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Sustainable Development Goals and Agro-food System: the Case Study of the Future Food Institute

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Abstract

In 2015, the United Nations Member States adopted the 2030 Agenda, which sets out a 15-year plan to achieve 17 different Sustainable Development Goals (SDGs). The aim is at "ending poverty, protecting the planet and ensuring prosperity for all", providing a holistic and multidimensional view on development. To implement the SDGs, policies need to take account of the interactions among them, minimizing the negative and enhancing the positive ones. This is necessary for avoiding cross-cutting impacts and diverging results, how it happened so far. It is time to search for a key element, transversal to the whole SDGs, able to create interactions and to avoid the aforementioned trade-offs. The agro-food system can play this role, specifically for food security, nutritional and cultural diversity, ecological long-term stability, and climate-smart systems. According to these premises, this paper aims at presenting the case study of the Future Food Institute that developed an open source tool (Food for Earth), still in elaboration phase, in order to model the climate crisis and regenerate the planet, starting from food. This is composed of five innovation areas (Food diplomacy, Circular living, Climate smart ecosystems, Food identity and Prosperity), which involve at different level the 2030 Agenda SDGs, and four action tools (Humana Communitas, Platforms, Models, and Metrics) to analyze and customize them on some specific cases. Food for Earth may be a very important instrument for policymakers, food authorities, food managers, local governments, etc. who are seeking solutions to environmental problems that require behavioral change.

Keywords: *Sustainable Development Goals, Agro-food system, Climate crisis, Circular Economy, Food innovation*

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1. Introduction

The climate change is no longer an intangible concern since its impacts are being felt worldwide. The IPCC (Intergovernmental Panel on Climate Change) gives humanity 10 years to keep the raising of global warming under 1.5 °C. (IPCC, 2018). Right now, climate change is affecting millions of people, thwarting their efforts to escape poverty (Munang et al., 2013) and forcing to move away from their land to continue to survive. Moreover, the high population growth aggravates this situation as it increases the demand for essential resources: water, energy, medicine, materials, and above all food, contributing to generate much more concerns (de Amorim, et al., 2019).

Even if the whole agro-food system contributes between 25-30% of global greenhouse gas emissions (Ritchie, 2020; IPCC, 2019; Poore and Nemecek, 2018), it has great potential to offer emissions efficiency gains, absolute reductions and carbon sinks, while supporting resilience-building and socio-economic development (FAO, 2018). It represents, indeed, a major driver of climate change, changes in land use, depletion of freshwater resources, and pollution of aquatic and terrestrial ecosystems through excessive nitrogen and phosphorus inputs. Thus, it is necessary to uptake innovative technology, practices, and farming systems for meeting global greenhouse gas mitigation and targets and simultaneity for allowing a sustainable increase of food production (Smith and Lampkin, 2019).

In this context, in 2015, the United Nations Member States adopted the 2030 Agenda, which sets out a 15-year plan to achieve 17 different Sustainable Development Goals (SDGs and their relative 169 targets). The aim is at "ending poverty, protecting the Planet and ensuring prosperity for all" (United Nations, 2015), providing a holistic and multidimensional view on development. Notwithstanding the early efforts, most of the 169 targets have not been achieved yet. The main concern is the fact that recent trends along several dimensions with cross-cutting impacts, across the entire 2030 Agenda, are not even moving in the right direction (Independent Group of Scientists appointed by the Secretary-General, 2019). Thus, it is necessary to think and approach differently, searching for a key element, transversal to the whole SDGs, able to create interactions and to limit the cross-cutting impacts.

The food systems and agriculture are surely transversal to the whole SDGs framework, as also recognized by the European Commission (EC) that unveiled in May 2020 its "Farm to Fork Strategy", for addressing

comprehensively the challenges of sustainable food systems and recognizing the inextricable links among health of people, societies and the planet.
According to these premises, the present paper aims at presenting the case study of the Future Food Institute (FFI), an Italian non-profit organization that developed an open source tool, called *Food for Earth*. The idea is to model the climate crisis and regenerate the planet, searching besides to limit the negative interactions and create the positive ones among SDGs.

