

## *Lectio Magistralis*

Qu Dongyu

The Food and Agriculture Organization of the United Nations (FAO) was established on 16 October 1945 at the first session of the newly created UN in Quebec City, Canada, with 44 nations formally joining the organization. It was the fruit of two years of hard work, which began at the Hot Springs Conference organized by US President Franklin D. Roosevelt. During the conference, the countries decided to establish a specialized agency focused on food and agriculture.

FAO took over the mandate of the Rome-based International Institute of Agriculture, whose mission was to help farmers share their knowledge and establish rural credit unions. The appointment of John Boyd Orr, a prominent British nutritionist, whose research showed the link between poverty and malnutrition, as the first Director General spoke to the mission of the organization. Specifically, the FAO charter stipulates the organization's mandate to reduce extreme poverty, eliminate hunger, improve nutrition, increase agricultural productivity and rural living standards, and contribute to global economic growth.<sup>1</sup>

FAO made an enormous contribution to the Green Revolution through capacity building and technology transfer. New high-yielding wheat and rice varieties developed by Norman Borlaug enabled farmers to double or triple their yields from the 1970s through mid-1990s, especially in Asia, and the Green Revolution helped save hundreds of millions of lives.<sup>2</sup> But it also decayed the environment through the excessive use of fertilizers and pesticides, damaging biodiversity and depleting water resources.

FAO is now working to complete the unfinished agenda of the Green Revolution to reform policies and institutions guided by

<sup>1</sup> FAO Charter, in *Basic Texts of the Food and Agricultural Organization*, 2017, <http://www.fao.org/3/K8024E/K8024E.pdf>.

<sup>2</sup> University of California – San Diego, “Green Revolution Saved over 100 Million Infant Lives in Developing World: Increased Global Agricultural Production Had Large and Positive Effects on Child Health”, *ScienceDaily*, 17 December 2020. <https://www.sciencedaily.com/releases/2020/12/201217145235.htm>.

science and in line with the 2030 Agenda for Sustainable Development – a collective effort made possible only through partnerships and the generosity of the host government Italy.

A strategic foresight exercise at FAO (CSFE, Corporate Strategic Foresight Exercise) identified key current and emerging socio-economic and environmental drivers and related trends which impact agri-food systems and are in turn impacted by them through feedback effects. Some drivers (systemic [overarching] drivers) directly affect the entire agri-food systems given their high interconnectedness with both supply and demand sides, and their linkages with the global socio-economic context within which food and agricultural activities occur. Other drivers directly impact food access (food demand) and livelihoods, production and distribution processes, or the environment natural resource base supporting food and agricultural activities.

### Systemic (overarching) drivers

*Population dynamics and urbanization* are expected to keep increasing and changing food demand. Sub-Saharan Africa and South Asia are leading these changes. In addition to population growth, other factors relative to different locations are also important (e.g. ageing in rural areas and high-income countries). Other social aspects, such as spatial location and/or gender balances, change also as a consequence of internal and international migration. A recent UN report<sup>3</sup> on megatrends affecting global societies and economies notes that between 2020 and 2050, the portion of people living in urban areas will shift from 53% to 70% globally. These population dynamics present interconnected implications for agri-food systems because population growth and changing structure, urbanization and food demand are closely linked. Urbanization is seen as a challenge for food and agriculture, for instance in its encroaching on fertile land. In addition, the growth of young cohorts, particularly in sub-Saharan Africa and in South Asia, raises serious concerns regarding employment opportunities and the risks of degrading the quality of jobs (remunerations, exploitation, safety) within and outside agri-food systems.

<sup>3</sup> UN (United Nations), *Report of the UN Economist Network for the UN 75th Anniversary: Shaping the Trends of Our Time*, 2020.

*Economic growth, structural transformation and macro-economic stability* are not always delivering the expected results in the inclusive economic transformation of societies. The transformation of agri-food systems is closely tied to the structural transformation of socio-economic systems at large and their macro-economic stability. Economic growth and economy-wide structural transformation are results and drivers of food and agriculture transformation processes. The World Bank<sup>4</sup> suggested that stronger economic growth is an important driver of poverty reduction; however, poverty reduction is only realized when the gains of economic growth are shared across social strata. Sub-Saharan Africa, for instance, despite its very high economic growth in the last two decades, still awaits substantive economic transformation. The outbreak of Covid-19 is expected to add to the already existing macro-economic imbalances of several countries, where “if the current policy stances continue, the global economy from here to 2030 will face slower growth and higher instability. As labour shares across the world continue on their decreasing path, household spending will weaken, further reducing the incentive to invest in productive activities.”<sup>5</sup>

*Cross-country interdependencies* tie together agri-food systems globally, but low-income food-deficit countries (LIFDCs), Small Island developing States (SIDS) and landlocked developing countries (LLDCs) heavily depend on imports for their food needs. Other countries depend on a small number of export commodities in order to import technology, energy, financial services or health-care equipment. This commodity-dependence makes economic systems fragile and leads to negative impacts on the lives of people. *The State of Food Security and Nutrition in the World (SOFI) 2019*<sup>6</sup> reports that “eighty percent of the countries (52 out of 65) with a rise in hunger during recent economic slowdowns and downturns are countries whose economies are highly dependent on primary commodities for export and/or import.” Furthermore, commodity-dependency may increase the difficulty of addressing environmental and social concerns *inter alia*, because multilateral

<sup>4</sup> World Bank, *Poverty and Shared Prosperity 2018. Piecing Together the Poverty Puzzle*, 2018.

