The State of Food and Agriculture: Agriculture Food Systems Transformation: from Strategy to Action

Executive Summary

Even before COVID-19, hundreds of millions of people suffered from hunger. Billions more were malnourished, with no access to healthy diets. The agriculture food systems (agri-food systems) of the world are under tremendous stress from loss of biodiversity and climate change. To meet the challenges of growing enough food for everyone while protecting the planet, FAO offers a bold vision to push for better production, better nutrition, a better environment, and a better life. Taking a systems-based approach to tackle the complex challenges, FAO is working to accelerate innovation, technology, data, governance, and institutions to transform today’s agri-food systems for tomorrow’s world where no one goes hungry.

Suggested action by the Conference

The Conference is invited to:

a) recognize the role of agri-food systems in addressing global hunger and malnutrition. The COVID-19 pandemic has exacerbated already serious global hunger and malnutrition, while laying bare the systemic inequalities that underpins current agri-food systems.

b) note FAO’s strategy, particularly its systems-based approach to transforming agri-food systems, to reverse the hunger trend, invest in rural transformation, and empower vulnerable and marginalised populations, and to acknowledge the organizing principles and progress accelerators behind the strategy.

c) support FAO’s multi-pronged approach of putting knowledge into action, from digitalization and promotion of aquaculture to sustainable rural development and including the use of Hand-in-Hand Initiative to integrate actions, to achieve agri-food systems transformation.

Queries on the substantive content of this document may be addressed to:

Máximo Torero Cullen
Chief Economist
Tel: +39 06570 50869 - E-mail: Chief-Economist@fao.org
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I. Introduction

1. Even before COVID-19, 690 million people suffered from hunger, despite progress made in the last 75 years since FAO was created and despite enough amount of food that is produced to feed everyone in the world. Millions more are micronutrient deficient, and the number of people who are overweight across all ages, classes and borders are growing at an alarming rate. The pandemic has added as many as 132 million people to the ranks of the undernourished, putting a spotlight on the vulnerability of the world’s food systems. At the same time, fourteen percent of the food produced is lost, and 17 percent is wasted. Other stressors — such as transboundary pests and diseases, natural disasters, loss of biodiversity and habitat destruction, and conflict — already affect our current agri-food systems and climate change. Suffice it to say, one of the greatest challenges of the 21st century is to meet the world’s growing food need, while simultaneously reducing the environmental impact of agriculture.

2. The agri-food system covers the journey of food (for example, cereals, vegetables, fish, fruits and livestock) from farm to table – including when it is grown, harvested, processed, packaged, transported, distributed, traded, bought, prepared, eaten and disposed of. It also encompasses non-food products (for example forestry, animal rearing, use of feedstock, biomass to produce biofuels, and fibres) that also constitute livelihoods and all of the people as well as the activities, investments and choices that play a part in getting us these food and agricultural products.

Figure 1: Agri-food systems

3. FAO’s *new vision* in the world, where food and agriculture, people’s livelihoods and wellbeing, and preservation of natural resources cannot be addressed in isolation, is to optimize *four betters: better production, better nutrition, a better environment* and *a better life*. FAO focuses on technological and innovative solutions to produce more with less (to mitigate water scarcity, land degradation, food loss and overuse of inputs, and loss of biodiversity); to reduce food and agricultural prices, including the cost of nutritious food; and to reduce the risks of epidemics and pandemics. Innovative technologies are also expected to increase transparency in transactions, create new earning opportunities, and boost overall technical progress while promoting social inclusion.

4. Several entry points to support the development of emerging sectors, such as ocean and inland fisheries and aquaculture exists. They include biotechnologies and all systemic technologies, certain management practices, such as conservation agriculture, integrated agriculture, and precision agriculture, agroforestry, and agro-ecology. To address structural issues, like the excessive
concentration of ownership, use and control of big data, and inequalities in income distribution, further research and better governance are required.

5. There is a need to harness the power of digital innovation to link rural, small-scale producers with consumers. Such digital solutions include online platforms for e-commerce or delivery services and marketing, as well as blockchain technology for better traceability and certification schemes along the value chain. Technology and innovation can be an enabler, but they could also deepen the technological divide. This would affect smallholder farmers who may be left behind due to initial investment costs and lack of training and education. Institutions and appropriate governance should be put in place to address the digital divide.

6. Improving access to markets and specially reducing barriers to trade to boost global and intra-regional trade is essential. This entails strengthening policy and technical capacities of intergovernmental as well as national institutions to implement trade facilitation practices and reduce procedural barriers to trade, particularly those related to the application of sanitary and phytosanitary (SPS) measures.