2. Problem

2.1 Cross-cutting impacts across the entire 2030 Agenda

Despite the initial efforts, the world is not on track for achieving most of the 169 targets that comprise the SDGs. Specifically, four of them are not moving in the right direction, presenting negative trends: rising inequalities (SDG n. 10), climate change (SDG n. 13), biodiversity loss (SDG n. 15) and increasing amounts of waste from human activity (SDG n. 12). Recent analysis, indeed, suggested that these negative trends could cause tipping points with dramatic and irreversible changes for society (Independent Group of Scientists appointed by the Secretary-General, 2019). Thus, even if the 2030 Agenda should be treated as a unified whole, it is very important to identify what interactions occur among the SDGs, their nature, and what the resulting implications for policy- and decision-making (Nilsson et al., 2018). The acknowledgment of these connections could prevent diverging results and allow policy makers to be able in planning pathways in order to minimize these negative effects and improve the positive ones. In this context, the academic community has been playing a fundamental role in providing an additional knowledge on the SDGs' interactions, contributing recently with numerous studies (Bennich et al., 2020). For instance, van Vuuren et al. (2015) revealed diverse pathways in order to reach these goals simultaneously, requiring substantial transformations in the energy and food systems and a comprehensive approach that should develop a wider strategy to meet the SDGs by planning near-term actions. Nilsson et al. (2016) highlighted that no one specified exactly how goals depend on each other and thus which are the interactions both negative and positive. If policymakers ignore the overlaps and just start trying to tick off targets one by one, they risk perverse results. In this sense, they propose a seven-point scale of SDGs' interactions (see 'Goals scoring') to organize evidence and support decision-making about national priorities. Additionally, Pradhan, et al. (2017), using official SDG indicator data for 227 countries, systematized the identification of these synergies and trade-offs. Specifically, positive and negative correlations between indicator pairs

allowed for the identification of particular global patterns. SDG 1 (No poverty) has synergistic connections with most of the other goals, whereas SDG 12 (Responsible consumption and production) is the goal most commonly associated with trade-offs. Similarly, Moyer & Bohl (2019) identified some alternative pathways to human development for achieving SDG targets: technology, lifestyle change, and decentralized governance. They showed that, among the different scenario, technology is the most successful in contradiction of the reduced consumption or secondary education, sanitation, and electricity. According to the previous premises, it is necessary to think and approach in a different way, in search of a key element, transversal to all the SDGs, capable of creating interactions and limiting transversal impacts. The agro-food system should play this role as already showed by some recent research models.

2.2 The Agro-food system and SDGs

A first study model, called "the wedding cake", was elaborated in 2016 by the Stockholm Resilience Center. It shows the wide spectrum of possible goals that can be achieved regarding the biosphere, society, and economy, through actions connected to food. Thus, it placed food as a connection for all the SDGs, moving away from an anthropocentric approach to an ecocentric one (Stockholm Resilience Centre, 2016). This means that all SDGs are directly or indirectly linked to sustainable and healthy food. Indeed, hitting the target of halving food waste would also help to achieve the SDG 1 targets on poverty (less waste equals greater economies for farmers, businesses and families) and SDG 2 on hunger (less waste, more food), as well as to many other targets regarding life on land and underwater and the climate. However, these advances depend on developments in other spheres: innovation, education, strong institutions and partnerships (Stockholm Resilience Center, 2016).
This model was re-elaborated by TEEB (The Economics of Ecosystems and Biodiversity) - a global initiative that aims at mainstreaming the values of biodiversity and ecosystem services into decision-making at all levels. According to TEEB, the Stockholm model is a necessary but not sufficient condition to achieve social objectives (such as SDG 1 on poverty and SDG 10 on reduced inequalities) and economic ones (such as SDG 8 on good jobs and economic growth). Thus, their SDG wedding cake, focusing on the agro-food system, renames the spheres as in Planet, People, Justice, Dignity, and Prosperity (TEEB, 2019) (Figure 1). Thus, the agriculture and food systems interact through a complex range of multilayer mechanisms with all SDGs. These interactions operate through climate systems, markets and policies, implying potential compromises or managing risks among different goals.

The FFI, i.e. the case study of this research, adopted this latter model, from which a toolbox, called *Food for Earth*, was developed in order to model the climate crisis and regenerate the planet, just starting from food.