<sup>5</sup> UNCTAD, *Trade and Development Report 2019. Financing a Global Green New Deal*, 2019.

<sup>6</sup> FAO, IFAD, UNICEF, WFP and WHO, *The State of Food Security and Nutrition in the World (SOFI) 2019. Safeguarding against Economic Slowdowns and Downturns*, 2019.

trade agreements create uncertainties,<sup>7</sup> as well as potentially lead to illicit financial flows that draw resources from low-income towards high-income countries, due to weak institutions.<sup>8</sup> The conditions under which these interdependencies increase the resilience and sustainability of agri-food systems and economic systems in general, or force them towards commodity-dependency or other forms of dependency (technological, energy, financial, cultural, geo-political and strategic etc.), is an issue that requires further consideration, while it is hoped that as a reaction to Covid-19, selected countries and communities may move towards self-sufficiency.

*Big data generation, control, use and ownership* enable real-time decision-making in agriculture and food systems. However, due to the large economies of scale that exist in digital industries, digitalization of many aspects of human life, social interactions and production, including agri-food value chain processes, has resulted in a digital divide, raising concerns also about the economic benefits of big data platforms that are able to amass extraordinary amounts of information on consumer behaviour and preferences.<sup>9</sup> Capacities in National Statistical Systems and awareness of consumers and civil society need to be built on data harvesting, storage, management and control, to ensure country-driven independent, transparent and accountable data generation, validation and utilization processes, as well as their conversion into statistics – and this is particularly important for small countries.

*Geopolitical instability and increasing impacts of conflicts*, including those relating to competition over resources and energy, are a major driver of food insecurity and malnutrition.<sup>10</sup> SOFI 2017<sup>11</sup> highlights that the vast majority of chronically food-insecure and malnourished people live in countries affected by conflicts. Furthermore, research suggests that 40-60% of intrastate armed

<sup>7</sup> For instance, “Since carbon footprint is not in essence a physical part of products [...] the implications of the TBT [Technical Barriers to Trade] Agreement requirement for the equal treatment for imports of ‘like’ products remain untested”, FAO (Food and Agriculture Organization), *The State of Agricultural Commodity Markets (SOCO): Agricultural Trade, Climate Change and Food Security*, 2018.

<sup>8</sup> Cf. SDG 16, target 4, and Joint African Union Commission (AUC), United Nations Economic Commission (ECA), *Illicit Financial Flows: why Africa Needs to “Track It! Stop It! Get It!”*. High Level Panel on Illicit Financial Flows, 2014.

<sup>9</sup> UN Chief Executives Board for Coordination, CEB/2019/1/Add.2.

<sup>10</sup> The number of forcibly displaced persons in 2019 reached almost 80 million people: UNHCR, *Global Trends. Forced Displacement in 2019*, 2019.

<sup>11</sup> FAO, IFAD, UNICEF, WFP and WHO, *The State of Food Security and Nutrition in the World (SOFI) 2017. Building Resilience for Peace and Food Security*, 2017.

conflicts over the past 60 years have been triggered, funded, or sustained by natural resources. Conflicts reduce food availability, disrupt access to food and health care, and undermine social protection systems, and the majority of food-insecure people in many parts of the world result from conflicts. This driver, interacting with climate change, the degradation of renewable natural resources and desertification, is disrupting agricultural livelihoods and food systems. Extractive activities tend to be concentrated in rural areas that include indigenous territories and have been a recurrent reason for socio-economic and ethno-territorial conflicts. A “world in disorder”, where international and national conflicts emerge and persist, is among the possible future scenarios. Agriculture and food systems would be affected by disruptions in various parts of socio-economic and environmental systems and would affect people according to their social features (gender, age, ethnicity, socio-economic status, etc.).

*Uncertainties.* All drivers affecting agri-food systems are subject to multiple systemic risks of hazards carrying uncertainties that often materialize in sudden occurrences. *The Future of Food and Agriculture*<sup>12</sup> (FOFA) highlights that the future of food and agriculture faces uncertainties that give rise to serious questions and concerns, and that these uncertainties revolve around different factors, including population growth, dietary choices, technological progress, income distribution, the state of natural resources, climate change, and the sustainability of peace. The timing, speed, geographic spread and magnitude of the outbreak of Covid-19 and its impacts is a case in point.<sup>13</sup> Multiple risks of disasters and crises, often combined with conflicts and other shocks, generate damage and losses. Extreme climate events such as drought, floods and storms, seasonal variabilities in weather and slow onset events such as sea-level rise are also unfolding emergencies. The 2020 desert locust upsurge together with other high-impact and trans-boundary food chain crises are also threatening agriculture and food systems. Uncertainties, and more specifically, their impacts on agri-food systems, are difficult to predict and measure, but prevention with risk management and anticipation, including emergency preparedness and capacity to face them, may reduce their impacts.

