



Task Force 5
2030 Agenda and Development Cooperation

Policy brief

A MORE SUSTAINABLE AND RESILIENT AGRI-FOOD SECTOR TO BETTER DEAL WITH THE PANDEMIC

SEPTEMBER 2021

Patrizia Brigidi University of Bologna
Gabriele Canali Catholic University of the Sacred Heart of Piacenza
Arnaldo Dossena University of Parma
Gianni Galaverna University of Parma
Daniele Fattibene Istituto Affari Internazionali (IAI)
Fabio Fava University of Bologna
Erasmus Neviani University of Parma
Fabrizio Storti University of Parma

T20 NATIONAL COORDINATOR AND CHAIR



T20 CO-CHAIR



T20 SUMMIT CO-CHAIR



Università
Bocconi
MILANO





ABSTRACT

The COVID-19 pandemic has put new emphasis on the intrinsic weaknesses of current food production and consumption models across the world. These weaknesses include an unsustainable use of natural resources, the relocation of unprofitable production and limited exploitation of local specificities, with detrimental effects on communities' natural and social assets. More efficient, eco-sustainable and site integrated/specific agri-food production, combined with optimized food distribution and management, especially in the cities, and healthier and more sustainable eating habits are required for a more effective, fairer and more resilient post-pandemic food safety and nutrition security regime worldwide.



CHALLENGE

The pandemic has highlighted the essential role of the agri-food system, which, together with the health care system, is a top priority for modern societies (Torero, 2020). It has done so partly by unveiling the system's vulnerabilities and weaknesses, namely the unsustainable use of natural resources, with long food supply chains relocated at a global level, which directly impacts on the sustainability and resilience of food systems and threatens food security. An increasing disconnection with local resources and agro-ecological conditions has detrimental effects on communities' natural and social assets, affecting people engaged in agriculture, "the hand that feed us" (Editorial Nature Food, 2020), contributing to the intensification of migration and significant losses of biomass and food. Moreover, during the pandemic, labor shortages occurred as a consequence of lockdowns, and the social and human costs of increasingly opaque food chains were unveiled (Ceccarelli, 2020).

Furthermore, to cope with a continuously growing world population, and the expected demand for a 70% increase in global food production by 2050, strategies for a sustainable intensification of food biomass production must be implemented, strategies which also bear in mind the impact of unsustainable and unhealthy diets.

Finally, COVID-19 has exposed cities – which already host more than half of the global population and consume 75% of food produced globally – to serious challenges in terms of food supply, security, safety and sustainability. Lockdowns and restrictive measures have increased the cost of and limited access to food, in particular quality food, for most people. Food distribution networks have exposed the most vulnerable and marginalized groups of the population (e.g. children, women, informal workers, the elderly) to old and new forms of vulnerabilities, such as recourse to poor diets (FAO, 2020). A healthy diet costs about five times more than a high starch diet, a fact that is particularly alarming not only for regions such as sub-Saharan Africa and Southern Asia, but also for Europe and Northern America (FAO, 2020).

Therefore, a resilient food system must guarantee sufficient, appropriate and accessible food for all and everywhere, promoting the development of local specificities with shorter and transparent supply chains and site-specific, sustainable and safe intensification of production, avoiding farming practices that negatively impact on soil fertility and biodiversity and contrasting desertification (Webb et al., 2020) as well as the acidification of seas and oceans, which negatively affects global seafood production.

This model would valorize the quality of labor and employment and empower communities, leaving no one behind, thus also helping to mitigate the effects of and need for migration. Tailored capacity-building and joint responsible research and innovation actions are required for achieving such objectives.

These are all key challenges for the G20 and non-G20 states alike, including developing countries that need to sustainably increase their domestic production of safe and nutritious foods, thus diminishing their dependence on developed countries and creating new internal business and social opportunities which may help to achieve the SDGs of UN's Agenda 2030.



PROPOSAL

The authors recommend, as part of an integrated and holistic approach, a) developing *more resilient food systems* based on more efficient and sustainable primary production, food processing and distribution, *integrated in the territory*, and b) identifying alternative sources of food biomass (terrestrial and aquatic), while recovering and exploiting marginal areas for the production of plant biomass for animal breeding and aquaculture.

