One planet
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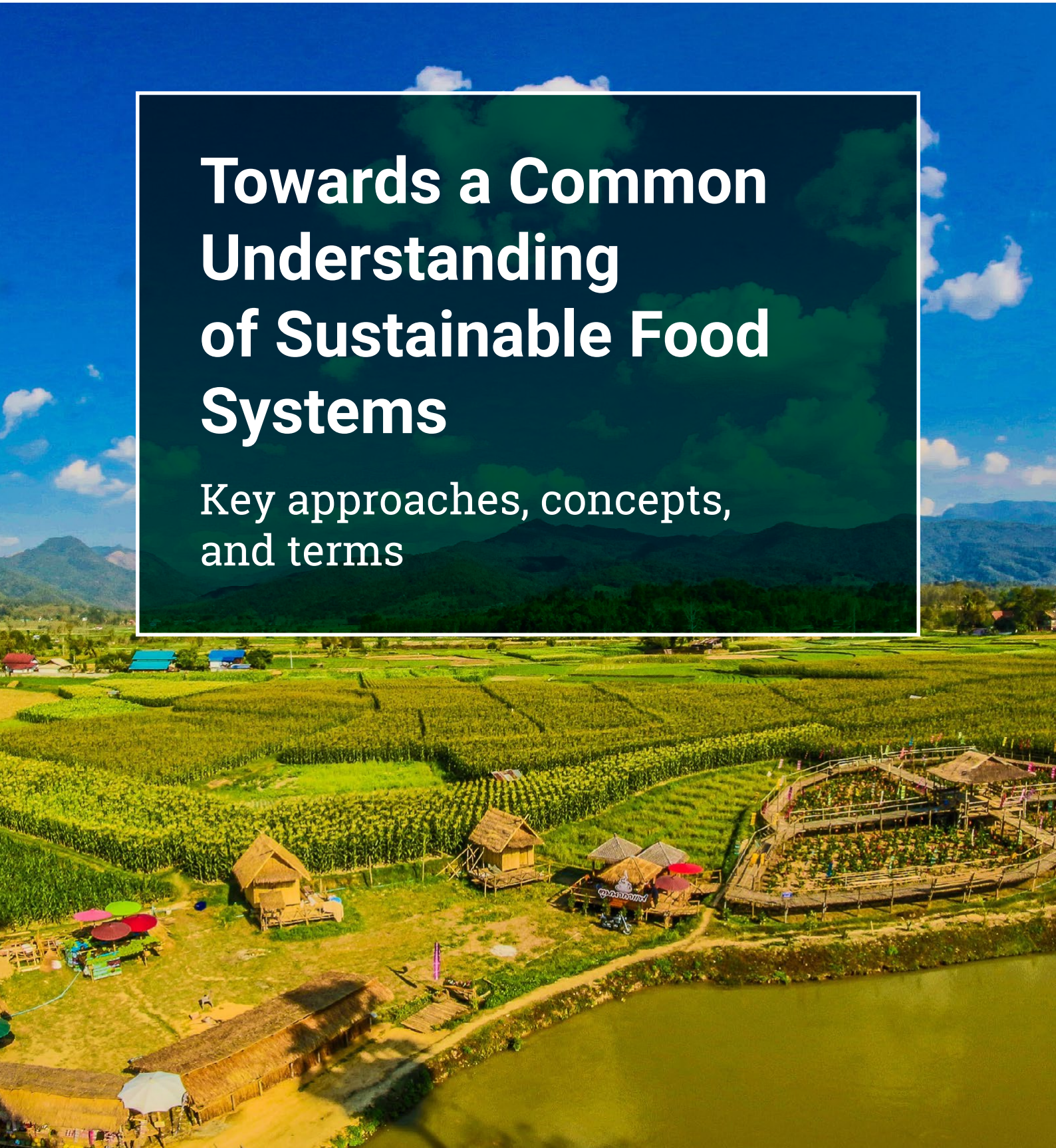
Sustainable Food Systems

Towards a Common Understanding of Sustainable Food Systems

Key approaches, concepts, and terms



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List of Abbreviations

CFS	Committee on World Food Security
Collaborative FS Framework	Collaborative Framework for Food Systems Transformation
ECOSOC	United Nations Economic and Social Council
FAO	Food and Agriculture Organization of the United Nations
FBDGs	Food Based Dietary Guidelines
FLW	Food losses and waste
FSN	Food security and nutrition
GHG	Greenhouse gas
GIs	Geographical indications
IARC	International Agency for Research on Cancer
IES	Incentives for ecosystem services
IPM	Integrated pest management
HLPE	High Level Panel of Experts on Food Security and Nutrition
HLPF	High-level Political Forum on Sustainable Development
HortIMPACT	Kenya Market-led Horticulture Project
MAC	Multi-stakeholder Advisory Committee
NCDs	Non-communicable diseases
OECD	Organisation for Economic Co-operation and Development
PES	Payments for ecosystem services
RAI Principles	Principles for Responsible Investment in Agriculture and Food Systems
RAS	Rural advisory services
Rio+20 Conference	UN Conference on Sustainable Development in Rio de Janeiro
SCP	Sustainable consumption and production
SDGs	Sustainable Development Goals
SFS	Sustainable food systems
SFS Programme	Sustainable Food Systems Programme of the One Planet network
SFVC	Sustainable food value chain
UN Environment	United Nations Environment Programme
VBFCs	Values-based food chains
WHO	World Health Organization
10YFP	10-Year Framework of Programmes on Sustainable Consumption and Production

Contents

1. Introduction: Rationale and Background

Today's challenges are complex and therefore require the adoption of a system-based approach. In addition, they call for innovative partnerships and multi-stakeholder collaboration.

Photo: Tom Fisk / Pexels

1.1 Rationale

Current food systems around the world are straining under the weight of multiple challenges, while at the same time contributing significantly toward several of those challenges. Hunger and malnutrition are again on the rise, up from about 620 million undernourished people in 2014 to almost 690 million in 2019,[1] and from 563 million obese adults in 2012 to 672 million in 2016.[2] At the same time, land and soils, as well as biodiversity and ecosystems, are increasingly being degraded.

Local and native crops, many of which are climate resilient and adapted to the local conditions and cultural context, are rapidly disappearing. Nearly 90 percent of the world's marine fish stocks are fully exploited, overexploited, or depleted.[3] Greenhouse gas (GHG) emissions from the food value chain, including agriculture-related deforestation, farming, processing, packaging, transportation, and waste, account for about

1 FAO, IFAD, UNICEF, WFP, and WHO. 2020. The State of Food Security and Nutrition in the World 2020. Transforming Food Systems for Affordable Healthy Diets. Rome, FAO.
According to The State of Food Security and Nutrition in the World, much of the recent increase in food insecurity can be attributed to the greater number of conflicts, often exacerbated by climate-related shocks. Even in some peaceful settings, food security has deteriorated as a result of economic slowdowns threatening access to food for the poor. Furthermore, while the number of stunted children has declined over the past years, this rate of reduction is too slow to achieve the 2030 target of a 50-percent reduction in the number of stunted children. Only 44 percent of infants under six months are exclusively breastfed, which is far from the 2030 target of 70 percent. In 2019, 6.9 percent of children were wasted, and this must be reduced by more than half to reach the target of less than 3 percent by 2030. In 2018, anemia affected 33 percent of women of reproductive age – more than double the 2030 target of 15 percent.

2 FAO, IFAD, UNICEF, WFP, and WHO. 2019. The State of Food Security and Nutrition in the World 2019. Safeguarding against economic slowdowns and downturns. Rome, FAO.

3 WEF. 2018. 90% of fish stocks are used up – fisheries subsidies must stop emptying the ocean. Available at: https://www.weforum.org/agenda/2018/07/fish-stocks-are-used-up-fisheries-subsidies-must-stop/ (accessed 25 June 2020).

Photo: ©FAO/Giulio Napolitano

half of all human GHG emissions.[4] Approximately one-third of all food produced is lost or wasted rather than consumed, with a significant environmental footprint in terms of the water and land used. In turn, climate change is increasing the risk of weather-related natural disasters jeopardizing livelihoods, food security, clean water, and sanitary conditions, which are essential for good nutrition. Meanwhile, the global population is projected to grow to 9.7 billion by 2050, adding another 2 billion people to be fed while increasing pressures on natural resources – hence the need for the adoption of more sustainable consumption and production patterns.[5] Urbanization is a key structuring feature of current societies and raises new challenges. People in many parts of the world are shifting toward diets that are based on ultra-processed foods and that rely primarily on animal proteins. These developments raise questions linked to unbalanced diets with low nutritional value and high levels of salt, sugars, saturated fat, and trans fats. Unhealthy diets have become a main risk for human health, leading to a rise in non-communicable diseases (NCDs) like diabetes and obesity, and translating into increasing public health costs.[6] NCDs are now the main cause of mortality worldwide and are responsible for 70 percent of global deaths, equivalent to 40 million people.[7]

The COVID-19 crisis has added to these challenges and laid bare some of the structural deficiencies at their core, thereby calling further attention to the urgent need for transformation toward food systems that are sustainable and resilient.[8]

While fighting global poverty, food insecurity, and malnutrition are moral imperatives, promoting sustainability is a sine qua non for food security and nutrition. If our natural resources are depleted and our ecosystems collapse, it will no longer be possible to produce and consume food. To avoid such a situation, we need to transform our food systems and pursue the achievement of the Sustainable Development Goals (SDGs), which call for major transformations in order to end hunger, achieve food security, and improve nutrition in a sustainable way by 2030.[9]

The challenges described above are multidimensional and interrelated, and therefore require the adoption of a system-based approach that takes into account the interrelations between the different elements across the food system, rather than focusing only on one or a limited subset of food system components in isolation.[10] In addition, they call for multi-stakeholder collaboration, including public-private and other forms of innovative partnerships. This conclusion is echoed by the Ministerial Declaration of the 2018 High-level Political Forum on

4 TEEB. 2018. TEEB for Agriculture & Food: Scientific and Economic Foundations. UN Environment, Geneva.

5 FAO. 2017a. The future of food and agriculture – Trends and challenges. FAO, Rome.

6 Obesity has become a global pandemic, with rates at least doubling in more than 70 countries since 1980. Many countries now face a "double burden," where undernutrition coexists with overnutrition, because our food systems and lifestyles are enabling these trends (SOFI 2018). The annual cost of unhealthy diets has been estimated to range from €3 to €148 per capita (Joy Candari *et al.* 2017), with a recent study finding that unhealthy diets cost the United States USD 50 billion per year (Veiga Jardim *et al.* 2019).

7 WHO. 2018. Noncommunicable diseases. Available at: http://www.who.int/mediacentre/factsheets/fs355/en/ (accessed 25 June 2020).

8 A more detailed discussion of the links between food systems and COVID-19 is contained in: United Nations. 2020. Policy Brief: The Impact of COVID-19 on Food Security and Nutrition.

9 Adapted from: FAO. 2018a. Sustainable food systems - Concept and framework. FAO, Rome.

10 This is in some ways similar to the nexus approach, which focuses its analysis mainly on the interlinkages between energy, water, and food; however it goes beyond that, taking into account a broader range of policy areas. For more information on the nexus approach, see, for example: FAO. 2014a. The Water-Energy-Food-Nexus. Rome, FAO.

Photo: ©FAO/Riccardo De Luca

Sustainable Development (HLPF), which calls "upon all stakeholders to adopt a sustainable food systems approach […]", as well as a series of further recent decisions from different UN bodies in the environment, agriculture, and health policy areas.[11]

The Sustainable Food Systems Approach described in this publication looks at food systems through a truly holistic lens. It is a tool that can support governments and other food systems actors in creating policy environments that are conducive to more sustainable food systems. Thereby, the Sustainable Food Systems Approach substantiates the potential for food systems transformation of the nature and scale needed to meet global challenges and achieve the SDGs. The coherent implementation of globally agreed frameworks and commitments, such as the 2030 Agenda for Sustainable Development, the UN Framework Convention on Climate Change, the Convention on Biological Diversity, and the Second International Conference on Nutrition, can be a useful step in this direction.

Over the past years, there has been increased attention to the issue of sustainable food systems, in recognition of their centrality to many objectives. Diverse actors from around the world, including from different government agencies, the business and scientific communities, and international and civil society organizations, with different backgrounds and mission areas, are part of the ever-expanding conversation.

While this increased attention is a welcome indication of the growing global awareness for the need to transition toward more sustainable food systems, there is a potentially confusing and counterproductive diversity of views and language being used among countries and other stakeholders about what sustainable food systems are and how they can be achieved.

This publication puts into context related concepts and approaches that can be used to address the multiple challenges described above, with the aim to facilitate a common understanding. This common understanding is expected to support a more rapid and robust transition to more sustainable food systems at local, national, regional, and global levels.

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11 ECOSOC. 2018. Ministerial declaration of the 2018 high-level political forum on sustainable development, convened under the auspices of the Economic and Social Council, on the theme "Transformation towards sustainable and resilient societies."
UN Environment. 2019a. Ministerial declaration of the United Nations Environment Assembly at its fourth session. Innovative solutions for environmental challenges and sustainable consumption and production.
FAO. 2019a. Report of the Conference of FAO.
United Nations. 2019. Resolution adopted by the General Assembly on 19 December 2019. Agriculture development, food security and nutrition.

Photo: ©Pep Bonet/NOOR for FAO

1.2 Background on the One Planet Network's Sustainable Food Systems Programme

This publication is a product of the One Planet network's Sustainable Food Systems (SFS) Programme – a global multi-stakeholder partnership with a network of currently more than 180 food system actors worldwide.[12] The SFS Programme's goal is to accelerate the shift toward sustainable food systems, through advocacy and conceptual as well as action-oriented work implemented by collaborative initiatives at global, regional,[13] and national/local levels. To achieve its goal, the SFS promotes a holistic, system-based approach to more integrated and inclusive policy making, in support of the transition to sustainable food systems. The initiatives of the SFS Programme promote awareness-raising activities, strengthen capacities and enabling environments, and increase access to information, knowledge, and tools.[14]

The SFS Programme was launched in 2015, and is currently being co-led by Costa Rica, Switzerland, and WWF.[15] The co-leads jointly steer and coordinate the implementation of the SFS Programme, with strategic discussions and decisions by a Multi-stakeholder Advisory Committee (MAC).[16]

The SFS Programme is part of the broader One Planet network, which formed to implement the United Nations 10-Year Framework of Programmes on Sustainable Consumption and Production (10YFP). The 10YFP was adopted at the UN Conference on Sustainable Development in Rio de Janeiro (Rio+20 Conference) in 2012.[17]

The implementation of the 10YFP is enshrined in Target 12.1 of the 2030 Agenda for Sustainable Development. Operationally, the SFS Programme reports through the

12 Status: 31 March 2020

13 For the purposes of this publication, the word "regional" refers to the supra-national level.

14 Adapted from: Mulet Solon *et al.* 2018. The One Planet Sustainable Food Systems (SFS) Programme as a Multi-stakeholder Platform for a Systemic Approach. In: Sustainable Diets: Linking Nutrition and Food Systems. Burlingame and Dernini (Eds.). CABI Publishers, Oxfordshire, UK.

15 Status: 31 March 2020. From 2015 to 2019, the co-leadership was composed of South Africa, Switzerland, Hivos, and WWF.

16 SFS Programme. 2017a. Sustainable Food Systems Programme (SFS Programme) of the 10-Year Framework of Programmes on Sustainable Consumption and Production (10YFP). Terms of Reference (ToR). Available at: http://www.scpclearinghouse.org/sites/default/files/10yfp_sfsp_terms_of_reference_tor_-_editable_v31oct2017.docx (accessed 25 June 2020).

17 United Nations. 2012. Resolution adopted by the General Assembly on 27 July 2012. The future we want.

10YFP Secretariat to the UN Economic and Social Council and HLPF.[18] As noted in the 2018 HLPF Ministerial Declaration, the One Planet network serves as "an important implementation mechanism for Sustainable Development Goal 12."[19]

In its early inception phase, the SFS Programme solicited expert input through an online open public consultation about key actions and topics related to building sustainable food systems. It also carried out a comprehensive mapping exercise of ongoing projects of key players in relation to sustainable food systems. Based on this analysis, the SFS Programme identified the following focus themes:[20]

- Sustainable diets;
- Sustainability along all food value chains;
- Reduction of food losses and waste; and
- Resilient, inclusive, and diverse food production systems.

The SFS Programme views these as key leverage points to promote the transformation toward more sustainable food systems. While their respective importance can vary depending on the socio-economic context of any given country, they are a part of any food system, and together they address all food system activities and outcomes.[21]

1.3 Intended Use, Structure, and Scope of this Publication

The objective of this publication is to facilitate knowledge and promote a common understanding of key approaches, concepts, and terms related to sustainable food systems among a broad range of relevant stakeholders, globally. The ambition is for the publication to become a reference document for anyone working toward more sustainable consumption and production patterns in the area of food and agriculture. It is part of the "SFS Toolbox," which also includes a Collaborative Framework for Food Systems

Photo: August de Richelieu / Pexels

Transformation, a set of case studies, and an online learning course. While this publication provides the nomenclature and theoretical background in relation to sustainable food systems, the other components focus on practical ways to improve food systems.

The publication is intended as a living document that will be reviewed as the science and knowledge around food systems evolve. The inclusion of any specific term does not imply endorsement by the individual members of the SFS Programme, nor should there be any implication that a sustainable food system must include all the concepts described here.

The publication is structured in two main parts: the first (→ Chapter 2 / page 11) focuses on the sustainable food systems concept, approach, and main strategies for transformation to more sustainable food systems. The second part (→ Chapter 3 / page 26) contains a glossary with definitions of terms that are of relevance to sustainable food systems, along with a discussion of some of the terms that are either central to the SFS Programme or closely related to the Sustainable Food Systems Approach.

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18 For more information on the governance structure of the 10YFP, see: UN Environment. 2014. Guidance document on programme development and implementation for the Ten Year Framework of Programmes on Sustainable Consumption and Production (10YFP). Available at: https://www.oneplanetnetwork.org/sites/default/files/10yfp-guidance-programmedev.pdf (accessed 25 June 2020).

19 ECOSOC. 2018. *Op. cit.*, para. 26.
However, the development of sustainable food systems is not only central to achieving SDG12 on responsible production and consumption, it also contributes significantly to poverty reduction (SDG1), ending hunger, achieving food security and improved nutrition (SDG2), improving health and well-being (SDG3), and promoting decent work and employment (SDG8), among others.

20 These four themes are in addition to "Local, national, and regional multi-stakeholder platforms," which is the fifth "focus theme" of the SFS Programme, and discussed in Box 3.

21 For more information on the SFS Programme's focus themes, please refer to → Box 2 / page 17.

2. Sustainable Food Systems: Concept, Systems Approach, and Strategies

This chapter focuses on examining the complexity and scope of the concept of sustainable food systems and introduces the notion of a Sustainable Food Systems Approach.

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This chapter focuses on examining the complexity and scope of the concept of sustainable food systems and introduces the notion of a Sustainable Food Systems Approach. It concludes with an overview of some of the main strategies for achieving the transformation to more sustainable food systems.

2.1 The Concept of Sustainable Food Systems

The One Planet network's (10YFP) SFS Programme was developed based on the definitions of food system and sustainable food system that were proposed by the High Level Panel of Experts on Food Security and Nutrition (HLPE) of the Committee on World Food Security (CFS) in 2014.[22] According to these definitions, a "food system gathers all the elements (environment, people, inputs, processes, infrastructures, institutions, etc.) and activities that relate to the production, processing, distribution, preparation and consumption of food, and the outputs of these activities, including socio-economic and environmental outcomes." A sustainable food system (SFS) is a "food system that ensures food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition of future generations are not compromised."[23]

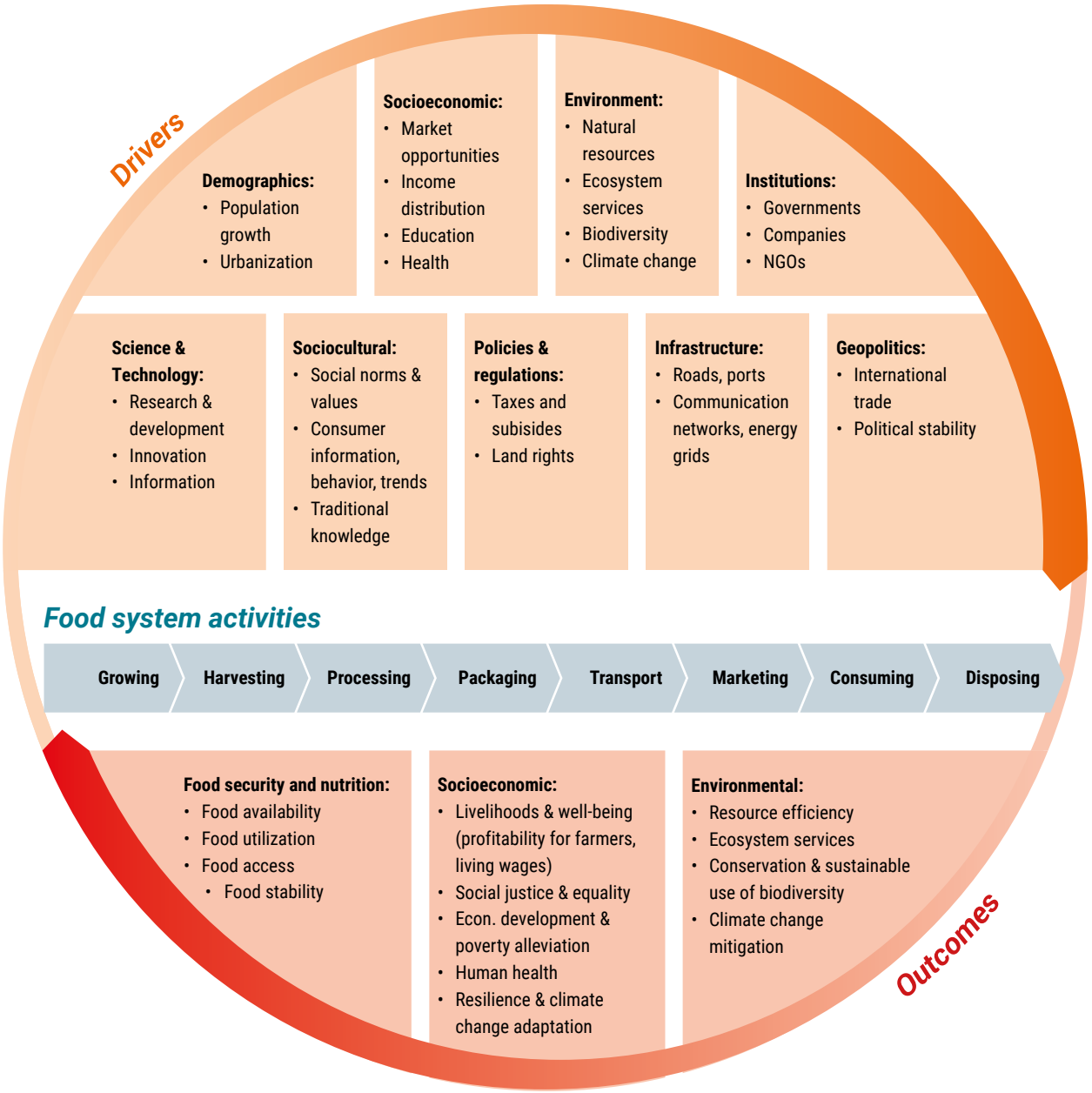
It is important to note that the food system elements mentioned in this definition are not exhaustive, and that many others (e.g., finance, technology, or regulations) could be included.

Similarly, additional activities could be added. Many

22 FAO-UN Environment. 2014. Agri-Food Task Force on Sustainable Consumption and Production. Fifth meeting. Summary report, p. 5. Available at: http://www.fao.org/fileadmin/templates/ags/docs/SFCP/Activities/Report_of_the_5th_Meeting_of_the_Agri-food_Task_Force_on_SCP.pdf (accessed 25 June 2020).

23 HLPE. 2014a. Food losses and waste in the context of sustainable food systems. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security. Rome.

Figure 1: An illustration of food systems elements, drivers, activities and outcomes (adapted from CIAT)[24]



24 Adapted from CIAT. Found in: UN Environment/SFS Programme. 2019. Collaborative Framework for Food Systems Transformation, p. 12.

would argue that recycling or disposal, for example, should also be understood as food system activities. Alternative designations for food system activities could also be used, such as "growing and harvesting" – or "fishing and capturing" in the case of fisheries – instead of "production," for example. These food system activities should be seen as umbrella terms for further "sub-activities," such as plant and animal breeding and input provision, which are both crucial to food production, and stocking, refrigeration, and marketing, which could be understood as part of the broader distribution process.

Finally, the definition's socio-economic and environmental outcomes cover a series of more specific outputs, with human health, for example, as an important component of the socio-economic outcomes cluster. Figure 1 illustrates a variety of the main elements, activities, and outcomes of food systems.

This broad understanding of the definitions proposed by the HLPE acknowledges that the absence of an explicit reference to certain aspects therein does not necessarily imply that these are not part of a sustainable food system.

Such a broad understanding would also imply that the term sustainability considers both future and current generations, as suggested by the reference to "all" in the above definition of sustainable food systems: to avoid compromising the economic, social, and environmental basis to generate food security and nutrition of future generations, a sustainable food system must also guarantee these bases for present generations. This understanding also recognizes the importance of meeting all three bases of sustainability: economic (sustainable food systems are profitable throughout, generating income and livelihoods); social (have broad-based benefits for society, such as health and nutrition); and environmental (have a positive or neutral impact on the natural environment, within planetary boundaries).[25] And finally, this understanding recognizes that the above definition implies that sustainable food systems must also be resilient to external shocks, such as extreme weather events caused by climate change, financial crises, or epidemics.

In a nutshell: In a sustainable food system, all people would at all times eat sufficient safe, healthy, and nutritious diets, which are produced and consumed within planetary boundaries, while all producers are able to make decent livelihoods.

A key element of the HLPE definition of a food system is that it describes a system that is more than a linear linking of the individual stages of the food value chain, from production to processing, distribution, preparation, and consumption. Instead, food systems incorporate a web of all of the elements and activities that relate to these stages, as well as their socio-economic and environmental impacts. This can be visualized as a feedback-loop mechanism, with a series of food system elements that impact on the outcomes of food system activities, while the food system activities and their outcomes, in turn, have an effect on the elements that act as drivers in the food system.[26] For example, natural resources such as soil, water, and biodiversity – both terrestrial and aquatic[27] – form the basis of all food consumption and production, while food consumption and production patterns impact on the natural resource base, e.g. through pollution and waste. Feedback can be positive or negative, impacting socio-economic outcomes (e.g., small-holder farmers' socio-economic situation, poverty, employment generation, and income), environmental health (e.g., forest conservation/degradation, more/less pollution, etc.), and food security and nutrition (e.g., safe and healthy food and diets, access to food, food prices, etc.).[28] This also implies that the level of performance in terms of sustainability of any food system is conditioned by its respective social, economic, and environmental (e.g., arid areas vs. temperate areas) context.