<sup>12</sup> FAO (Food and Agriculture Organization), *The Future of Food and Agriculture. Alternative Pathways to 2050*, 2018, <https://www.fao.org/3/I8429EN/i8429en.pdf>.

<sup>13</sup> FAO (Food and Agriculture Organization), *Protecting People and Animals from Disease Threats*, 2018.

## Drivers directly affecting food access and livelihoods

*Rural and urban poverty.* Rural areas are lagging behind. Despite great potential in many instances, a high proportion of rural inhabitants live in poverty or extreme poverty. Labour income in the agricultural sector is lower than the average income of other sectors and is characterized by higher gender imbalances. Many rural territories face severe deficits in infrastructure, institutional weakness, limited access to basic services and natural resources, and an eroded social fabric. Overall, the number of food-insecure people is increasing and malnourishment is widespread, as stated in *SOFI 2020*, because the cost of a healthy diet is much higher than the international (extreme) poverty line, established at 1.90 US dollars purchasing power parity (PPP) per day,<sup>14</sup> and there are significant risks for the most vulnerable of falling into poverty. While the whole of Agenda 2030 is grounded on the 'Leave no one behind' principle, still certain groups within society such as the elderly, children and youth, women, as well as indigenous people, in many instances risk discrimination and marginalization. Moreover, in some instances these groups face conditions such as insecurity, violence and/or involvement in illegal economic activities which aggravate their situation. An additional issue brought about by the outbreak of Covid-19 is the disparity of access to public healthcare services, as well as other public services, within societies and across countries, topped by exacerbated pre-existing gender inequalities along many dimensions, including the increase of care and domestic work that limit women's participation in the labour market. These often unmeasured disparities may provide a more severe picture of current poverty levels, with resulting worsening of purchasing power, and consequent resorting to mere calorie consumption, thus worsening their nutritional status.

*Inequalities.* Societies are characterized by high inequalities in income, job opportunities, access to assets including natural resources, basic services, and fiscal burden. There are large segments of populations that are living either below the threshold, or at the edge of, poverty, while a few make very significant profits, within and outside the food and agriculture sectors. Women, girls, youth, small producers and indigenous groups suffer the most, and in ways that are not always measured because they go very far beyond

<sup>14</sup> FAO, IFAD, UNICEF, WFP and WHO, *The State of Food Security and Nutrition in the World (SOFI) 2020. Transforming Food Systems for Affordable Healthy Diets*, 2020.

mere economic inequalities. Increased inequality can erode social cohesion, lead to political polarization and ultimately lower economic growth.<sup>15</sup> Worryingly, inequality of income is growing. In Asia, for instance, despite high economic growth over the past few decades (an average annual gross domestic product, GDP, per capita growth rate of 5% from 2000 to 2016), income inequality has risen, thus slowing progress in poverty reduction, with further exacerbating inequalities due to the impact of Covid-19.

*Food prices* are significantly higher in recent years than they were 20-30 years ago. Indeed, food is around 30% more expensive than in the '90s, even without considering the price spikes of 2008 and 2011.<sup>16</sup> This occurred despite the fact that current pricing mechanisms fail to capture the whole cost of food, including social and environmental externalities at all levels (full cost accounting). FOFA 2050 highlights that if environmental costs were accounted for, food prices might significantly increase, all things being equal, by 30-35% in the next decades. While political and media attention is sensitive to the price of food, and policy makers raise concerns on the efficiency of food and agricultural systems, cheap, unhealthy, and socially and environmentally unsustainable food cannot be the solution.

## Drivers directly affecting food and agricultural production and distribution processes

*Innovation and science.* Several technologies currently applied in agri-food systems contribute to degradation of natural resources. This is due to intensive production systems focusing on profitability over environmental aspects. Technical progress including the emergence of more “systemic” technologies, digitalization, biotechnologies and all other innovative approaches raise opportunities<sup>17</sup> to

<sup>15</sup> IMF (International Monetary Fund), *Fiscal Monitor: Tackling Inequality*, 2017.

<sup>16</sup> As measured by the real FAO Food Price Index (FFPI). The FFPI is a measure of the monthly change in international prices of a basket of food commodities. It consists of the average of five commodity group price indices weighted by the average export shares of each of the groups over 2014-2016.

<sup>17</sup> FAO advocates leveraging ecosystem services to complement these external inputs. The overuse of external inputs increases the environmental footprint of food production – too much irrigation exerts more pressure on an already scarce resource, just as too many pesticides and herbicides damage the environment, reduce biodiversity (which generate ecosystem services) and potentially are prejudicial to human health.

achieve, in concert, the dual aims of producing sufficient food and safeguarding the environment, while remaining mindful of challenges.<sup>18</sup> Research is ongoing into their development, limits and potential drawbacks to ensure that their safety and acceptability aspects are properly addressed, providing gender-balanced access and bringing low-income countries onboard to avoid technological divides.