7. In summary, to transform the world through food and agriculture, FAO must lead the efforts to bring together and accelerate innovation, technology, data, governance, and institutions. Doing so would help to i) reduce hunger, putting it back on a downward slope; ii) transform agri-food systems to nourish people, nurture the planet, and build resilient livelihoods and ecosystems; iii) increase investment in rural transformation and vulnerable populations to reduce inequality, leaving no country and no person behind.

### II. Agri-food systems: where we are

**Critical drivers of agri-food systems and related trends**

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

**Systemic (overarching) driver**

9. *Population dynamics and urbanization* are expected to result in growing populations and increasing food demand. Sub-Saharan Africa and South Asia are leading these changes. In addition to population growth, other factors relative to the different locations — for example, ageing in rural areas and changes in high-income countries — are also important. Other social aspects, such as spatial location or gender balances, are also subject to change as a result of internal and international migration. A recent UN report 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 percent to 70 percent. These population dynamics have implications for agri-food systems because population growth, urbanization and food demand are closely linked. Urbanization is a challenge for food and agriculture. For example, it increases encroachment on fertile land. In addition, the growth of young cohorts, particularly in sub-Saharan Africa and South Asia, raises serious concerns regarding the availability of safe, high-quality employment opportunities, with decent remunerations, within and outside agri-food systems.
10. **Climate change**-due to agricultural and economy-wide greenhouse gas (GHG) emissions is already affecting agri-food systems, food safety, and natural resources. It is expected to accelerate hunger and poverty in rural areas. \(^1\) In Latin America, climate change will continue to impact agri-food systems in the medium- and long-term. It is estimated that rain-fed production in selected areas, including 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. According to IPCC, “an estimated 23% of total anthropogenic greenhouse gas emissions (2007-2016) derive from agriculture, forestry, and other land use”. \(^2\) Agri-food systems contribute a large share of global CO\(_2\)-equivalent emissions, including through deforestation and other land use changes. Most economy-wide development paradigms are based on fossil fuels and huge GHG emissions. \(^3\) Overall, there are no risk-informed measures to tackle a warming planet beyond a 1.5-degree scenario. There is limited understanding of the implications of deep decarbonisation. A deep understanding of these issues is particularly important for the post-COVID recovery process to ‘build back better’.

11. **Economic growth, structural transformation, and macro-economic stability** do not always deliver results towards inclusive economic transformation of societies. The transformation of agri-food systems is closely tied to structural transformation of socio-economic systems and their macro-economic stability. Economic growth and economy-wide structural transformation is a result and driver of food and agriculture transformation processes. The World Bank suggested that stronger economic growth is an important driver of poverty reduction. \(^4\) However, poverty reduction is only achieved when the gains of economic growth are shared across the social strata. Sub-Saharan Africa, for instance, still awaits substantive economic transformation, despite high economic growth in the last two decades. The impact of COVID-19 is expected to add to the 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.” \(^5\)

12. **Cross-country interdependencies** tie together agri-food systems globally. 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 negatively impact people’s lives. *The State of Food Security and Nutrition in the World (SOFI) 2019* states, “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”. \(^6\) Furthermore, commodity-dependency may increase the difficulty of addressing environmental and social concerns, partially because multilateral trade agreements create uncertainties. \(^7\) Weak institutions potentially contribute to illicit financial flows that draw resources from low-income towards high-income countries. \(^8\) Whether these conditions of interdependencies

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1. Regarding the impact on food safety, see *Climate change: Unpacking the burden of food safety*, FAO 2020.
2. IPCC, 2019.
3. This also applies to activities that are increasingly portrayed as complementary to agricultural activities in rural areas, including tourism, whose GHG footprint has to be investigated.
5. UNCTAD, 2019.
increase resilience and sustainability of agri-food systems or force them to bend towards commodity-dependency or technological, energy, financial, cultural, geo-political and strategic dependencies is an issue that merits further consideration.

13. **Big data generation, control, use and ownership** enable real-time decision-making in agri-food systems. However, due to large economies of scale that exist in digital industries, digitalization of social interactions and production, including agri-food value chain processes, has resulted in a digital divide. It has also raised concerns about the economic benefits of big data platforms that are able to amass extraordinary amounts of information on consumer behaviour and preferences.\(^9\) Capacities of National Statistical Systems to harvest, storage, manage and control data, as well as the awareness of consumers and civil society should be strengthened. This would ensure country-driven, independent, transparent and accountable data generation, validation and utilization processes, as well as their conversion into statistics. This is particularly important for small countries.

14. **Geopolitical instability and increasing impacts of conflicts** are a major driver of food insecurity and malnutrition, including those related to competition over resources and energy.\(^10\) The vast majority of chronically food insecure and malnourished people live in countries affected by conflicts.\(^11\) Furthermore, research suggests that 40-60 percent of intrastate armed 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. This driver, interacting with climate change, degradation of renewable natural resources, and desertification, is disrupting agricultural livelihoods and agri-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 persist is among the possible future scenarios. Agri-food systems would be affected by disruptions in various parts of socio-economic and environmental systems. It would in turn affect people according to their social features, including gender, age, ethnicity, and socio-economic status.