The simplified food systems illustration in Figure 1 shows that the food and agriculture sector[29] exists within a complex web of activities, outcomes, and drivers.[30] For example, in addition to the natural resource base and the activities related to producing and consuming food, food systems are shaped by the social norms and the culture in which those activities are embedded and which influence dietary preferences. Moreover, food systems include a multitude of actors who influence the food sector, both indirectly and directly, including consumers and producers, processors, retailers, governments, NGOs, agriculture and health officers, teachers, etc., each representing a different set of interests. In addition, different types of institutions, regulations, subsidies, and laws further influence everyday performance and outcomes of food systems.[31]

Figure 1 serves an illustrative purpose and is not meant

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25 An alternative way to illustrate the three dimensions of sustainable development, implying that economies and societies are seen as embedded parts of the biosphere, has been proposed by the Stockholm Resilience Centre. The illustration is contained in → Annex 1 / page 67.

26 An illustration of such a feedback loop mechanism can be found in → Annex 2 / page 68.

27 Today aquaculture and capture fisheries directly employ over 180 million people, supporting the livelihoods of 8 percent of the world's population. See: FAO. 2019b. Aquatic Genetic Resources - A valuable and unexplored reserve of biodiversity for food and agriculture. Available at: http://www.fao.org/aquatic-genetic-resources/home/en/ (accessed 25 June 2020).

28 Adapted from: Mulet Solon *et al.* 2018. *Op. cit.*

29 While specific definitions are likely to vary from country to country, the food and agriculture sector typically comprises: i) entities that are engaged in growing crops, raising livestock, and harvesting other animals, as well as timber; ii) entities that transform agricultural products into food and beverage products for intermediate or final consumption (including packaging, etc.); iii) wholesalers and retailers (including transportation, etc.).

30 In addition to Figure 1 of this publication, there are a series of further illustrations of food systems in the annexes, including one proposed by the High Level Panel of Experts on Food Security and Nutrition (HLPE) in its 2017 report "Nutrition and food systems" in → Annex 3 / page 69 and the Food System Wheel put forward by FAO in → Annex 4 / page 70. An even more comprehensive diagram, the Global Food System Map, is contained in → Annex 5 / page 71.

31 Adapted from: UN Environment/SFS Programme. 2019. *Op. cit.*

Box 1: Rede Ecovida, Brazil[32]

The Rede Ecovida in Brazil is a network of agroecological farmers and other stakeholders operating along the production chain, including local NGOs. The network is organized in local food systems, each of which consist of about 30 farmer families that produce, exchange, and consume what they grow. These farmer groups are connected in a network of more than 5,000 families across three states in Southern Brazil, where they exchange their goods across agro-ecological zones, with some farmers specialized in processed products and the farmers themselves taking responsibility for the transportation. Some farmers also sell a portion of their produce to the public procurement program, which organizes the farmers into a national system of competitive sourcing. Finally, since the farmers are certified according to the Brazilian organic standard, they are integrated into national and regional supermarket supply chains, and some coffee producers are also exporting their products to Europe.

32 Niederle *et al.* 2020. Social movements and institutional change in organic food markets: Evidence from Participatory Guarantee Systems in Brazil and France. In: Journal of Rural Studies.

Photo: Og Mpango / Pexels

to be exhaustive. Many of the drivers and outcomes could be further broken down or made more explicit. For example, soil and water efficiency, among others, would fall under resource efficiency; decent work[33] could be mentioned under livelihoods and well-being; and food safety is implicitly covered as a central element of food security.[34] Also, irrigation could be highlighted as an additional sub-component under infrastructure.

As is shown in Figure 1, food systems have a series of outcomes across the different sustainability dimensions.

These outcomes contribute to the achievement of a number of SDGs, as can be seen in → Table 1 / page 15.

Food systems are composed of sub-systems (e.g., farming systems, waste management systems, input supply systems, etc.), and they interact with other systems (e.g., energy systems, trade systems, health systems, financial systems, etc.). Therefore, a structural change in another system, for example a policy promoting more biofuel in the energy system, may also have a significant impact on the food system.[35]

Finally, food systems can cover different geographic and organizational scales and can be driven by a variety of public, private, and civic actors. One example of a food system that runs across different scales is provided in → Box 1 / above. Trade and transportation infrastructure – both at the national level as well as internationally – are playing an increasing role in food systems, as food production and processing often do not geographically coincide with where food is consumed. Climate is another example of a factor interlinked with food systems that is not contained within borders.

The HLPE report on Nutrition and Sustainable Food Systems proposes a typology of three different broad

33 For more information, please refer to the joint FAO and ILO activities in relation to decent rural employment: FAO. FAO-ILO Partnership. Available at: http://www.fao.org/rural-employment/background/partnerships/fao-ilo-partnership/en/ (accessed 25 June 2020).

34 For the definition of food security, please refer to the glossary in → Chapter 3 / page 41.

35 Adapted from: FAO. 2018a. *Op. cit.*

Table 1: Linking Food Systems Outcomes to the SDGs

	Food systems outcomes	Relevant SDG targets
Socio-economic	**Livelihoods and well-being (profitability for farmers, living wages)**	2.3, 2.4, 8.2, 8.5, 10.1
	Social justice and equality (incl. gender)	1.4, 2.5, 4.4, 5.5, 8.5, 8.6, 8.7, 8.8, 10.2, 15.6, 16.7, 17.16
	Economic development and poverty alleviation	1.1, 1.2, 8.1, 9.3
	Human health	2.4, 2.5, 3.4, 3.9, 6.3, 8.8, 12.4
	Resilience and climate change adaptation	1.5, 2.4, 2.5, 11.5, 13.1
Environmental	**Resource efficiency**	2.4, 3.9, 6.3, 6.4, 6.5, 7.3, 8.4, 9.4, 12.2, 12.3, 12.4, 12.5, 14.1
	Ecosystem services	2.4, 6.6, 12.2, 14.5, 15.1, 15.2, 15.3, 15.4
	Conservation and sustainable use of biodiversity	2.4, 2.5, 11.4, 12.2, 14.4, 15.4, 15.5
	Climate change mitigation	2.4, 6.6, 12.2, 12.3, 15.2
Food security and nutrition	**Food availability**	2.1, 2.2, 2.3, 2.4, 2.5, 3.4, 12.2, 12.3, 14.4[36], 15.3
	Food utilization	2.1, 2.2, 3.4, 12.3
	Food access	2.1, 2.2, 3.4
	Food stability	2.1, 2.2, 2.3, 2.4, 2.5, 3.4

36 To read more about the importance of sustainable fisheries and aquaculture for food security and nutrition, please refer to: HLPE. 2014b. Sustainable fisheries and aquaculture for food and nutrition. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security. Rome.

types of food systems – traditional food systems, modern food systems, and mixed food systems – each with their own specific challenges. While acknowledging that food systems exist on a continuum, and multiple food systems can co-exist within any given country, the HLPE report suggests that this typology is useful to illustrate the complexity of food systems, and may support context-specific policy making.

In traditional food systems, people generally live in rural areas. Dietary diversity can be low, partly because people rely mainly on locally grown, fished, herded, hunted, or gathered foods and often lack appropriate infrastructure to access distant markets. Stunting rates may therefore be high, along with the incidence of micronutrient deficiencies, impacting people's immune systems and making them more susceptible to infectious diseases. In mixed food systems, there is a higher proportion of people living in peri-urban and urban areas and having greater incomes than in traditional food systems. People still have access to local wet markets, but also to supermarkets that have a wide variety of processed, packaged, and fresh foods all year long. In these systems, while people tend to have access to sufficient calories and proteins, there generally is increased intake of saturated and trans fats and sugar, with dietary changes often resulting in an increasing incidence of overweight and obese people, and thus an increase in non-communicable diseases (NCDs) such as cardiovascular disease and diabetes. In modern food systems, a higher proportion of people tend to live in urban areas and have greater incomes and an overwhelming number of food choices all year long that tend to be of better quality. This abundance of food, especially highly processed food, is associated with increased risk of being overweight or obese and NCDs.[37]

While the HLPE typology is a useful illustration, the complexities increase further once other socio-economic and environmental considerations are added to the equation. Indeed, the scope and complexity of food systems can lead to significant challenges in the pursuit of sustainability, as well as to possible trade-offs. For instance, eating a certain type of food may be nutritious from a purely human health point of view, but the way it is produced, processed, and/or distributed may have more or fewer negative impacts on the environment; likewise, food can only be considered as being produced sustainably if it provides a decent income to those who produce it.

2.2 The Sustainable Food Systems Approach

According to the SFS Programme, the "Sustainable Food Systems Approach considers food systems in their totality, taking into account the interconnections and trade-offs among the different elements of food systems, as well as their diverse actors, activities, drivers and outcomes. It seeks to simultaneously maximize societal outcomes across environmental, social (incl. health) and economic dimensions."[38]

The Sustainable Food Systems Approach thus considers all relevant causal variables of a problem and all social, environmental, and economic impacts of possible solutions. It investigates underlying causes, as well as possible interlinkages and unforeseen consequences. While there are potential trade-offs between key priorities of food systems, such as inclusive poverty reduction, increased agricultural productivity, improved nutrition, and enhanced environmental sustainability, there are also opportunities to simultaneously accomplish multiple objectives.[39] A Sustainable Food Systems Approach can help identify such trade-offs and synergies. It can help facilitate the coordination needed to manage trade-offs and possibly even turn them into „trade-ons" or synergies, by choosing the right mix of policies and practices. For example, this can lead to the development of nutrition recommendations that – in addition to health aspects – take into account environmental, economic, and social sustainability dimensions.[40] Another example with regard to practices is involving local farming communities in the plant breeding process, which may bring results that are positive in terms of productivity, biodiversity conservation, and climate resilience, as well as nutrition.[41]

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37 Adapted from: HLPE. 2017. Nutrition and food systems. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security. Rome, pp. 35–40.
For further classifications, see also FAO's e-learning course "Sustainable Food Systems: Systems Thinking," at https://elearning.fao.org/course/. The course refers to "alternate food systems" in addition to modern and traditional food systems.

38 UN Environment/SFS Programme. 2019. *Op. cit.*, p. 12.

39 Adapted from: FAO. 2018a. *Op. cit.*

40 UN Environment/SFS Programme. 2019. *Op. cit.*

41 Leakey. 2018. Converting 'trade-offs' to 'trade-ons' for greatly enhanced food security in Africa: multiple environmental, economic and social benefits from 'socially modified crops'. In: Food Security.

Box 2: The SFS Programme and the Sustainable Food Systems Approach

The concept of a Sustainable Food Systems Approach – and the need for it – is embedded in the SFS Programme. The first objective of the SFS Programme is to "raise awareness of the need to shift to more sustainable food systems and to apply a holistic, system-based approach to addressing food security and nutrition." With regard to this approach, the SFS Programme funding document states: "[…] Linkages need to be actively made between food production and consumption, nutritional health and the underlying social-economic, biophysical, cultural and institutional elements that ultimately affect the quantity, quality and affordability of food, as well as health and well-being. Such a Sustainable Food Systems Approach embraces the interconnectedness of all the food-related activities and the environment within which these activities occur […]."[42]

In its early implementation phase, the SFS Programme has identified the following focus themes[43] as main leverage points for its Sustainable Food Systems Approach. They are a part of any food system, and together they can cover all food system activities and outcomes.

Photo: cottonbro / Pexels

Sustainable diets

The concept of sustainable diets takes into account four dimensions: health and nutrition, environment including biodiversity, economy, and socio-cultural factors. Sustainable and healthy diets have co-benefits for the health and well-being of both consumers and producers, as well as for planetary health. A transition to more nutritious and diverse diets is frequently projected to result in reduced GHG emissions, as well as likely reductions in non-communicable diseases.[44] Sustainable diets, such as the traditional Mediterranean diet, the traditional Japanese diet, or the new Nordic diet, that are mainly plant-based dietary patterns provide viable alternatives to diets that rely mainly on animal proteins.

Sustainability along all food value chains

The term "value chain" was coined by Michael Porter[45] as a management tool that could help firms first to identify and then exploit their competitive advantage within an industry, then to "create shared value" among supply chain actors.[46] One way to promote sustainability in the food system along the food value chain is through "green" value chains.

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42 SFS Programme. 2016a. Sustainable Food Systems Programme (SFS Programme). Programme document. Available at: http://www.oneplanetnetwork.org/sites/default/files/10yfp_sfsp_programme_document.pdf (accessed 25 June 2020).

43 These four themes are in addition to "Local, national, and regional multi-stakeholder platforms," which is the fifth "focus theme" of the SFS Programme, and discussed in Box 3.

44 UNSCN. 2017. Sustainable Diets for Healthy People and a Healthy Planet. Rome.
Globally, it is estimated that transitioning to more plant-based diets, in line with WHO recommendations on healthy eating (WHO 2015), guidelines on human energy requirements (WHO 2004), and recommendations by the World Cancer Research Fund (WCRF/AICR, 2007), could reduce global mortality by 6-10 percent and food-related greenhouse gas emissions by 29-70 percent, compared with a reference scenario for 2050 (Springmann *et al.* 2016).

45 Porter. 1985. Competitive advantage: creating and sustaining superior performance. Free Press, New York.

46 Porter and Kramer. 2011. Creating Shared Value. In: Harvard Business Review.

Photo: Jack Sparrow / Pexels

These are value chains where environmental and social indicators are taken into consideration in determining the sustainability of the supply chain.[47] More recently, the concept of *circuit court*[48] or short food supply chain has emerged, where short supply chains are defined as those with few intermediaries between farmers and consumers.[49]

Reduction of food losses and waste

Food loss and waste occurs along all parts of the food value chain, with impacts on food security and natural resources. A number of efforts are aimed at providing guidance on how to measure food loss and waste accurately and systematically. The Food Loss Index, developed under the lead of FAO, focuses on food that is lost early in the supply chain, from harvest to processing, while the Food Waste Index, developed under the lead of UN Environment, focuses on consumer and retail waste. The World Resources Institute's Food Loss and Waste Protocol is a global accounting and reporting standard for quantifying food loss and waste along the food supply chain. Expressing the amount of food loss and waste in terms such as nutritional value or resource use can further catalyze action in ways that volume or weight measures might not.

Resilient, inclusive, and diverse food production systems

Food production systems are vulnerable to disruptions from a wide range of phenomena such as climate variability, extreme weather events and market volatility, pandemics, and civil strife and political instability. As the COVID-19 crisis has shown, the ramifications of disruptions to food production systems can be dire, with impacts on the productivity and stability of agricultural production systems, food security, and household income, and increased uncertainties and risks for producers and consumers. This translates into disruptions in the value chain that may affect an entire global or national food system. Resilience is a key component of a sustainable food system, enabling it to absorb shocks and recover.

For definitions and a more detailed discussion of these terms, please refer to the glossary in → Chapter 3 / page 26.

47 Carter and Rogers. 2008. A framework of sustainable supply chain management: moving toward new theory. In: International Journal of Physical Distribution & Logistics Management.

48 Chiffoleau. 2012. Circuits courts alimentaires, dynamiques relationnelles et lutte contre l'exclusion en agriculture. In: Économie rurale.

49 Santini *et al.*2013. Short Food Supply Chains and Local Food Systems in the EU. A State of Play of their Socio-Economic Characteristics. Luxembourg, European Union.

Photo: rawpixel.com

With a Sustainable Food Systems Approach, sustainability is examined holistically across the food system. This is illustrated in → Figure 2 / page 20. On the economic dimension, sustainability in a food system depends on commercial or fiscal viability of the activities conducted by food system actors or support service providers, taking into account positive as well as negative externalities. It also depends on the distribution of costs and benefits, including economic value-added and livelihoods for all categories of stakeholders: income for producers and workers, taxes for governments, profits for enterprises, and food supply improvements for consumers. On the social dimension, sustainability in a food system depends on the level of equity in the distribution of the economic value-added, including among vulnerable groups categorized by gender, age, race, and so on. Importantly, it depends on the ability of food system activities to contribute to the advancement of important socio-cultural outcomes, such as food security and nutrition, health, traditions, labor conditions, and animal welfare. The social dimension of sustainability in food systems may be conditioned by further factors, such as the degree to which social sustainability builds upon social structures, traditional solidarity mechanisms, and respect for culture and human rights – including the right to adequate food, as well as the level of participation of people and institutions in the system. On the environmental dimension, sustainability is determined by the extent to which food systems are able to function within planetary boundaries, with impacts on the natural environment that are neutral or positive. Key elements to be taken into consideration in this respect include biodiversity, water, soil, animal and plant health, the carbon footprint, water footprint, and land footprint, as well as food loss and waste, and toxicity.[50]

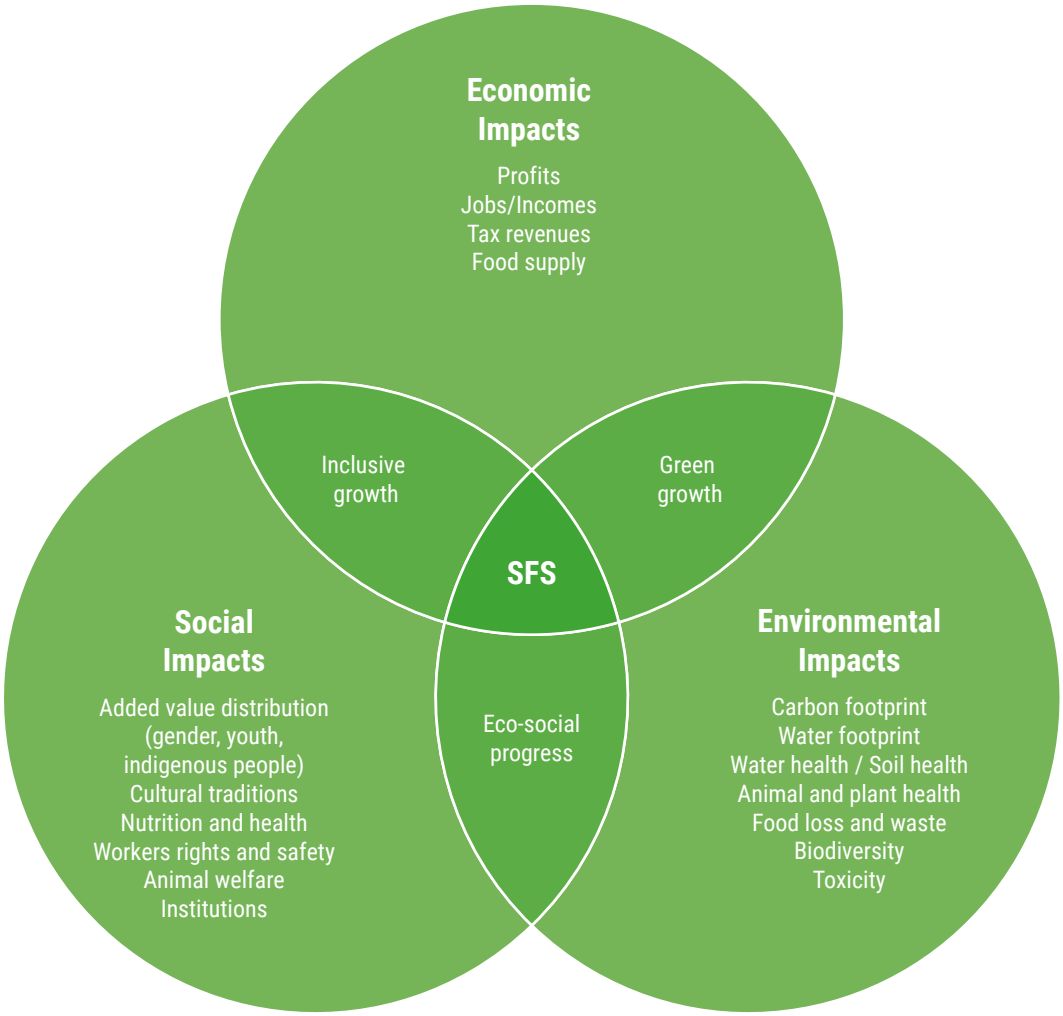
By way of illustration, any proposed measures to address a food system problem (e.g., animal diseases) or to take advantage of a new opportunity (e.g., a new green technology or profitable market) should be assessed against all other dimensions of sustainability to ensure there are no undesirable impacts. This will ensure that all three dimensions are being addressed, in order to achieve an overall positive impact. Such a holistic vision allows us to use potential synergies and to reveal often hidden trade-offs, to ensure that while the targeted impact is positive, the net overall impact on the value-added of the food system activities will also be positive.[51] It is important to note that the impacts listed in Figure 2 are not exhaustive and further examples could be mentioned, for example land footprint under environmental impacts.

In order to assess trade-offs and promote viable solutions to food system challenges, the Sustainable Food Systems Approach is also a multi-stakeholder approach. A multi-stakeholder approach helps ensure an accurate assessment of trade-offs, which is a necessary first step for truly sustainable food systems transformation. Multi-stakeholder councils or roundtables for food system actors can help create spaces that act as environments of experimentation to develop new rules for engagement

50 Adapted from: FAO. 2018a. *Op. cit.*

51 Adapted from: FAO. 2018a. *Idem.*

***Figure 2: Sustainability in Food Systems*[52]**



52 FAO, 2018a. *Op.cit.*, p. 4.

to assess trade-offs and tackle a specific complex problem.[53] The SFS Programme is an example of such a co-owned space at the global level (see → Box 3 / page 21).

In policy terms, a food systems approach should connect elements within various policy agendas – primarily environmental, agricultural, health, trade, and industry – expanding opportunities for any country to achieve sustainability in its food systems.[54] When applied to policy making, the Sustainable Food Systems Approach can bring about more coherent, holistic food systems policies. Ideally, such policies would ensure that sufficient nutritious, sustainable, culturally acceptable, desirable, and affordable food is produced and consumed, while generating decent incomes for producers and other value chain actors, as well as protecting natural resources both domestically and abroad. Moving toward such a policy-enabling environment is a precondition for the transition to more sustainable food systems. This may require a revision of current legal and regulatory frameworks.

53 Waddell *et al.* 2013. Learning and transformative networks to address wicked problems: A GOLDEN invitation. In: International Food and Agribusiness Management Review.

54 Adapted from: UN Environment/SFS Programme. 2019. *Op. cit.*

Box 3: The SFS Programme's Multi-stakeholder Approach[55]

Accelerating the shift toward more sustainable food systems requires a holistic, system-based, and multi-stakeholder approach. The One Planet network's Sustainable Food Systems (SFS) Programme recognizes that overcoming polarization and conventional power dynamics, as well as promoting inclusiveness, are paramount conditions to enhance multi-stakeholder collaboration[56] and contribute to this transformation by building synergies and cooperation among stakeholders. In fact, the Programme itself is composed of a diverse group of stakeholders.

Since its launch in 2015, the SFS Programme's co-leadership has been composed of a group of civil society organizations and governments.[57] In spring 2020, it had gathered a network of over 180 members[58] worldwide, grouped into five stakeholder clusters: government agencies, UN agencies and other intergovernmental organizations, civil society organizations, scientific and technical organizations, and the private sector. The co-lead organizations are supported by a Multi-stakeholder Advisory Committee (MAC) with 23 seats representing all five stakeholder clusters, which makes its decisions by consensus.[59]

By building on the respective strengths as well as existing expertise and activities of the different actors involved, and by promoting new partnerships and synergies, the SFS Programme managed to pool resources and make their use more efficient, to achieve stronger collective impact. Several of its members have joined forces in so-called "core initiatives," which are in themselves multi-stakeholder partnerships acting at different levels (global, regional, national/local).[60]

In spring 2020, the SFS Programme had a portfolio consisting of eight core initiatives and 50 affiliated projects, described on the website and implemented at regional, national, or even subnational levels.

55 Box adapted from: HLPE. 2018. Multi-stakeholder partnerships to finance and improve food security and nutrition in the framework of the 2030 Agenda. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security. Rome; and: Mulet Solon *et al.* 2018. *Op. cit.*

56 CNS-FAO. 2016. Working towards Sustainable Agriculture and Food Systems. Available at: https://www.blw.admin.ch/blw/en/home/international/institutionen/multistakeholder-partnerschaften/cns-fao.html (accessed 25 June 2020).

57 From 2015 to 2019, the co-leads were Hivos, WWF, South Africa, and Switzerland. Since October 2019, the co-leadership is composed of Costa Rica, Switzerland, and WWF.

58 For the SFS Programme's membership, refer to: http://www.scpclearinghouse.org/sustainable-food-system/actors (accessed 25 June 2020).

59 For more information on the governance of the SFS Programme and the respective roles of its different actors, please refer to: SFS Programme. 2017a. *Op. cit.*

60 For an overview of the SFS Programme's core initiatives, refer to: https://www.oneplanetnetwork.org/sustainable-food-system/core-initiatives-sfs-programme (accessed 25 June 2020).

The Collaborative Framework for Food Systems Transformation (hereafter "Collaborative FS Framework") developed within the framework of the SFS Programme aims to engage and strengthen capacities of governments and stakeholders to apply a food systems approach to their policies, programs, and strategies. It recommends key activities across the food system for accelerating the transition to sustainable food systems. Please refer to → Box 4 / page 22 for more information on the Collaborative FS Framework.

2.3 Main Strategies to Promote Sustainable Food Systems

While the Sustainable Food Systems Approach described above elaborates multiple entry points for stakeholders to contribute to the development and implementation of sustainable food systems, the following strategies elaborate organizational and policy approaches to support transformational change to more sustainable food systems.[61]

61 The Sustainable Food Systems Approach as promoted by the SFS Programme makes use of all these strategies, as described in → Box 6 / page 24.

Box 4: The Collaborative Framework for Food Systems Transformation[62]

The Collaborative FS Framework is a practical guide to developing and applying a food systems approach to policy making and implementation. It suggests four actions to build a food systems transformation.

Action 1: Identify an individual or group of food systems champions and build momentum

- Call attention to and advocate for the need to adopt a different approach to food and agriculture policies – a food systems approach.
- Raise awareness and speak at public events to spread the message concerning the key benefits of systemic thinking.
- Organize trainings on a food systems approach.
- Seek buy-in of high-level representatives.