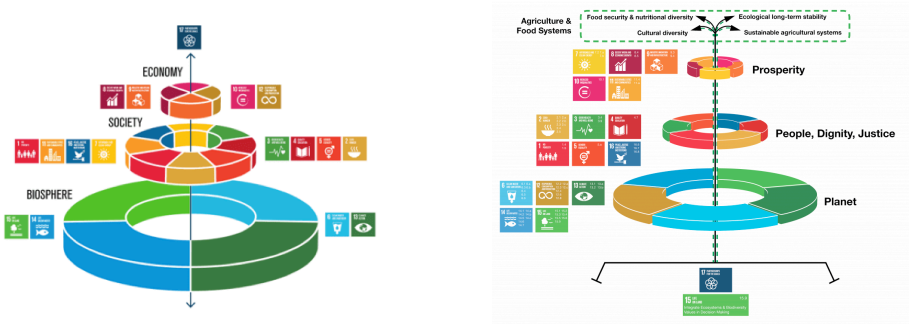

Figure 1. Sustainability models based on food
Source: Stockholm Resilience Center (2016); TEEB (2019)

3. Aims of the research

In the light of the preceding statement, the aim of this research is to present a new sustainability model, based on the transversal role of the agro-food system among SDGs, able to create some positive interactions and limit the negative ones specifically for food security, nutritional and cultural diversity, long-term ecological stability and smart climate eco-systems. This study could enrich the academic literature in this field, reporting a new and multidisciplinary approach born from the concrete experience of a non - profit organization (The FFI) acting at the international level with enterprises, private and public research institutions, experts and scientists, individuals and organizations.

4. Research Methods

4.1. Methodology

In this paper, a brief qualitative analysis has been used to develop a summary of the most representative sustainable models applied to SDGs and linked to the agro-food system. Additionally, an empirical analysis has been carried out thanks to the direct involvement of two members (Dr. Sara Roversi (founder of FFI) and Dr. Claudia Laricchia (Head of Institutional Relations and Global Strategic Partnerships, FFI) of the case study, acting as co-authors of this paper. This allowed to receive data directly experienced by them. Thus, the elaboration of the toolbox is the result based on their real professional

experience, supported also by the academic researches as reported in the Food for Earth document.

4.2 Case study

The Future Food Institute is a non – profit organization, born in Bologna (Italy) in 2013 as a center of excellence for food intelligence and a training platform for change-makers, climate shapers and future leaders. Over the time, it has become the core of a wider food innovation ecosystem that has included different living labs around the world. The mission of this new inclusive network and inspirational platform is to make exponential positive change, in order to sustainably improve life on Earth, through education and innovation in the global food systems, in an entrepreneurial way. The network involves: Future Farm (Ravenna - Italy), a 70-hectare farm that becomes a playground for AgTech startups; Future Food Living Lab (Bologna - Italy), a laboratory dealing in food innovation that welcomes hundreds people every day. It offers traditional food, healthy food, and a service to the community that stimulates critical thinking and participation by all; Future Food Americas Inc. (San Francisco), the American headquarters; Future Food China (Shanghai), the Chinese headquarters of the group at the Center of Excellence, UNIDO ITPO Shanghai; and Future Food Kyobashi Living Lab (Tokyo), the Japanese FF Hub. The network's driven approach is to use examples of life and of lives, capable of inspiring virtuous behaviors. Recently, the FFI has launched an initiative, called "Good after covid-19", connecting people, entrepreneurs, experts, scientists, to intercept the small positive signs for the future, to try to understand that scenario will leave this current emergency situation, in line with the Farm to Fork Strategy of the EC.

5. Findings

5.1. Food for Earth

As already aforementioned, the FFI has developed the *Food for Earth,* an open source toolbox for modeling the climate crisis and regenerate the planet. Indeed, the current post-industrial and globalized society has been revealing both the complexity of the food system, and the consequences that its inefficiency may generate on a local, national, international scale, from an environmental, social and economic point of view. It should be respected the strict interconnection among all natural ecosystems at the decision level, requiring multilevel, multisectorial and multidisciplinary perspectives. Therefore, the *Food for Earth*, catching this issue, offers a different approach to manage the inefficiencies of the agro-food system and its connections with