15. **Uncertainties.** All drivers affecting agri-food systems are subject to multiple systemic risk of hazards carrying uncertainties, often materialized in sudden occurrences of events. The future of food and agriculture faces uncertainties that give rise to serious questions and concerns.\(^12\) 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 the COVID-19 pandemic and its impacts are a case in point.\(^13\) 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, weather seasonal variabilities, and slow onset events such as sea-level rise are also unfolding emergencies. The 2020 desert locust upsurge, together with other high-impact and transboundary food chain crises, also threaten agri-food systems. Uncertainties and their impact on agri-food systems are difficult to predict and measure, but risk management efforts and emergency preparedness may reduce their impacts.

**Drivers directly affecting food access and livelihoods**

16. **Rural and urban poverty.** 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 inequalities. 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

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\(^9\) CEB/2019/1/Add.2
\(^10\) UNHCR, 2020.
\(^11\) FAO et al., 2017.
\(^12\) FAO, 2018.
\(^13\) FAO, 2018.
growing and malnourishment is widespread. This is because the cost of a healthy diet is much higher than the international or extreme poverty line, established at USD1.90 purchasing power parity per day.\textsuperscript{14} There are also significant risks for the most vulnerable to fall into poverty. While Agenda 2030 is grounded on the ‘Leave no one behind’ principle, certain groups within society, like the elderly, children, youth, women, and indigenous people, face discrimination and marginalization. Moreover, these groups also face insecurity, violence, involvement in illegal economic activities. An additional issue laid bare by the COVID-19 pandemic is the disparity in access to social and health care services within and across countries. This is in addition to pre-existing gender inequalities, including responsibilities for domestic work and care that limit women’s participation in the labour market. These often unmeasured disparities lead to worsening of purchasing power, which result in worsening nutritional status.

17. **Inequalities.** Societies are characterized by high inequalities in income, job opportunities, access to assets like natural resources, basic services, and fiscal burden. There are large segments of populations living either below the threshold, or on the edge of poverty. Then there are a few who make significant profits. Women, girls, youth, small producers, and indigenous groups suffer the most in ways that are not always measured because they go beyond mere economic inequalities. Increased inequality can erode social cohesion, lead to political polarization, and ultimately lower economic growth.\textsuperscript{15} Unfortunately, income inequality is growing. In Asia, for instance, income inequality has risen, despite an average annual GDP growth of 5 percent between 2000 and 2016. This has slowed progress in poverty reduction, further exacerbating inequalities with the arrival of the coronavirus pandemic.

18. **Food prices.** Food is around 30 percent more expensive than it was in the 1990s, even without considering the food price spikes of 2008 and 2011.\textsuperscript{16} Current pricing mechanisms also do not capture the whole cost of food, namely social and environmental externalities at all levels (full cost accounting). If environmental costs were accounted for, food prices might increase as much as by 30-35 percent in the next decades.\textsuperscript{17} Food prices are a sensitive topic for politicians and the media, and policymakers raise concerns on the efficiency of food and agricultural systems. However, cheap, unhealthy, and socially and environmentally unsustainable food cannot be the solution to high food prices.

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

19. **Innovation and science.** Currently, several technologies 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 other innovative approaches, implies opportunities\textsuperscript{18} to achieve the dual aim of producing sufficient food and safeguarding the environment.\textsuperscript{19} Research is ongoing to ensure safety and acceptability, gender-balanced access, and inclusion of low-income countries to avoid technological divides.

20. **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).

\textsuperscript{14} FAO et al., 2020.

\textsuperscript{15} IMF, 2017.

\textsuperscript{16} This is as measured by the FAO Food Price Index. The index measures monthly changes in international prices of food commodities. It consists of the average of five commodity group price indices, weighted with the average export shares of each of the groups for 2014-2016.

\textsuperscript{17} FAO, 2018.

\textsuperscript{18} 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 much use of pesticides and herbicides damages the environment, reduces biodiversity, which generates ecosystem services, and could be detrimental to human health.

\textsuperscript{19} UN, 2018.
In many instances, priorities set by governments, particularly those in low-income countries, like LIFDC, SIDS, and LLDCs, are not implemented due to insufficient public investment or low priority given to local agri-food systems. Thus, those countries that are currently heavily dependent on imports to meet demand for food are likely to remain so, unless they shift priorities. In addition, adequate regulatory and legal frameworks to secure financing are limited and not conducive to attracting private sector investments.