Action 2: Conduct a holistic food systems assessment

- Prepare a diagnosis, based on food systems lenses – i.e., What is the present state of the food system today?
- In a first phase, do not break the assessment into food systems sub-sectors or focus on too narrow a problem.
- The assessment is a basis of evidence for further discussions between stakeholders.
- It provides a foundation for a political agenda and cross-cutting dialogue within the government.
- The assessment will provide an in-depth understanding of the elements, drivers, and outcomes of food systems, identify who are the main actors involved, catalogue existing policies and activities related to food and agriculture, and review potential linkages with existing strategies

Action 3: Initiate a multi-stakeholder process for dialogue and action

- Establish a permanent multi-stakeholder platform.
- Through this type of dialogue, politically sensitive issues that were previously uncomfortable can be addressed.
- Discuss the assessment with the multi-stakeholder group.
- Create a joint vision: discuss areas of priorities, targets, and roles.
- Develop an Action Plan for SFS.
- Promote integration among different food systems policies and domains.
- Link with existing development strategies and (inter) national commitments.

Action 4: Strengthen institutional capacity for food systems governance in the long term

- This action will empower public institutions to manage and guide the management of food systems to long-term outcomes.
- Create a mandated mechanism to improve institutional arrangements and frameworks (agriculture, environment, finance, health, education, etc.).
- Develop a platform where policies, laws, regulations, and programs are continually reviewed, improved, and implemented.
- Define key performance indicators.
- Monitor and review based on lessons learned.

62 UN Environment/SFS Programme. 2019. *Op. cit.*, p. 7.

Multi-stakeholder engagement

Food systems actors currently represent the largest group of natural resource managers in the world. When it comes to sustainability in the system, they are critical in both creating the problems and implementing the solutions. Multidisciplinary collaboration and enhanced dialogue are thus keys to building consensus for change and a joint vision toward sustainable food systems. Through such dialogue, politically sensitive issues that were previously uncomfortable (for example nutrition and livelihoods) can be tackled and consequently become less polarizing. This

type of multi-stakeholder engagement can be promoted through formats such as food systems roundtables, food labs, or food policy councils.[63]

Public-private partnerships

Progression toward sustainable food systems depends on acting toward clear and common goals among all stakeholders. The private sector is a major stakeholder in the transformation to sustainable food systems. Public-private partnerships, in which private business and government enter into cooperative arrangements to leverage their efforts toward a common goal, can therefore play a powerful role. The public and private sectors can collaborate in terms of research and development, infrastructure, and other services.[64]

Education, awareness raising, and capacity building

Establishing a common understanding of goals and sharing knowledge about the practices that lead to achieving them are crucial to improving practices, whether it is in production techniques, consumer choices, or other practices in the food system. Research and experimentation, extension services, school programs, public campaigns, training of government agents and other service providers, and forums for exchange among different stakeholder groups to enable understanding of interdependence, commonality of purpose, and individual roles are vital for mutually supportive, sustained efforts. The second global conference of the SFS Programme identified the promotion of behavioral change and consumer awareness through education and hands-on learning as a priority, with a focus on school-aged children and youth as key agents of change.[65]

Strengthening the policy environment

Policies that protect and steward common goods and resources (such as soil, water, air, mineral resources, biodiversity, energy resources), including by providing suitable incentives to stakeholders, and that increase investment in human development (i.e., health, education, and growth opportunities) can play a powerful role in building more sustainable food systems. Such policies are strengthened when they are accompanied by an assessment of their impacts on different populations and sectors of the economy and an effort is made to address inequalities and account for possible trade-offs. Policies that support pricing in which the true costs and benefits of certain practices are used in market-based transactions can also drive movement toward sustainable

Box 5: Providing Incentives for Food Systems Transformation by Linking Consumer Investments to Production

A key strategy to promote sustainable food systems is to recognize the need to promote a combination of measures to compensate, adjust, and incentivize change. For example, for agricultural producers to adopt more sustainable practices, these need to be integrated in a package of actions that genuinely improves farm management and income. Agriculture producers will only be able to comply with conservation requirements and restoration goals if they can maintain or improve productivity elsewhere on their farms and reduce both pressure on remaining natural ecosystems and the opportunity cost of land for restoration. Similarly, investment in rehabilitation and sustainable management must have an economic return.

But this does not necessarily require much additional investment, as there already are a variety of programs offering incentives for this transformation. These range from policy-driven investments to fulfil mandatory regulations, such as taxes and charges, to private strategies for saving production costs (water-quality protection programs), to opening new markets (certification/standards), to voluntary investments in social and livelihood benefits (corporate social responsibility and NGO investments in social development).

The Sustainable Food Systems Approach allows for linkage of investments from the consumer side – through certification and other strategies for sourcing of sustainable agricultural products and services – to the production side, thereby providing better rewards for producers for the environmental and social benefits that they are generating.

63 Adapted from: UN Environment/SFS Programme. 2019. *Op. cit.*

64 For a review of international experiences of public-private partnerships for agribusiness development, see: FAO. 2016a. Public-private partnerships for agribusiness development. FAO, Rome.

65 SFS Programme. 2019a. 2nd Global Conference of the One Planet (10YFP) Sustainable Food Systems (SFS) Programme. Call to Action. P. 2. Available at: https://docs.wixstatic.com/ugd/491351_4204b7b388e44b57aadb2b24026e5431.pdf (accessed 25 June 2020).

Box 6: How the SFS Programme implements the strategies discussed in Section 2.3 in the context of its Sustainable Food Systems Approach

Multi-stakeholder engagement: The One Planet network's SFS Programme has five stakeholder clusters[66] and is co-led in a multi-stakeholder way by Costa Rica, Switzerland, and WWF.[67] The co-leads are supported by a 20-member Multi-stakeholder Advisory Committee (MAC) that operates by consensus (three of the MAC's 23 available seats are currently unfilled).[68] MAC members are elected by the membership for two years, while the co-leads are elected by the MAC for a mandate of four years. Several members have joined forces in so-called "core initiatives," which are in themselves multi-stakeholder partnerships acting at different levels (global, regional, national).[69] As a contribution toward its objective in relation to "promoting enabling environments that are conducive to sustainable food systems," the SFS Programme stimulates the creation of roundtables to strengthen multi-stakeholder engagement at national and local levels.

Public-private partnerships: The private sector is actively engaged in the SFS Programme's work, both in policy-related discussions and through the implementation of the Programme's project portfolio. For example, Nestlé is co-leading the core initiative "Complementing existing value chain sustainability assessments: Measuring, communicating, and valuing biodiversity in food systems," together with the civil society organization Global Nature Fund and with the active involvement of UN Environment.

Awareness raising and capacity building: Raising awareness about the need for a shift to more sustainable food systems and building capacity for that shift are among the SFS Programme's four main objectives. In the context of the core initiative on food losses and waste,[70] for instance, FAO and UN Environment are running social media campaigns on the need to reduce food losses and waste. On a different level, the social enterprise Foodways Consulting has developed a smartphone app to help Millennials make more sustainable food choices.[71]

Strengthening the policy environment: Contributing toward the SFS Programme's objective of "promoting enabling environments that are conducive to sustainable food systems," the Collaborative FS Framework described in → Box 4 / page 22 provides guidance on how to implement a food systems approach to decision making. It proposes key policy levers, methodologies, tools, and collaborative activities to explore how the transition to sustainable food systems could be accelerated.

Research and innovation: The SFS Programme has a strong research basis, and all the work undertaken is thoroughly underpinned by science. Many leading food and agriculture research and technical institutions are part of the Programme. For example, the University of Michigan and CIAT, through their affiliated project "Entry Points to Advance Transitions towards Sustainable Diets" (EATS), work on generating unique information packages aimed at informing evidence-based, systems-level decision making on sustainable diets, by identifying critical decision-making needs, data gaps, and insights into the policy process at diverse scales.[72]

Metric-based monitoring and evaluation: The SFS Programme and its members report annually on their progress and activities, through the rigorous monitoring and evaluation framework of the One Planet network. The Secretariat of the One Planet network compiles and

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66 The five clusters are: government agencies, UN agencies and other intergovernmental organizations, civil society organizations, scientific and technical organizations, and the private sector.

67 Status: March 31, 2020. From 2015 to 2019, the co-leadership was composed of South Africa, Switzerland, Hivos, and WWF.

68 For the current composition of the SFS Programme MAC see: SFS Programme. 2019b. Actors. Available at: https://www.oneplanetnetwork.org/sustainable-food-systems/actors (accessed 26 June 2020).

69 See Box 3 for a more detailed description of the SFS Programme's multi-stakeholder approach.

70 For more information see: SFS Programme. 2017b. Delivering SDG Target 12.3 on Food Loss and Waste Reduction [CORE]. Available at: http://www.oneplanetnetwork.org/initiative/delivering-sdg-target-123-food-loss-and-waste-reduction-core (accessed 26 June 2020).

71 For more information see: SFS Programme. 2016b. MyFoodways [AFFILIATED]: A smartphone app that helps young adults enjoy healthy and sustainable meals. Available at: http://www.oneplanetnetwork.org/initiative/my-food-skills-affiliated (accessed 26 June 2020).

72 For more information see: CIAT. 2019. Fighting hunger through the mapping of key food systems indicators in the 1000 poorest communes of Vietnam. Available at: https://blog.ciat.cgiar.org/fighting-hunger-through-the-mapping-of-key-food-systems-indicators-in-the-1000-poorest-communes-of-vietnam/ (accessed 26 June 2020).

consolidates the submitted information and produces a narrative report to the attention of the High-level Political Forum on Sustainable Development (HLPF) and the UN Economic and Social Council (ECOSOC).[73]

73 For more information on the One Planet network's annual reporting see: One Planet network. 2019. Reporting progress on SDG 12. Available at: https://www.oneplanetnetwork.org/reporting (accessed 26 June 2020).

food systems. As large customers, governmental entities can influence supply dynamics and activities across the value chain by enacting procurement guidelines that favor sustainably produced goods and services. The City of Copenhagen, for example, due to the implementation of a new public procurement policy with an increased focus on environmental, health, and safety requirements, achieved an 88-percent organic share of public sector meals (offices, schools, kindergartens, etc.) as of August 2016.[74]

Research and innovation

While many solutions already exist and are available for solving a number of society's challenges, these solutions must be further enhanced and new ones need to be devised in order to achieve transformational change. Ongoing investment in and encouragement of innovations and the appropriate precautions involved with overseeing them is one of the animating forces of continual improvement and progress. For example, novel food production approaches, such as new plant breeding techniques, controlled-environment farming, alternative animal feeds, cultured meat, new processing techniques, edible insects, and personalized nutrition, may all contribute to food systems sustainability.[75] However, it is important to note that traditional knowledge remains an important source for innovation, and that innovation can originate from any stakeholder. Furthermore, for full impact, innovative solutions need to be more fully disseminated; such amplification may also need another innovation to make that happen, whether said innovation is technical, technological, social, or political. IPES FOOD has produced a series of scientific reports on innovative approaches and policies for the transition to sustainable food systems.[76]

Photo: ©FAO/Karen Minasyan

Metric-based monitoring and evaluation

The ability to track progress is a fundamental tool for assessing performance and making improvements over time. Different levels of operations, activities, or oversight may require different data collection and focus, but all metrics should have a reasonable degree of compatibility, from the most detailed sets of data collected for individual enterprises or actors up to more macro- or aggregated data sets to measure progress on a societal basis. Monitoring and evaluation using metrics depends on identifying the desired outcomes at any given level. Furthermore, metrics for calculating absolute performance and improvement over time with respect to use of natural or human capital (and corresponding monetization of such – see true cost accounting in the glossary in → Chapter 3 / page 65) can serve as concrete levers for changing practices.

74 Procura+ Network. Copenhagen. Available at: http://www.procuraplus.org/public-authorities/copenhagen/ (accessed 25 June 2020).

75 FAO, WHO, WTO and African Union. 2019. The First FAO/WHO/AU International Food Safety Conference. Novel food production. Available at: http://www.fao.org/3/CA2979EN/ca2979en.pdf (accessed 25 June 2020); and: The Parliamentary Office of Science and Technology. 2015. Novel Food Production. Available at: https://researchbriefings.files.parliament.uk/documents/POST-PN-0499/POST-PN-0499.pdf (accessed 25 June 2020).

76 IPES FOOD. 2020. Reports. Available at: http://www.ipes-food.org/reports/ (accessed 26 June 2020).

3. Terms of Relevance to Sustainable Food Systems: Definitions and Discussion

A common understanding of terms and concepts forms the basis for meaningful dialogue. This glossary intends to help strengthen that understanding.

Photo: ©FAO/Jeanette Van Acker

This chapter contains a list of definitions of terms and concepts that are often used in relation to sustainable food systems. Whenever possible, this glossary makes use of broadly agreed definitions, including definitions coined by relevant inter-governmental organizations and/or other authoritative scientific and/or multi-stakeholder bodies or processes. In cases where commonly used, highly relevant terms did not have a broadly agreed definition, a selection of the leading definitions has been included.

Additional discussion has been added to some of the terms that are either central to the SFS Programme or closely related to the Sustainable Food Systems Approach.

A

Agriculture

"The science or practice of farming, including cultivation of the soil for the growing of crops and the rearing of animals to provide food, wool, and other products." (Lexico)[77]

According to FAO's definition, agriculture also encompasses "horticulture, livestock, fishing and forestry activities, along with forage and milk production." (FAO)[78]

Agro-biodiversity

"Agricultural biodiversity is a broad term that includes all components of biological diversity of relevance to food and agriculture, and all components of biological diversity that constitute the agricultural ecosystems, also named agro-ecosystems: the variety and variability of animals, plants and micro-organisms, at the genetic, species and ecosystem levels, which are necessary to sustain key functions of the agro-ecosystem, its structure and processes.

Agricultural biodiversity is the outcome of the interactions among genetic resources, the environment and the management systems and practices used by farmers. This is the result of both natural selection and human inventive developed over millennia.

The following dimensions of agricultural biodiversity can be identified:

1) *Genetic resources for food and agriculture:*
    - Plant genetic resources, including crops, wild plants harvested and managed for food, trees on farms, pasture and rangeland species,
    - Animal genetic resources, including domesticated animals, wild animals hunted for food, wild and farmed fish and other aquatic organisms,
    - Microbial and fungal genetic resources.
    - These constitute the main units of production in agriculture, and include cultivated and domesticated species, managed wild plants and animals, as well as wild relatives of cultivated and domesticated species.
2) *Components of biodiversity that support ecosystem services* upon which agriculture is based. These include a diverse range of organisms that contribute, at various scales to, *inter alia*, nutrient cycling, pest and disease regulation, pollination, pollution and sediment regulation, maintenance of the hydrological cycle, erosion control, and climate regulation and carbon sequestration.
3) *Abiotic factors,* such as local climatic and chemical factors and the physical structure and functioning of ecosystems, which have a determining effect on agricultural biodiversity.
4) *Socio-economic and cultural dimensions.* Agricultural biodiversity is largely shaped and maintained by human activities and management practices, and a large number of people depend on agricultural biodiversity for sustainable livelihoods. These dimensions include traditional and local knowledge of agricultural biodiversity, cultural factors and participatory processes, as well as tourism associated with agricultural landscapes." (Convention on Biological Diversity)[79]

Agro-ecological zones

"The agro-ecological zones are defined as homogenous and contiguous areas with similar soil, land and climate characteristics." (FAO)[80]

"Geographic areas with homogeneous sets of climatic parameters and natural resource characteristics, such as rainfall, solar radiation, soil types and soil qualities, which correspond to a level of agricultural potential." (IPBES)[81]

77 Lexico. 2020. UK Dictionary. Available at: https://www.lexico.com/definition/agriculture (accessed 26 June 2020).

78 FAO. 2018b. FAO Regional Conference for Latin America and the Caribbean. Mainstreaming biodiversity in agriculture, forestry, fisheries and aquaculture, footnote 1.

79 CBD. 2008. What is Agricultural Biodiversity? Available at: https://www.cbd.int/agro/whatis.shtml (accessed 26 June 2020).

80 FAO. 2012a. Global Agro-Ecological Zones. Available at: http://www.fao.org/nr/gaez/programme/en/ (accessed 26 June 2020).

81 IPBES. Glossary. Agro-ecological zones. Available at: https://ipbes.net/glossary/agro-ecological-zones (accessed 26 June 2020).

Agroecology

Definitions

"Agroecology is a scientific discipline, a set of practices and a social movement" (Wezel *et al.*).[82] "As a science, it studies how different components of the agroecosystem interact. As a set of practices, it seeks sustainable farming systems" that optimize and stabilize production, through enhanced use of ecosystem services and limited use of external inputs. "As a social movement, it pursues multifunctional roles for agriculture, promotes social justice, nurtures identity and culture," and strives to strengthen "the economic viability of rural areas" (FAO).[83] "Agroecology is an integrated approach that simultaneously applies ecological and social concepts and principles to the design and management of food and agricultural systems" (FAO).[84]

Ten elements of agroecology have been identified by the FAO Council:[85] diversity; co-creation and sharing of knowledge; synergies; efficiency; recycling; resilience; human and social values; culture and food traditions; responsible governance; circular and solidarity economy.

Discussion

The agroecological approach is promoting holistic, integrated, and long-term sustainable strategies for the management of agroecosystems. From a technical point of view, agroecology is mainly about applying ecological concepts, principles, and knowledge to agricultural production, rather than relying on external inputs. Its main focus is not just on agricultural production, but also on environmental, social, and cultural dimensions, and it places agriculture and people within the perspective of ecosystems. For example, it promotes the conservation and use of local varieties and breeds adapted to specific environments, and it recognizes the importance of considering all forms of relevant information, including scientific as well as indigenous and local knowledge, innovations, and practices. Furthermore, it is based on the idea that solutions are context-dependent, and management should be decentralized to the lowest appropriate level.

Photo: ©FAO/Alessandra Benedetti

Many agricultural systems that are included in sustainable intensification approaches integrate agroecological principles, including organic, permaculture, biodynamic, agroforestry, or integrated grazing/animal management, etc. Agroecology, however, seeks a whole redesign of agro-ecosystems to eliminate the root causes of problems in an integrative way.[86] Furthermore, agroecology aims to empower family farmers, including smallholder farmers, indigenous peoples, and rural communities, as key agents of change.[87]

Agroecology's strong social and cultural perspective differentiates it from other ecological and sustainable intensification approaches.[88] Even though there is a broad variety of agroecological social movements and discourses,[89] most include community-based dynamic, more direct connection between producers and consumers, or defense of food sovereignty and farmers' rights. Agroecology is also emerging as a pro-poor paradigm, with fairer and diversified incomes for farmers and built on a vision of a solidarity economy.

82 Wezel *et al.* 2009. Agroecology as a science, a movement and a practice. A review. In: Agronomy for Sustainable Development.

83 Adapted from: FAO. 2020. Family Farming Knowledge Platform. Agroecology & Family Farming. Available at: http://www.fao.org/family-farming/themes/agroecology/en/ (accessed 26 June 2020).

84 FAO. 2018c. The 10 Elements of Agroecology. Guiding the Transition to Sustainable Food and Agriculture Systems, p. 1.

85 FAO. 2019c. Council. Hundred and Sixty-third Session. The Ten Elements of Agroecology.

86 Gliessman. 2014. Agroecology: The Ecology of Sustainable Food Systems, 3rd ed. CRC. Taylor & Francis Group, Boca Raton, FL.

87 FAO. 2018d. FAO's work on agroecology. A pathway to achieving the SDGs.

88 Wezel *et al.* 2015. The blurred boundaries of ecological, sustainable, and agroecological intensification: a review. In: Agronomy for sustainable development.

89 Bernard and Lux. 2017. How to feed the world sustainably: an overview of the discourse on agroecology and sustainable intensification. In: Regional Environmental Change.

The lack of a precise definition of agroecological movements or practices can still create confusion among scientists, practitioners, and the public, and limits the creation of a coherent and unified movement. The scale and dimension of the application of the concept of agroecology has widened over the years from the farm level toward a broader food systems approach.[90] An important example is the current movement within agroecology to shorten supply chains, with growing networks of farmers' markets, community-supported agriculture schemes, consumer cooperatives, and other more direct marketing arrangements that bypass industrial models (including processing and selling).

→ Annex 6 / page 72 contains an overview that places this approach on the food systems spectrum.oil types and soil qualities, which correspond to a level of agricultural potential." (IPBES)

Agro-ecosystem

"A dynamic association of crops, pastures, livestock, other flora and fauna, atmosphere, soils, and water. Agroecosystems are contained within larger landscapes that include uncultivated land, drainage networks, rural communities, and wildlife." (FAO)[91]

"An agro-ecosystem is an ecosystem under agricultural management, connected to other ecosystems." (OECD)[92]

Agroforestry

"Agroforestry is a collective name for land-use systems and technologies where woody perennials (trees, shrubs, palms, bamboos, etc.) are deliberately used on the same land-management units as agricultural crops and/or animals, in some form of spatial arrangement or temporal sequence. In agroforestry systems there are both ecological and economical interactions between the different components. Agroforestry can also be defined as a dynamic, ecologically based, natural resource management system that, through the integration of trees on farms and in the agricultural landscape, diversifies and sustains production for increased social, economic and environmental benefits for land users at all levels. In particular, agroforestry is crucial to smallholder farmers and other rural people because it can enhance their food supply, income and health. Agroforestry systems are multifunctional systems that can provide a wide range of economic, sociocultural, and environmental benefits.

There are three main types of agroforestry systems:

- Agrisilvicultural systems are a combination of crops and trees, such as alley cropping or home gardens.
- Silvopastoral systems combine forestry and grazing of domesticated animals on pastures, rangelands or on-farm.
- The three elements, namely trees, animals and crops, can be integrated in what are called agrosylvopastoral systems and are illustrated by home gardens involving animals as well as scattered trees on croplands used for grazing after harvests." (FAO)[93]

Animal welfare

"The broader wellbeing of animals for food production, covering their handling, feeding, housing, transport and slaughter in food systems and emphasizing the avoidance of unnecessary suffering." (FAO)[94]

The Terrestrial Animal Health Code of the World Organisation for Animal Health defines animal welfare as „how an animal is coping with the conditions in which it lives. An animal is in a good state of welfare if (as indicated by scientific evidence) it is healthy, comfortable, well nourished, safe, able to express innate behaviour, and if it is not suffering from unpleasant states such as pain, fear, and distress. Good animal welfare requires disease prevention and veterinary treatment, appropriate shelter, management, nutrition, humane handling and humane slaughter/killing. Animal welfare refers to the state of the animal; the treatment that an animal receives is covered by other terms such as animal care, animal husbandry, and humane treatment." (World Organisation for Animal Health)[95]

90 Wezel *et al.* 2009. *Op. cit.*

91 FAO. 2005. Water for food and ecosystems. Glossary. Available at: (accessed 29 June 2020).

92 OECD. 2003. Glossary of Statistical Terms. *Op. cit.*

93 FAO. 2015a. Agroforestry. Definition. Available at: http://www.fao.org/forestry/agroforestry/80338/en/ (accessed 29 June 2020).

94 FAO. FAO Term Portal. Available at: http://www.fao.org/faoterm/en/ (accessed 13 October 2020).

95 OIE. 2011. Terrestrial Animal Health Code. Twentieth edition. Paris, France.

Aquaponics

Photo:©FAO/Riccardo De Luca

"Aquaponics refers to any system that combines conventional aquaculture (raising aquatic animals such as snails, fish, crayfish or prawns in tanks) with hydroponics (cultivating plants in water) in a symbiotic environment. In normal aquaculture, excretions from the animals being raised can accumulate in the water, increasing toxicity. In an aquaponic system, water from an aquaculture system is fed to a hydroponic system where the by-products are broken down by nitrifying bacteria initially into nitrites and subsequently into nitrates that are utilized by the plants as nutrients. The water is then recirculated back to the aquaculture system.

As existing hydroponic and aquaculture farming techniques form the basis for all aquaponic systems, the size, complexity, and types of foods grown in an aquaponic system can vary as much as any system found in either distinct farming discipline." (Rakocy *et al.*)[96]

B

Biodiversity

"*Biological diversity* means the variability among living organisms from all sources including, *inter alia,* terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems." (Convention on Biological Diversity)[97]

Biological Pest Control

"Method of controlling pests, diseases and weeds in agriculture that relies on natural predation, parasitism or other natural mechanisms that restrain the development of pathogenic organisms." (FAO)[98]

Bioregion

"A bioregion is a land and water territory whose limits are defined not by political boundaries, but by the geographical limits of human communities and ecological systems. Such an area must be large enough to maintain the integrity of the region's biological communities, habitats, and ecosystems; to support important ecological processes, such as nutrient and waste cycling, migration, and stream flow; to meet the habitat requirements of keystone and indicator species; and to include the human communities involved in the management, use, and understanding of biological resources. It must be small enough for local residents to consider it home.

A bioregion would typically embrace thousands to hundreds of thousands of hectares. It may be no bigger than a small watershed or as large as a small state or province. In special cases, a bioregion might span the borders of two or more countries.

A bioregion is also defined by its people. It must have a unique cultural identity and be a place in which local residents have the primary right to determine their own development. This primary right does not, however, imply an absolute right. Rather, it means that the livelihoods,

96 Rakocy *et al.* 2011. Update on Tilapia and Vegetable Production in the UVI Aquaponic System. University of the Virgin Islands Agricultural Experiment Station.

97 United Nations. 1992. Convention on Biological Diversity.

98 FAO. 2013. Glossary of terms on ecosystem services in agriculture. Available at: http://www.academia.edu/9915424/Glossary_of_terms_on_ecosystem_services_in_agriculture (accessed 26 June 2020).

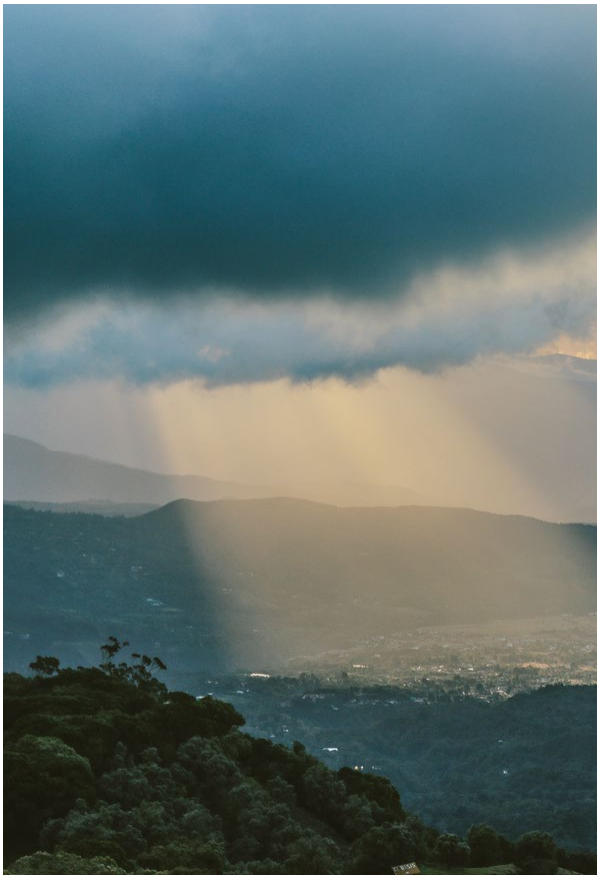

Photo:Luis Quintero / Pexels

claims, and interests of local communities should be both the starting point and the criteria for regional development and conservation. Within that framework many other state, investor, and other economic interests must be accommodated.