natural ecosystems. Today, in addition to providing universal tools capable of supporting the interpretation of the present, the toolbox is being transformed into a real "compass" to support companies in capturing and analyzing the signs of a positive future on which they can invest. For its development, database and sources of information were derived by both a top-down and bottom up approach. The former refers to documents published by FAO and academic scholars, quality interview with experts of important organizations and relative big data. The second concerns activity of open innovation of FFI with national and international enterprises. Additionally, two phases were crucial for its improvement: a) co-design within international training experiences; and b) validation and involvement of stakeholders. The first one took place during three summer schools, organized in collaboration with FAO in 2019. These focused on the three places where human being has more modified the natural ecosystem and, therefore, need to intervene for rebalancing the relationship between Human being/Planet. These are cities (Climate Smart Cities, New York, July 2019), rural agricultural areas (Climate Smart Farms, Tokyo, August 2019) and, oceans and seas (Climate Smart Oceans, Iceland, September 2019). The second phase, started in September 2019, has been involving public and private partners, scientists, individuals and organizations. A first version of toolbox was presented, together with the Delegation of the European Union to the United Nations, on September 27 2019 at the 74th UN General Assembly and Week for Future, the demonstration of young people for the climate. It is composed of five areas of innovation, which correspond to some of the 2030 Agenda's SDGs, and four tools to analyze and customize them on some specific cases.

5.2. Innovation areas and tools

Food diplomacy refers to the use of a country's food resources to influence global food markets and to influence international political and economic relations beyond the food market. However, it is also a fundamental discipline for the management of access to safe food and water, and of the impacts that environmental catastrophes are generating on agriculture. *Circular living* is an innovative approach aimed at eliminating waste through continuous resource management. By focusing on increasing efficiency, waste outputs are converted into useful inputs, minimizing the loss of resources. *Climate-smart ecosystems* are a smart climate approach that facilitates adaptation design and mitigation strategies, moving from an intensive approach to a low environmental impact one. *Food identity* provides a representation of the richness and cultural diversity existing in a city's food and social landscape. The interaction of different food identities determines the general culture of the places where the local

community resides. *Prosperity* is not isolated from financial gain but it includes critical elements such as emotional, physical, mental and cultural prosperity. The understanding of prosperity must change and develop to include all the necessary facets. In this new integrated approach to prosperity, it is necessary to rethink the indicators and generators of well-being and determine how food and nutrition can act as a tool to create new prosperity. All the innovation areas are linked to some action tools necessary to analyze and customize them on some specific cases. The FFI identified: *humana communitas* as an entire community keeping diversity as a core value, which influences life on the Planet; *platforms* as emerging tool enable to activate and facilitate a positive change; new organizational and regenerating *models* to replicate positive results and make impact exponential; new *metrics* (indexes and data) to measure the impacts deriving from the innovation areas (Figure 2).

Figure 2. Food for Earth
Source: our elaboration

6. Conclusions

For tackling multiple challenges that humankind is facing, policies need to take account of the interactions among SDGs, because these latter may cause diverging results. Therefore, it is necessary to develop pathways that minimize negative interactions and enhance positive ones. FFI recognized this problem and proposed the *Food for Earth* toolbox. Among the innovation areas, identified by the FFI, surely food diplomacy and prosperity involved the majority of SDGs (8 and 7 respectively). Conversely, both climate-smart ecosystems and circular living involve few SDGs (respectively 5 and 4). Two are the SDGs more shared among innovations areas: no. 2 (Zero Hunger) and

no. 11 (Sustainable and smart communities). This indicates the important role of urban centers and the agro-food sector for hunger and poverty eradication as well as for preserving the communities identities, strengthening the ties that generate social cohesion. FFI already took actions to test the toolbox at different layers: education, for advancing knowledge, and community, for creating awareness. Currently, there are different actions for different people, such as: the Food Innovation Digital Executive Program to empower and advance the careers of forward thinking professionals already active in the food industry; the digital boot camps and hands-on experience supported by a series of master classes, open conversations, hackathons and FAO e-learning courses, addressed to students, trainers, change-makers and food industry, leaders. The idea is to sensitive, for example, food companies in improving their performance in terms of environmental impact (ecological long-term stability); local institutions in undertaking resilience actions with respect to climate change through the use of ecosystem services (climate smart systems); chefs, and consequently the catering sector, in reducing food waste (food security). Finally, in this global health emergency, caused by the Covid-19 pandemic, it is crucial to rethink to a new model of the agro-food system. It must be focused more on the human, cultural, environmental and socio-political dimension for facing the problem post this pandemic, as the FFI proposed with its toolbox.