21. **Capital/information intensity of production** is increasing due to mechanization and digitalization of production in almost all sectors, including in food and agriculture. While these trends help raise overall productivity, they also raise concerns for the levels of employment both in rural and urban areas\(^{20}\). Increasing capital intensity in the downstream segments of food value chains limits labour demand in processing and distribution. In addition, the mechanization/digitalization of primary production lowers profits for farmers who cannot appropriate new capital assets. Young farmers, more inclined to adopting digital technologies and other innovations, can increase their capital ownership only if they have access to finance, training, and capacity development. Even though the spread of advanced technologies is likely to increase the profitability of food-related livelihoods and create new job opportunities, the net job balance is likely to be negative. Thus, increasing capital/information intensity of food production associated to ageing may further contribute to urban migration. Subsequently, if employment opportunities cannot be found in urban areas, poverty and food insecurity may increase.

22. **Market concentration of food and agricultural inputs and outputs** represents a challenge for resilience, equitability, and sustainability of agri-food systems. Unprecedented levels of market concentration throughout the global agri-food systems\(^{21,22}\) — 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 with lack of land use regulation affects access to resources. This puts rural, local areas and low-income economies at risk, as it increases dependency on external actors. The COVID-19 pandemic has revealed the weaknesses of such concentrations. Addressing such concentrations may require relying more on locally produced goods.

23. **Consumption and nutrition patterns** resulting from behavioural change of 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 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.\(^{23}\) Building sustainable food systems and healthy nutrition patterns to accelerate progress towards the SDGs requires collaborative action by various stakeholders, including consumers.\(^{24}\)

**Drivers regarding environmental systems**

24. **Scarcity and degradation of natural resources**. Water scarcity, land degradation, soil nutrients depletion, large scale deforestation, overexploitation of marine resources and pasture, pollution at all levels raise serious concerns, not only for the entire agri-food systems, but also for the achievements

\(^{20}\) E/CN.9/2020/2 UN Economic and Social Council, 2020. *Population, food security, nutrition and sustainable development* states, “... 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”.

\(^{21}\) IPES-Food, 2017.

\(^{22}\) UNCTAD, 2018.

\(^{23}\) FAO, 2018.

\(^{24}\) UN, 2019.
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.”\textsuperscript{25} Availability and accessibility of natural resources per capita are one of the most important bottlenecks for agri-food systems. For instance, although the Asia and the Pacific region accounts for more than half of the world population (56 percent), the region covers less than one-quarter of the global land area. Population increase, urbanization and industrialization are increasing pressure on natural resources. Latin America’s natural resources have been degraded by intensive productive activities related to agri-food systems. Sub-Saharan Africa is also experiencing severe degradation of natural resources — water scarcity in dryland areas of the Sahel and the Horn of Africa, as well as in Southern Africa. Also taking place is massive deforestation linked to the extension of agricultural land, exploitation of mining, infrastructure works (hydroelectric dams or roads), urbanization, and excessive logging. Competition over scarce natural resources contribute to conflicts. The agriculture sector across regions is increasingly affected by the frequency and intensity of extreme weather events.\textsuperscript{26}

25. \textit{Epidemics and degradation of ecosystems} beyond the COVID-19 pandemic may increase in the future. This is because of the rising trends in transboundary animal and plant diseases and pests, agricultural encroachment of wild areas and forests, antimicrobial resistance, and the increasing production and consumption of animal products. According to a UNEP-ILRI report, “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”.\textsuperscript{27} All this adds to the increasing occurrences of events that threaten food safety, aggravated by climate change, and calls for a One Health approach.\textsuperscript{28}

26. \textit{The ‘Blue Economy’} is the development of economic activities related to oceans and coastal areas. It is increasing globally, and countries, particularly SIDS and other states that enjoy large Exclusive Economic Zones (EEZ), are building their economic development policies around it. A recent IPCC report highlights an important role for sustainable ocean industries to reduce GHG emissions and adapt to climate change.\textsuperscript{29} At the same time, even though aquaculture is expected to provide the necessary increase in aquatic products globally, its regional development is uneven and hampered by constraints. This must be addressed through better governance, increased investment, and targeted support to 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. It is the only region thought to have declining ‘apparent consumption’.\textsuperscript{30} Aquatic food production systems are nested in the larger development framework. However, many ‘blue economy’ policies favour large projects, such as oil and gas, shipping and ports, or even tourism. They bring economic benefits as well as environmental degradation, with impacts on food from the ocean and ocean biodiversity. These trade-offs require further investigation for risk-informed policymaking.

Global hunger and malnutrition indicators

27. 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

\textsuperscript{25} UNEP, 2019.

\textsuperscript{26} Full cost accounting of natural resource use and degradation, while engendering shifts in prices, may have impacts on natural resource use, GHG emissions and biodiversity.

\textsuperscript{27} UNEP and International Livestock Research Institute, 2020.