Within a bioregion lies a mosaic of land or aquatic uses. Each patch provides habitats in which different species survive and flourish, and each has its own particular relationship to the region's human population. All the elements of the mosaic are interactive; the management of a watershed affects riverine habitats, farms, estuaries, fisheries, and coral reefs. The components are also dynamic; each changes over time as rivers change course, fallow fields regenerate, storms batter coasts, and fires ravage forests. This dynamism gives a well-managed bioregion the resilience and flexibility to adapt to natural evolution and human-induced activity—be it changing climate or changing markets.

Within this ecological and social framework, governmental, community, corporate, and other private interests share responsibility for coordinating land-use planning for both public and private land and for defining and implementing development options that will ensure that human needs are met in a sustainable way. Innovative forms of institutional integration and social cooperation are needed to meet these needs. Dialogue among all interests, participatory planning, and great institutional flexibility are essential. A wide range of conservation tools and technologies must also be brought to bear—among them, protected-areas management, ex situ technologies, landscape restoration, and sustainable management of such resources as forests, fisheries, and croplands." (World Resources Institute)[99]

Biotechnology

"Biotechnology includes a broad range of technologies applied in crops, livestock, forestry, fisheries and aquaculture, and agro-industry.

They are used for many different purposes, such as the genetic improvement of plants and animals to increase their yields or efficiency; characterization and conservation of genetic resources for food and agriculture; plant and animal disease diagnosis; vaccine development; and production of fermented foods." (FAO)[100]

"A range of tools, including traditional breeding techniques, that alter living organisms, or parts of organisms, to make or modify products; improve plants or animals; or develop microorganisms for specific agricultural uses. Modern biotechnology today includes the tools of genetic engineering." (USDA)[101]

Blockchain

"A blockchain is a digital record of transactions. The name comes from its structure, in which individual records, called blocks, are linked together in a single list, called a chain. Blockchains are used for recording transactions made with cryptocurrencies, such as Bitcoin, and have many other applications." (TechTerms)[102]

99 WRI. 2000. What is a bioregion? Available at: https://bioregion.org.uk/about/what-is-a-bioregion/ (accessed 26 June 2020).

100 FAO. Biotechnology. Available at: http://www.fao.org/biotechnology/en/ (accessed 26 June 2020).

101 USDA. Agricultural Biotechnology Glossary. Available at: https://www.usda.gov/topics/biotechnology/biotechnology-glossary (accessed 26 June 2020).

102 TechTerms. 2018. Blockchain Definition. Available at: https://techterms.com/definition/blockchain (accessed 26 June 2020).

"Blockchain technology has vast applications across many food industry areas, especially traceability, logistics, and finance." (Institute of Food Technologists)[103]

Blue economy

"The blue economy refers to the sustainable and integrated development of economic sectors in healthy oceans." (World Bank)[104]

"The concept of a blue economy came out of the 2012 Rio+20 Conference and emphasizes conservation and sustainable management, based on the premise that healthy ocean ecosystems are more productive and a must for sustainable ocean-based economies." (FAO)[105]

Photo:©FAO/Rosetta Messori

C

Certification

"Certification is a procedure by which a third party gives written assurance that a product, process or service is in conformity with certain standards. Certification can be seen as a form of communication along the supply chain. The certificate demonstrates to the buyer that the supplier complies with certain standards, which might be more convincing than if the supplier itself provided the assurance." (FAO)[106]

Conservation agriculture

"Conservation agriculture is a farming system that promotes maintenance of a permanent soil cover, minimum soil disturbance (i.e., no tillage), and diversification of plant species. It enhances biodiversity and natural biological processes above and below the ground surface, which contribute to increased water and nutrient use efficiency and to improved and sustained crop production.[107] Conservation agriculture principles are universally applicable to all agricultural landscapes and land uses with locally adapted practices. Soil interventions such as mechanical soil disturbance are reduced to an absolute minimum or avoided, and external inputs such as agrochemicals and plant nutrients of mineral or organic origin are applied optimally and in ways and quantities that do not interfere with, or disrupt, the biological processes.

Conservation agriculture facilitates good agronomy, such as timely operations, and improves overall land husbandry for rainfed and irrigated production. Complemented by other known good practices, including the use of quality seeds, and integrated pest, nutrient, weed and water management, etc., conservation agriculture is a base for sustainable agricultural production intensification. It opens increased options for integration of production sectors, such as crop-livestock integration and the

103 IFT. 2018. IFT Food Facts. The Potential of Blockchain Technology Application in the Food System. Available at: https://www.ift.org/career-development/learn-about-food-science/food-facts/food-facts-emerging-science-and-technologies/the-potential-of-blockchain-technology-application (accessed 26 June 2020).

104 World Bank. Problue. Healthy Oceans – Healthy Economies – Healthy Communities. Available at: https://www.worldbank.org/en/programs/problue (accessed 26 June 2020).

105 FAO. 2014b. Blue growth – unlocking the potential of seas and oceans. Available at: http://www.fao.org/zhc/detail-events/en/c/233765/ (accessed 26 June 2020).

106 FAO. 2003. Environmental and Social Standards, Certification and Labelling for Cash Crops. FAO, Rome.

107 FAO. 2017b. Conservation Agriculture. Available at: http://www.fao.org/conservation-agriculture/en/ (accessed 22 June 2020).

integration of trees and pastures into agricultural landscapes." (FAO)[108]

Circular economy

"The aspiration of a circular economy is to shift material flows toward a zero waste and pollution production system." (Tecchio *et al.*)[109]

"A 'circular agriculture economy' proposes a viable model for the current linear economy 'take-make-waste' approach by minimizing the amount of external inputs for agricultural production, closing nutrient loops and reducing negative impacts to the environment by eliminating discharges (i.e., wastewater) and surface runoff. Under the lens of the circular economy, agriculture can offer a multitude of opportunities, from primary production using precision agriculture techniques to the recycling and utilization of agricultural wastes and materials (i.e., reuse of plastic containers)." (FAO)[110]

City-Region Food System

"The food system of any city is a hybrid — it combines different means of food provisioning and consumption. Some cities mainly rely on urban, peri-urban and nearby rural farms and food processors, while others depend mostly on food produced and processed in other countries or continents. Food systems link rural and urban communities within a country, across regions and sometimes between continents. Consequently, cities and urban food supply systems play an important role in shaping their surrounding and more distant rural areas. Land use, food production, environmental management, transport and distribution, marketing, consumption and water management are of concern in both urban and rural areas." (FAO and RUAF Foundation)[111]

City-Region Food System Approach

"As a specific type of territorial approach, the city-region food system approach provides a critical lens for analysis while supporting on the-ground policy transformation and implementation. Working at city-region level can leverage the complexity of rural-urban linkages to a practical level by making food the common denominator. This implies that broader issues (i.e., human rights, climate change and resilience) can be addressed in a more focused manner.

Improved city-region food systems could help achieve better economic, social and environmental conditions in both urban and nearby rural areas, as it aims to facilitate:

- Access to affordable, safe and nutritious traded foods from local and regional producers that could help improve consumer food security and nutrition and could enhance transparency in the food chain.
- Access to markets and support to alternative markets (i.e., farmers' markets, community supported agriculture) that could improve livelihoods of both small-scale and larger-scale producers.
- Local and regional food hubs and shorter value chains, and more broadly, efficient and functioning agricultural supply chains that link hinterland producers to market systems, and that could contri-bute to sustainable diets, reduce food waste along the chain and stabilize livelihoods in distribution, processing and manufacture of food and fibre products.
- Circular management of water, nutrients and energy in agricultural production.
- Creation of participatory governance structures to include stakeholders from multiple sectors, from both urban and rural areas." (FAO and RUAF Foundation)[112]

Climate-smart agriculture

"Climate-smart agriculture is an approach to help the people who manage agricultural systems respond effectively to climate change. The climate-smart agriculture approach pursues the triple objectives of sustainably increasing productivity and incomes, adapting to climate change and reducing greenhouse gas emissions where

108 FAO. 2017b. *Op. cit.* What is Conservation Agriculture? Available at: http://www.fao.org/conservation-agriculture/overview/what-is-conservation-agriculture/en/ (accessed 22 June 2020).

109 Tecchio *et al.* 2017. In search of standards to support circularity in product policies: A systematic approach. In: Journal of Cleaner Production.

110 FAO. Land & Water. Circular Economy: Waste-to-Resource & COVID-19. Available at: http://www.fao.org/land-water/overview/covid19/circular/en/ (accessed 29 June 2020).

111 FAO and RUAF. 2017. A Vision for City Region Food Systems. Available at: http://www.fao.org/3/a-i4789e.pdf (accessed 26 June 2020).

112 FAO and RUAF. 2017. *Idem.*

possible. This does not imply that every practice applied in every location should produce 'triple wins'. Rather the climate-smart agriculture approach seeks to reduce trade-offs and promote synergies by taking these objectives into consideration to inform decisions from the local to the global scales and over short and long time horizons, to derive locally-acceptable solutions." (FAO)[113]

Community supported agriculture

"Community supported agriculture is a partnership between a farm and consumers where the risks and rewards of farming are shared. No two forms of community supported agriculture are alike, but all of them are generally organized according to 4 principles:

- Partnership: community supported agriculture is based on a partnership, usually formalized as an individual contract between each consumer and the producer, and characterized by a mutual commitment to supply one another (with money and food) over an extended period of time, beyond any single act of exchange. The contracts, oral or written, last for several months, a season or a year.
- Local: community supported agriculture is part of an active approach to relocalizing the economy. But local in the community supported agriculture movement

  is not restricted to a geographical meaning. The idea is that local producers should be well integrated into their surrounding areas: their work should benefit the communities which support them.
- Solidarity: community supported agriculture is based on solidarity between producers and support groups and involves:
  - Sharing both the risks and the benefits of a healthy production that is adapted to the natural rhythm of the seasons and is respectful of the environment, natural and cultural heritage and health.
  - Paying a sufficient fair price up-front to enable farmers and their families to maintain their farms and live in a dignified manner.

  The producer/consumer tandem: is based on direct person-to-person contact and trust, with no intermediaries or hierarchy." (URGENCI)[114]

Collaborative consumption

"Collaborative consumption can be defined as the set of resource circulation systems, which enable consumers to both „obtain" and „provide", temporarily or permanently, valuable resources or services through direct interaction with other consumers or through a mediator." (Ertz *et al.*)[115]

Conservation tillage

"Conservation tillage is an agricultural management approach that aims to minimize the frequency or intensity of tillage operations in an effort to promote certain economic and environmental benefits.

These include a decrease in carbon dioxide and greenhouse gas emissions, less reliance on farm machinery and equipment, and an overall reduction in fuel and labor costs. In addition, conservation tillage methods have been shown to improve soil health, reduce runoff, and limit the extent of erosion. With a range of potential environmental and economic benefits, a well-developed and properly integrated conservation tillage practice can contribute toward the sustainability of an agricultural system." (UC Davis)[116]

Consumer behavior

"Consumer behaviour reflects the choices made by consumers, at household or individual levels, on what food to acquire, store, prepare and eat, and on the allocation of food within the household (including gender repartition, feeding of children). Consumer behaviour is influenced by personal preferences determined by taste, convenience, culture and other factors. However, consumer behaviour is also shaped by the existing food environment. Collective changes in consumer behaviour can open pathways to more sustainable food systems

113 FAO. Climate-smart agriculture. Available at: http://www.fao.org/climate-smart-agriculture/overview/en/ (accessed 26 June 2020).

114 URGENCI. 2013. European Handbook on Community Supported Agriculture.

115 Ertz *et al.* 2016. Collaborative Consumption: Conceptual Snapshot at a Buzzword. In: Journal of Entrepreneurship Education.

116 UC Davis. 2017. Agricultural Sustainability Institute. Conservation tillage. Available at: https://asi.ucdavis.edu/programs/ucsarep/about/what-is-sustainable-agriculture/practices/conservation-tillage (accessed 26 June 2020).

that enhance food security and nutrition (FSN) and health." (HLPE)[117]

Consumer information

Consumer information comprises information on the qualities and characteristics of products and services on the market. According to the European Community, the most common instruments for consumer information include:

- labelling;
- instructions for use;
- assembly instructions;
- precautions regarding employment or use; and
- any warning intended for the final user of the product or service. (EUR-Lex)[118]

Cradle to cradle

"Cradle to cradle promotes the principle that products can be designed from the outset so that, after their useful lives, they will provide nourishment for something new. This could be either as a biological nutrient that will easily re-enter the water or soil without depositing synthetic materials and toxins or as technical nutrients that will continually circulate as pure and valuable material within a closed loop industrial cycle." (UN Environment)[119]

Photo:©FAO/Rethink Food

D

Determinants of health

The determinants of health include:

- the social and economic environment;
- the physical environment; and
- the person's individual characteristics and behaviors.

Individuals are unlikely to be able to directly control many of the determinants of health. These determinants — the things that make people healthy or not — include the above factors, and many others, including:

- "Income and social status – higher income and social status are linked to better health.
- Education – low education levels are linked with poor health, more stress and lower self-confidence.
- Physical environment – safe water and clean air, healthy workplaces, safe houses, communities and roads all contribute to good health. Employment and working conditions.
- Social support networks – greater support from families, friends and communities is linked to better health.
- Culture – customs and traditions, and the beliefs of the family and community all affect health.
- Genetics – inheritance plays a part in determining lifespan, healthiness and the likelihood of developing certain illnesses.
- Personal behaviour and coping skills – balanced eating, keeping active, smoking, drinking, and how we deal with life's stresses and challenges all affect health.
- Health services – access and use of services that prevent and treat disease influences health.
- Gender – men and women suffer from different types of diseases at different ages." (WHO)[120]

117 HLPE. 2017. *Op. cit.*

118 Adapted from: EUR-Lex. 2007. Summaries of EU Legislation. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=legissum:l32036 (accessed 27 June 2020).

119 UN Environment. 2010. ABC of SCP. Clarifying Concepts on Sustainable Consumption and Production. UN Environment, Paris.

120 Trenoweth *et al.* 2011. Nursing and Mental Health Care.

E

Ecosystem approach

"The ecosystem approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. It is based on the application of appropriate scientific methodologies focused on levels of biological organization which encompass the essential processes, functions and interactions among organisms and their environment, and recognizes that humans, with their cultural diversity, are an integral component of ecosystems." (Convention on Biological Diversity)[121]

Ecosystem services (incl. incentives and payments for ecosystem services)

"Ecosystem services are the multitude of benefits that nature provides to society. Ecosystem services make human life possible by, for example, providing nutritious food and clean water, regulating disease and climate, supporting the pollination of crops and soil formation, and providing recreational, cultural and spiritual benefits. Despite an estimated value of $125 trillion, these assets are not adequately accounted for in political and economic policy, which means there is insufficient investment in their protection and management." (FAO)[122]

"The benefits people obtain from ecosystems. In the Millennium Ecosystem Assessment, ecosystem services can be divided into supporting, regulating, provisioning and cultural. This classification, however, is superseded in IPBES assessments by the system used under 'nature's contributions to people.' This is because IPBES recognises that many services fit into more than one of the four categories. For example, food is both a provisioning service and also, emphatically, a cultural service, in many cultures." (IPBES)[123]

Incentives for ecosystem services

"Incentives for Ecosystem Services (IES) are packages of measures that aim to support farmers in the adoption of sustainable agricultural practices that will benefit the environment, and improve long-term food security.

Without incentives, farmers are limited in their ability to invest the time and capital to change agricultural practices and overcome technical, cultural or financial adoption barriers to sustainable production. These incentives encourage farmers to protect and deliver more ecosystem services through better management of crops, livestock, forests and fisheries, and conservation of endangered species and protected habitats.

To overcome these barriers, an IES package can create an umbrella of programmes to support farmers' transition to more sustainable agricultural production. Public policies to improve farm productivity can be combined with those that reward conservation practices. Both can see its results maximized by partnering with green business strategies such as ecological value-added markets, and civil society initiatives that support improved livelihoods and social protection." (FAO)[124]

Payments for ecosystem services

"Payments for Ecosystem Services (PES) is an economic instrument designed to provide positive incentives to users of agricultural land and those involved in coastal or marine management. These incentives are expected to result in continued or improved provision of ecosystem services, which, in turn, will benefit society as a whole.

In the most commonly-accepted definition of PES, as given by Wunder (2005), PES is a voluntary transaction whereby a well-defined ecosystem service is 'bought' by a minimum of one ecosystem service buyer from a minimum of one ecosystem service provider if and only if the ecosystem service provider continually secures the ecosystem service provision (i.e., with an element of conditionality)." (FAO)[125]

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121 CBD. 2004. CBD Guidelines. The Ecosystem Approach.

122 FAO. Ecosystem Services & Biodiversity (ESB). Available at: http://www.fao.org/ecosystem-services-biodiversity/en/ (accessed 27 June 2020).

123 IPBES. Glossary. Ecosystem Services. Available at: https://ipbes.net/glossary/ecosystem-services (accessed 27 June 2020).

124 FAO. Incentives for Ecosystem Services. Available at: http://www.fao.org/in-action/incentives-for-ecosystem-services/en/ (accessed 27 June 2020).

125 FAO. 2011. Payments for Ecosystem Services and Food Security. FAO, Rome, pp. xiii & 2.

Enabling environments

"The set of societal and natural elements that create the broader environment in which food system actors operate." (FAO)[126]

"The enabling environment — often described as the laws, social and cultural norms, institutions, and procedures that guide behavior — is cross-cutting in relation to these domains in agricultural markets and the food systems. A facilitating enabling environment is inclusive of the informal and formal rules, codes of conduct, and the structures and institutions that support them. It also includes the important social and cultural norms and incentives that ultimately influence behavior, relationships and decision-making across transactions in a system." (Agrilinks)[127]

Externalities

"Environmental externalities refer to the economic concept of uncompensated environmental effects of production and consumption that affect consumer utility and enterprise cost outside the market mechanism.

As a consequence of negative externalities, private costs of production tend to be lower than its 'social' cost. It is the aim of the 'polluter/user-pays' principle to prompt households and enterprises to internalize externalities in their plans and budgets." (OECD)[128]

"Unintended consequences of an activity on its surrounding societal and natural environment, and the cost or benefit of which is not incurred or captured by the actor engaged in the activity. Externalities can be positive and bring value to society, or negative, and result in costs to society." (FAO)[129]

Extension services

See rural advisory services.

F

Family farming

"Family farming includes all family-based agricultural activities, and it is linked to several areas of rural development. Family farming is a means of organizing agricultural, forestry, fisheries, pastoral and aquaculture production which is managed and operated by a family and predominantly reliant on family labour, including both women's and men's.

Both in developing and developed countries, family farming is the predominant form of agriculture in the food production sector.

At the national level, there are a number of factors that are key for a successful development of family farming, such as: agro-ecological conditions and territorial characteristics; policy environment; access to markets; access to land and natural resources; access to technology and extension services; access to finance; demographic, economic and socio-cultural conditions; availability of specialized education among others.

Family farming, therefore, has an important socio-economic, environmental and cultural role." (FAO/IFAD)[130]

Fast-moving consumer goods

"Fast-moving consumer goods are products that sell quickly at relatively low cost. Examples include milk, gum, fruit and vegetables, toilet paper, soda, beer and over-the-counter drugs." (Investopedia)[131]

Food banking

"Food banking systems capture surplus food and deliver it to the people who need it most, engaging all sectors of

126 FAO. FAO elearning Academy. Introduction to Sustainable Food Systems [forthcoming]. To become available at: https://elearning.fao.org/ (accessed 13 October 2020).

127 Agrilinks. 2018. Measuring Business and Enabling Environment Change in Market System Development. Available at: https://www.agrilinks.org/post/measuring-business-and-enabling-environment-change-market-system-development (accessed 27 June 2020).

128 OECD. 2003. Glossary of Statistical Terms. Available at: https://stats.oecd.org/glossary/detail.asp?ID=824 (accessed 27 June 2020).

129 FAO. FAO elearning Academy. *Op. cit.*

130 FAO/IFAD. 2019. United Nations Decade on Family Farming 2019-2028. Available at: http://www.fao.org/family-farming-decade/about/en/ (accessed 27 June 2020).

131 Investopedia. 2020. Fundamental Analysis. Sectors & Industries Analysis. Fast-Moving Consumer Goods (FMCG). Available at: https://www.investopedia.com/terms/f/fastmoving-consumer-goods-fmcg.asp (accessed 27 June 2020).

society (governments, business, and civil) in the process. Food banks acquire donated food, much of which would otherwise be wasted, from farms, manufacturers, distributors, retail stores, consumers, and other sources, making it available to those in need through an established network of community agencies. These agencies include school feeding programs, food pantries, soup kitchens, AIDS and TB hospices, substance abuse clinics, after-school programs, and other nonprofit programs that provide food to the hungry." (The Global FoodBanking Network)[132]

Food-based dietary guidelines

"Short, science-based, positive messages on healthy eating and lifestyles aimed at preventing various forms of malnutrition and keeping people well-nourished and healthy. Simple messages on healthy eating, aimed at the general public. They give an indication of what a person should be eating in terms of foods rather than nutrients, and provide a basic framework to use when planning meals or daily menus." (FAO)[133]

Food environment

"The food environment refers to the physical, economic, political and socio-cultural context in which consumers engage with the food system to acquire, prepare and consume food. The food environment consists of: 'food entry points', i.e. the physical spaces where food is obtained; the built environment that allows consumers to access these spaces; personal determinants of food choices (including income, education, values, skills, etc.); and the political, social and cultural norms that underlie these interactions. The key elements of the food environment that influence food choices, food acceptability and diets are: physical and economic access to food (proximity and affordability); food promotion, advertising and information; and food quality and safety." (HLPE)[134]

Food label

"A food label, the information presented on food product, is one of the direct means of communicating information to the consumer. The internationally accepted definition of a food label is any tag, brand, mark, pictorial or other descriptive matter, written, printed, stencilled, marked, embossed or impressed on, or attached to, a container of food or food product. This information, which includes items such as ingredients, quality and nutritional value, and health claims, can accompany the food or be displayed near the food to promote its sale." (FAO/WHO)[135]

Food losses and waste

Definitions

"*Food loss and waste* refers to a decrease, at all stages of the food chain from harvest to consumption, in mass, of food that was originally intended for human consumption, regardless of the cause.

Food losses refers to a decrease, at all stages of the food chain prior to the consumer level, in mass, of food that was originally intended for human consumption, regardless of the cause.

Photo:©FAO

132 The Global FoodBanking Network. Why We Exist. Global Hunger & Food Waste. Available at: https://www.foodbanking.org/why-we-exist/ (accessed 27 June 2020).

133 FAO. 2014d. ICN2 Glossary. Available at: http://www.fao.org/fileadmin/user_upload/faoterm/ICN2Glossary-Nov2014-Updated2016_01.xls (accessed 29 June 2020).

134 HLPE. 2017. *Op. cit.*

135 FAO/WHO. 2007. Codex Alimentarius – Food labelling. Fifth edition. Codex Alimentarius Commission, Rome.

Food waste refers to food appropriate for human consumption being discarded or left to spoil at the consumer level – regardless of the cause.

Food quality loss or waste refers to the decrease of a quality attribute of food (nutrition, aspect, etc.), linked to the degradation of the product, at all stages of the food chain from harvest to consumption." (HLPE)[136]

Food waste can be classified into three categories:

"*Avoidable losses:* refers to food and drink thrown away because it is not used, e.g., they have exceeded their expiry date. Most avoidable losses are composed of foods that were, at one time, edible prior to disposal. A proportion of the food has deteriorated and become inedible at the time of disposal e.g., decomposed.

Possibly avoidable losses: refers to food that people discard, e.g., apple peels or bread crusts that can be eaten, or that can be eaten if prepared in a way that makes them consumable, e.g., potato skins, or are edible but discarded as they do not meet aesthetic criteria, e.g., crooked carrots.[137]

Unavoidable losses: includes waste from food and preparations which cannot be eaten under normal circumstances, e.g., apple cores, banana or orange peels, tea leaves, coffee grounds and egg shells. In addition, losses related to harvesting, storage, transport and treatment which cannot be avoided by using the best technologies available and within reasonable additional costs are also classified as unavoidable."[138] (Beretta *et al.* and WRAP)[139]

Discussion

The concept (and associated definitions) of food loss and waste is central to the sustainable food systems debate, as food loss and waste occurs along all parts of the food value chain, with impacts on food security and natural resources. In recognition of the damage caused by food loss and waste, reducing it was adopted as one of the core targets of the 2030 Agenda for Sustainable Development, specifically Target 12.3, which seeks to reduce food waste globally by 50 percent by 2030.

Our level of understanding of the amount of food loss and waste at global, regional, country, and local levels is still in its infancy, with either ad hoc studies on particular areas of interest (such as a particular food chain, or stage in the food chain) or high-level or aggregated studies at a regional or national level. Many cited global and regional estimates of food loss and waste are in fact from a seminal piece of work carried out by the FAO in 2011–2012.[140] This work estimates global food loss and waste at around 30 percent of the world's food supply. However, data is improving significantly in many countries, such as the UK and United States, and with companies using localized data.

A number of efforts are aimed at providing guidance on how to measure food loss and waste accurately and systematically. The Food Loss and Waste Protocol[141] is a multi-stakeholder effort that developed a widely used accounting and reporting standard (known as the FLW Standard) for quantifying food loss and waste. In addition, both FAO and UN Environment are leading efforts to develop methodologies to measure SDG 12.3's progress, including through the SFS Programme's core initiative "Delivering SDG Target 12.3 on Food Loss and Waste Reduction." The Food Loss Index, developed under the leadership of FAO, focuses on food that is lost early in the supply chain, from harvest to processing, while the Food Waste Index, developed under the leadership of UN Environment, focuses on consumer and retail waste. Together with alliances, such as Champions 12.3, that are helping to galvanize private sector action on food loss and waste,[142] the emphasis on better understanding food loss and waste globally at a national level is gaining traction.

Efforts to translate the mass (volume) of food loss and waste into other meaningful metrics is also advancing. These metrics help to convey the significance of food

136 HLPE. 2014a. *Op. cit.*

137 In addition, the SFS Programme acknowledges that further reasons for food waste may exist that are potentially avoidable, such as food that is discarded due to cultural habits (e.g., beet greens).