*Public investment in agri-food systems* decreased significantly in the last 15 years, as shown by the FAO Agriculture Orientation Index (AOI) for Government Expenditures (SDG Indicator 2.a.1). In many instances, priorities set by governments, particularly those of low-income countries, including LIFDCs, SIDS, and LLDCs, are not implemented due to insufficient public investment and/or the low priority they attribute to local food systems. Thus, those countries that are currently heavily dependent on imports to cover their food needs are likely to remain such, unless they shift their priorities. In addition, adequate regulatory and legal frameworks to secure financing are limited and not conducive to attract private sector investments.

*Capital/information intensity of production* is increasing due to the mechanization and digitalization of production in almost all sectors, including in food and agriculture. While these trends contribute to augmenting the overall productivity, they also raise concerns for the levels of employment, both in rural and urban areas.<sup>19</sup> Increasing capital intensity in the downstream segments of food value chains limits labour demand in processing and distribution, all things being equal. In addition, the mechanization/digitalization of primary production lowers profits for farmers who do not or cannot appropriate new capital assets. Young farmers, possibly more inclined to adopt digital technologies and other innovations, can increase their capital ownership only if they have access to finance, training and capacity development. However, despite the fact that the progressive spread of advanced technologies is likely to increase the profitability of food-related livelihoods and create new job opportunities, the net job balance is most likely to be

<sup>18</sup> UN (United Nations), *UN Secretary-General's Strategy on New Technologies*, 2018.

<sup>19</sup> UN Economic and Social Council, E/CN.9/2020/2, *Population, Food Security, Nutrition and Sustainable Development*, 2020: “[...] the manufacturing, agrifood and service sectors are themselves undergoing capital intensification through the adoption of information technologies (robotics, digitalization and artificial intelligence) that reduce the need for workers”.



negative. Thus, increasing capital/information intensity of food production, associated with ageing, may further contribute to urban migration and the emptiness of rural areas, and if employment and other earning opportunities cannot be found in urban areas, poverty and food insecurity may increase.

*Market concentration of food and of agricultural inputs and outputs* represents a challenge for the resilience, equitability and sustainability of agri-food systems. Unprecedented levels of market concentration throughout the global agri-food systems<sup>20</sup> spanning from crop seeds, agricultural chemicals, veterinary pharmaceuticals, agricultural machinery, fertilizers, livestock genetics, fishing rights, food processing and commodity trading deserve attention. Furthermore, land concentration associated to the lack of land-use regulations also affects access to resources. This puts rural, local and low-income economies at risk and increases their dependency on external actors. The Covid-19 pandemic is showing the weaknesses of such concentrations, which may require in some circumstances relying more on locally produced goods.

*Consumption and nutrition patterns*, resulting from a behavioural change in consumers, are key factors affecting food and agriculture systems. Consumers are increasingly making complex choices about the sustainability, nutritional content and safety of what they eat. Shifting consumer demand in the direction of sustainable and healthier eating patterns is important. Recognizing that consumers are ready to change their behaviour if correctly informed may lead to deep changes in production systems. For instance, carbon labelling could help shape consumer preferences, contributing to the transition to a low-emissions economy. This would require an internationally recognized approach in setting the related standards (FAO SOCO, 2018) and, as recalled in the *Global Sustainable Development Report*, building sustainable food systems and healthy nutrition patterns to accelerate progress towards the SDGs (Sustainable Development Goals) requires collaborative action by various stakeholders, including consumers.<sup>21</sup>

<sup>20</sup> IPES-Food, *Too Big to Feed: Exploring the Impacts of Mega-Mergers, Concentration, Concentration of Power in the Agrifood Sector*, 2017, [https://www.ipes-food.org/\\_img/upload/files/Concentration\\_FullReport.pdf](https://www.ipes-food.org/_img/upload/files/Concentration_FullReport.pdf); UNCTAD (United Nations Conference on Trade and Development), *Trade and Development Report 2018: Power, Platforms and the Free Trade Delusion*, 2018.

<sup>21</sup> UN (United Nations), *Global Sustainable Development Report 2019: The Future is Now: Science for Achieving Sustainable Development*, 2019.

## Drivers regarding environmental systems

*Scarcity and degradation of natural resources.* Land, water, soil and biodiversity are progressively degrading. Water scarcity, land degradation, soil nutrient depletion, large-scale deforestation, overexploitation of marine resources and pasture, and pollution at all levels raise serious concerns, not only for the entire agriculture and food systems, but also for the achievements of the SDGs. “Inefficient or unsustainable farming systems are often associated with environmental and soil degradation and biodiversity loss and an increase in crop specialization and distribution can raise the risk of poor harvests.”<sup>22</sup> Availability and accessibility of natural resources per capita, including land and water, are one of the most important bottlenecks for agri-food systems. For instance, although the Asian and the Pacific region account for more than half (56%) of the world population, the region covers less than one-quarter of the global land area. Population growth, urbanization and industrialization are increasing pressure on natural resources used by the agricultural sector. In Latin America, the natural resources of the region have been degraded by the development of intensive productive activities related to agriculture and food systems. Sub-Saharan Africa is experiencing the same situation of severe degradation of natural resources, water scarcity in dryland areas of the Sahel and the Horn of Africa, as well as in Southern Africa. Massive deforestation is also occurring, linked to the extension of agricultural land, to the exploitation of mining, to infrastructure works such as hydroelectric dams or roads, to urbanization, and even to excessive logging. Competition over progressively scarce natural resources contribute to conflicts, and likewise, the agricultural sector across many regions is increasingly deeply affected by the frequency and intensity of extreme weather events.<sup>23</sup>

*Epidemics and degradation of ecosystems,* beyond Covid-19, may increase in the future due to rising trends in transboundary animal and plant diseases and pests, agriculture encroaching on wild areas and forests, antimicrobial resistance and the increasing production and consumption of animal products. According to a UNEP-ILRI

<sup>22</sup> UNEP (United Nations Environment Programme), *Global Environment Outlook – GEO-6: Healthy Planet, Healthy People*, 2019.