\textsuperscript{28} World Health Organization (WHO). One Health approach to designing and implementing programmes, policies, legislation, and research requires multiple sectors to work together to achieve better public health outcomes, like food safety, the control of zoonoses (diseases that can spread between animals and humans, including flu, rabies and Rift Valley Fever), and combating antibiotic resistance of bacteria.

\textsuperscript{29} IPCC, 2019. \textit{Special Report on the ocean and cryosphere in a changing climate}.

\textsuperscript{30} 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).
harmful to health, the economy, and the planet. For example, the world is not on track to end hunger. The number of hungry people in the world continues to rise. Almost 690 million people went hungry around the world in 2019, an increase of 10 million over 2018. During the five years before that, the ranks of the hungry swelled by 60 million. The COVID-19 pandemic is estimated to have pushed an additional 83-132 million into chronic hunger in 2020. Additionally, 2 billion people globally do not have regular access to safe, nutritious, and sufficient food. If recent trends continue, the number of people affected by hunger would surpass 840 million by 2030.

28. The world is not on track to defeat malnutrition. Despite some progress, child stunting remains unacceptably high. In 2019, over 21 percent (144 million) of children under 5 years of age were stunted, and almost 7 percent (47 million) were wasted. Child overweight is also not improving, with about 38 million, or 5.6 percent, 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.

29. 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.

### Table 1 — Hunger and malnutrition progress status

<table>
<thead>
<tr>
<th>Where we are</th>
<th>Where we should be</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hungry, undernourished people: 690mill. in 2019,</td>
<td>Undernourishment to be reduced everywhere to a</td>
</tr>
<tr>
<td>+132mill. because of COVID-19</td>
<td>maximum of 5%</td>
</tr>
<tr>
<td>Stunting among children: Unacceptably high</td>
<td>Healthy diets have to be affordable for all!</td>
</tr>
<tr>
<td>Micronutrients deficiencies: Harm over two billion</td>
<td>Overweight reduced everywhere to levels of 15%, similar</td>
</tr>
<tr>
<td></td>
<td>to what it was in the 1980s</td>
</tr>
<tr>
<td>Healthy diets: Not affordable for 3bill. people</td>
<td>Obesity reduced to no more than 5% in any country</td>
</tr>
<tr>
<td>Obesity: at more than 800 million people</td>
<td>Stunting among children need to decrease significantly</td>
</tr>
<tr>
<td>Unsafe food: Affects ca. 1 in 10 people</td>
<td>We should recover the lost decade in Rural poverty</td>
</tr>
<tr>
<td>High food loss and waste: 14% lost and 17% being</td>
<td>Inequalities need to be reduced substantially</td>
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<tr>
<td>wasted</td>
<td></td>
</tr>
<tr>
<td>Environmental destructions: To land, water, sea</td>
<td>And for the planet: achieving land degradation neutrality,</td>
</tr>
<tr>
<td>and atmosphere</td>
<td>increasing the efficiency in the use of water for agriculture</td>
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<td></td>
<td>and reaching the Paris Agreement target of reducing</td>
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<td></td>
<td>greenhouse gas (GHG) emissions to limit global climate</td>
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<tr>
<td></td>
<td>warming between 1.5 and 2.0 degrees Celsius (°C)</td>
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<tr>
<td>Poverty: &gt;80% extreme poor live in rural areas</td>
<td></td>
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<tr>
<td>and work in agriculture</td>
<td></td>
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<tr>
<td>Inequality: Increasing in nearly half of the</td>
<td></td>
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<tr>
<td>countries in the world and exacerbated by COVID-19</td>
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30. By 2030, undernourishment must fall everywhere as much as 5 percent. Healthy diets must be affordable for all. Overweight has to be cut everywhere to 15 percent or lower, similar to what it was in the 1980s. In every country, obesity needs to fall to no more than 5 percent. 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 must meet the Paris agreement target of limiting global warming to less than 2°C.

32 Ibid.
33 Ibid.
Why focus on agri-food systems

31. Agri-food systems are the largest economic system, measured in terms of employment, livelihoods, and planetary impact. Globally, they employ 4 billion people, directly and indirectly. Poverty and inequality are also 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 percent of the extreme poor live in rural areas, working in agri-food systems.

Figure 2 — Rural populations across countries

Figure 3 — Employment in agriculture across countries

32. To achieve the food security and nutrition goals, it is important to approach the challenges in a systems-based way and adopt a holistic view. That means recognizing the interconnectedness of the economic, social, and environmental impacts of the world’s 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 carbon food print 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 is essential in ending hunger and malnutrition.
Agri-food systems and environmental impacts

33. As mentioned earlier, agri-food systems are the major driver of climate change and the planet’s unfolding environmental crisis. Agriculture uses about 40 percent of the Earth’s land and emits more greenhouse gases than all cars, trucks, trains, and airplanes combined. Runoff from fertilizers pollutes waterways and coastal ecosystems. Agriculture also consumes 70 percent of all fresh water on earth. And it causes approximately 80 percent 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. Sixty percent of all infectious diseases are zoonotic, and 75 percent of all emerging diseases are zoonotic.