138 The SFS Programme acknowledges that as technology tends to improve, losses that are unavoidable in the present may become avoidable in the future.

139 Beretta *et al.* 2013. Quantifying food losses and the potential for reduction in Switzerland. In: Waste Management; and WRAP. 2009. Household food and drink waste in the UK. Final report.

140 Gustavsson *et al.* 2011. *Global food losses and food waste.*

141 WRI. Food Loss & Waste Protocol. Available at: https://www.wri.org/our-work/project/food-loss-waste-protocol (accessed 27 June 2020).

142 WRI. Champions 12.3. Available at: https://champions123.org/ (accessed 27 June 2020).

loss and waste by expressing it in terms of, for example, economic loss, nutritional and caloric value, or resource use. Four often-cited metrics help illustrate the scope of impact:

- Monetary loss (global): US$ 1 trillion.[143]
- Nutritional loss at US retail and consumer levels (reflected as per capita per day): 1,217 kcal, 33 g protein, 5.9 g dietary fiber, 1.7 mcg vitamin D, 286 mg calcium, and 880 mg potassium.[144]
- Carbon loss (global): 3.6 gigatonnes CO2 eq (excl. land-use change) – if food waste were a country, it would be the third-largest emitter of CO2 in the world.[145]
- Water consumption (blue) loss (global): 250km3 – equivalent to 3.6 times the blue water footprint of total US consumption.[146]

Expressing the amount of food loss and waste in terms such as nutritional value or resource use can catalyze action in ways that volume or weight measures might not. For example, estimates of the nutritional value of food that goes to waste can help fuel efforts to recover surplus food to feed people in need. This is particularly useful in countries that suffer from food insecurity or nutritionally poor diets. Seminal work in this area has been done by Johns Hopkins University in the United States.[147]

One important avenue for reducing food losses is supporting research and infrastructure, including in relation to cold chain and storage facilities that protect harvested food. This is also recognized in the resolution "Promoting sustainable practices and innovative solutions for curbing food loss and waste," adopted at the Fourth Session of the United Nations Environment Assembly in 2019.[148] The resolution, *inter alia*, invites countries to share best practices on cold chain solutions and to establish national strategies for reducing food loss and waste, and urges them to establish mechanisms for measuring food loss and waste. It calls upon UN Environment, FAO, and others to provide their technical support to countries in this regard, notably within the scope of the SFS Programme.

As research on food loss and waste expands – including data collection – a shift in some of the terminology seems to be occurring. For example, for those conducting food waste research in the field, the term "waste" has proved to be problematic, since no farmer or producer wants to be accused of wastefulness. Shifting the terminology to "surplus" food or food utilization rates, however, can create a more positive conversation, and this terminology is becoming more widely adopted by many practitioners.

The SFS Programme currently has one core initiative under its focus theme "reduction of food losses and waste," which is jointly led by FAO and UN Environment and entitled "Delivering SDG Target 12.3 on Food Loss and Waste Reduction." The initiative seeks to take stock of the current state of knowledge and ongoing methodological activities, share approaches and promote harmonization of FLW measurement around SDG 12.3. More concretely, it promotes the development of a Community of Practice on Food Waste, awareness raising, and communication activities, as well as the development of a methodology for measuring food waste in the context of SDG 12.3.[149]

Food safety

"Food Safety refers to handling, preparing and storing food in a way to best reduce the risk of individuals becoming sick from foodborne illnesses.

Food safety is a global concern that covers a variety of different areas of everyday life.

The principles of food safety aim to prevent food from becoming contaminated and causing food poisoning. This is achieved through a variety of different avenues, some of which are:

143 FAO. 2015b. Global Initiative on Food Loss and Waste Reduction. Available at: http://www.fao.org/3/a-i4068e.pdf (accessed 27 June 2020).

144 Neff and Spiker. 2017. Wasted Food, Wasted Nutrients: Nutrient Loss From Wasted Food in the US and Comparison to Gaps in Dietary Intake. In: Journal of the Academy of Nutrition and Dietetics.

145 FAO. 2015c. Food wastage footprint & Climate Change.

146 Mekonnen and Hoekstra. 2011. National water footprint accounts: The green, blue and grey water footprint of production and consumption. UNESCO-IHE Institute for Water Education.

147 Neff and Spiker. 2017. *Op. cit.*

148 UN Environment. 2019b. Resolution adopted by the United Nations Environment Assembly on 15 March 2019. Promoting sustainable practices and innovative solutions for curbing food loss and waste.

149 SFS Programme. 2017b. *Op. cit.*

- Properly cleaning and sanitising all surfaces, equipment and utensils
- Maintaining a high level of personal hygiene, especially hand-washing
- Storing, chilling and heating food correctly with regards to temperature, environment and equipment
- Implementing effective pest control
- Comprehending food allergies, food poisoning and food intolerance.

Regardless of why you are handling food, whether as part of your job or cooking at home, it is essential to always apply the proper food safety principles. Any number of potential food hazards exist in a food handling environment, many of which carry with them serious consequences." (Australian Institute of Food Safety)[150]

Food security

"Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life." (World Food Summit 1996)[151]

In 2009, the following additions were made to the definition of 1996:

"The four pillars of food security are availability, access, utilization and stability. The nutritional dimension is integral to the concept of food security." (World Summit on Food Security 2009)[152]

Food sovereignty

„Food sovereignty is the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems." (World Forum for Food Sovereignty 2007)[153]

Food standards

"Standards for food and agricultural products specify characteristics linked to the product's content or composition, function or performance, process or production methods, origin, and/or labelling or packaging. Voluntary standards refer to a broad group of public and private standards whose adoption by users is not mandatory. They are developed by governments, intergovernmental organizations, private companies or consortia, non-governmental organizations or multiple stakeholders." (FAO)[154]

The Codex Alimentarius is a collection of internationally adopted food standards and related texts presented in a uniform manner. These food standards and related texts aim at protecting consumers' health and ensuring fair practices in the food trade. The publication of the Codex Alimentarius is intended to guide and promote the elaboration and establishment of definitions and requirements for foods to assist in their harmonization and, in doing so, to facilitate international trade. (FAO/WHO)[155]

Food swap

"A food swap is a recurring event where members of a community share homemade, homegrown, or foraged foods with each other." (Food Swap Network)[156]

Food system

"A food system gathers all the elements (environment, people, inputs, processes, infrastructures, institutions, etc.) and activities that relate to the production, processing, distribution, preparation and consumption of

150 Australian Institute of Food Safety. What is Food Safety. Available at: https://www.foodsafety.com.au/blog/what-is-food-safety (accessed 29 June 2020).

151 FAO. 1996. World Food Summit. World Food Summit Plan of Action. Available at: http://www.fao.org/docrep/003/w3613e/w3613e00.htm (accessed 27 June 2020).

152 FAO. 2009a. World Summit on Food Security. Declaration of the World Summit on Food Security.

153 Nyéléni. 2007. World Forum for Food Sovereignty. Declaration of Nyéléni.

154 FAO. FAO Engaging Partners on Voluntary Standards. Available at: http://www.fao.org/docrep/018/mg159e/mg159e.pdf (accessed 27 June 2020).

155 FAO/WHO. Codex Alimentarius. About Codex Alimentarius. Purpose of the Codex Alimentarius. Available at: http://www.fao.org/fao-who-codexalimentarius/en/ (accessed 27 June 2020).

156 Food Swap Network. 2014. What is a food swap? Available at: https://foodswapnetwork.com/what-is-a-food-swap/ (accessed 27 June 2020).

food, and the outputs of these activities, including socio-economic and environmental outcomes." (HLPE)[157]

Food systems resilience

"Food systems resilience is the capacity over time of a food system and its units at multiple levels to provide sufficient, adequate and accessible food to all, in the face of various and even unforeseen disturbances. It is complementary and essential to sustainability." (Tendall *et al.*)[158]

"Resilience is the capacity of a food system to continue generating and delivering value in the face of abrupt or gradual disturbances in supply or demand through the recovery from unexpected shocks, the avoidance of tipping points, and adaptation to ongoing change. Resilience is a meta-dimension of sustainability." (FAO)[159]

Food value chain

"A food value chain consists of all the stakeholders who participate in the coordinated production and value-adding activities that are needed to make food products." (FAO)[160]

Food groups

"Food groups include a variety of foods that are similar in nutritional makeup, and each group plays an important role in an overall healthy eating pattern. Some of the food groups are broken down further into subgroups to emphasize foods that are particularly good sources of certain vitamins and minerals."

"Food groups simplify dietary recommendations by focusing on foods instead of nutrients." (USDA)[161]

Footprint approaches (carbon, ecological, land, water)

Carbon footprint

"The net total greenhouse gas emissions, expressed in tonnes of carbon dioxide equivalent, that are directly and indirectly associated with the food products in a food system, from the delivery of inputs at the production stage to consumption in end markets." (FAO) [162]

"A total product carbon footprint is a measure of the direct and indirect greenhouse gas (GHG) emissions associated with all activities in the product's life cycle. Products are both goods and services. Such a carbon footprint can be calculated by performing (according to international standards) a life cycle analysis that concentrates on GHG emissions that have an effect on climate change." (Life Cycle Initiative)[163]

Ecological footprint

"The ecological footprint is an index of the area of productive land and aquatic ecosystems required to produce the resources used and to assimilate the wastes produced by a defined population at a specified material standard of living, wherever on Earth that land may be located." (Millennium Ecosystem Assessment)[164]

"The ecological footprint measures the ecological assets that a given population requires to produce the natural resources it consumes (including plant-based food and fiber products, livestock and fish products, timber and other forest products, space for urban infrastructure,

157 HLPE. 2014a. *Op. cit.*
There is not one unified global food system, but rather a multitude of different types of food systems at various geographic and organizational scales, which co-exist and interact with each other to different degrees. In addition, the elements and activities in this definition are not to be understood as exhaustive. Similarly, sub-components of environmental and socio-economic food system outcomes, such as human health, are not explicitly mentioned in this definition. See in this context also Figure 1.

158 Tendall *et al.* 2015. Food system resilience: Defining the concept, p. 19.

159 FAO. FAO elearning Academy. *Op. cit.*

160 FAO. 2014c. Developing Sustainable Food Value Chains: Guiding Principles.

161 USDA. 2017. Back to Basics. All About MyPlate Food Groups. Available at: https://www.usda.gov/media/blog/2017/09/26/back-basics-all-about-myplate-food-groups (accessed June 27 2020).

162 FAO. Sustainable Food Value Chains Knowledge Platform. SFVC vocabulary. (accessed 13 October 2020).

163 Life Cycle Initiative. Carbon Footprint. Available at: https://www.lifecycleinitiative.org/starting-life-cycle-thinking/life-cycle-approaches/carbon-footprint/ (accessed 27 June 2020).

164 Millennium Ecosystem Assessment. 2005. Ecosystems and Human Well-being: Synthesis. Washington, DC.

goods and services) and to absorb its waste, especially carbon emissions. The ecological footprint measures how fast we consume resources and generate waste. It can be measured for a single process, such as growing rice, for a product, such as a pair of jeans, for the fuel we put in our car, or for an entire multi-national company. The water footprint can also tell us how much water is being consumed by a particular country – or globally – in a specific river basin or from an aquifer." (Global Footprint Network)[165]

"Ecological footprint of food systems expresses the impact of food consumed by a defined group of people (an individual, a village, a city, a country or the whole global population), measured in terms of the area of biologically productive land and water required to produce the food consumed and to assimilate the wastes generated." (HLPE)[166]

Land footprint

"The land footprint usually assesses those land areas that are directly and indirectly required to satisfy the consumption either for specific product(s) or for total consumption. It is a powerful method of illustrating the dependencies of local areas (regions or countries) on foreign land, which is embodied in imports and exports ('virtual land')." (Cucek *et al.*)[167]

Water footprint

"The total volume of freshwater that is used in the operations of a food system, from the delivery of inputs at the production stage to consumption in end markets." (FAO)[168]

"The water footprint is an indicator of freshwater use that looks at both direct and indirect water use of a consumer or producer. The water footprint of an individual, community or business is defined as the total volume of freshwater used to produce the goods and services consumed by the individual or community or produced by the business. Water use is measured in terms of water volumes consumed (evaporated or incorporated into a product) and/or polluted per unit of time. A water footprint can be calculated for a particular product, for any well-defined group of consumers (for example, an individual, family, village, city, province, state or nation) or producers (for example, a public organization, private enterprise or economic sector). The water footprint is a geographically explicit indicator, showing not only volumes of water use and pollution, but also the locations." (Hoekstra *et al.*)[169]

Photo:©FAO/Rosetta Messori

165 Global Footprint Network. 2019. Ecological Footprint. Available at: https://www.footprintnetwork.org/our-work/ecological-footprint/ (accessed 27 June 2020).

166 HLPE. 2019. Agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security. Rome.

167 Cucek *et al.* 2015. Assessing and Measuring Environmental Impact and Sustainability.

168 FAO. FAO Term Portal. *Op. cit.*

169 Hoekstra *et al.* 2011. The Water Footprint Assessment Manual: Setting the Global Standard. Earthscan, London.

G

Gastronomy

"Gastronomy is the study of the relationship between food and culture, the art of preparing and serving rich or delicate and appetizing food, the cooking styles of particular regions, and the science of good eating." (Oxford English Dictionary)[170]

Genetically engineered/modified organisms

"Genetically engineered/modified organisms, and products thereof, are produced through techniques in which the genetic material has been altered in a way that does not occur naturally by mating and/or natural recombination. Techniques of genetic engineering/ modification include, but are not limited to: recombinant DNA, cell fusion, micro and macro injection, encapsulation, gene deletion and doubling. Genetically engineered organisms will not include organisms resulting from techniques such as conjugation, transduction and hybridization." (FAO/WHO)[171]

Geographic indications

Definition

"A geographical indication (GI) is a sign used on products that have a specific geographical origin and possess qualities or a reputation that are due to that origin. In order to function as a GI, a sign must identify a product as originating in a given place. In addition, the qualities, characteristics or reputation of the product should be essentially due to the place of origin. Since the qualities depend on the geographical place of production, there is a clear link between the product and its original place of production." (WIPO)[172]

Discussion

GIs have been shown to deliver positive economic and social impacts on rural development, such as increasing production, employment, food system resilience, and sociocultural sustainability.[173] GIs primarily differentiate and add value to products with specific characteristics, qualities, or reputation resulting essentially from their geographical origin, and protect both consumers and producers from misuse of the territorial name, while also contributing to the preservation of public goods.[174] Collective action is at the heart of GI processes, whereby producers and the local community are able to organize themselves around a local identity and heritage. Local producers elaborate their GI product specifications, allowing the rules to be adapted to local conditions (natural and human resources) instead of being imposed by downstream segments of the value chain. Some producer organizations that develop GIs have also demonstrated an important dynamism that supports environmental conservation at the landscape level of their territory ("terroir") and promotes local culture and gastronomy. Proliferation of GIs, however, has the potential to reduce their value, particularly if consumers cannot distinguish quality differences among similar products.

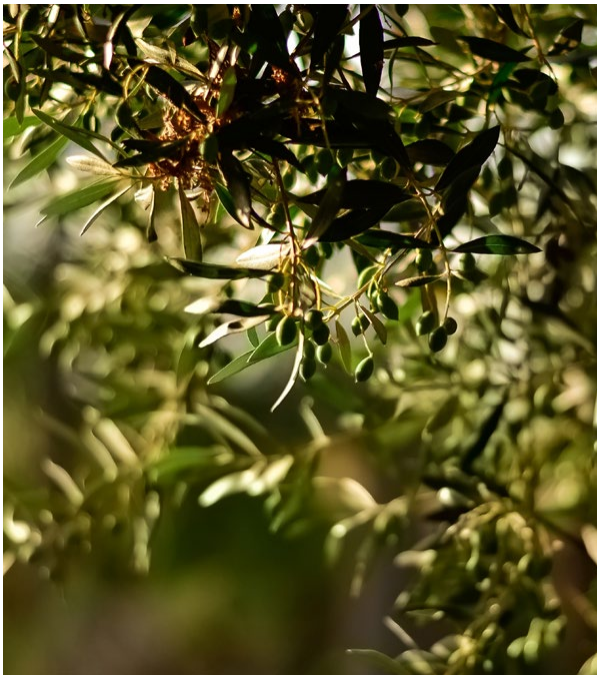

Photo: Julia Sakelli / Pexels

170 Oxford English Dictionary. 2020. Available at: https://www.oed.com/ (accessed 27 June 2020).

171 FAO/WHO. 2001. Codex Alimentarius – Organically Produced Foods. Codex Alimentarius Commission, Rome.

172 WIPO. 2020. Geographical Indications. Available at: https://www.wipo.int/geo_indications/en/ (accessed 27 June 2020).

173 Barham and Sylvander. 2011. Labels of origin for food. Local development, global recognition. CABI Publishing, Cambridge; and FAO. 2018. Strengthening sustainable food systems through geographical indications: an analysis of GI economic impacts. FAO, Rome.

174 Vandecandelaere. 2016. Geographical indications: a tool for supporting sustainable food systems. In: Arfini *et al.* (Eds.). Intellectual property rights for geographical indications: what is at stake in the TTIP? Cambridge Scholars Publishing, Cambridge, UK.

H

Health

"A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." (WHO)[175]

Photo: ©FAO/Sven Torfinn

I

Integrated pest management

"Integrated Pest Management (IPM) means the careful consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimize risks to human health and the environment. IPM emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms." (FAO)[176]

Integrated production

Integrated production "is a form of agriculture aiming at minimizing the use of inputs from outside the farm by implementing a variety of production enterprises, long and diversified crop rotations, crop residue or animal excreta restitution to the soil. Their implementation promotes the recycling of soil nutrients and overall soil quality, and reduces the issues linked to pests and diseases. In line with the principles of agroecology, integrated [production] relies on a global or systemic approach of farm management whose aim is to better organize the interactions between production enterprises in time and/or in space (e.g., supply of grain legumes from the cropping system to the livestock system, and provision of manure from the livestock system to the cropping system)." (INRAE)[177]

Interconnected policy making

According to the 2011 Foresight report, "interconnected policy making implies that policy in all areas of the food system should consider the implications for volatility, sustainability, climate change and hunger, etc., while policy in other sectors outside the food system (including energy, water, land use, the sea, ecosystem services and biodiversity, etc.) also need to be developed in much closer conjunction with that for food." (Foresight)[178]

175 WHO. 1946. Constitution of the World Health Organization.

176 FAO. AGP – Integrated Pest Management. Available at: http://www.fao.org/agriculture/crops/thematic-sitemap/theme/pests/ipm/en/ (accessed 27 June 2020).

177 Adapted from: INRAE. 2016. Dictionary of Agroecology. Integrated Farming. Available at: https://dicoagroecologie.fr/en/encyclopedia/integrated-farming/ (accessed 27 June 2020).

178 Foresight. 2011. The Future of Food and Farming. Final Project Report. The Government Office for Science, London.

L

Land use

"Land use is based on the functional dimension of land for different human purposes or economic activities. Typical categories for land use are dwellings, industrial use, transport, recreational use or nature protection areas." (OECD)[179]

Leverage point

"A point in the system where if change happens, it would have a big impact on the rest of the system." (FAO)[180]

"In systems thinking a leverage point is a place in a system's structure where a solution element can be applied. It's a low leverage point if a small amount of change force causes a small change in system behavior. It's a high leverage point if a small amount of change force causes a large change in system behavior." (Ecotrust)[181]

Life-cycle assessment

"The compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle." (International Organization for Standardization)[182]

M

Market-based approaches

"Market-based instruments seek to address the market failure of ‚environmental externalities' either by incorporating the external cost of production or consumption activities through taxes or charges on processes or products, or by creating property rights and facilitating the establishment of a proxy market for the use of environmental services." (OECD)[183]

Market systems approaches

"Approaches to poverty reduction based on the central idea that the poor are dependent on market systems for their livelihoods. Therefore changing those market systems to work more effectively and sustainably for the poor will improve their livelihoods and consequently reduce poverty." (BEAM Exchange)[184]

"An approach that involves strengthening the product-to-market system linkages by addressing the root causes of market systems failures to meet the needs of people; it aims to catalyze systemic changes, which are changes in the way core markets, supporting functions and rules perform that ultimately improves the participation of target groups (such as people living in poverty, youth, marginalized groups) within the market system. The entry point is market systems." (FAO)[185]

Mitigation hierarchy

"The mitigation hierarchy is defined as:

Avoidance: measures taken to avoid creating impacts from the outset, such as careful spatial or temporal placement of elements of infrastructure, in order to completely avoid impacts on certain components of biodiversity.

179 OECD. 2005. Glossary of Statistical Terms. Available at: https://stats.oecd.org/glossary/detail.asp?ID=6493 (accessed 27 June 2020).

180 FAO. FAO elearning Academy. *Op. cit.*

181 Ecotrust. 2020. Leveraging Turbulence: Integrating Diversity, Equity, and Inclusion Into Culture and Management. Available at: https://ecotrust.org/event/leveraging-turbulence-integrating-diversity-equity-and-inclusion-into-culture-and-management/ (accessed 29 June 2020).

182 ISO. 2006. ISO 14040:2006..

183 OECD. 2007. Business and the Environment: Policy Incentives and Corporate Responses. OECD, Paris.

184 BEAM Exchange. Market systems. Glossary. Available at: https://beamexchange.org/market-systems/glossary/ (accessed 27 June 2020).

185 FAO. FAO elearning Academy. *Op. cit*.

Minimisation: measures taken to reduce the duration, intensity and/or extent of impacts (including direct, indirect and cumulative impacts, as appropriate) that cannot be completely avoided, as far as is practically feasible.

Rehabilitation/restoration: measures taken to rehabilitate degraded ecosystems or restore cleared ecosystems following exposure to impacts that cannot be completely avoided and/or minimised.

Offset: measures taken to compensate for any residual significant, adverse impacts that cannot be avoided, minimised and/or rehabilitated or restored, in order to achieve no net loss or a net gain of biodiversity. Offsets can take the form of positive management interventions such as restoration of degraded habitat, arrested degradation or averted risk, or protecting areas where there is imminent or projected loss of biodiversity.

Compensation: measures to recompense, make good or pay damages for loss of biodiversity caused by a project that can fall short of achieving no net loss. For instance: conservation actions may not have been planned to achieve no net loss; losses and gains of biodiversity may not have been quantified; no mechanism may be in place for long term implementation; it may be impossible to offset the impacts; or compensation payments may be used for training, capacity building, research or other outcomes that will not result in measurable conservation outcomes on the ground." (Business and Biodiversity Offsets Programme)[186]

Multi-stakeholder partnerships

"Multi-stakeholder partnerships are defined as any collaborative arrangement among stakeholders from two or more different spheres of society (public sector, private sector and/or civil society), pooling their resources together, sharing risks and responsibilities in order to solve a common issue, to handle a conflict, to elaborate a shared vision, to realize a common objective, to manage a common resource and/or to ensure the protection, production or delivery of an outcome of collective and/or public interest." (HLPE)[187]

N

Nature-based solutions

"Actions to protect, sustainably manage, and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits." (IUCN)[188]

"Nature-based solutions aim to help societies address a variety of environmental, social and economic challenges in sustainable ways. They are actions inspired by, supported by or copied from nature; both using and enhancing existing solutions to challenges, as well as exploring more novel solutions, for example, mimicking how non-human organisms and communities cope with environmental extremes. Nature-based solutions use the features and complex system processes of nature, such as its ability to store carbon and regulate water flows, in order to achieve desired outcomes, such as reduced disaster risk and an environment that improves human well-being and inclusive green growth. This implies that maintaining and enhancing natural capital is of crucial importance, as it forms the basis for solutions. These nature-based solutions ideally are resilient to change, as well as energy and resource efficient, but in order to achieve these criteria, they must be adapted to local conditions." (European Commission)[189]

Nutrition

"The intake of food, and the interplay of biological, social, and economic processes that influence the growth, function and repair of the body." (FAO)[190]

"Nutrition is the intake of food, considered in relation to the body's dietary needs. Good nutrition – an adequate, well-balanced diet combined with regular physical activity – is a cornerstone of good health. Poor nutrition can lead to reduced immunity, increased susceptibility to disease, impaired physical and mental development, and reduced productivity." (WHO)[191]

186 BBOP. 2018. Glossary. BBOP, Washington, D.C.

187 HLPE. 2018. *Op. cit.*

188 IUCN. Commission on Ecosystem Management. Nature-based Solutions. Available at: https://www.iucn.org/commissions/commission-ecosystem-management/our-work/nature-based-solutions (accessed 27 June 2020).

189 European Commission. 2015. Towards an EU Research and Innovation Policy Agenda for Nature-based Solutions & Re-naturing Cities. Final Report of the Horizon 2020 Expert Group on Nature-Based Solutions and Re-Naturing Cities. European Commission, Brussels.

190 FAO. 2014d. *Op. cit.*

191 WHO. Health topics. Nutrition. Available at: https://www.who.int/health-topics/nutrition (accessed 27 June 2020).

O

Organic agriculture

"Organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfil any specific function within the system. An organic production system is designed to:

a) enhance biological diversity within the whole system;

b) increase soil biological activity;

c) maintain long-term soil fertility;

d) recycle wastes of plant and animal origin in order to return nutrients to the land, thus minimizing the use of non-renewable resources;

e) rely on renewable resources in locally organized agricultural systems;

f) promote the healthy use of soil, water and air as well as minimize all forms of pollution thereto that may result from agricultural practices;

g) handle agricultural products with emphasis on careful processing methods in order to maintain the organic integrity and vital qualities of the product at all stages;

h) become established on any existing farm through a period of conversion, the appropriate length of which is determined by site-specific factors such as the history of the land, and type of crops and livestock to be produced." (FAO/WHO Codex)[192]

P

Participatory guarantee systems

"Participatory Guarantee Systems are locally focused quality assurance systems. They certify producers based on active participation of stakeholders and are built on a foundation of trust, social networks and knowledge exchange." (IFOAM)[193]

Permaculture

"The definition of permaculture varies among sources and displays an expansion in subject area over time. In 1978, permaculture was defined as 'an integrated, evolving system of perennial or self-perpetuating plant and animal species useful to man [...] in essence, a complete agricultural ecosystem, modeled on existing but simpler examples' (Mollison and Holmgren).[194]

By 1988, the definition had grown in scope to encompass broader issues of human settlement while maintaining a core agricultural focus: 'Permaculture [...] is the conscious design and maintenance of agriculturally productive ecosystems which have the diversity, stability, and resilience of natural ecosystems. It is the harmonious integration of landscape and people providing their food, energy, shelter, and other material and non-material needs in a sustainable way' (Mollison)[195]." (Ferguson and Lovell)[196]

Personalized nutrition

"A field that leverages human individuality to drive nutrition strategies that prevent, manage, and treat disease and optimize health, and be delineated by three synergistic elements: personalized nutrition science and data, personalized nutrition professional education and training, and personalized nutrition guidance and therapeutics." (Bush *et al.*)[197]

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192 FAO/WHO. 1999. Codex Alimentarius. Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods. Codex Alimentarius Commission, Rome.