<sup>23</sup> Full-cost accounting of natural resource use and degradation, mentioned above, while engendering shifts in prices may have impacts on natural resource use, GHG (Greenhouse Gas) emissions and biodiversity.

report,<sup>24</sup> “the pathogens originate in animals, and the emergence or spillover of the diseases they cause in humans is usually the result of human actions, such as intensifying livestock production or degrading and fragmenting ecosystems, or exploiting wildlife unsustainably.” All this adds to the increasing occurrences of events that threatens food safety, aggravated by climate change, and calls for a One Health approach.<sup>25</sup>

*Climate change*, due to agricultural and economy-wide greenhouse gas (GHG) emissions, is already affecting food systems, food safety and natural resources, and is expected to accelerate hunger and poverty in rural areas.<sup>26</sup> In Latin America, for instance, food systems will be impacted, both currently and in the medium- and long-term, by climate change. It is estimated that rain-fed production in selected areas (e.g. in the Southern Cone of Latin America) will be reduced by seasonal water stress. In addition, fisheries and aquaculture production will be affected. SIDS and coastal areas will face sea level rise, increased hurricane frequency and intensity, saline intrusion, ocean acidification and warming and increased incidence of coral bleaching. On the other hand, “an estimated 23% of total anthropogenic greenhouse gas emissions (2007-2016) derive from agriculture, forestry and other land use”.<sup>27</sup> Not only agri-food systems contribute a large share of total global CO<sub>2</sub>-equivalent emissions, including through deforestation and other land use changes, but almost all prevailing economy-wide development paradigms are based on fossil fuels and huge GHG emissions.<sup>28</sup> Overall, there are no risk-informed measures to tackle a warming planet

<sup>24</sup> UNEP (United Nations Environment Programme) and ILRI (International Livestock Research Institute), *Preventing the Next Pandemic: Zoonotic Diseases and how to Break the Chain of Transmission*, 2020.

<sup>25</sup> WHO (World Health Organization) One Health approach to designing and implementing programmes, policies, legislation and research requires that multiple sectors work together to achieve better public health outcomes such as food safety, the control of zoonoses (diseases that can spread between animals and humans, such as flu, rabies and Rift Valley Fever), and combatting antibiotic resistance of bacteria.

<sup>26</sup> Regarding the impact on food safety, see for instance: FAO (Food and Agriculture Organization), *Climate Change: Unpacking the Burden of Food Safety*, Rome, 2020, <https://www.fao.org/3/ca8185en/CA8185EN.pdf>.

<sup>27</sup> IPCC (Intergovernmental Panel on Climate Change), *Special Report on Climate Change, Desertification, land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems*, 2019.

<sup>28</sup> This also applies to some activities that are increasingly portrayed as complementary to agricultural activities in rural areas such as tourism, whose GHG footprint has largely to be investigated.

beyond a 1.5 degree scenario, and there is limited understanding of the implications of deep decarbonization. Vision and knowledge about these issues is particularly important for the post-Covid recovery process that, it is assumed, will “build back better”.

*The “Blue Economy”*, that is the development of economic activities related to oceans and coastal areas, is increasing globally, and increasingly the concept around which countries (particularly SIDS and other states that enjoy large Exclusive Economic Zones, or EEZ) build their economic development policies. A recent IPCC report<sup>29</sup> highlights an important role for sustainable ocean industries to reduce GHG emissions and adapt to climate change. At the same time, while aquaculture is expected to provide the necessary increase in aquatic products globally, its regional development is uneven and hampered by constraints which need to be adequately addressed through better governance, increased investment, and targeted support of environmentally friendly production systems such as integrated multi-trophic aquaculture in coastal areas and integrated agriculture-aquaculture in inland regions, with a special focus on Africa which is the only region foreseen to have declining “apparent consumption”.<sup>30</sup> Aquatic food production systems are nested in the larger development framework. However, many “blue economy” policies favour large projects such as oil/gas and shipping/ports or even tourism, which bring economic benefits, but also environmental degradation, with impacts on food from the ocean and ocean biodiversity. Arising trade-offs require further investigation for risk-informed, sound policy-making and investments for resilient and sustainable development.

Current agri-food systems are failing. They are not delivering the food security and nutrition outcomes that countries aim to achieve by 2030. They are also creating vicious feedback loops that are harmful to health, the economy and the planet.