Biodiversity

34. Agri-food systems have contributed to substantial biodiversity loss, even though it is indispensable to food security. Biodiversity 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. It should raise the alarm that key components of biodiversity for food and agriculture are declining. Humans have fundamentally altered 75 percent of the Earth’s land surface. Around 1 million animal and plant species are threatened with extinction. About 66 percent 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

35. Deforestation and forest degradation continue to take place at alarming rates. This is resulting in significant loss of biodiversity. Forests cover 31 percent 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.

36. Forests remove about one third of the fossil fuel emissions every year. Therefore, 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. Agricultural expansion is the main driver of deforestation and the associated loss of forest biodiversity. In order to stop deforestation and the loss of biodiversity, agri-food systems must change.

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34 UN, 2020.
35 UNDP, 2021.
36 FAO, 2019.
38 IPBES, 2019.
40 Ibid.
III. Agri-food systems strategy for transformation

Organizing principle

37. FAO 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 (zero hunger), SDG 10 (reduced inequalities), and to achieve the broader SDG agenda, which is crucial for achieving FAO’s overall vision. The *four 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.

Progress accelerators

38. 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.

39. 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, the accelerators can help reduce physical inputs and improve/optimize their use. Digital tools — from e-commerce and blockchain transaction ledgers 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.

40. 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 security and nutrition.

41. 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.

42. 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 central that the labour supply responds 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 in order to ensure that everyone has access to them. Other structural barriers, including lack of education and training, must be identified and addressed.
IV. Agri-food systems from Knowledge to Action

43. FAO has prioritized 20 Programme Priority Areas around the *four betters* of the new strategic narrative.

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

45. **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.

46. **A 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, bioeconomy for sustainable food and agriculture, and biodiversity and ecosystem services for food and agriculture.

47. All of the above contribute to a **Better Life**. It means promoting inclusive economic growth by eliminating hunger, improving 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 (HiH) Initiative focus on ensuring that collective action towards SDG achievement can be scaled to trigger transformational change in agri-food systems.

48. 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.

49. 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.

50. The following showcases transformative program priority areas around the betters.

**Digitalization**

51. FAO seeks to identify 1,000 villages across the world to convert them into digital village hubs. This effort will be implemented in collaboration with “AI, Food for all” and other partners. A successful implementation of this project can make digital linkages engines for increased resilience by introducing key capabilities like e-commerce to rural areas, facilitating the farmers’ access to markets and diversifying their incomes, which is particularly critical in light of restrictions related to the COVID-19 pandemic. It will help to build back better and achieve the *four betters.*

52. The initiative also aims to unleash the potential of digital agriculture in bridging the urban-rural divide by creating rural-urban linkages and integrating rural areas in the digital economy to better
address food and nutrition insecurity. It will reduce the gender digital divide\(^\text{42}\) by increasing rural women’s access to digital technologies and expanding the concept of ‘access to digital technologies’ to agriculture as well as rural services and diversification of incomes. With the rapid development of digital technologies, a digital village can be an entry point to rural development, digitalization; rural revitalization; employment generation, including for youth, modernization of agriculture and income generation.

53. It is FAO’s vision to contribute to a world free from hunger and malnutrition where food and agriculture contribute to improving the living standards of all, especially the poorest, in an economically, socially, and environmentally sustainable manner\(^\text{43}\). There are good synergies between key data, information and knowledge provided by the HiH Initiative,\(^\text{44}\) the FAO Digital Services Portfolio,\(^\text{45}\) the e-Agriculture Strategy Guide, the International Platform for Digital Food and Agriculture,\(^\text{46}\) and AI Food for All.\(^\text{47}\) The Hand-in-Hand Geospatial Platform\(^\text{48}\) and FAO Data lab\(^\text{49}\) will be used to identify countries and villages. Also, the Smart Villages project in Niger\(^\text{50}\) provides a good framework for deeper collaboration\(^\text{51}\) as ONE UN with our UN partners ITU, UNDP, UNESCO, UNICEF and WHO, as well as DIAL, ANSI and Smart Africa.

**The model**

54. FAO plans to build the core of the “Smart Village Approach”\(^\text{52}\) through digitalization of agricultural elements, such as organisms and the environment, production and agri-business management, and related market-oriented and social services of agricultural processes. The 1000 Digital Villages project will focus on several digital technologies to improve production and agri-business management, and related market-oriented and social services of agricultural processes.