193 IFOAM. 2008. Standards & Certification. Participatory Guarantee Systems (PGS). Available at: https://www.ifoam.bio/en/organic-policy-guarantee/participatory-guarantee-systems-pgs (accessed 27 June 2020).

194 Mollison and Holmgren. 1978. Permaculture one: a perennial agricultural system for human settlements.

195 Mollison. 1988. Permaculture: A Designer's Manual.

196 Ferguson and Lovell. 2014. Permaculture for agroecology: design, movement, practice, and worldview. A review. In: Agronomy for Sustainable Development.

197 Bush *et al.* 2019. Toward the Definition of Personalized Nutrition: A Proposal by The American Nutrition Association. In: Journal of the American College of Nutrition.

Planetary boundaries

Photo: Pixabay / Pexels

"The Planetary Boundaries concept identifies nine global priorities relating to human-induced changes to the environment. The science shows that these nine processes and systems regulate the stability and resilience of the Earth System — the interactions of land, ocean, atmosphere and life that together provide conditions upon which our societies depend. Four of nine planetary boundaries have now been crossed as a result of human activity: climate change, loss of biosphere integrity, land-system change, altered biogeochemical cycles (phosphorus and nitrogen). Two of these, climate change and biosphere integrity, are what the scientists call 'core boundaries.' Significantly altering either of these core boundaries would drive the Earth System into a new state." (Stockholm Resilience Centre)[198]

Precision agriculture

"Precision agriculture is a management system that is information and technology based, is site specific and uses one or more of the following sources of data: soils, crops, nutrients, pests, moisture or yield, for optimum profitability, sustainability and protection of the environment." (USDA)[199]

"A management strategy that utilizes site-specific information to precisely and economically manage and optimize production inputs." (USDA)[200]

Processed food

Ultra-processed foods

"Formulations of ingredients, mostly of exclusive industrial use, made by a series of industrial processes, many requiring sophisticated equipment and technology (hence 'ultra-processed'). Processes used to make ultra-processed foods include the fractioning of whole foods into substances, chemical modifications of these substances, assembly of unmodified and modified food substances using industrial techniques such as extrusion, moulding and pre-frying; use of additives at various stages of manufacture whose functions include making the final product palatable or hyper-palatable; and sophisticated packaging, usually with plastic and other synthetic materials. Ingredients include sugar, oils or fats, or salt, generally in combination, and substances that are sources of energy and nutrients that are of no or rare culinary use such as high fructose corn syrup, hydrogenated or interesterified oils, and protein isolates; classes of additives whose function is to make the final product palatable or more appealing such as flavours, flavour enhancers, colours, emulsifiers, and sweeteners, thickeners, and anti-foaming, bulking, carbonating, foaming, gelling, and glazing agents; and additives that prolong product duration, protect original properties or prevent proliferation of microorganisms.

Processes and ingredients used to manufacture ultra-processed foods are designed to create highly profitable products (low-cost ingredients, long shelf life, emphatic branding), convenient (ready-to-consume) hyper-palatable products liable to displace freshly prepared dishes and meals made from all other NOVA food groups." (FAO)[201]

Highly processed foods

"Foods that have been industrially prepared, including those from bakeries and catering outlets, and which require no or minimal domestic preparation apart from heating and cooking (such as bread, breakfast cereals, cheese, commercial sauces, canned foods including jams, commercial cakes, biscuits and sauces)." (IARC)[202]

198 Steffen *et al.* 2015. Planetary Boundaries: Guiding human development on a changing planet. In: Science.

199 USDA. 2007. Agronomy Technical Note No. 1. Precision Agriculture: NRCS Support for Emerging Technologies.

200 USDA. National Agricultural Library. Available at: https://agclass.nal.usda.gov/mtwdk.exe?k=glossary&l=60&w=11622&s=5&t=2 (accessed 27 June 2020).

201 FAO. 2019d. Ultra-processed foods, diet quality, and health using the NOVA classification system. FAO, Rome.

202 FAO. 2015d. Guidelines on the collection of information on food processing through food consumption surveys. FAO, Rome, p. 26.

Moderately processed foods

"This category includes two sets of foods. First, industrial and commercial foods involving relatively modest processing and consumed with no further cooking, such as dried fruits, raw food stored under controlled or modified atmosphere (e.g., salads), vacuum-packed food, frozen basic foods, extra virgin olive oil, fruits and vegetables canned in water or brine or in own juice. Second, foods processed at the household level and prepared or cooked from raw or moderately processed foods (e.g., vegetables, meat and fish cooked from raw fresh ingredients, or vacuum-packed, deep-frozen, canned in water or brine or in own juice)." (IARC)[203]

Non-processed foods

"Foods consumed raw without any further processing or preparation, except washing, cutting, peeling, squeezing (e.g., fruits, non-processed nuts, vegetables, crustaceans, molluscs, fresh juices)." (IARC)[204]

Product sustainability information

"A range of tools and systems that seek to guide consumers to make more sustainable choices about goods and services (products), including in their use and end of life phase. These include ecolabels, voluntary standards, product declarations, ratings, marketing claims, footprinting, life-cycle assessments and other ways of communicating with consumers on environmental, (socio) economic and social issues. They can be single- or multi-issue, and may follow a life cycle approach to provide a holistic perspective considering the impacts of every stage of the product life, including how a product is used and how it is treated responsibly at end-of-life." (One Planet network's Consumer Information Programme)[205]

Public health approaches to food systems (including One Health approach)

Photo: Alex Green / Pexels

Definition

Public health approaches to food systems focus on studying (i) human health as a result of food quality and safety across the chain from primary production and its impact on potable water, air quality, and food quality, to the final products' nutritional profile/density; and (ii) consumer awareness, behaviors, and education, including personal dietary choices, often within the context of cultural traditions, and the compound effects of these factors on individual and population health.

Public health approaches build on the "One Health" approach, which is defined as "an approach to designing and implementing programmes, policies, legislation and research in which multiple sectors communicate and work together to achieve better public health outcomes.

The areas of work in which a One Health approach is particularly relevant include food safety, the control of zoonoses (diseases that can spread between animals and humans, such as flu, rabies and Rift Valley Fever), and combatting antibiotic resistance (when bacteria change after being exposed to antibiotics and become more difficult to treat)." (WHO)[206]

203 FAO. 2015d. *Op. cit.*, p. 26.

204 *Idem.*

205 CI-SCP. 2017. Guidelines for Providing Product Sustainability Information, p. 51.

206 WHO. 2017. One Health. Available at: http://www.who.int/features/qa/one-health/en/ (accessed 27 June 2020).

Discussion

The health of individuals and the broader society to which they belong is inexorably linked and intertwined with the health of the plants and animals that form the basis of our food, as well as the sustainability of the food production system as a whole, from primary production through processing and distribution. Attainment of a sustainable food system can be approached from either "end" of the production-consumption loop, depending on the interests and potential contributions from different players in the system. From an anthropocentric viewpoint, true sustainability and health are interconnected and interdependent, if not inseparable, which in the context of food systems is reflected in the definition of sustainable diets further below.

The SDGs could be distilled into a few main outcomes in terms of such an anthropocentric approach – namely, food that is healthy for people and the planet, produced in a way that provides healthy and sustainable livelihoods to all those involved in any given system.

In a public health based approach to food systems, the entry point is through studying and engaging the act and effects of consumption and the preceding steps that enable that to happen. What kind of food is provided – namely the quality (i.e., product nutritional profile, nutrient density, safety risk factors such as toxic residues or pathogens), diversity (completeness of diet provided overall, and related excesses or deficiencies), and the steps needed to get it to the consumer all must be considered. Consumers can only choose to eat that which is actually available and affordable for them to choose.

Health effects extend beyond just the direct act of eating. Indirect effects of the surrounding environment and conditions under which the food is produced, processed, and distributed also contribute to individual and public health in positive or negative ways. For example, drinking water supplies polluted by toxic agricultural chemicals or effluent from confined animal feed operations, air contaminated by pesticides, or too-concentrated emissions from livestock also pose public health threats. Access to clean water for washing hands is also very important for enhancing food safety, in particular in the global south. Packaging materials accumulate and/or break down in the environment and threaten the health of soils, water supplies, and marine life, as well as potentially pose threats from migration of packaging material components into the food itself; the manufacturing of packaging materials can also have localized negative environmental effects that impact communities.

Photo: Ketut Subiyanto / Pexels

Non-communicable diseases are on the rise, a result of a combination of dietary, environmental, and cultural factors, where the balance of such factors depends on the disease in question and particular circumstances of the person(s) involved. Food that provides calories but lacks adequate levels of micronutrients per energy – mainly due to impoverished soils, over-processing, unbalanced genetics,[207] or some combination of these – is also a topic of study from a public health perspective. Furthermore, the health effects of diet – of eating habits – needs to be taken broader than the analysis of the qualities of individual products and the systems that make them, to a holistic synthetic picture of what constitutes a "complete," sustainable diet for any given individual or population, and to the production system that provides the diet in question.

Health is a multidimensional phenomenon, with biological, emotional, mental, and spiritual facets, and as such must be addressed through a lens that is as much anthropological as it is biochemical. The WHO Constitution defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity."[208] Nonetheless, and despite this complexity, a public health based approach to the study and implementation of sustainable food systems can reveal best practices for correcting more or less obvious detriments and reinforcing positive behaviors across the spectrum of production and consumption practices.

→ Annex 6 / page 72 contains an overview that places this approach on the food systems spectrum.

207 This can be the result if breeding for yield increases focuses mainly on increases in starch.

208 WHO. 1946. *Op. cit.*

R

Regenerative agriculture

"Regenerative Agriculture is a system of farming principles and practices that increases biodiversity, enriches soils, improves watersheds, and enhances ecosystem services.

Regenerative Agriculture aims to capture carbon in soil and aboveground biomass, reversing current global trends of atmospheric accumulation.

At the same time, it offers increased yields, resilience to climate instability, and higher health and vitality for farming and ranching communities.

The system draws from decades of scientific and applied research by the global communities of organic farming, agroecology, holistic management, and agroforestry." (Terra Genesis International)[209]

Resilient production systems

Definitions

Resilience refers to "the ability of a system to prevent disasters and crises as well as to anticipate, absorb, accommodate or recover from them in a timely, efficient and sustainable manner. It can refer to livelihoods, ecosystems, production systems, organizations, etc. It includes, for instance, protecting, restoring and improving livelihoods systems in the face of threats that impact agriculture, nutrition, food security and food safety.

In other words, resilience is the ability of people, communities or systems that are confronted by disasters or crises to withstand damage and to recover rapidly." (FAO)[210]

In the context of agricultural production systems, resilience can be defined as "the capacity of agro-ecosystems, farming communities, households or individuals to maintain or enhance system productivity by preventing, mitigating or coping with risks, adapting to change, and recovering from shocks." (FAO)[211]

Discussion

The concept of resilient production systems is particularly important in a food systems perspective, for two reasons. First, food production systems are vulnerable to disruptions from a wide range of phenomena such as climate variability, extreme weather events and market volatility, and pandemics, as well as civil strife and political instability. Second, the ramifications of disruptions to food production systems can be dire, with impacts on the productivity and stability of agricultural production systems, food security, household income, and increased uncertainties and risk for producers and consumers. This translates into disruptions in the value chain that may affect an entire global or national food system. Such incidents of fragility, crises, and climate change constitute system drivers – not only within the production system, but of the broader food system as a whole. While this section focuses on resilient production systems in particular, resilience is a key component of a sustainable food system, as it enables the food system to absorb shocks and recover adequately.

Given this interplay and broad impact, resilient food production systems would support a number of the SDGs, notably: SDG 1 (no poverty), 2 (zero hunger), 3 (good health and well-being), 6 (water for all), 11 (sustainable cities and communities), 12 (responsible consumption and production), 13 (climate action), and 15 (life on land).

Policies, technologies, and practices that build producers' resilience to risks and uncertainties contribute to sustainable production systems. They can include building flexibility into programs and policies, developing risk management strategies, and specific measures such as flexible fishing strategies, soil health and practices to protect soil, the introduction of pest-resistant varieties and breeds, improved market governance, social safety nets, insurance, and credit. Strategies to foster more resilient production systems also include integrating gender equity and social justice into agriculture and food security research and initiatives; promoting production systems that make better use of resilient ecological processes; fostering diversified production systems, food markets, distribution networks, and waste reduction, including at the local level; and providing social protection

209 Terra Genesis International. Regenerative Agriculture. Available at: http://www.regenerativeagriculturedefinition.com/ (accessed 27 June 2020).

210 FAO. FAO in emergencies. Resilience. Available at: http://www.fao.org/emergencies/how-we-work/resilience/en/ (accessed 28 June 2020).

211 FAO. 2014e. Building a common vision for sustainable food and agriculture. Principles and approaches. FAO, Rome.

Box 7: An Example of a Resilient Production System from Kenya

The Kenya Market-led Horticulture Project (KMHP or HortIMPACT) combines private sector expertise with social impact solutions to build sustainable, inclusive, climate-resilient horticulture value chains and markets in Kenya that benefit small and medium-sized farmers. HortIMPACT works with Kenyan and Dutch agri-businesses to develop business cases that support SME farmers to overcome the challenges they face to access markets, increase production, improve food safety, and reduce post-harvest losses. Find out more at www.snv.org/project/hortimpact.

Photo: ©FAO/Luis Tato

measures to farmers.

The adoption of resilient food production systems can occur nationally, regionally, locally, and within sectors and organizations. Collaborative holistic policies, institutions, and technologies that recognize the complexity of the system and interlinkages can aid the design and implementation of more resilient production systems. Such systems are often based on the concept of a circular economy, with models that involve reuse and recycling, thereby reducing the dependency on external inputs and exposure to external shocks. This also involves the actors within the food systems being clear about and understanding the implications and possibilities to do good by their actions.[212]

The SFS Programme currently has two core initiatives under its focus theme "resilient, inclusive, and diverse production systems." One is being jointly implemented by FAO and UN Environment and focuses on increasing understanding of barriers to the adoption of more sustainable production practices, as well as on improving coordination of incentives to help food system actors overcome such barriers.[213] The other, jointly led by IFOAM-Organics International, FQH, and Beras, promotes the development of the organic food sector as a pilot model and living laboratory for sustainable food systems, using the organic food system as a model to identify, understand, and describe transformation processes toward sustainable food systems.[214]

In addition, a number of other One Planet network initiatives illustrate and/or respond to the practice of creating resilient production systems, such as:

- Building Climate Resilient Farming Communities in Cambodia;[215]
- Climate and Sustainable Livelihood Initiatives in Odisha, India;[216]
- The Declaration of Abu Dhabi for Global Food Security through Good Agricultural Practices – of which an element is to support farms to become more sustainable and resilient;[217] and

212 IIED. Building Resilient Food Systems. Available at: https://www.iied.org/building-resilient-food-systems (accessed 27 June 2020).

213 For more information see: SFS Programme. 2017c. Sustainable Food Systems – What's in it for Farmers? [CORE]. Available at: http://www.oneplanetnetwork.org/initiative/sustainable-food-systems-whats-it-farmers-core (accessed 28 June 2020).

214 For more information see: SFS Programme. 2017d. The Organic Food System Program (OFSP): Organic food systems as models and living laboratories for transformation processes towards sustainable food systems [CORE]. Available at: http://www.oneplanetnetwork.org/initiative/organic-food-system-program-ofsp-organic-food-systems-models-and-living-laboratories (accessed 28 June 2020).

215 One Planet network. 2014a. CEDAC - Building Climate Resilient Farming Communities in Cambodia (BCR). Available at: www.oneplanetnetwork.org/initiative/cedac-building-climate-resilient-farming-communities-cambodia-bcr (accessed 28 June 2020).

216 SFS Programme. 2017e. Fair Climate and Sustainable Livelihood Initiatives in Odisha. Available at: www.oneplanetnetwork.org/initiative/fair-climate-and-sustainable-livelihood-initiatives-odisha (accessed 28 June 2020).

217 One Planet network. 2014b. The Declaration of Abu Dhabi for Global Food Security through Good Agricultural Practices. Available at: www.oneplanetnetwork.org/initiative/declaration-abu-dhabi-global-food-security-through-good-agricultural-practices (accessed 28 June 2020).

- IFAD Rural Growth Programme, Yemen – to reduce poverty and food insecurity in rural areas and to increase the climate resilience of small farmers.[218]

Resource efficiency

"Resource efficiency means using the Earth's limited resources in a sustainable manner while minimising impacts on the environment. It allows us to create more with less and to deliver greater value with less input." (European Commission)[219]

"In practice it means using resources sensibly to ensure that future generations are able to enjoy the same quality of life that we have now." (European Commission)[220]

Responsible investments in agriculture and food systems

The Committee on World Food Security's (CFS) Principles for Responsible Investment in Agriculture and Food Systems – known as RAI – "acknowledge that the starting point for defining how responsible investment in agriculture and food systems can contribute to food security and nutrition is the recognition and respect for human rights. They are a set of ten principles that apply to all types and sizes of agricultural investment including fisheries, forests and livestock. They address all stakeholders and apply to all stages of the value chain. As a soft law instrument they are globally applicable and include actions to address a range of environmental, social and economic issues." (CFS)[221]

Rural advisory services

"Also called extension, rural advisory services are all the different activities that provide the information and services needed and demanded by farmers and other actors in rural settings to assist them in developing their own technical, organizational, and management skills and practices so as to improve their livelihoods and well-being."

GFRAS, the Global Forum for Rural Advisory Services, holds the view that rural advisory services need to be demand-driven and pluralistic (e.g., multisectoral). (GFRAS)[222]

Photo: ©FAO / Andrew Eseibo

218 One Planet network. 2014c. IFAD - Rural Growth Programme (RGP). Available at: www.oneplanetnetwork.org/initiative/ifad-rural-growth-programme-rgp (accessed 28 June 2020).

219 European Commission. 2020. Environment. Sustainable Development. Resource Efficiency. Available at: http://ec.europa.eu/environment/resource_efficiency/ (accessed 28 June 2020).

220 European Commission. 2011. The European Agricultural Fund for Rural Development. Examples of Food Projects.

221 CFS. Responsible Investment in Agriculture and Food Systems. Available at: http://www.fao.org/cfs/cfs-home/activities/rai/en/ (accessed 28 June 2020).

222 GFRAS. 2011. Rural Advisory Services Worldwide: A Synthesis of Actors and Issues, p. 1.

S

Smallholder farmers

"While there is no unique and unambiguous definition of a smallholder, the most common approach is based on scale, measured either in absolute terms (2 hectares is standard) or relative to a country-specific threshold that takes into account agro-ecological, economic and technological factors. Definitions based on farm size ignore a number of other characteristics that are generally associated with smallholders, such as limited access to resources, reliance on family labour and less integration into markets." (FAO)[223]

Social farming (care farming)

"Social farming, or care farming as it is also called, defines short- or long-term activities that use agricultural resources such as animals and plants to promote and generate social services in rural areas. Examples of these services include rehabilitation, therapy, sheltered employment, life-long education and other activities that contribute to social inclusion." (Di Iacovo and O'Connor)[224]

Sustainability information schemes

Sustainability information schemes comprise a "wide set of policies and initiatives providing information to external users about one or more aspects of the environmental or social performance of a product or service."

"Schemes involve either business-to-business (B2B) or business-to-consumer (B2C) communication, or both simultaneously." They vary in scope and nature and include, notably, ecolabels, certification, self-declared claims, and quantitative footprint schemes for GHG and broader environmental impact. (OECD)[225]

Sustainable agricultural development

"Sustainable agricultural development is agricultural development that contributes to improving resource efficiency, strengthening resilience and securing social equity/responsibility of agriculture and food systems in order to ensure food security and nutrition for all, now and in the future." (HLPE)[226]

Sustainable consumption and production

"The use of services and related products, which respond to basic needs and bring a better quality of life while minimizing the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardize the needs of future generations." (UN Environment)[227]

Sustainable diets and sustainable healthy diets

Definitions

Sustainable diets

"Sustainable diets are those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources." (FAO)[228]

Sustainable healthy diets

"Sustainable healthy diets are dietary patterns that promote all dimensions of individuals' health and well-being; have low environmental pressure and impact; are accessible, affordable, safe and equitable; and are culturally acceptable. The aims of sustainable healthy diets are to achieve optimal growth and development of all individuals and support functioning and physical, mental,

223 FAO. 2012b. The State of Food and Agriculture. Investing in agriculture for a better future, p. 56.

224 Di Iacovo and O'Connor. 2009. Supporting Policies for Social Farming in Europe: Progressing Multifunctionality in Responsive Rural Areas.

225 OECD. 2016. Environmental labelling and information schemes. Policy perspective. OECD, Paris.

226 HLPE. 2017. *Op. cit.*

227 UN Environment. 2010. *Op. cit.*

228 FAO. 2012c. Sustainable Diets and Biodiversity: Directions and solutions for policy, research and action. FAO, Rome.

Photo: Ella Olsson / Pexels

and social well-being at all life stages for present and future generations; contribute to preventing all forms of malnutrition (i.e., undernutrition, micronutrient deficiency, overweight and obesity); reduce the risk of diet-related NCDs; and support the preservation of biodiversity and planetary health. Sustainable healthy diets must combine all the dimensions of sustainability to avoid unintended consequences." (FAO/WHO)[229]

Discussion

The concept of sustainable diets takes into account four dimensions: health and nutrition, environment including biodiversity, economy, and socio-cultural factors. Taking into consideration the multi-dimensional nature of diets and food systems, an assessment of the sustainability of diets requires multi-criteria and trans-disciplinary approaches. This is needed in order to advance the existing knowledge-sharing tools and mechanisms for improving the sustainability of current diets while improving the ability of sustainable food systems to deliver food security and nutrition for all.

There is increasing interest in the concept of sustainable diets in both developed and developing countries, which is substantiated by the fact that several international and regional conferences have been organized as platforms for peer-to-peer learning toward a greater understanding of what the term implies in different locations.[230] Choosing seafood from non-threatened stocks surfaced as one recommended way to be more sustainable, as did choosing locally sourced, seasonal products. Reducing the consumption of ultra-processed foods will have an important documented positive effect on human health.

Sustainable and healthy diets have co-benefits on human health and well-being, for both consumers and producers, as well as on planetary health. A transition to more nutritious and diverse diets is frequently projected to result in reduced GHG emissions, as well as likely reductions in non-communicable diseases.[231] Thus, sustainable diets provide a way forward for achieving relevant goals, targets, and commitments, both global and local, including the Sustainable Development Goals of the 2030 Agenda for Sustainable Development,[232] as well as the commitments of the United Nations Decade of Action on Nutrition (2016–2025).[233]

Sustainable diets, such as the traditional Mediterranean diet, the traditional Japanese diet, or the new Nordic diet, which are mainly plant-based dietary patterns, provide viable alternatives to diets that rely mainly on animal proteins. These could all be considered as models to be used elsewhere.

The traditional Mediterranean diet is one example of a sustainable diet,[234] in practice (→ Box 8 / page 57). Though there are country-specific variations, it is generally characterized by four common benefits:

229 FAO and WHO. 2019. Sustainable Healthy Diets - Guiding Principles. Rome.

230 For example the International Symposium on Biodiversity and Sustainable Diets: United against Hunger; the Second International Conference on Nutrition; and the International Symposium on Sustainable Food Systems for Healthy Diets and Improved Nutrition.

231 UNSCN. 2017. *Op. cit.*
Globally, it is estimated that transitioning to more plant-based diets, in line with WHO recommendations on healthy eating (WHO 2015) and guidelines on human energy requirements (WHO 2004) and recommendations by the World Cancer Research Fund (WCRF/AICR, 2007), could reduce global mortality by 6–10 percent and food-related greenhouse gas emissions by 29–70 percent compared with a reference scenario for 2050 (Springmann *et al.* 2016).

232 In particular to SDG2 (End hunger, achieve food security and improved nutrition and promote sustainable agriculture) and SDG12 (Ensure sustainable consumption and production patterns), as well as poverty (SDG1), health (SDG3), climate change (SDG13), and land degradation and biodiversity (SDG15).

233 In particular the 3rd "Enhance sustainable food systems."

234 UNSCN. 2017. *Op. cit.*

Box 8: The Mediterranean diet as an example of a sustainable diet

The traditional Mediterranean diet is considered an example of a sustainable diet that fully fits the definition of sustainable diets. It is a mainly plant-based dietary pattern with low environmental impacts and richness in biodiversity, and in 2010 it was acknowledged by UNESCO as an intangible cultural heritage of humankind, in particular for its high socio-cultural values and acceptance among Mediterranean people. The health benefits of the Mediterranean diet are broadly documented in scientific literature, and it can be considered both economically fair and affordable, while providing sustainable economic benefits at the territorial level.

Photo: Valeria Boltneva / Pexels

i) well-documented health and nutrition benefits, ii) low environmental impacts and richness in biodiversity, iii) high socio-cultural food values, and iv) positive local economic returns.[235]

To encourage the uptake of sustainable diets, a joint publication of FAO and the Food Climate Research Network, "Plates, pyramids, planet,"[236] provides decision makers with an in-depth review of how countries incorporate sustainability into their Food Based Dietary Guidelines (FBDGs). Currently, only a few countries, including Brazil, Germany, Qatar, and Sweden, have included sustainability criterion in their FBDGs, but more could be considered to reap its benefit. Market regulations and economic incentives could be effective in steering dietary patterns.

Improving food systems for sustainable diets requires a cross-sectoral effort to reverse the processes of simplification and homogenization of diets, the degradation of ecosystems, and the erosion of biodiversity. Both programmatic activities as well as holistic policies toward sustainable food production and food consumption are needed for the promotion of sustainable diets.

There is a need for further studies that explore the linkages and synergies of sustainable diets and agricultural biodiversity, nutrition, food consumption, food production, agriculture, and sustainability to improve nutrition and food security, through the characterization of different agro-ecological zones and bioregions for different related models of sustainable diets. In addition, people need better information and clearer recommendations regarding environmentally, socially, and economically sustainable food and how food consumption impacts on all elements of the food system; in this regard, the development of voluntary guidelines addressed to consumers and producers, as well as policy makers, may be one part of the solution. Yet, although the evidence base must be improved, existing knowledge warrants immediate action to promote more sustainable diets in nutrition and food systems programs, by linking food security, nutrition, and sustainability. Finally, industry also has an important role to play in ensuring the provision of sustainable food choices.

