural Africa: From commitments to outcomes. 2019. DOI:10.2499/9780896293649.
- 83 Knippenberg E, Hoddinott J. Shocks, social protection, and resilience: Evidence from Ethiopia. Ethiopia: IFPRI, Ethiopian Development Research Institute (EDRI), 2017.
- 84 International Fund for Agricultural Development. Rural development: report 2016 : fostering inclusive rural transformation. Roma: IFAD, 2016.
- 85 Research Institute (IFPRI) IFP. 2019 Global food policy report. Washington, DC: International Food Policy Research Institute, 2019 DOI:10.2499/9780896293502.
- 86 FAO, IFAD, UNICEF, WFP, WHO. The State of Food Security and Nutrition in the World 2020. Rome: FAO, 2020 DOI:10.4060/ca9692en.
- 87 Batal M, Decelles S. A Scoping Review of Obesity among Indigenous Peoples in Canada. *Journal of Obesity* 2019; **2019**. DOI:10.1155/2019/9741090.
- 88 Domingo A, Spiegel J, Guhn M, *et al.* Predictors of household food insecurity and relationship with obesity in First Nations communities in British Columbia, Manitoba, Alberta and Ontario. *Public Health Nutrition* 2020; : 1–13.
- 89 Vallengia CR, Snodgrass JJ. Health of Indigenous Peoples. *Annual Review of Anthropology* 2015; **44**: 117–35.
- 90 Stephens C, Nettleton C, Porter J, Willis R, Clark S. Indigenous peoples' health—why are they behind everyone, everywhere? *The Lancet* 2005; **366**: 10–3.
- 91 Desmarais AA, Wittman H. Farmers, foodies and First Nations: getting to food sovereignty in Canada. *Journal of Peasant Studies* 2014; **41**: 1153–73.



- 92 Vernon RV. A Native Perspective: Food Is More Than Consumption. *1* 2015; **5**: 137–42.
- 93 Mosby I, Galloway T. “Hunger was never absent”: How residential school diets shaped current patterns of diabetes among Indigenous peoples in Canada. *CMAJ* 2017; **189**: E1043–5.
- 94 Levy S. Progress against poverty: sustaining Mexico’s Progresa-Oportunidades program. Washington, D.C: Brookings Institution Press, 2006.
- 95 Théodore FL, Bonvecchio Arenas A, García-Guerra A, *et al.* Sociocultural Influences on Poor Nutrition and Program Utilization of Mexico’s Conditional Cash Transfer Program. *J Nutr* 2019; **149**: 2290S-2301S.
- 96 Dyson T. The Role of the Demographic Transition in the Process of Urbanization on JSTOR. *Population and Development Review, Population Council* 2011; **37**: 34–54.
- 97 United Nations, editor. Replacement migration: is it a solution to declining and ageing populations? New York: United Nations, 2001.
- 98 Lastarria-Cornhiel S. Feminization of Agriculture: Trends and Driving Forces. Background paper for the World Development Report. Washington, DC, 2008.
- 99 Gray C. Environment, Land, and Rural Out-migration in the Southern Ecuadorian Andes. *World Development* 2009; **37**: 457–68.
- 100 Gustafson S. The Global Food System and Employment | Food Security Portal. 2018; published online Feb 13. <https://www.foodsecurityportal.org/blog/global-food-system-and-employment> (accessed March 14, 2021).
- 101 Nordhagen S, Condes S. Supporting gender-equitable food systems through access to finance for small- and medium-sized companies. Geneva, Switzerland: Global Alliance for Improved Nutrition (GAIN), 2020.
- 102 Popkin BM, Reardon T. Obesity and the food system transformation in Latin America. *Obesity Reviews* 2018; **19**: 1028–64.
- 103 Carletto G, Ruel M, Winters P, Zezza A. Farm-Level Pathways to Improved Nutritional Status: Introduction to the Special Issue. *The Journal of Development Studies* 2015; **51**: 945–57.
- 104 Bron GM, Siebenga JJ, Fresco LO. In the age of pandemics, connection food systems and health: a Global One Health approach. Food Systems Summit Brief prepared by Research Partners of the Scientific Group of the Food Systems Summit. 2021.