55. **From the perspective of agricultural production, it refers to “e-Agriculture”,**\(^\text{53}\) which focuses on improving the productivity by using ICTs and relevant digital solutions. Examples include climate smart agriculture, precision agriculture, and intelligent facility agriculture.

56. **From the perspective of farmer’s livelihood, it refers to “Digital Farmer Services”,** which focus on how to enhance farmers’ accessibility to different kinds of social and economic services in terms of finances, social protection, employment. Examples include digital finance, Fintech, Digital-based agricultural insurance schemes and farm registries.

57. **From the perspective of the village, it refers to Digital Services to support “Rural transformation”,** which focuses on how to enhance the delivery of public services in health, education, jobs, welfare, tourism as eco-tourism and agri-tourism.

58. E-commerce platforms can leverage market linkages, shorten the food value chain, strengthen business engagements, support market intelligence systems, and promote market access. Blockchain can be used to build trust and increase food safety. Advisory services can augment and support the farmer extension system. And promotion of farmer led frugal innovation can increase the adoption and

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\(^{42}\) Gender imbalances also extend into the digital realm, with rural women having the least access to the internet. Worldwide, 48 percent of women have access to the internet, compared to 58 percent of men.

\(^{43}\) FAO, 2020

\(^{44}\) FAO, Hand-in-Hand Initiative.

\(^{45}\) FAO, Digital Services Portfolio

\(^{46}\) FAO, 2020

\(^{47}\) FAO, 2020

\(^{48}\) The Hand-in-Hand Geospatial Platform.

\(^{49}\) FAO Data Lab.

\(^{50}\) World Bank, 2020.

\(^{51}\) Smart Villages, 2019.

\(^{52}\) ITU, 2020.

\(^{53}\) FAO, E-Agriculture Strategy Guide.
impact of actionable novel digital services\textsuperscript{54}. Lastly, digital financial products can increase digital inclusion of and digital dividends for family farmers.

59. It is therefore key that the 1000 Digital Villages project adheres to the Digital Principles\textsuperscript{55} that marked the start of the Innovation Agenda and Innovation Principles of the United Nations in 2015\textsuperscript{56}, and it uses Human-Centred Design principles, as marked by the mAgri Design Toolkit User-centred design for mobile agriculture from GSMA\textsuperscript{57}. A good example is the “Broadband Village” in China that has made great efforts to promote the integration of the internet, big data, and artificial intelligence with the development of agriculture and rural areas, develop digital agriculture, accelerate the development of e-commerce, and promote digitalization in rural areas\textsuperscript{58}. In order to promote digital agriculture and e-commerce to rural farmers, China’s approach is promoting the adoption of e-agriculture and e-village. The project, which saw the improvement of the internet, speeds up and reduces the tariffs for farmers to encourage them to consume and utilize more internet-based solutions.

60. In line with FAO’s Strategic Framework 2022-31 focusing on SDGS 1, 2 and 10 and creating synergy with the HiH Initiative, particularly using geospatial data and analytical tools, FAO is committed to leaving no one behind, giving priority to the most vulnerable groups, closing the economic and technological divide and reducing inequality. Accelerated rural digitalization in an all-inclusive approach is a powerful means to achieve these goals. Depending on the country and village specificity FAO will adapt our digital village model based on the four models previously described in coordination with local government, private sector, civil society and academia of the respective countries and locations.

**Transformation through aquaculture**

61. Capture fisheries peaked in the mid-1990s. It has 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.

**Figure 4 — Aquaculture, a story of transformation**

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.

\textsuperscript{54} CTA, 2019.
\textsuperscript{55} Principles for Digital Development.
\textsuperscript{56} UNDP, UNFPA, UNOPS, UNICEF, UN-Women and WFP, 2015.
\textsuperscript{57} mAgri Design Toolkit.
\textsuperscript{58} FAO, 2019.
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.

63. 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. Therefore, 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.

Figure 5 — Conversion efficiency

Sustainable urban and rural development

64. Maintaining sustainable agri-food systems and having more green spaces, including urban and peri-urban agriculture and forests, are essential for cities, making them more resilient towards the impacts of climate change and COVID-19, ensuring that health-related episodes do not disrupt agri-food systems and lead to food, nutrition, and environmental crises. In response to this need, we launched a Green Cities Initiative that builds on FAO experience of integrating agriculture, forestry, fisheries, and sustainable food systems in urban and peri-urban settings.