Taking into account that food systems differ greatly both across and within regional and national circumstances, promoting sustainable diets provides a strategic and unique added value to the SFS Programme, as it can foster the involvement of key stakeholders and food system actors.

The SFS Programme currently has two core initiatives under its focus theme "sustainable diets." One is jointly led by FAO and UN Environment, and aims to improve the evidence base by developing guidelines for assessing

235 Dernini *et al.* 2017. Med Diet 4.0: the Mediterranean diet with four sustainable benefits. In: Public health nutrition.

236 FAO/University of Oxford. 2016. Plates, pyramids and planets. Developments in national healthy and sustainable dietary guidelines: a state of play assessment. Rome.

sustainable diets in the context of sustainable food systems, including by identifying trends and drivers for the development of a multidisciplinary framework on sustainable diets.[237] The other, under the joint leadership of Costa Rica, Hivos, IFOAM-Organics International, CACORE, and INBio, focuses on promoting healthy and sustainable gastronomy as a driver of agriculture development and a way to strengthen diversified family farming systems. The program will initially be piloted in Costa Rica, with a view to replication in other countries.[238]

Sustainable food systems

"A sustainable food system is a food system that ensures food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition of future generations are not compromised." (HLPE)[239]

Sustainable food systems approach

"A sustainable food systems approach considers food systems in their totality, taking into account the interconnections and trade-offs among the different elements of food systems, as well as their diverse actors, activities, drivers and outcomes. It seeks to simultaneously maximize societal outcomes across environmental, social (incl. health) and economic dimensions." (One Planet network's Sustainable Food Systems Programme)[240]

Sustainable food value chain

Photo: ©FAO/Luis Tato

Definition

"A sustainable food value chain (SFVC) is a food value chain that:

- is profitable throughout all of its stages (economic sustainability);
- has broad-based benefits for society (social sustainability);
- has a positive or neutral impact on the natural environment [within planetary boundaries] (environmental sustainability).

The SFVC concept recognizes that value chains are dynamic, market-driven systems in which vertical coordination (governance) is the central dimension and for which value added and sustainability are explicit, multidimensional performance measures, assessed at the aggregate level." (FAO)[241]

237 For more information see: SFS Programme. 2017f. Sustainable diets in the context of sustainable food systems [CORE]. Available at: http://www.oneplanetnetwork.org/initiative/sustainable-diets-context-sustainable-food-systems-core (accessed 28 June 2020).

238 For more information see: SFS Programme. 2017g. Sustainable and healthy gastronomy as a key driver for sustainable food systems [CORE]. Available at: http://www.oneplanetnetwork.org/initiative/sustainable-and-healthy-gastronomy-key-driver-sustainable-food-systems-core (accessed 28 June 2020).

239 HLPE. 2014a. *Op. cit.*
There is not one unified global food system, but rather a multitude of different types of food systems at various geographic and organizational scales that co-exist and interact with each other to different degrees. In addition, the elements and activities in this definition are not to be understood as exhaustive. Similarly, sub-components of environmental and socio-economic food system outcomes, such as human health, are not explicitly mentioned in this definition. See in this context also Figure 1.

240 UN Environment / SFS Programme. 2019. *Op. cit*; Adapted from: FAO. 2018a. *Op. cit.*

241 FAO. 2014c. *Op. cit.*

Discussion

Value chain approaches are used analytically to understand how supply (or food provisioning) chains work in practice and how they can be influenced to achieve desired outcomes (e.g., value-addition, producer upgrading, equitable trading relations, or sustainability).[242] In the Sustainable Food Systems Approach, food supply chains are considered as the core "productive" activities of the food system.

There are a range of tools and concepts that have been developed since the 1950s to assess the production, trade, and purchasing of specific products and commodities.[243] Four of these have been particularly influential in bringing the concept of global value chains[244] into policy discussions:[245] 1) In the 1960s, the French filière approach mapped and calculated the socioeconomic characteristics of agro-enterprises and the monetary value of product flows from production to consumption.[246] 2) In the 1970s–80s, sub-sector analysis became common as a means to map, quantify, and analyze the various competing channels for specific raw materials. This approach focused on the competitive dynamics of the interactions between firms, using different technologies and trading relationships, to identify leverage points for increasing value and finding cost-efficiencies. 3) In the 1980s, Immanuel Wallerstein's world systems theory[247] was further developed to analyze tropical commodity systems,[248] in order to understand sociological questions of power and exploitation in these long chains. 4) The term "value chain" was coined by Michael Porter[249] as a management tool that could help firms first identify and then exploit their competitive advantage within an industry, then to "create shared value" among supply chain actors.[250]

One way to promote sustainability in the food system along the food value chain is through "green" value chains. These are value chains where environmental and social indicators are taken into consideration in determining the sustainability of the supply chain.[251] They range from closed-loop supply chains that reduce their environmental footprint by recycling the used products back through the chain,[252] creating circular economies,[253] to sustainable sourcing strategies that focus on the purchasing of certified raw materials where the "value" of sustainability is certified by a third-party.[254]

Linked to the notion of sustainable sourcing, but slightly different, is the concept of values-based food chains (VBFCs). These are a particular type of mid-tier supply chain that has formed through alliances between producers and buyers to distribute significant volumes of high-quality, differentiated food products while maintaining transparent relationships and fair distribution of revenues. The values that VBFCs reproduce throughout the supply chain are social, cultural, economic, environmental, or quality-related. They can be linked to the products themselves, the way the production process is carried out, and the way that supply chain participants interact and create social value.[255]

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242 Kaplinsky and Morris. 2002. A Handbook for Value Chain Research. Institute of Development Studies. Brighton, UK.

243 See FAO 2014c for a good overview.

244 This is the conceptual basis for the notion of Food Value Chains. See: Gereffi and Korzeniewicz. 1994. Commodity chains and global capitalism. Greenwood Press, Westport, CT.

245 This section is based on the following reference: Loconto *et al.* 2018. Sustainability along all value chains: exploring value chain interactions in sustainable food systems. In: Sustainable Diets: Linking Nutrition and Food Systems. Burlingame and Dernini (Eds.). CABI Publishers, Oxfordshire, UK.

246 Raikes *et al.* 2000. Global commodity chain analysis and the French filière approach: comparison and critique. In: Economy and Society.

247 Hopkins and Wallerstein. 1986. Commodity Chains in the World-Economy Prior to 1800. In: Review.

248 Friedland. 2001. Reprise on commodity systems methodology. In: International Journal of Sociology of Agriculture and Food.

249 Porter. 1985. *Op. cit.*

250 Porter and Kramer. 2011. *Op. cit.*

251 Carter and Rogers. 2008. *Op. cit.*

252 Srivastava. 2007. Green supply-chain management: A state-of-the-art literature review. In: International Journal of Management Reviews.

253 Andersen. 2007. An introductory note on the environmental economics of the circular economy. In: Sustainability Science.

254 Loconto. 2010. Sustainably Performed: Reconciling Global Value Chain Governance and Performativity. In: Journal of Rural Social Science 25; Loconto and von Hagen. 2016. Influencing sustainable sourcing decisions in agri-food supply chains. ITC Trade Information Services Technical Paper. International Trade Centre, Geneva; OECD/FAO. 2016. OECD-FAO Guidance for Responsible Agricultural Supply Chains. OECD Publishing, Paris; SAI. 2013. Sustainable Sourcing of Agricultural Raw Materials: A Practitioner's Guide. The Sustainable Agriculture Initiative (SAI) Platform, Brussels.

255 Ostrom *et al.* 2017. Values-based Food Chains from a Transatlantic Perspective: Exploring a Middle Tier of Agri-food System Development. In: International Journal of Sociology of Agriculture & Food.

More recently, the concept of *circuit court*[256] or short food supply chain has emerged, where short supply chains are defined as those with few intermediaries between farmers and consumers.[257] Many short supply chains are designed with a focus on geographic proximity or shared values. These try to capture how proximity (geographic or shared values) is often a common denominator in creating strong linkages between consumers and producers that contribute to the sustainability of the food system.[258] In these chains, proximity serves as a starting point for the collective construction of a new vision and identity around food production and consumption for urban communities.[259] Proximity has also been shown to have positive effects on reinforcing site-specific cultural identity and the ability of local actors to be actively engaged in their local food systems,[260] such as community-supported agriculture[261] or consumer-driven food initiatives.[262] The construction of geographical or social/institutional proximity in food systems implies building conscious relationships between producers, consumers, and other intermediary actors who are increasingly fundamental in ensuring that sustainable production and consumption activities can meet.[263] These approaches move out of a linear focus on one product or commodity toward "baskets of goods" that offer diverse food options for closely linked consumers and producers.

The SFS Programme currently has two core initiatives under its focus theme "sustainability along all food value chains." One is led by FAO and INRAE, with the participation of UN Environment, the Costa Rican Ministry of Agriculture and Livestock (MAG), and the Honduran National Sustainable Development Council (CONADES), and focuses on documenting, analyzing, and providing guidance on the diversity of values produced through linking small-scale producers and consumers. Core activities include mapping local and territorial markets and innovation in local food systems.[264] The other, implemented under the lead of Nestlé, the Global Nature Fund, and IFOAM-Organics International, aims to develop better biodiversity standards and valuation methods, with the objective of motivating companies to use these tools in order to increase the biodiversity performance of the food sector.[265]

Sustainable food value chains approach

Definition

"The sustainable food value chains approach addresses the full range of farms and firms and their successive coordinated value-adding activities that produce particular raw agricultural materials and transform them into particular food products that are sold to final consumers and disposed of after use, in a manner that is profitable throughout, has broad based benefits for society and does not permanently deplete natural resources." (FAO)[266]

256 Chiffoleau. 2012. *Op. cit.*

257 Santini *et al.* 2013. *Op. cit.*

258 Aubry and Kebir. 2013. Shortening food supply chains: A means for maintaining agriculture close to urban areas? The case of the French metropolitan area of Paris. In: Food Policy; Renting *et al.* 2003. Understanding Alternative Food Networks: Exploring the Role of Short Food Supply Chains in Rural Development. In: Environment and Planning A.

259 Parker. 2005. Sustainable food? Tei-ki, cooperatives and food citizenship in Japan and UK. Working Paper in Real State and Planning. University of Reading, Reading, UK.

260 Renting *et al.* 2012. Building food democracy: exploring civic food networks and newly emerging forms of food citizenship. In: International Journal of Sociology of Agriculture & Food.

261 Hinrichs. 2000. Embeddedness and local food systems: notes on two types of direct agricultural market. In: Journal of Rural Studies.

262 Fonte. 2013. Food consumption as social practice: Solidarity Purchasing Groups in Rome, Italy. In: Journal of Rural Studies.

263 FAO. 2016b. Innovative markets for sustainable agriculture: How innovations in market institutions encourage sustainable agriculture in developing countries. FAO and INRAE, Rome; FAO. 2018e. Constructing markets for agroecology. An analysis of diverse options for marketing products from agroecology. FAO, Rome.

264 For more information see: SFS Programme. 2017h. Sustainability along all value chains: identifying and promoting local initiatives linking small-scale producers and consumers [CORE]. Available at: http://www.oneplanetnetwork.org/initiative/sustainability-along-all-value-chains-identifying-and-promoting-local-initiatives-linking (accessed 28 June 2020).

265 For more information see: SFS Programme. 2017i. Complementing existing value chain sustainability assessments: Measuring, communicating, and valuing biodiversity in food systems [CORE]. Available at: http://www.oneplanetnetwork.org/initiative/complementing-existing-value-chain-sustainability-assessments-measuring-communicating-and (accessed 28 June 2020).

266 FAO. 2014c. *Op. cit.*, p. 6.

Photo: ©FAO/Joerg Boethling

Discussion

If considered systemically, as in the FAO's sustainable food value chains approach, the food value chain can be used to implement sustainability in the food system.[267] This approach places the value chain at the heart of a system of complex environments that determines the behavior and performance of farms and other agri-food enterprises. This vision implies that the chain is not only a logistical structure, as some of the more instrumentalist approaches propose, but rather a chain of relationships where different actors along the chain are adding value as the product moves from one actor to the next within a food system. This approach provides a roadmap from which to trace the actors who, through different nodes of negotiation, are involved in creating values throughout the chain.[268] The approach also highlights the importance of institutional actors and input and support services providers who enable value chain actors to engage in their value-adding activities, such as banks, extension workers, government agencies, etc. Thus, creating sustainable food value chains is seen as a core function of a sustainable food system. In addition, a Sustainable Food Systems Approach will look beyond individual value chains in order to gain a more comprehensive and systemic understanding of the dynamic horizontal relationships that emerge as actors who are participating in individual value chains begin to interact in new relationships that add value to their food systems.

→ Annex 6 / page 72 contains an overview that places this approach on the food systems spectrum.

Sustainable intensification and sustainable crop production intensification

Definitions

Sustainable intensification

"While there is no agreed definition on sustainable intensification, there is broad consensus that it refers to a process where agricultural productivity is increased while maintaining or improving environmental outcomes." (Pretty *et al.*)[269]

Sustainable crop production intensification

The FAO defines sustainable crop production intensification as production that „provides opportunities for optimizing crop production per unit area, taking into consideration the range of sustainability aspects including potential and/or real social, political, economic and environmental impacts." (FAO)[270]

Discussion

The concept of sustainable intensification was developed primarily in relation to crop production, and further broadened to the whole agricultural production system. It was developed in response to the need to address the issue of feeding a growing population while mitigating the negative environmental impacts of agriculture. Sustainable intensification looks at whole landscapes, territories, and ecosystems to optimize resource utilization and management. Through sustainable intensification, farmers produce more from the same area

267 FAO. 2014c. *Op. cit.*, p. 6.

268 Ponte and Gibbon. 2005. Quality Standards, Conventions and the Governance of Global Value Chains. In: Economy and Society.

269 Pretty *et al.* 2018. Global Assessment of Agricultural System Redesign for Sustainable Intensification. In: Nature Sustainability.

270 FAO. Sustainable Crop Production Intensification. Available at: http://www.fao.org/agriculture/crops/thematic-sitemap/theme/spi/en/ (accessed 28 June 2020).

Photo: ©FAO/Riccardo De Luca

of land (or from the same volume of water) and use fewer inputs, while producing greater yields.[271]

In a world with growing pressure on resources, sustainable intensification of agriculture is critical in achieving both social and environmental goals. By producing more with less, in particular less land, it limits the need for expanding agricultural land and reduces encroachment on natural systems, including forests. By better using inputs like water, energy or chemicals, it can further reduce the negative environmental impacts of agriculture.

The concept of sustainable intensification does not prescribe any particular vision or method of agricultural production. There is no pre-determined technology package, species mix, or cookie-cutter design applications. However, this does not imply that sustainable intensification is "business-as-usual" agriculture. As observed by Godfray (2015): "Sustainable intensification if treated seriously is genuinely radical. It is not a smorgasbord of interventions that can be chosen at will to justify different farming methods and philosophies. It is a coherent program that seeks radical change in the way food is produced and which places as much weight on improving environmental sustainability as on economic efficiency. It should not be seen as business-as-usual with marginal improvements that benefit the environment, nor as a call for a purely environmental agenda that fails to acknowledge the need to meet people's expectations for affordable, nutritious and varied food."[272]

Sustainable intensification emphasizes the outcomes of production – that is, both more food and improved environmental goods and services. While no particular method of production is prescribed, a number of specific agronomic techniques are associated with sustainable intensification, like conservation agriculture, precision agriculture, integrated pest management, integrated soil fertility management, and the move towards more integrated production systems. All of these have the potential to contribute to the principle of producing more with less. It should be noted that the concept of sustainable intensification focuses exclusively on the production side of food systems.[273]

A specific example of precision agriculture leading to sustainable intensification would include precision technologies that target water application to areas of a field that need it, resulting in less, but more efficient and effective, water application. Likewise, soil mapping – either with modern technologies or by farmers with long experience of local soils and growing patterns – could help farmers improve yields while reducing input use by targeting specific management practices to those areas of a field that could most benefit from them and reducing application to soils that do not need it.

→ Annex 6 / page 72 contains an overview that places this approach on the food systems spectrum.

Sustainable lifestyles

"A 'sustainable lifestyle' is a way of living enabled both by efficient lifestyles infrastructures, goods and services, and by individual choices and actions that minimize the use of natural resources, and generation of emissions, wastes and pollution, while supporting equitable socio-economic development and progress for all.

271 FAO. 2019e. Policy Support and Governance. Sustainable Intensification of Crop Production. Available at: http://www.fao.org/policy-support/policy-themes/sustainable-intensification-agriculture/en/ (accessed 28 June 2020).

272 Godfray. 2015. The debate over sustainable intensification. In: Food Security.

273 FAO. Sustainable Agricultural Mechanization. Implementing the Save and Grow Approach. Available at: http://www.fao.org/sustainable-agricultural-mechanization/strategies/save-and-grow/en/ (accessed 28 June 2020).

Creating sustainable lifestyles means rethinking our ways of living, how we buy and how we organize our everyday life. It is also about altering how we socialize, exchange, share, educate and build identities. It is about transforming our societies and living in balance with our natural environment. As citizens, at home and at work, many of our choices on energy use, transport, food, waste, communication and solidarity contribute to building sustainable lifestyles.

Governments have a key role to play by creating the appropriate frameworks and infrastructures (regulatory instruments, technological innovations, new public services) to enable citizens to change. Information and education are essential, as well as the full participation of civil society in the movement and the involvement of the business sector that can develop innovative solutions for sustainable lifestyles." (UN Environment)[274]

Photo: ©FAO/Pier Paolo Cito

T

Territorial approaches

Definition

"While there is no one, single definition, territorial approaches can be described as addressing the development of multiple sectors, implemented by a range of stakeholders and structured by multi-level governance.

- Focus on poverty and inequalities: recognizes that all regions have development potential, not only urban areas.
- Area-based: starting point is the economy, aims to capitalize on the strengths inherent in a territory so that locally-based products and services drive development.
- Scale: determined by the social and economic make-up of a given territory; management is inclusive and starts at the grass-roots level to evolve into the multi-level governance network.
- Key activities: territorial analysis, livelihood analysis, negotiation, consensus building, conflict resolution, consultation." (The Food Crisis Prevention Network)[275]

"A territorial approach applied to food systems would entail a collective planning process that takes into account all stages from food production to consumption occurring in a given territory. It would involve looking at food systems in a holistic, cross-sectoral manner, at the sub-national level (metropolitan, rural adjacent, and remote rural spaces) in order to develop strategies that can more sustainably develop the territory" (FAO)[276]

Discussion

The territorial approach to rural development referred to here is a socio-economic means to "(1) derive added value from locally under-used resources relative to current potential, (2) integrate rural and urban activities in a territorial dimension centered around regional economic projects, and (3) incorporate the rural poor into the employment and investment opportunities created by local growth."[277]

274 UN Environment. 2010. *Op. cit.*

275 RPCA. 2017. 33rd Annual Meeting. Innovative and Territorial Approaches to Food and Nutrition Security, p. 8.

276 FAO. FAO Term Portal. *Op. cit.*

277 De Janvry and Sadoulet. 2007. Toward a territorial approach to rural development. In: Electronic Journal of Agricultural and Development Economics.

©FAO/Alessia Pierdomenico

In general, this approach is a territorial planning tool.[278] It is a "public intervention which builds on local capabilities and promotes innovative ideas through the interaction of local and general knowledge and of endogenous and exogenous actors."[279] As an approach, it combines: "(i) institutional development to promote consultations among local and external agents, and include poor people in production transformation processes and benefits; and (ii) production transformation to link the territory's economy with dynamic markets."[280] The focus is on better linking urban and rural areas in the comprehensive development of a territory (including both more rural and more urban areas in a defined space), at the same time as addressing the development of multiple sectors, implemented by a range of stakeholders (particularly informal micro-enterprises as well as small and medium enterprises) and structured by multi-level governance – or governance that involves coordination between local, regional, and national-level authorities and stakeholders.

The concept of territory, used in territorial approaches, thus derives from the concept first articulated in French, Italian, Spanish, and Portuguese, of an area of land that has been inhabited by a people who have traditionally practiced an identifiable form of agriculture and agro-industry (processing and value-addition) that is economically, socially, and culturally tied to this geo-political space. Thus, the notion of a territory goes beyond its English definition that denotes only the geographic area to include the agroecosystems, people, economy, and socio-cultural practices of that space. In this sense, it is closely linked to the French notion of "terroir."[281] A well-established approach to territorial development has been the promotion of geographical indications.[282]

In sum, a territorial approach applied to food systems would entail a collective planning process that takes into account all stages, from food production to consumption, occurring in a given territory. It would involve looking at food systems in a holistic, cross-sectoral manner, at the sub-national level (metropolitan, rural-adjacent, and remote rural spaces), in order to develop strategies that can more sustainably develop the territory.[283]

→ Annex 6 / page 72 contains an overview that places this approach on the food systems spectrum.

278 FAO. 2017c. Territorial tools for agro-industry development – A Sourcebook. FAO, Rome.

279 Cistulli *et al.* 2014. Addressing food security and nutrition by means of a territorial approach. In: Food Security.

280 CFS. 2017. Forty-fourth Session. Addressing food security and nutrition in the context of changing rural-urban dynamics: experiences and effective policy approaches. CFS, Rome.

281 Barham. 2003. Translating terroir: the global challenge of French AOC labeling. In: Journal of Rural Studies.

282 FAO. 2009b. Linking people, places and products. A guide for promoting quality linked to geographical origin and sustainable geographical indications. FAO, Rome.

283 OECD/FAO/UNCDF. 2016. Adopting a Territorial Approach to Food Security and Nutrition Policy. OECD Publishing, Paris, p. 36.

True cost accounting and impact valuation

Photo: ©FAO/Pelin Turan

True cost accounting

"True cost accounting is a critical tool to help us, as a global community, better understand the impacts of food systems, address the most harmful practices, and find new, positive pathways forward. By evaluating the impacts – both positive and negative – inherent in different food systems, and making these impacts transparent, decision-makers on farms and in governments, institutions, and businesses can make better informed decisions that take into account the economic, environmental, and social impacts of their choices." (Global Alliance for the Future of Food)[284]

Impact valuation

Impact valuation can be defined as "the application of welfare economics to determine the positive and negative value contribution of business activities to society in monetary terms." (Impact Valuation Roundtable)[285]

U

Urban and peri-urban agriculture

"Urban and peri-urban agriculture or urban and peri-urban agriculture and forestry is defined as the growing of trees, food and other agricultural products (herbs, pot plants, fuel, fodder) and raising of livestock (and fisheries) within the built-up area or on the fringe of cities. Urban and peri-urban agriculture and forestry includes production systems such as horticulture, livestock, (agro-)forestry and aquaculture and input supply, processing and marketing activities.

The most striking feature of urban agriculture is not its urban location but rather the fact that it is an integral part of the urban socio-economic and ecological system (Mougeot, 2000). It uses urban resources (land, labour and urban organic wastes), grows produce for urban citizens, is strongly influenced by urban conditions (urban policies and regulations, high competition for land, urban markets, prices, etc.) and impacts the urban system (having effects on urban food security and poverty, as well as on ecology and health).

The precise nature of urban agriculture varies from city to city and depends on the following dimensions:

- actors involved;
- location (intra-urban or peri-urban; on or off plot; private or public, etc.);
- types of products grown (food products from different types of crops and animals, as well as non-food products).
- types of economic activities (production, processing and marketing, as well as inputs and services delivery;
- product destination/degree of market orientation (self-consumption, market-oriented urban agriculture);
- scales of production and technology used." (RUAF)[286]

284 GAFF. 2019. On True Cost Accounting & the Future of Food. Available at: https://issuu.com/futureoffood/docs/ga_tca_booklet_2019_digital (accessed 28 June 2020).

285 Impact Valuation Roundtable. 2017. Operationalizing Impact Valuation. Experiences and Recommendations by Participants of the Impact Valuation Roundtable. White Paper. Available at: https://docs.wbcsd.org/2017/04/IVR_Impact%20Valuation_White_Paper.pdf (accessed 28 June 2020).

286 RUAF. Urban Agriculture and City-Region Food Systems: What and Why. Available at: https://ruaf.org/urban-agriculture-and-city-region-food-systems/#urban-and-peri-urban-agriculture (accessed 28 June 2020).