For starters, the world is not on track to ending hunger.<sup>31</sup> The number of hungry people in the world has continued to rise. Almost 690 million people went hungry around the world in 2019,

<sup>29</sup> IPCC (Intergovernmental Panel on Climate Change), *Special Report on the Ocean and Cryosphere in a Changing Climate*, 2019.

<sup>30</sup> Apparent consumption is a proxy measure for consumption of a product or material defined as production plus imports minus exports of the product or material (UN Stats Glossary).

<sup>31</sup> FAO, IFAD, UNICEF, WFP and WHO, *The State of Food Security and Nutrition in the World (SOFI) 2020, Key Messages*, 2020, [https://www.fao.org/3/ca9692en/online/ca9692en.html#chapter-Key\\_message](https://www.fao.org/3/ca9692en/online/ca9692en.html#chapter-Key_message).

an increase of 10 million over 2018. During the five years before that, the ranks of the hungry swelled by 60 million. The coronavirus pandemic is estimated to have pushed an additional 83-132 million into chronic hunger in 2020. Additionally, 2 billion people globally don't have regular access to safe, nutritious and sufficient food. If recent trends continue, the number of people affected by hunger will surpass 840 million by 2030.

The world is also not on track to defeating malnutrition.<sup>32</sup> Despite some progress, child stunting remains unacceptably high. In 2019, over 21% (144 million) of children under 5 years of age were stunted, and almost 7% (47 million) were wasted. Child overweight is also not improving, with about 38 million, or 5.6%, of children being overweight. Adult overweight and obesity are also on the rise in rich and poor countries alike. The number of people living with obesity exceeded that of people in hunger in 2012. And more than 3 billion people globally cannot afford a healthy diet.

Our dietary choices and agri-food systems have dire consequences not only on health. They inflict significant environmental damage, including staggering levels of food loss and food waste, air pollution, greenhouse gas emissions, and loss of biodiversity. They are also a growing source of inequality.

Understanding these hidden costs is critical for making progress in other Sustainable Development Goals.<sup>33</sup>

By 2030, undernourishment must fall everywhere to a maximum of 5%. Healthy diets must be affordable for all. Overweight has to be cut everywhere to 15% or lower, similar to what it was in the 1980s. In every country, obesity needs to fall to no more than 5%. Stunting among children must be reduced significantly. The lost decade in rural poverty reduction needs to be recovered. In order to cut rural poverty, inequality must be addressed. Finally, the world has to meet the Paris agreement target of limiting global warming to less than 2°C.

Agri-food systems are the largest economic system, measured in terms of employment, livelihoods and planetary impact. They employ 4 billion people, directly and indirectly. Poverty and inequality are endemic in agri-food systems. As stated earlier, 690 million people go to bed hungry every night, even though the world produces enough food for everyone. About 80% of the extreme poor live in rural areas, working in agri-food systems.

<sup>32</sup> Ibid.

<sup>33</sup> Ibid.

To achieve our food security and nutrition goals, it is important to approach the challenges in a systems-based way, adopting a holistic view. That means recognizing the interconnectedness of the economic, social and environmental impacts of our agri-food systems, looking for synergies and trade-offs in policy solutions. Evidence must guide how to prioritize policy actions and investments.

The pay-off of doing this can be tremendous, including an array of solutions to reduce our carbon footprint and ensure environmental sustainability, while making healthy foods more affordable for everyone and addressing inequality. A systems-based approach could also help policymakers manage trade-offs. For example, some low- and lower-middle income countries may need to increase their carbon footprints in order to meet the dietary needs of their populations, particularly to prevent malnutrition.

Making agri-food systems more inclusive, sustainable and resilient will go a long way toward ending hunger and malnutrition.

Agri-food systems are the major driver of climate change and the planet's unfolding environmental crisis.<sup>34</sup> Agriculture uses about 40% of the Earth's land and emits more greenhouse gases than all cars, trucks, trains, and aeroplanes combined. Runoff from fertilizers pollutes waterways and coastal ecosystems. Agriculture also consumes 70% of all freshwater on Earth. And it causes approximately 80% of forest loss.

The coronavirus pandemic is a wake-up call on the urgent need to transform agri-food systems. This is because Covid-19 and climate change are intimately linked. Covid-19 and other diseases are rooted in environmental change. 60% of all infectious diseases are zoonotic, and 75% of all emerging diseases are zoonotic.<sup>35</sup>

Food systems have contributed to substantial biodiversity loss, even though biodiversity is indispensable to food security. It supplies many vital ecosystem services, such as maintaining healthy soils, pollinating plants, controlling pests and providing habitat for wildlife – for fish and other species that are vital to food production.<sup>36</sup>

<sup>34</sup> UN (United Nations), *Policy Brief: The Impact of COVID-19 on Food Security and Nutrition*, June 2020, [https://www.un.org/sites/un2.un.org/files/sg\\_policy\\_brief\\_on\\_covid\\_impact\\_on\\_food\\_security.pdf](https://www.un.org/sites/un2.un.org/files/sg_policy_brief_on_covid_impact_on_food_security.pdf).