The authors underline the importance of promoting *innovation in agriculture* by the adoption of appropriate disease-resistant cultivars, biotechnologically improved crops and agronomic practices and digitalization (precision farming), allowing the effective, sustainable and differentiated use of local cultures and traditions, for the production of high-quality raw materials and food certified for territoriality and traceability. In particular, sustainable and precision agriculture, linked with efficient transformation and delivery pathways, will contribute to reducing the environmental footprint of the value chains, soil degradation and nutrient depletion, safeguarding aquifers, preventing food safety hazards and waste, and providing safe, healthy and nutritious food. Such an integrated food production system has to be well integrated in the territory, while also safeguarding different cultures, to have shorter and more circular supply chains. At the same time, lesser dependence on the production of a single crop would enrich local biodiversity, give higher yields and an increased year-to-year stability of the total national harvest of all combined crops (Renard and Tilman, 2019), with higher sustainability and resilience of the production chain quality and product specificity. Thus, current production, based on only a few commodities manufactured in large amounts (and distributed far from the locality, with consequent logistical and sustainability issues) should be flanked by a more diverse local ones from local crop species and/or crop groups to increase the year-to-year stability of national total annual harvest, leading to a diversification of the food supplied and reducing the risk of crop failures. This could be achieved only by a holistic vision combining environmental, social and cultural aspects of food production, promoting typical specific local products at the global level.

Moreover, *aquaculture should be promoted* as a potentially highly efficient system for integrating the production of foods and in particular of proteins to counteract the global protein deficiency (Napier et al., 2020). Projections indicate that aquaculture in the Mediterranean Sea could grow by more than 100% by 2030 with an increase of the sector's total (direct and indirect) value of 5 billion euros and about 10,000 additional jobs. At the global level, current sea food production could increase by 36–74% by 2050 – that is, 12–25% of all animal food proteins needed to feed 9.8 billion people by 2050 (Costello et al., 2020). Furthermore, lesser dependence on a few species of fish, especially if bred on a global level, can favor local biodiversity and generate greater annual stability of production, avoiding negative spill-over effects on water ecosystems (Belton et al., 2020).

Moreover, to promote the transformation of agricultural production systems, increase the efficient use of resources and the traceability and to guarantee the quality of production and products, the authors identify a *need to increase the digitalization of the system by introducing greater use of big data and artificial intelligence (AI)*. Digitalization may also foreshadow an advanced logistics, based on AI management approaches, that allows the



synergic territorial networking of production, surpluses and production waste (“physical internet” of raw materials, products and waste). AI also facilitates the monitoring of natural resources, reducing the isolation of inland areas and counteracting the abandonment phenomena. Further, the digitalization and complete traceability of the systems will enable more effective responses to emergencies in the future, based on a solid predictive capacity and a transition from a reactive to a proactive strategy, increasing the overall resilience of the food system.

Finally, to redesign our food systems it is mandatory to *ensure the efficient interconnection of primary production, biomass processing, food delivery and byproduct/waste reuse and valorization, at the global and local levels*. Sustainable and appropriate intensification goes hand in hand with the creation of more circular food supply chains and economies. The integration of the agri-food chain and bio-based industry, in line with EU and the Italian Bioeconomy strategy, can lead to the valorization of by-products and waste of the whole food chain through the cascading production of food ingredients, feeds, biobased chemicals, materials and fuels of interest for the pharmaceutical, cosmetic, textile and chemical industry along with digestate and compost for soil regeneration.

Building on the FAO and UNEP (UNEP, 2021) indexes, the Italian G20 Presidency should also *promote a strong global commitment to improve national and local metrics to target, measure and reduce food losses and waste* in line with UN Agenda 2030 related targets.