- 105 Badiane O, Collins J. AKADEMIYA2063’s Multi-Workstream Agenda on Covid-19. AKADEMIYA2063 Covid-19 Bulletin No. 1, July. Kigali: AKADEMIYA2063, 2020.
- 106 Hobbs JE. Food supply chains during the COVID-19 pandemic. *Canadian Journal of Agricultural Economics/Revue canadienne d’agroeconomie* 2020; **68**: 171–6.
- 107 Barrett CB. Actions now can curb food systems fallout from COVID-19. *Nat Food* 2020; **1**: 319–20.
- 108 OECD. Food Supply Chains and COVID-19: Impacts and Policy Lessons. 2020 <http://www.oecd.org/coronavirus> (accessed March 9, 2021).
- 109 Fei S, Ni J, Santini G. Local food systems and COVID-19: an insight from China. *Resources, Conservation and Recycling* 2020; **162**: 105022.
- 110 Hatab AA, Lagerkvist C-J, Esmat A. Risk perception and determinants in small- and medium-sized agri-food enterprises amidst the COVID-19 pandemic: Evidence from Egypt. *Agribusiness* 2021; **37**: 187–212.

- 111 Resnick D. 16. COVID-19 lockdowns threaten Africa's vital informal urban food trade. ; : 2.
- 112 Matchaya G, Nhlengethwa S, Fakudze B, Greffiths J. Maize Grain Price trends in food surplus and deficit areas of Mozambique under Covid-19. Covid-19 Bulletin No. 7, September. Kigali: AKADEMIYA2063, 2020.
- 113 Guthiga P, Kirui L, Karugia J. The impact of the COVID-19 pandemic on staples food prices in local markets: The case of cooking banana ('Matooke') in Uganda. Covid-19 Bulletin No. 12, October. Kigali: AKADEMIYA2063, 2020.
- 114 Ulimwengu J, Magne-Domgho L. Impact of COVID-19 on hidden hunger in Senegal. Covid-19 Bulletin No. 8, August. Kigali: AKADEMIYA2063, 2020.
- 115 Fofana I, Sall LM. Impact of trade shocks on growth and poverty in selected countries. Covid-19 Bulletin No. 13, November. Kigali: AKADEMIYA2063, 2020.
- 116 Headey D, Heidkamp R, Osendarp S, *et al.* Impacts of COVID-19 on childhood malnutrition and nutrition-related mortality. *The Lancet* 2020; **396**: 519–21.
- 117 Jribi S, Ismail HB, Doggui D, Debbabi H. COVID-19 virus outbreak lockdown: What impacts on household food wastage? *Environ Dev Sustain* 2020; **22**: 3939–55.
- 118 Gamlen A. Migration and mobility after the 2020 pandemic: The end of an age? Geneva: International Organization for Migration (IOM), 2020.
- 119 International Labour Organization. Protecting migrant workers during the COVID-19 pandemic. Recommendations for policy-makers and Constituents. 2020.
- 120 Marschke M, Vandergeest P, Havice E, *et al.* COVID-19, instability and migrant fish workers in Asia. *Maritime Studies* 2021; **20**: 87–99.
- 121 Ulimwengu JM, Collins J. Assessing community vulnerability to Covid-19 in the Sahel Covid-19 Bulletin No. 10, October. Kigali: AKADEMIYA2063, 2020.
- 122 IWGIA, ILO. The impact of COVID-19 on indigenous communities: Insights from the Indigenous Navigator. The International Working Group for Indigenous Affairs, and the International Labour Organization, 2020.
- 123 Liverpool-Tasie LSO, Reardon T, Belton B. "Essential non-essentials": COVID-19 policy missteps in Nigeria rooted in persistent myths about African food supply chains. *Applied Economic Perspectives and Policy* 2021; **43**: 205–24.
- 124 Ly R, Dia K, Diallo M, Ahid M, Ceesay B. 2020 Pearl millet production forecasts for selected West African countries: Côte d'Ivoire, Mali, Burkina Faso, Sierra Leone, The Gambia, and Senegal. Covid-19 Bulletin No. 14, December. Kigali: AKADEMIYA2063, 2020.
- 125 Neufeld LM, Hendriks S, Hugas M. Healthy diet: A definition for the United Nations Food Systems Summit. 2021.