<sup>35</sup> UNDP (UN Development Programme), *Coinciding Crises: how COVID-19 and Climate Change Are Putting Pressure on Health Systems Worldwide – and How we Can Prepare for the Future*, 2020, <https://reliefweb.int/report/world/coinceding-crises-how-covid-19-and-climate-change-are-putting-pressure-health-systems>.

<sup>36</sup> FAO (Food and Agriculture Organization), *The State of the World's Biodiversity for Food and Agriculture*, 2019, <http://www.fao.org/state-of-biodiversity-for-food-agriculture/en/>.

It should raise the alarm that key components of biodiversity for food and agriculture are declining. Humans have fundamentally altered 75% of the Earth's land surface.<sup>37</sup> Around 1 million animal and plant species are threatened with extinction.<sup>38</sup> About 66% of the ocean area is experiencing multiple impacts from people, including from fisheries, pollution, and chemical changes from acidification. Nearly a third of fish stocks are overfished.

Deforestation and forest degradation continue to take place at alarming rates.<sup>39</sup> This is of course resulting in significant loss of biodiversity. Forests cover 31% of the global land area. And the proportion of land covered by forests is decreasing. In the last 30 years, the world lost 178 million hectares of forest, an area about the size of Libya. Since 1990, an estimated 420 million hectares of forest has been lost through deforestation. While the rate of deforestation is going down, the world is still losing an area of forest the size of Italy every 3 years.

Forests remove about one third of the fossil fuel emissions every year. So the loss of forests means not only a loss of resources and products forests provide for humans, plants and animals, but also not being able to meet the global climate goals. If deforestation is halted and degraded forests are restored, it can provide up to one third of climate mitigation needed between now and 2030 to stabilize global warming to below 2°C.<sup>40</sup>

Agricultural expansion is the main driver of deforestation and the associated loss of forest biodiversity. So to stop deforestation and the loss of biodiversity, agri-food systems must change.

FAO's Strategic Framework seeks to support the 2030 Agenda through sustainable, inclusive and resilient agri-food systems for better production, better nutrition, a better environment, and a better life.

The four "betters" represent an organizing principle for how FAO intends to contribute directly to SDG 1 (no poverty), SDG 2

<sup>37</sup> UN (United Nations), *First Person: COVID-19 is not a Silver Lining for the Climate, Says UN Environment Chief*, 5 April 2020, <https://news.un.org/en/story/2020/04/1061082>.

<sup>38</sup> IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services), *The Global Assessment Report on Biodiversity and Ecosystem Services. Summary for Policymakers*, 2019, [https://ipbes.net/sites/default/files/2020-02/ipbes\\_global\\_assessment\\_report\\_summary\\_for\\_policymakers\\_en.pdf](https://ipbes.net/sites/default/files/2020-02/ipbes_global_assessment_report_summary_for_policymakers_en.pdf).

<sup>39</sup> FAO (Food and Agriculture Organization), *The State of the World's Forests*, 2020, *Key Messages*, [https://www.fao.org/3/ca8642en/online/ca8642en.html#chapter-Key\\_message](https://www.fao.org/3/ca8642en/online/ca8642en.html#chapter-Key_message).

<sup>40</sup> Ibid.

(zero hunger), SDG 10 (reduced inequalities), and to achieve the broader SDG agenda, which is crucial for achieving FAO's overall vision. The “betters” reflect the interconnected economic, social and environmental dimensions of agri-food systems. As such, they also encourage a strategic and systems-oriented approach within all FAO interventions.

In order to maximize efforts in meeting the SDGs and to accomplish the organization's aspirations – the four betters – FAO will apply four cross-cutting/cross-sectional “accelerators”: technology, innovation, data and complements (governance, human capital, and institutions) in all of its programmatic interventions.

Emerging technologies are already changing the food and agriculture sector. Helping farmers take full advantage of new technologies such as digital agriculture, biotechnologies, precision agriculture, innovations in agroecology, 5G, and Artificial Intelligence can increase food production, while minimizing the environmental footprint. For example, accelerators can help reduce physical inputs and improve or optimize their use. Digital tools – from e-commerce and blockchain transaction ledger to improved pest control and crop genetics using AI – can optimize natural resources and enhance food security.

Innovation in agriculture is a driving force for achieving a world free from hunger and malnutrition. Social innovations, policy innovations, institutional innovations, financial innovations, and technological innovations are important drivers affecting food and agricultural production and distribution processes.

FAO's geospatial platform and the big data lab exemplify how data on food, agriculture, socio-economics, and natural resources can come together to help strengthen evidence-based decision-making in the food and agriculture sectors. Data can enable monitoring of agricultural water productivity, allowing the design of targeted agricultural interventions and investment plans through a territorial approach which fosters inclusion and sustainable food and nutrition security.

Complements refer to the needed governance, human capital and institutions that can ensure agri-food systems transformation is inclusive and equitable. It is critical that technology, innovations and data are inclusive and gender-sensitive, and are used to spur development. Transformative processes require as a precondition much stronger, more transparent and accountable institutions and governance, including adaptive and effective regulatory governance.