Minimizing losses and waste in food systems throughout the entire supply chain can be achieved by a) introducing digitalization and big data management in precision and sustainable agriculture (e.g. blue agriculture, conservative and intensive agriculture, sod sowing, use of biostimulants to reduce synthetic chemical fertilization); b) adopting cultivars with enhanced resistance to abiotic stresses and pests/diseases, developed on the base of fast breeding techniques as well as synthetic biology; c) sustainable livestock breeding and management; d) more efficient processing, and more sustainable packaging and supply chain logistics; e) recycling technologies for soil nutrients, especially phosphate and nitrate, organic matter, water and energy; f) exploiting unavoidable by-products and food that has passed its expiry date with the production of food ingredients and novel food products; g) implement sustainable preservation processes and promote the natural cycles of soil regeneration to counteract the accumulation of organic and inorganic pollutants.

To address SDG 2 (End hunger, achieve food security and improved nutrition and promote sustainable agriculture), 8 (Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all) and 12 (Ensure sustainable consumption and production patterns), the T20 Task Force 5 stresses the importance of sustainable supply chains that are interconnected, efficient, resilient to climate change and linked to the local resources. Sustainable and effective local food chains should be empowered through tailored greener public procurement. This can ensure benefits to the G20 countries that need high-quality and sustainable food production, but also to other countries that need to increase their domestic production and reduce their dependence on other countries and create new internal business and social opportunities, to regenerate their lands, reduce desertification and deforestation, and increase cooperation between the public and private sectors to create a sustainable and inclusive transition.



The authors recommend global strategies and initiatives to strengthen the role of local authorities in promoting more sustainable and innovative food supply chains. Cities can use normative, marketing and fiscal incentives to support shorter value chains, educate consumers to eat more seasonal and healthy foods through education campaigns, and school education programs, the adoption of more balanced diet in public and private cafeteria and canteens and strengthening urban–rural linkages, promoting local markets and the purchase of fresh products from local farmers, also via food distribution/delivery options. Feeding people in cities will require a radical food revolution and governance transformation, based on a new vision of food supply chains from farm to fork, which strongly integrates urban, peri-urban and rural environments. To sustain this transition, the G20 should work closely with city networks and alliances such as the Milan Urban Food Policy Pact (MUFPP), the C40, the EURO CITIES and the 100 Resilient cities. These networks are playing a fundamental role in enabling cities to share experiences and best practice, foster debate on sustainable diets and pave the way for replicating successful food policies in other regions of the world. However, several cities still lack adequate data and the human and financial resources needed to design, implement and monitor urban food policies using existing frameworks and datasets. Therefore, the G20 Presidency has to work in close synergy with other existing frameworks and organizations (e.g. the OECD, UN-Habitat) to launch a permanent G20 Urban Food Platform in the proposed G20 policy dialogue platform. The platform should serve as a tool for promoting the sharing of knowledge and best practice and new methodologies to map urban metabolism and monitor performances and integrate agriculture into climate change mitigation measures. The G20 Urban Food Platform should draw on the preliminary results of existing frameworks developed by the FAO (e.g. the Urban Monitoring Framework) and the OECD to raise the resources needed to launch pilot projects on the ground. This is essential to foster city-to-city diplomacy on food security, establish triangular partnerships and develop science-based, context-specific indicators to help local authorities design and assess effective food policies on the ground.

The authors recommend that access to healthy and more nutritious foods has to run in parallel with educating consumers about safe and sustainable consumption. Better knowledge of the relationship between diet and lifestyle is essential in the prevention of diet-related diseases and to help address the challenge of the triple burden of malnutrition affecting people who are hungry, those lacking sufficient nutrients and those who are overweight or obese (Ingram 2020). Nutrition security, which encompasses food security as well as nutrient content, may be achieved by taking into account not only the quantity but also the quality of food needed to meet dietary needs as well as food preferences, and has to be supported by an environment of adequate sanitation, health services and care, allowing for a healthy and active lifestyle.

In this context, sustainable food labels can play a crucial role in fostering more informed food decisions, as can tackling the social and environmental costs embedded in long and opaque food supply chains. Such labels could contain information about respect of the environment and circular agronomic practices, the amount of essential nutrients present, the water and carbon footprint of the food supply chains – all of which would enable consumers to make conscious choices about their food consumption. Furthermore, policy approaches for addressing hunger and food insecurity are highly recommended.