V

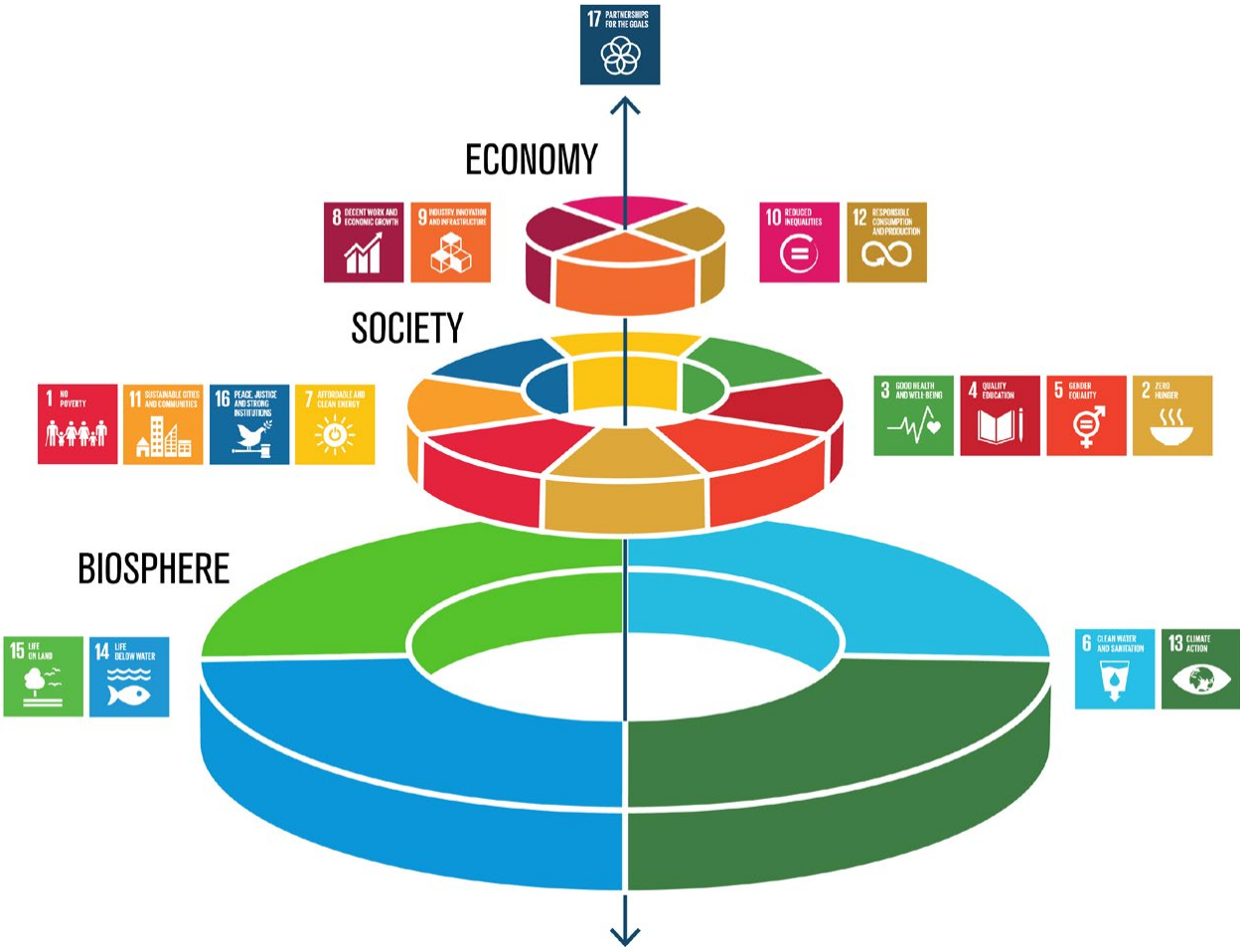
Voluntary sustainability standards

Photo: ©FAO/Riccardo De Luca

"Voluntary sustainability standards are rules that producers, traders, manufacturers, retailers or service providers may be asked to follow so that the things they make, grow or do don't hurt people and the environment. These standards help keep workers healthy and safe, protect communities and land, and uphold human rights, as well as moderating the environmental impacts of production and consumption." (UNFSS)[287]

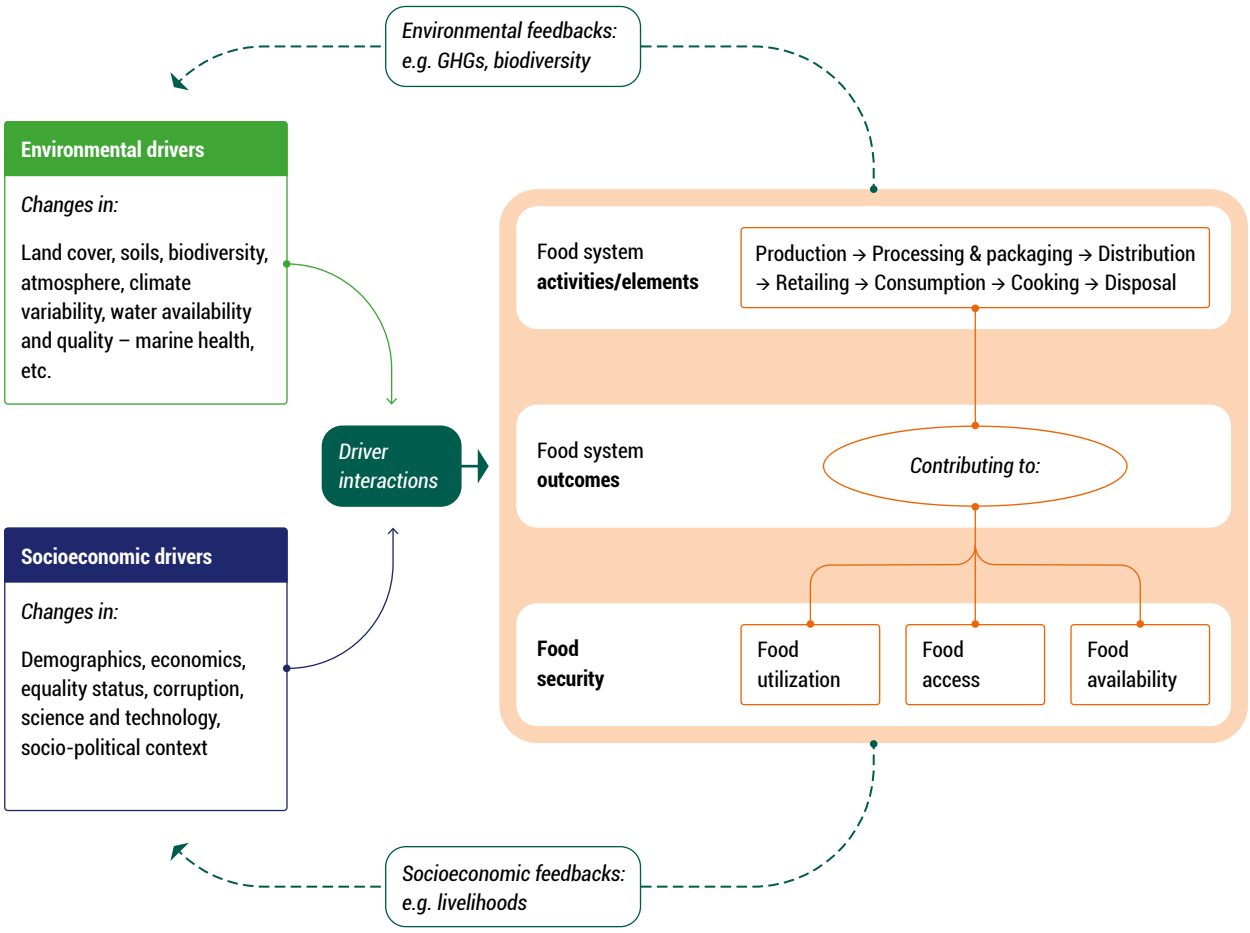
287 UNFSS. About UNFSS. What are Voluntary Sustainability Standards (VSS)? Available at: https://unfss.org/home/about-unfss/ (accessed 28 June 2020).

Annex 1: The SDG "Wedding Cake"[288]



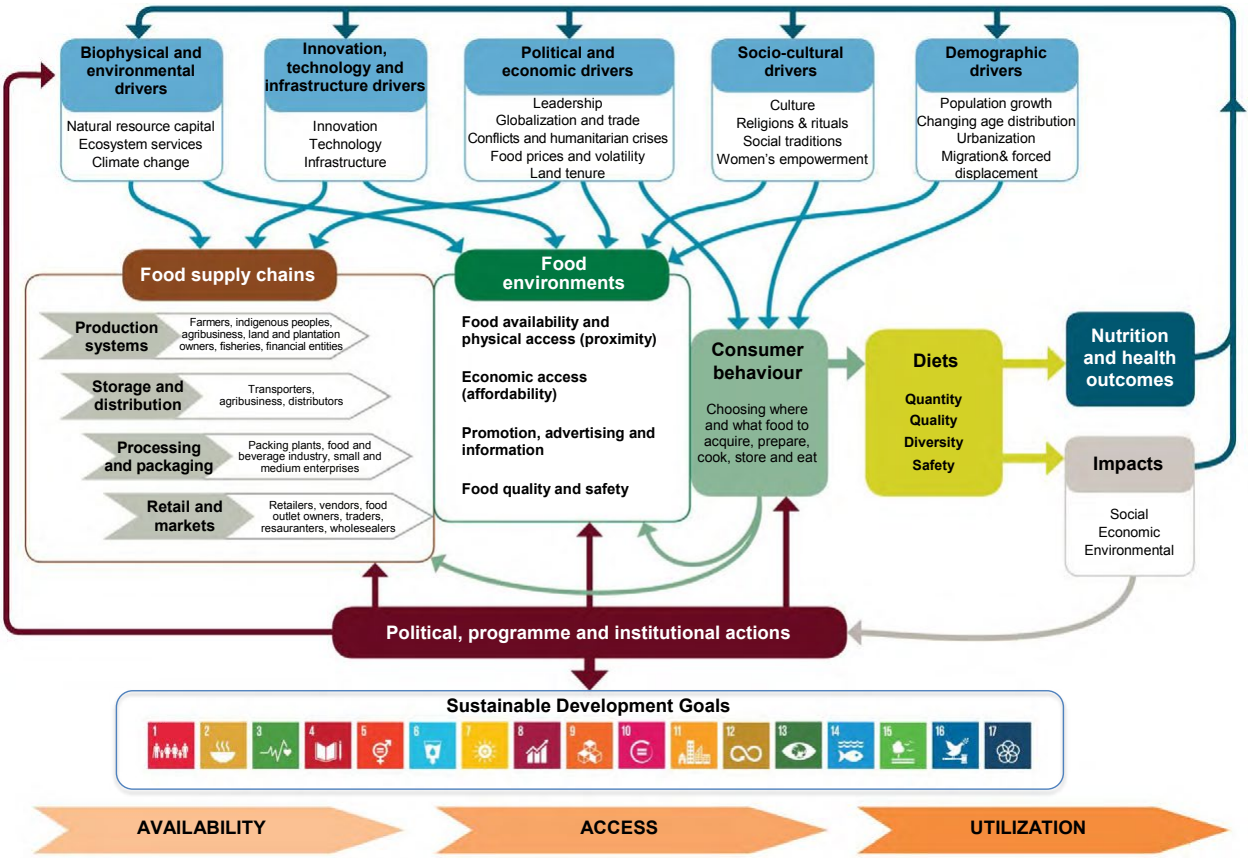
288 Stockholm Resilience Centre. 2016. Research. How food connects all the SDGs. Available at: https://www.stockholmresilience.org/research/research-news/2016-06-14-how-food-connects-all-the-sdgs.html (accessed 28 June 2020).

Annex 2: An Illustration of Food Systems Interactions and Feedback Loops[289]



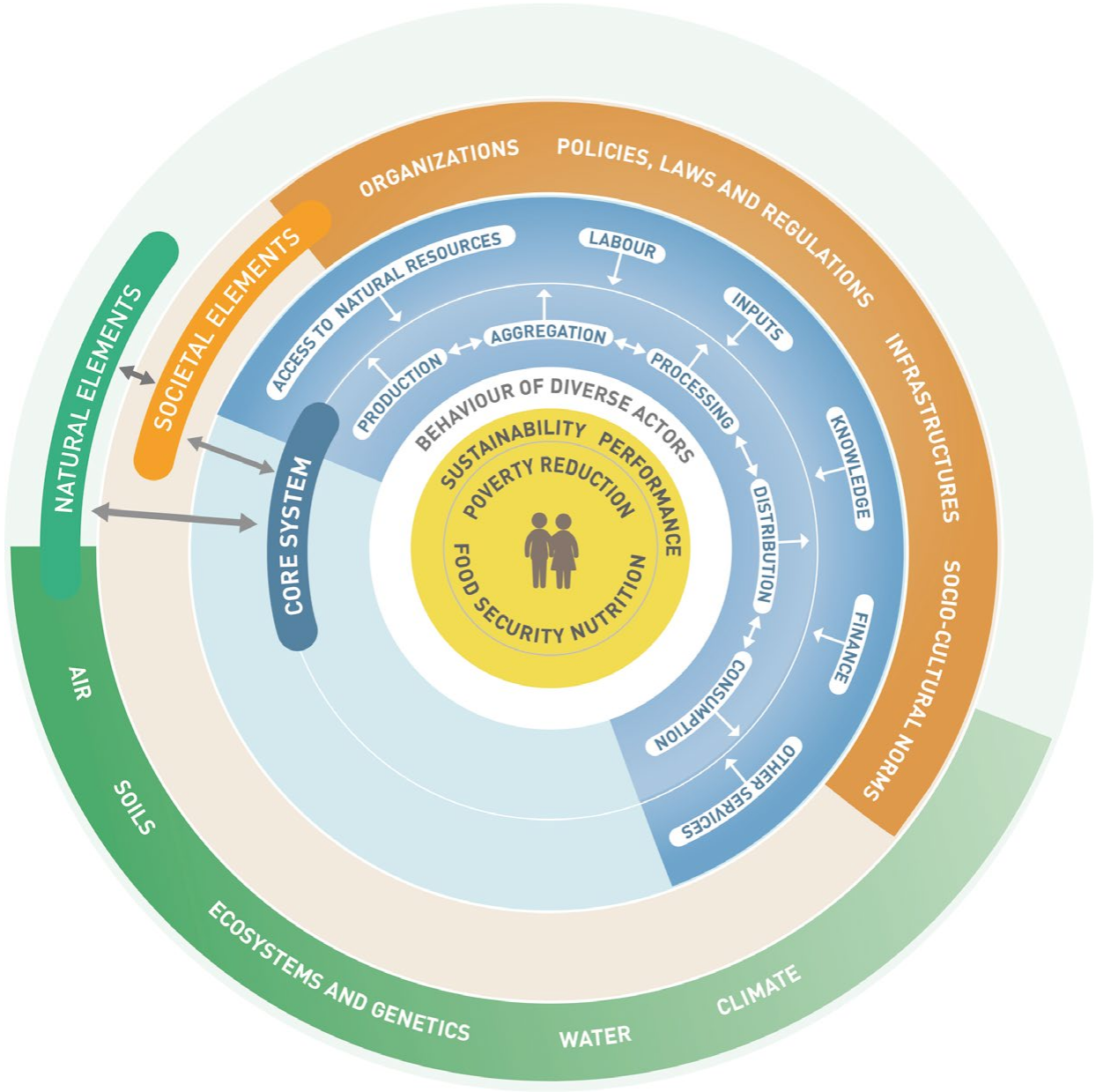
289 Mulet Solon *et al.* 2018. *Op cit.*

Annex 3: A Conceptual Framework of Food Systems for Diets and Nutrition[290]



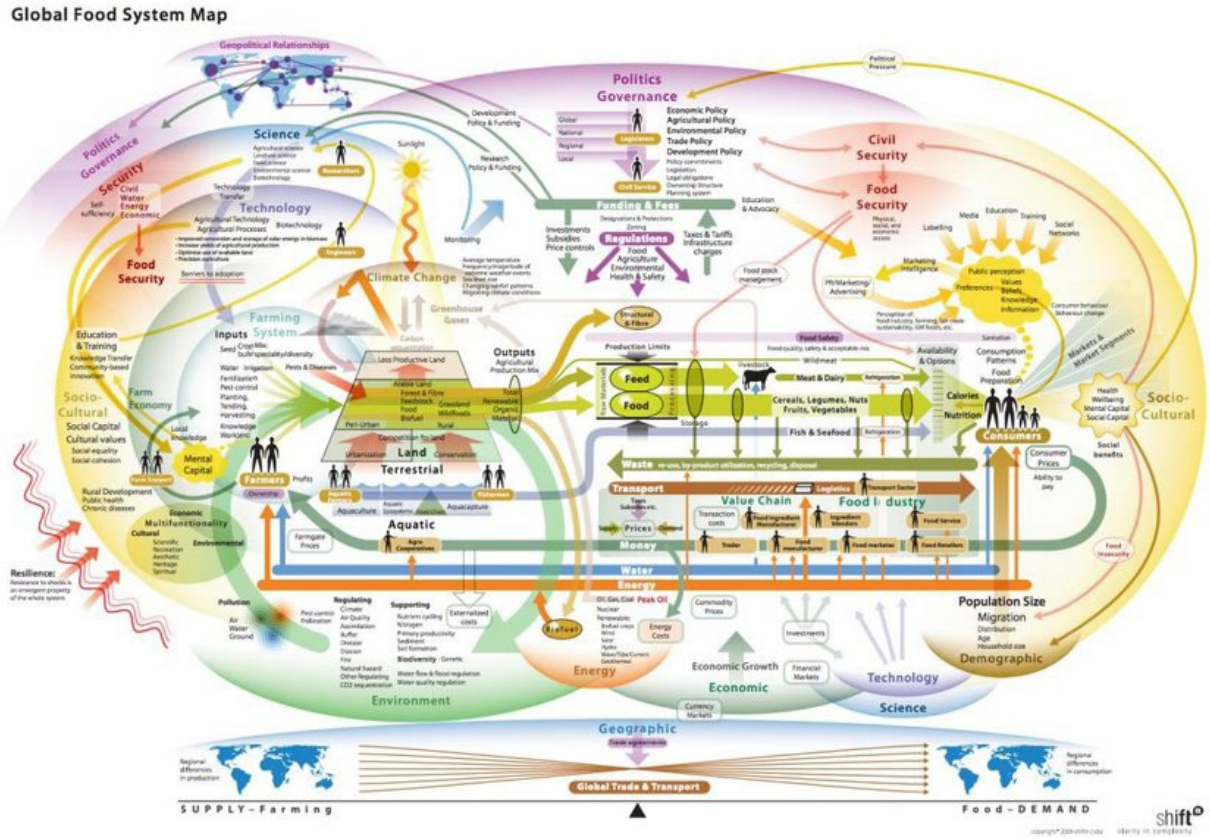
290 HLPE. 2017. *Op. cit.*

Annex 4: The Food System Wheel[291]



291 FAO. 2018a. *Op. cit.*, p. 3.

Annex 5: A Comprehensive Illustration of the Global Food System



One of the most comprehensive efforts at conceptualizing the linkages between agricultural systems and food and nutrition security is the global food system map, which depicts inter-related concepts and challenges that connect the global food system.[292]

292 ShiftN. 2009. Global food system map; retrieved in Nicholson *et al.* 2019. Setting priorities to address the research gaps between agricultural systems analysis and food security outcomes in low-and middle-income countries. Available at: https://www.researchgate.net/figure/Global-Food-System-Map-3-Source-ShiftN-2009_fig1_331311296 (accessed 28 June 2020).

Annex 6: Placing Different Approaches on the Food Systems Spectrum

	Sustainable	Agroecology	Sustainable food value chain approach	Sustainable intensification	Territorial approaches	Public health approaches
Main **sustainability dimension(s)** addressed	Economic, social & environmental	Economic, social & environmental (+cultural)	Economic, social & environmental	Economic, social & environmental	Primary focus on social and economic dimensions	Primary focus on social dimension (i.e., health)
Main **food systems activities** addressed	All food system activities	Primary production[293]	Primary production, processing & distribution	Primary production	Primary production, processing & distribution[294]	All food system activities
Main **food systems elements** addressed[295]	All food system elements	Natural resources, ecosystem services, biodiversity, market opportunities, income distribution, social norms and values, traditional knowledge	Market opportunities, income distribution, social norms and values, consumer information, traditional knowledge, natural resources, biodiversity	Population growth, natural resources, biodiversity, income distribution, market opportunities	Market opportunities, income distribution, social norms and values, traditional knowledge	Social norms and values, consumer information, behavior and trends, education, health
Main **food systems outcomes** addressed[296]	All food system outcomes	Ecosystem services, conservation & sustainable use of biodiversity, climate change mitigation, resilience & climate change adaptation, livelihoods & well-being, social justice & equality, poverty alleviation	Food security & nutrition (especially availability), resource efficiency, conservation & sustainable use of biodiversity, climate change mitigation, profitability for farmers & living wages, economic development	Food security & nutrition (especially availability), resource efficiency, profitability for farmers	Livelihoods & well-being, social justice & equality, economic development & poverty alleviation	Food security & nutrition (especially food safety & utilization), human health
Level of analysis	Entire food systems	Agro-ecosystems	Value chains of individual commodities	Landscapes, territories, ecosystems	Territory[297]	Entire food systems

293 However, as a social movement, the focus of agroecology goes beyond purely primary production. There are several examples of agroecological movements that aim to bring producers and consumers closer together, e.g., by promoting short value chains, community-supported agriculture, and farmers markets.

294 However, this approach goes beyond these production-side activities, linking them to the consumption side by promoting, *inter alia*, short value chains, community-supported agriculture, farmers markets, and geographic indications.

295 As per food systems elements provided in Figure 1.

296 As per food systems outcomes provided in Figure 1.

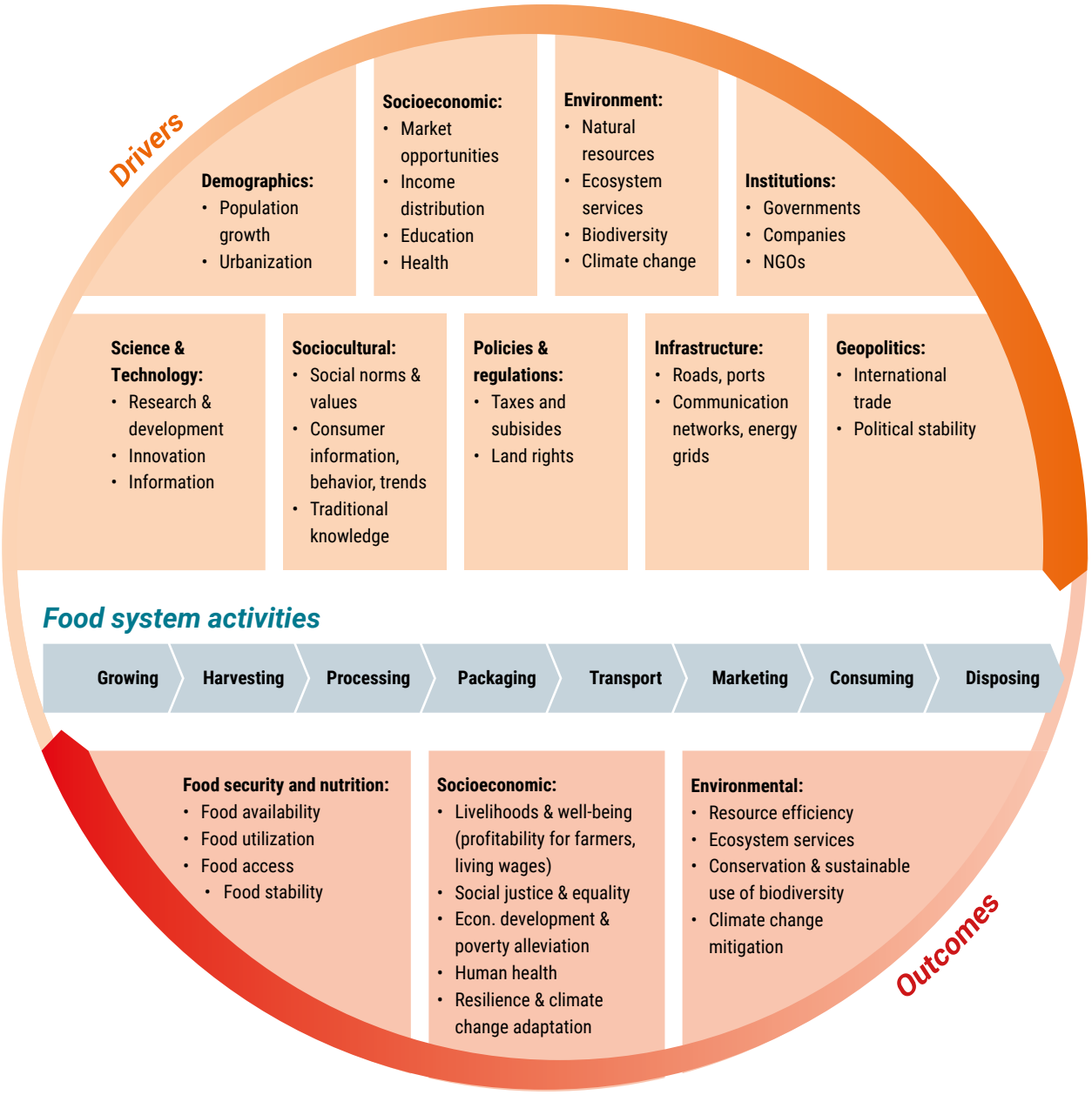
297 This includes sub-national as well as local urban-rural areas, combining agro-ecosystems, people, the economy, and socio-cultural practices.

This table places some of the approaches described in the glossary (→ Chapter 3 / page 26) in the context of sustainable food systems. It shows that they can all be important drivers toward more sustainable food systems. While using different entry points, they are all complementary. Other approaches could be added to this table, which is the intention for future versions of this publication.

The table refers to the food systems activities, elements, and outcomes in line with Figure 1 of this document (inserted below for ease of reference). In addition, it takes into account the main sustainability dimensions addressed by each approach, as well as their respective levels of analysis, to locate these approaches on the food systems spectrum.

While agroecology addresses all three dimensions of sustainable development, it has a particularly strong social and cultural dimension. With regard to food systems activities, it typically addresses primarily agricultural production, plus some elements of short

Figure 1: An illustration of food systems elements, drivers, activities and outcomes (adapted from CIAT)[298]



298 Adapted from CIAT. Found in: UN Environment/SFS Programme. 2019. *Op. cit.*, p. 12

value chain development. To be broadened to the entire food system, agroecological approaches could be combined with consumption-side initiatives, e.g., targeting food waste reduction or the promotion of sustainable and healthy diets.

The sustainable food value chains approach covers all three dimensions of sustainable development. It seeks to promote sustainability along the entire food value chain, however looking at individual value chains (e.g., carrots or beef). To be broadened to the entire food system, the sustainable food value chains approach could be combined with consumption-side initiatives, e.g., consumer information and awareness-raising campaigns.

Sustainable intensification addresses all three dimensions of sustainable development. However, with its focus on agricultural production – in particular productivity increases coupled with improvements in resource efficiency – it puts somewhat more emphasis on the economic and environmental dimensions. To be broadened to the entire food system, sustainable intensification could be combined with approaches that focus more on the social dimension, e.g., public health approaches.

Territorial approaches address all three dimensions of sustainable development, however they have a relatively stronger focus on the social and economic dimensions. Territorial approaches seek to promote multi-stakeholder involvement and sustainability along the entire food value chain. To be broadened to the entire food system, territorial approaches could be combined with initiatives that link the production and consumption sides, e.g., the promotion of healthy and sustainable diets.

Public health approaches address all three dimensions of sustainable development, with a particular focus on the social/health dimension. They consider food systems at all possible scales and covering all food systems activities, including consumption. To be broadened to the entire food system, public health approaches could be combined with approaches that focus more on economic and/or environmental dimensions, e.g., sustainable intensification.

The challenges involved with building truly sustainable food systems are multidimensional and interrelated, and thus require a holistic approach: examining food systems as a whole rather than in separate pieces, valuing outcomes over processes, and embracing a variety of voices instead of individual perspectives.

This publication explains what a sustainable food systems approach is, and explores implementation strategies for transformational change to more sustainable food systems. To that end, the objective of the publication is to promote a common understanding of related key approaches, concepts, and terms among a broad range of stakeholders, globally.

Taking a sustainable food systems approach when developing and implementing food and agriculture interventions is potentially transformative for any country or city. It will enable stakeholders to work within the complexity of food systems, and support more efficient use of natural resources, while simultaneously improving societal outcomes (such as human health and livelihoods).

This publication is an output of the One Planet network's Sustainable Food Systems (SFS) Programme, and a component of the broader "SFS Toolbox", which also includes a Collaborative Framework for Food Systems Transformation, a set of case studies, and an online learning course. It contributes to the SFS Programme's goal of accelerating the shift toward sustainable food systems.

The Co-Leads of the One Planet network's SFS Programme are:

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
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Federal Department of Economic Affairs, Education and Research EAER
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