As technologies revolutionize, the risks of unequal access and exclusion loom. Investments in human capital by building capacities, as well as policy and regulations minimizing such risks are



required. It is imperative that the labour supply respond to the new labour demand that will result from the new technologies and innovation to make the process more inclusive. Technologies have to be affordable, so that everyone can access them. Other structural barriers, including lack of education and training, must be identified and addressed.

FAO has prioritized 20 programme priority areas around the *four betters* of the new strategic narrative.

- *Better Production* means ensuring efficient, sustainable consumption and production patterns through sustainable and inclusive supply chains to boost food systems resilience. Priority areas include green innovation, blue transformation, one health, small-scale producers' equitable access to resources and digital agriculture.

- *Better Nutrition* means ending hunger, achieving food security and improving nutrition. Priority areas include healthy diets for all, nutrition for the most vulnerable, safe food for everyone, reducing food loss and waste and transparent markets and trade.

- *Better Environment* means protecting, restoring and promoting sustainable use of terrestrial and marine ecosystems, promoting a good environment for farming systems, and combating climate change through sustainable, inclusive and resilient agri-food systems. Priority areas include climate mitigating and adapted agri-food systems, bio-economy for sustainable food and agriculture, and biodiversity and ecosystem services for food and agriculture.

- All of the above contribute to *Better Life*. This means promoting inclusive economic growth by eliminating hunger, improving the life of vulnerable people, reducing inequalities, and improving quality of life in urban and rural areas. Priority areas include gender equality and rural women's empowerment, inclusive rural transformation, sustainable urban food systems, agriculture and food emergencies, and resilient agri-food systems. Scaling-up investment and the Hand-in-Hand Initiative focus on ensuring that collective action towards SDG achievement can be scaled to trigger transformational change in agri-food systems.

Cross-cutting themes around gender, youth and inclusion will ensure that FAO does not lose sight of vulnerable and marginalized groups in its work. FAO is deeply committed to leaving no one behind and contributing to the attainment of SDGs 1, 2 and 10.

Finally, as previously mentioned, FAO will apply the accelerators – technology, innovation, data and complements (governance, human capital and institutions) – in all its programmatic interventions to speed up progress and minimize trade-offs.

The following showcases FAO's programme priority areas around the *betters*.

## Digitalization

FAO proposes the development of “1,000 Digital Villages”, focusing on digital technologies to improve production and agri-business management as well as market-oriented agricultural processes.

- From the perspective of agricultural production, it refers to “e-Agriculture.” It focuses on improving productivity by using Information and Communications Technologies, as well as other digital solutions. Examples: climate-smart agriculture, precision agriculture, intelligent facility agriculture.

- From the perspective of farmer’s livelihood, it refers to “Digital Farmer Services.” It focuses on enhancing farmers’ access to financial services, social protection and insurance. Examples: digital finance, fintech, digital agricultural insurance schemes and farm registries.

- From the perspective of the village, it refers to digital services that can support “Rural transformation.” It focuses on enhancing the delivery of public services in health, education, jobs, welfare, eco-tourism and agri-tourism.

## Transformation through aquaculture

Capture fisheries peaked in the mid-1990s. They have since remained remarkably constant, regional variations notwithstanding. At the same time, aquaculture – an old production industry – started to grow, and it now matches capture fisheries in volume.

FAO has projected three future scenarios for both sectors: a high-road scenario, a low-road scenario, and business-as-usual scenario. There is a difference of 110 metric tonnes between a high-road and a low-road scenario. “Blue transformation” can take fishermen to the high-road scenario. There is a gap between sustainable intensification of aquaculture (where food is needed most) and transformative fisheries management (where sustainability is under threat). Blue transformation can fill this gap by 2050.

Fish are more efficient at converting protein than terrestrial livestock. This is because they expend less energy on maintaining bodily processes than terrestrial livestock do. So they outpace chicken, pork and beef in their efficiency. One kg of fish will provide 1 kg of feed; with beef, it would be 150 g of feed, with pork 280 g of feed. Even though fish is an excellent source of food to address micronutrient deficiencies, especially in pregnant women and children under 5 years of age, it wasn’t until 2014 that the

role fish can play in eliminating hunger and malnutrition was recognized by the Committee on World Food Security.

## Sustainable urban and rural development

FAO launched the Green Cities Initiative to improve the urban environment, strengthen urban-rural linkages and boost cities' resilience, services and populations against shocks, like climate change and the coronavirus pandemic. The initiative builds on FAO experience of integrating agriculture, forestry, fisheries, and sustainable food systems in urban and peri-urban settings. The main objective is to increase people's well-being through better access to improved products and services provided by urban and peri-urban forestry, agriculture and food systems. The initiative will be implemented in at least 100 cities around the globe in the next three years; 1,000 cities are expected to join by 2030.

FAO launched the Hand-in-Hand Initiative to accelerate agricultural transformation and sustainable rural development to end poverty, hunger and all forms of malnutrition. It is a country-led, country-owned programme to eradicate poverty and end hunger and malnutrition. It uses integrated geospatial, bio-physical and socio-economic analysis to identify territories where agricultural and rural transformation can have maximum impact within a 6- to 8-year timeframe. The programme supports countries that have limited capacities for sustaining such processes on their own, including those facing serious food crises. Currently, 34 countries have signed on.