The authors propose mandatory human rights and environmental due diligence regulations in supply chains to ensure that agri-food businesses comply with OECD guidelines and have the right tools and procedures to demonstrate that their operations do not cause harm to workers or the environment. We also need to actively include the voices of smallholders, Indigenous peoples, women and youth in the action planning.

In conclusion, the authors emphasize the need to build food systems that are resilient to shocks and unforeseen disturbances through collective actions along the entire agri-food chain, from primary production to food delivery systems, by means of wide-ranging partnerships, including policy-makers (Bakalis et al., 2020). A redesign of our food systems with the development of enhanced, robust agri-food chains will require a delicate balance between current, “global” food supply practices and other, “local” trends.

New digital technologies may usher in a new era in which the purchase and distribution of food exploits online shopping, food delivery and new small distribution centers in urban and rural areas, thus democratizing our food product choices and including new products from smaller manufacturers. The new sensing, automation and digital technologies developed –

e-commerce apps for ordering and delivering, online and smartphone apps to allow more informed consumer choice, preferences and practices and to increase opportunities for data acquisition and handling – may help in guiding the production and distribution of safe and nutritious food for all, leaving no one behind.

This would also result in the valorization of the role of family farmers, small producers, small and medium enterprises (SMEs) and their ability to access the market, thus widening consumers’ food choice opportunities. It is imperative to support SMEs with more effective government investments in agriculture, infrastructure and transport, policies and built-in procurement practices that support nutrient-rich foods sourced both locally and regionally, to protect and support all food system workers (also adopting flexibility of labor sourcing and timing, diversifying logistics), as well as to strengthen the design and modalities of social protection programmes and stable public procurement (Carducci 2021). Within this scenario, close ties to the land strengthen resilience by deepening the sense of community required for timely changes of production models and thus efficiency and quality along the supply chain, which are prerequisites for overcoming any emergency. At the same time, this may support innovation within the food industry, as it would become fundamental to identify the essential ingredients of the product formulation and recipes with the highest probability of shortage in case of a pandemic(s) or other unforeseen threatening event and develop strategies for manufacturing products with alternative ingredients (ideally locally available) or modified recipes that can fit with production lines without investments.

An interdisciplinary approach and combined synergic action by food producers, academic and research communities, policy-makers and consumers are recommended in order to re-design our future resilient food system, which calls for tailored capacity-building and joint research and innovation actions.



REFERENCES

Bakalis S, et al. (2020). Perspectives from CO+RE: How COVID-19 changed our food systems and food security paradigms. *Current Research in Food Science*, 3:166–172

Belton B, et al. (2020). Farming fish in the sea will not nourish the world. *Nature Communications*, 11, Art n. 5804

Carducci B, Keats EC, Ruel M, Haddad L, Osendarp SJM, Bhutta ZA (2021). Food systems, diets and nutrition in the wake of COVID-19. *Nature Food*, 2:68–70

Ceccarelli G, Fattibene D. (2020). Do we need an EU ethical food label? How a mix of measures could help clean up Europe's agri-food system. *Open Society Foundation Ed.*, 1-46

Costello C, et al. (2020). The future of food from the sea. *Nature*, 588:95–100

Editorial *Nature Food*, (Chief Editor, Anna Mullen) (2020). The hands that feed us. *Nature Food*, 1: 93. <https://doi.org/10.1038/s43016-020-0044-7>

FAO (Food and Agriculture Organization) (2020). Cities and local governments at the forefront in building inclusive and resilient food systems. www.fao.org/3/cb0407en/CB0407EN.pdf, accessed 15 July 2021

Ingram J (2020). Nutrition security is more than food security. *Nature*, 1:2. <https://doi.org/10.1038/s43016-019-0002-4>

Napier JA, Haslam RP, Olsen RE, Tocher DR, Betancor MB (2020) Agriculture can help aquaculture become greener. *Nature Food*, 1:680–683

Renard D, Tilman D (2019). National food production stabilized by crop diversity. *Nature*, 571:257–260