References

[1] Bennich, T., Weitz, N., Carlsen, H. (2020). Deciphering the scientific literature on SDG interactions: A review and reading guide. *Science of the Total Environment,* 728 (2020) 138405.

[2] de Amorim W. S., Deggau A. B., do Livramento Gonalves G., da Silva Neiva S., Prasath A. R., Salgueirinho J.B.., de Andrade Guerra O. (2019). Urban challenges and opportunities to promote sustainable food security through smart cities and the 4th industrial revolution. *Land Use Policy* 87 (2019) 104065.

[3] FAO, (2018). *FAO's work on climate change*, Available at: http://www.fao.org/3/CA2607EN/ca2607en.pdf

[4] Independent Group of Scientists appointed by the Secretary-General (2019). *Global Sustainable Development Report 2019: The Future is Now – Science for Achieving Sustainable Development*, United Nations (Eds), New York.

[5] IPCC (2018). *Global warming of 1.5 °C.* Available at: https://report.ipcc.ch/sr15/pdf/sr15_spm_final.pdf

[6] IPCC (2019). *Climate Change and Land, Chapter 5: Food Security.* Available at: https://www.ipcc.ch/site/assets/uploads/2019/08/2f.-Chapter-5_FINAL.pdf

[7] Moyer, J. D., Bohl, D. K. (2019). Alternative pathways to human development: Assessing trade-offs and synergies in achieving the Sustainable Development Goals. *Futures,* 105 (2019) 199–210.

[8] Munang R., Thiaw I., Alverson K., Mumba M., Li, J., Rivington M. (2013). Climate change and Ecosystem-based Adaptation: a new pragmatic approach to buffering climate change impacts. *Current Opinion in Environmental Sustainability* 5 (1), 67–71.

[9] Nilsson M., Griggs D., Visbeck M. (2016). Policy: map the interactions between Sustainable Development Goals. *Nature* 534, 320-322.

[10] Nilsson, M., Chisholm, E., Griggs, D., Howden-Chapman, P., McCollum, D., Messerli, P., Neumann, B., Stevance, A. S., Visbeck, M., Stafford-Smith, M. (2018). Mapping interaction between the sustainable development goals: lessons learned and ways forward. *Sustainability Science* 13, 1489–1503.

[11] Poore J., Nemecek T. (2018). Reducing food's environmental impacts through producers and consumers. *Science*, 360 (6392). 987-992.

[12] Pradhan P., Costa L., Rybski D., Lucht W., Kropp J.P. (2017). A systematic study of Sustainable Development Goal (SDG) interactions. *Earth's Future,* 5 (11), 1169–1179.

[13] Ritchie, H. (2020). Food Waste Is Responsible for 6% of Global Greenhouse Gas Emissions. March 18. Available at: https://ourworldindata.org/food-waste-emissions

[14] Smith L. G., Lampkin N. H. (2019). Greener farming: managing carbon and nitrogen cycles to reduce greenhouse gas emissions from agriculture, Chapter 19. In T. Letcher (Eds) *Managing global warming – An interface of Technology and Human Issues*, (pp. 553– 577) Academics press, Elsevier, Editors.

[15] Stockholm Resilience Center (2016). How food connects all the SDGs. Available at: https://www.stockholmresilience.org/research/research-news/2016-06-14-how-food-connects-all-the-sdgs.html

[16] TEEB (2019). *The 2030 Agenda is indivisible, we cannot cherry pick the SDGs*. Available at: http://www.teebweb.org/sdg-agrifood/annex-2/

[17] United Nations General Assembly (2015). *Transforming our world: The 2030 agenda for sustainable development*. Available at: http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E

[18] van Vuuren D.P., Kok M., Lucas P.L., Prins A.G., Alkemade R., van den Berg M., Bouwman L., van der Esch S., Jeuken M., Kram T. (2015). Pathways to achieve a set of ambitious global sustainability objectives by 2050: explorations using the IMAGE integrated assessment model. *Technological Forecasting and Social Change* 98, 303–323.