- 126 UN. Universal Declaration of Human Rights. 1948 [https://www.ohchr.org/EN/UDHR/Documents/UDHR\\_Translations/eng.pdf](https://www.ohchr.org/EN/UDHR/Documents/UDHR_Translations/eng.pdf).
- 127 FAO. Dimitra project: Gender, rural women and development. <http://www.fao.org/dimitra/about-dimitra/en/> (accessed March 20, 2021).
- 128 Ulimwengu JM, Matchaya G, Makombe T, Oehmke JF. Mutual accountability in African agricultural transformation. In: Resnick D, Diao X, Tadesse G, eds. Resakss Annual Trends and Outlook Report, 0 edn. Washington, DC and Kigali: International Food Policy Research Institute (IFPRI) and AKADEMIYA2063, 2020: 182–94.

- 129 Ambler K, de Brauw A, Godlonton S. Agriculture support services in Malawi: Direct effects, complementarities, and time dynamics. Washington, DC: International Food Policy Research Institute (IFPRI), 2018 DOI:10.2499/1037800842.
- 130 Loboguerrero AM, Campbell BM, Cooper PJM, Hansen JW, Rosenstock T, Wollenberg E. Food and Earth Systems: Priorities for Climate Change Adaptation and Mitigation for Agriculture and Food Systems. *Sustainability* 2019; **11**: 1372.
- 131 Caron P, Valette E, Wassenaar T, Coppens G, d'Eeckenbrugge G, Papazian V. Living territories to transform the world. Paris: Quae, 2017 DOI: 10.35690/978-2-7592-2731-0.
- 132 Adepoju A. Fostering Free Movement of Persons in West Africa: Achievements, Constraints, and Prospects for Intraregional Migration. *International Migration* 2002; **40**: 3–28.
- 133 Office of the Special Adviser on Africa (OSAA). <https://www.un.org/en/africa/osaa/> (accessed March 22, 2021).
- 134 UNICEF. Every Child Learns. UNICEF Education Strategy 2019-2030. New York, NY: UNICEF, 2019.
- 135 Menashe-Oren A, Stecklov G. Rural/Urban Population Age and Sex Composition in sub-Saharan Africa 1980–2015. *Population and Development Review* 2018; **44**: 7–35.
- 136 Thiele H. Deula: Presentation of our Institution. [https://www.deula.de/fileadmin/Redakteure/Witzenhausen/Presentation\\_institution.pdf](https://www.deula.de/fileadmin/Redakteure/Witzenhausen/Presentation_institution.pdf) (accessed March 22, 2021).
- 137 FAO. Developing gender-equitable legal frameworks for land tenure. A legal assessment tool. FAO, 2016.
- 138 Land Matrix. <https://landmatrix.org/> (accessed March 22, 2021).
- 139 Badiane O, Makombe T. Beyond a middle income Africa: Transforming African economies for sustained growth with rising employment and incomes. 2015. DOI:10.2499/9780896298927.
- 140 De Pinto A, Ulimwengu JM. A thriving agricultural sector in a changing climate: Meeting Malabo Declaration goals through climate-smart agriculture. 2017. DOI:10.2499/9780896292949.
- 141 Wouterse FS, Taffesse AS. Boosting growth to end hunger by 2025: The role of social protection. 2018. DOI:10.2499/9780896295988.
- 142 Sonobe T, Otsuka K. Cluster-Based Industrial Development. A Comparative Study of Asia and Africa. United Kingdom: Palgrave Macmillan, 2011 DOI: 10.1057/9780230295124.
- 143 Sonobe T, Jin K, Otsuka K. Applying the Kaizen in Africa. Saint Philip Street Press, 2020.
- 144 Lugo-Morin DR. Indigenous communities and their food systems: a contribution to the current debate. *J Ethn Food* 2020; **7**: 6.
- 145 Blanchet R, Willows N, Johnson S, Salmon Reintroduction Initiatives O, Batal M. Traditional Food, Health, and Diet Quality in Syilx Okanagan Adults in British Columbia, Canada. *Nutrients* 2020; **12**. DOI:10.3390/nu12040927.
- 146 Okanagan Nation Alliance – aḷi kwu\_swiwi-numtax, aḷi kwu\_suknaqinx, aḷi axa/ L/tmxwula/xw. <https://www.syilx.org/> (accessed March 22, 2021).