Torero M (2020). Without food, there can be no exit from the pandemic. *Nature*, 580:588–589

UNEP (United Nations Environment Programme) (2021). Food Waste Index Report 2021. <https://wedocs.unep.org/bitstream/handle/20.500.11822/35280/FoodWaste.pdf>, accessed 15 July 2021

Webb P, Benton TG, Beddington J, Flynn D, Kelly NM, Thomas SM (2020). The urgency of food system transformation is now irrefutable. *Nature Food*, 1:584–585

Appendix

EU Bioeconomy strategy. <https://op.europa.eu/en/publication-detail/-/publication/eda-ce3e3-e189-11e8-b690-01aa75ed71a1/language-en/format-PDF/source-149755478>, accessed 15 July 2021

Italian Bioeconomy strategy. <http://cnbbsv.palazzochigi.it/en/areas-of-work/bioeconomy/>, accessed 15 July 2021



ABOUT THE AUTHORS



Patrizia Brigidi University of Bologna

Brigidi is Full Professor of “Fermentation Biotechnology” at the School of Medicine of the University of Bologna. She has been Member of the Presidency Council and Chief of the Scientific Committee of the National Technological Cluster A.Food (2017-2020) and in 2021 she has been re-elected to the Presidency Council



Gabriele Canali Catholic University of the Sacred Heart of Piacenza

Canali (Ph.D) is associate professor (with qualification as full professor) of Agri-food Economics and Policy at the Catholic University of Piacenza (Italy). From January 2016 to March 2018 he has been Advisor of the Italian Ministry of Agriculture for Agricultural Economic Policies. He founded (2009) the Economic Research Centre on Sustainable agri-food chains and, on July 2017, Vsafe s.r.l., a spin-off of his University.



Arnaldo Dossena University of Parma

Dossena was Professor of Organic and Bioorganic Chemistry and currently Lecturer at the University of Parma. He was Director of the Interdepartmental Centre for Measurements and Director of the Department of Food Science of the same University, Coordinator of the Agro-Food Platform of the of High Technology Network and Vice President of the Agri-Food Clust-ER of the Emilia Romagna Region.



Gianni Galaverna University of Parma

Galaverna is Full Professor of Food Chemistry at the Department of Food and Drug of the University of Parma. He is member of the Scientific Committee of the Italian National Technological Agri-Food Cluster (CIAN), National Delegate of the Italian Chemical Society within the Food Chemistry Division of Eu-ChemS (EU), coordinator of the International and Interuniversity MSc in Food Safety and Food Risk Management and the co-Chair of the World Food R&I Forum.



Daniele Fattibene Istituto Affari Internazionali (IAI)

Fattibene is researcher at the Istituto Affari Internazionali. He has been working for many years as a researcher and consultant for several think tanks, Non Governmental Organizations, and Universities such as Save the Children, OXFAM and the Rome Business School. He is currently coordinating as Consultant for UNCTAD research project dealing with the role of G20 in promoting the voice of Least Developed Countries in its policy agenda.



Fabio Fava University of Bologna

Fava is Full Professor of Bioeconomy at the School of Engineering of the University of Bologna. He is the scientific Coordinator of the Italian Bioeconomy strategies and IAP, the Chair of the “National Bioeconomy Coordination Board” at the Presidency of Council of Ministers (Rome) and the Chair of the World Food R&I Forum.



Erasmo Neviani University of Parma

Neviani is Full Professor of Agricultural Microbiology at the University of Parma. From 2013 to 2015 he has been President of the Italian Society of Agriculture, Environmental and Food Microbiology (SIMTREA). Actually he is Coordinator of the “Food Project” of University of Parma, and President of Italian Board of International Dairy Federation (IDF).



Fabrizio Storti University of Parma

Storti is full professor of structural geology at the Department of Chemistry, Life Sciences and Environmental Sustainability, University of Parma, Italy. He is member of the Academia Europaea and of the European Science Foundation College of External Reviewers. He was member of the ERC panel PE10 from 2012 to 2018 and member of the European Geosciences Union Council from 2009 to 2016.