65. The FAO Green Cities Initiative and its action programme is aimed at increasing people’s well-being and establishing the green economy. This is achieved through better access to improved green products and green services provided by urban and peri-urban forestry, agriculture, and food systems on a sustainable basis. The FAO Green Cities Initiative will improve the livelihoods and well-being of urban and peri-urban populations in at least 100 cities (15 metropolitan, 40 intermediary, and 45 small cities) around the world over the next three years, while 1000 cities are expected to join by 2030. The initiative is focused on improving the urban environment, strengthening urban-rural linkages and the resilience of urban systems, services, and populations to external shocks. While ensuring access to a healthy environment and healthy diets from sustainable agri-food systems, it will also contribute to climate change mitigation and adaptation.
Integrating actions through the Hand-in-Hand Initiative

66. FAO launched the Hand-in-Hand Initiative to accelerate agricultural transformation and sustainable rural development to end poverty, hunger, and all forms of malnutrition. The Initiative, owned and led by countries, aims to eradicate poverty and end hunger and malnutrition through 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, 37 countries have signed on.

67. In most low-income countries and those in food crises, livelihoods are constrained by persistently low levels of productivity in agri-food production systems and by access to markets, weak capacities to manage complex processes of agricultural and rural transformation, and limited ability to cope with complex, evolving markets and accelerating climate change. These constraints are particularly pronounced for groups that face marginalization, constraints in access to resources and entitlements, and limited bargaining power, including women, youth, and minority ethnic groups.

68. The Hand-in-Hand (HiH) Initiative aims to eradicate poverty, end hunger and all forms of malnutrition, and reduce inequality within and among nations. As mentioned above, the programme uses integrated geospatial, bio-physical and socio-economic analysis and an agri–food systems lens to identify subnational territories where agricultural and rural transformation can have transformative impacts. It supports countries that have limited capacities for sustaining such processes on their own, are challenged by serious food crises, or have large pockets of poverty. The programme strengthens national capacities for evidence-based decision-making and for implementing and sustaining a complex, highly integrated programme of activities adapted to territory-specific conditions, needs and social contexts. It is brought to scale through matchmaking, investment, and sustained multi-partner collaboration. To overcome existing inequalities within agri-food systems, the HiH Initiative pays particular attention to building the resilience of the most vulnerable segments of the rural population. It also analyses and addresses all types of social and territorial inequalities to avoid perpetuating them or excluding vulnerable and marginalized groups.

V. Conclusions

69. Despite the enormous progress made in the last 75 years since FAO was founded, and even though we produce enough food to feed the world, 690 million people suffered from hunger even before the COVID-19 pandemic. Millions more are micronutrient deficient, and an alarmingly growing number of people are overweight across all ages, classes and borders. The pandemic has increased the number of undernourished up to 132 million more people, putting the importance and vulnerability of the world’s agri-food systems under the spotlight. At the same time, fourteen percent of the food we do manage to produce is lost and even more wasted. Other stressors such as transboundary pests and diseases, natural disasters, loss of biodiversity and habitat destruction, conflict, already affect our current agri-food systems and climate change. Therefore, one of the greatest challenges of the 21st century is to meet society’s growing food needs whilst simultaneously reducing the environmental impact of agriculture.

70. Our new vision in this world where challenges are complex and inter-related and in which food and agriculture, people’s livelihoods and wellbeing, as well as preservation of natural resources cannot be addressed in isolation, is one in which we need to optimize four betters: better production, better nutrition, a better environment and a better life. To achieve this, large reliance is put on ‘technological’ innovative solutions to: produce more with less (water, land degradation, food loss and inputs, loss of biodiversity etc.), reduce food and agricultural prices including the cost of nutritious food, and reduce the risks of epidemics and pandemics. Innovative technologies are also expected to increase transparency in transactions, create new earning opportunities and boost overall technical progress while promoting social inclusion.
71. Biotechnologies and all ‘systemic’ technologies, approaches and management practices, including conservation agriculture, integrated agriculture, and precision agriculture, agroforestry, and agro ecology are seen as entry doors to support the development of emerging sectors, such as aquaculture. Further research, in addition to better governance, is also needed to address structural issues such as the excessive concentration in big-data ownership, use and control, and to improve income distribution through better profit sharing. We also need to go further to harness the power of digital innovation to link rural and small-scale producers with consumers by promoting the adoption of digital solutions, such as online platforms for e-commerce or delivery services and marketing, or blockchain technology for better traceability and certification schemes along the value chain. It is important to note that technology and innovation can be an enabler, but could also lead to a technological divide-impacting the smallholder farmer, who due to the high initial investment costs and need for training and education, may not have access to the benefits. However, a strategic deployment of technology and innovation has the potential to resolve and minimize trade-offs among the SDGs but to avoid the increase of the divide institutions and appropriate governance needs to be in place.

72. In summary, to transform the world through food and agriculture, we must bring together and accelerate innovation, technology, data and governance and institutions so as to: i) get hunger back on a steep downward trend; ii) transform agri-food systems to nourish people, nurture the planet and build resilient livelihoods and ecosystems; and iii) commit to a rural transformation and invest expressly in vulnerable populations to reduce inequality, leaving no country and no person behind.
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