- 147 Cree Hunters and Trappers Income Security Board. <http://www.chtisb.ca/program/> (accessed March 22, 2021).

- 148 Sherwood S. Strengthening impact of the healthy food consumption campaign : 250,000 families in Ecuador. 2019 <https://idl-bnc-idrc.dspacedirect.org/handle/10625/59373>.
- 149 Grey S, Patel R. Food sovereignty as decolonization: some contributions from Indigenous movements to food system and development politics. *Agriculture and Human Values* 2014; **32**: 431–44.
- 150 Mabhaudhi T, Chibarabada TP, Chimonyo VGP, *et al.* Mainstreaming Underutilized Indigenous and Traditional Crops into Food Systems: A South African Perspective. *Sustainability* 2018; **11**: 1–22.
- 151 Kurashima N, Fortini L, Ticktin T. The potential of indigenous agricultural food production under climate change in Hawai'i. *Nature Sustainability* 2019; **2**: 191–9.
- 152 Asogwa I s, Okoye J i, Oni K. Promotion of Indigenous Food Preservation and Processing Knowledge and the Challenge of Food Security in Africa. *Journal of Food Security* 2017; **5**: 75–87.
- 153 Ministerio de Salud Pública del Ecuador, FAO. Guías Alimentarias del Ecuador. Quito, Ecuador: FAO, 2021 DOI:10.4060/ca9928es.
- 154 Sherwood S, Arce A, Paredes M, editors. Food, Agriculture and Social Change. The Everyday Vitality of Latin America. London, UK: Routledge, 2017 <https://doi.org/10.4324/9781315440088>.
- 155 Deaconu A, Mercille G, Batal M. The Agroecological Farmer's Pathways from Agriculture to Nutrition: A Practice-Based Case from Ecuador's Highlands. *Ecology of food and nutrition* 2019; **58**: 142–65.
- 156 Chianese F. The Traditional Knowledge Advantage: Indigenous peoples' knowledge in climate change adaptation and mitigation strategies. Rome: IFAD.
- 157 Kuhnlein HV, Receveur O. Dietary Change and Traditional Food Systems of Indigenous Peoples. *Annual Review of Nutrition* 1996; **16**: 417–42.
- 158 Kuhnlein HV. Karat, Pulque, and Gac: Three Shining Stars in the Traditional Food Galaxy. *Nutr Rev* 2004; **62**: 439–42.
- 159 Fanzo JC, Downs S, Marshall QE, Pee S de, Bloem MW. Value Chain Focus on Food and Nutrition Security. In: de Pee S, Taren D, Bloem M, eds. Nutrition and Health in a Developing World. Humana Press, Cham., 2017: 753–70.
- 160 Obodai M, Udoro-Yeboah C, Amoa-Awua W, *et al.* Kenkey production, vending, and consumption practices in Ghana. *Food Chain* 2015; **4**: 275–88.
- 161 Pintado A, Monteiro M, Talon R, *et al.* Consumer acceptance and sensory profiling of reengineered kitoza products. *Food Chemistry* 2016; **198**: 75–84.
- 162 Dury S, Alpha A, Bichard A. The Negative Side of the Agricultural-Nutrition Impact Pathways: A Literature Review. *World Food Policy* 2015; **2**: 78–100.
- 163 Food Systems Dashboard - Diets and Nutrition. Food Systems Dashboard. <https://foodsystemsdashboard.org/> (accessed March 22, 2021).
- 164 Fanzo J, Haddad L, McLaren R, *et al.* The Food Systems Dashboard is a new tool to inform better food policy. *Nat Food* 2020; **1**: 243–6.

Papers like this one from the Scientific Group for the UN Food Systems Summit are shared with the aim of providing information and facilitating discussion for transparent and evidence-based Summit preparations. This paper was revised by the authors after intensive external peer review. It remains under the responsibility of the authors. The views presented may not be attributed to the organisations with which the authors are affiliated. Helpful comments on an earlier draft by five external peer reviewers, by colleagues in the Scientific Group are gratefully acknowledged.

For further information about the Scientific Group,  
visit <https://sc-fss2021.org>  
or contact [info@sc-fss2021.org](mailto:info@sc-fss2021.org)  
or follow [@sc\\_fss2021](https://twitter.com/sc_fss2021) on twitter