2018

A Systems Approach to Research and Innovation for Food System Transformation

M. Gill
Aberdeen University

A.C.L. Den Boer

K.P. Kok

Jean Cahill
Technological University Dublin, jean.cahill@tudublin.ie

C. Callenius
University of Honenheim

POLICY BRIEF 1

A SYSTEMS APPROACH TO RESEARCH AND INNOVATION FOR FOOD SYSTEM TRANSFORMATION

Cite as:
Gill, M., den Boer, A. C. L., Kok, K. P. W., Breda, J., Cahill, J., Callenius, C., Caron, P., Damianova, Z., Gurinovic, M. A., Lähteenmäki, L., Lang, T., Laperrière, A., Mango, C., Ryder, J. Sonnino, R., Verburg G., Westhoek. H., Regeer, B. J., Broerse, J. E. W. (2018). *A systems approach to research and innovation for food system transformation.* Published by FIT4FOOD2030, https://fit4food2030.eu/eu-think-tank-policy-brief/.

Secretariat EU Think Tank:
VRIJE UNIVERSITEIT (VU) AMSTERDAM
fit4food2030.eu | #FOOD2030EU

Contact: info@fit4food2030.eu

KEY MESSAGE

A better understanding of key interactions between a multitude of actors, government levels and processes (production, consumption, distribution) and involving stakeholders is crucial to delivery of transformation.

Our food systems face severe, urgent and persistent challenges, and so do we as humanity. Therefore, we need to strengthen the **systems approach to Research and Innovation (R&I)** in order to inform policy and decision makers to foster the transformation of EU food systems, in line with societies' needs.

FOOD 2030 EU policy framework

The European Commission's (EC) FOOD 2030 framework aims to find solutions to the challenges facing our food systems, such as climate change, scarce resources, high levels of waste, obesity, malnutrition and hunger through R&I.

Prioritizing and integrating R&I on (1) nutrition (2) climate (3) circularity and (4) innovation is necessary for EU food systems to become future-proof - that is sustainable, resilient, responsible, competitive, diverse and inclusive.

This policy brief is a revised and updated version of policy brief 1, published in October 2018.

This policy brief of the European Union (EU) Think Tank – part of the FIT4FOOD2030 Coordination and Support Action (CSA) of the FOOD 2030 initiative – is a response and contribution to growing pleas for a 'systems approach' to transform food systems for Food and Nutrition Security (FNS) for present and future generations. This policy brief specifically focusses on **the necessity of the adoption of a systems approach to Research and Innovation (R&I) in order to foster the transformation of food systems.**

Introduction and urgency

Our food systems face severe, urgent and persistent challenges, and so do we as humanity. Food systems could be viewed as consisting of three constituent elements, including *food environments*, *consumer behaviour* and *food supply chains* (HLPE, 2017), which are all associated with **adverse health, environmental and/or economic impacts** (table 1). One of the most pressing universal problems is **malnutrition**, referring to undernourishment, micro-nutrient deficiencies and overnutrition, with **childhood overweight and obesity** of particular concern in Europe (WHO, 2018). In addition, many countries face a **double burden of malnutrition,** referring to the existence of both under- and overnutrition in the same population. A pressing health problem that is linked to food systems and goes beyond diet-related ill health is **antimicrobial resistance** (EC, 2019; Parsons and Hawkes, 2018). Severe environmental related food system challenges include types of **environmental degradation** (e.g. soil erosion), **emission of greenhouse gasses, resource scarcity** (e.g. water) and **biodiversity loss** (e.g. declined crop diversity and loss of pollinators). Demographic drivers such as **population growth** and **urbanization** in combination with increased competition for land often force changes in agricultural practices, leading to additional

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No774088

pressure on the environment. Furthermore, **food waste** along the entire food value chain is a tremendous challenge. The complex interrelations and interdependencies between (intensive) agricultural practices, environmental degradation and climate change, and the global scale of commercial food value chains causes additional problems, such as increased **social and economic vulnerabilities and inequities**, **livelihood stresses for farmers**, **disconnection between rural and urban areas, water and food-related conflicts, and ultimately (forced) migration**.

Table 1. The urgency for food system transformation.

Food system element	Urgent problems	Evidence
Food environment 'The physical, economic, political and socio-cultural context in which consumers engage with the food system to make their decisions about acquiring, preparing and consuming food.' (HLPE, 2017, p.28) **Consumer behaviour** All choices made on individual and household level, referring to the influence of personal preferences as well as to the influence of the wider food environment **Food supply chains** All steps of the chain including production, storage and distribution, processing and packaging and retail and market.	**Adult overweight & obesity**	**62% overweight**, including **25% obese** in EU in 2016 (WHO, 2018)
	Childhood obesity	Prevalence up to **30%** in EU countries (WHO, 2017)
	Double burden of malnutrition	**120 billion euros**/year/EU government (Shrimpton & Rokx, 2012)
	Antimicrobial resistance	**33.000 EU deaths**/year (EC, 2019)
	Soil erosion	**Affects 25%** of EU agricultural land (IPBES Secretariat, 2018)
	Greenhouse gas emissions	**26%** of EUs total energy consumption from food chain activities (EEA, 2016)
	Pesticide residues	**Found in 83%** of EU soils (Silva et al., 2018)
	Declining crop diversity	**Only 9 crops account for 66% of total crop production**, while more than 6.000 crops have been cultivated (FAO, 2019)
	Water scarcity	**66%** of renewable water resources used by agriculture (EEA, 2018)
	Vertebrate pollinator loss	**16.5% threatened** with global extinction (FAO, 2019)
	Food waste	**100 million tonnes** of food wasted/year in EU (EESC, 2016)

These **interlinked problems** are highly urgent, since they jeopardize many of the essential values in our food systems such as sustainability, accessibility and inclusiveness. There is now **rapidly growing awareness and acknowledgement of the need to radically change our food systems** (IPES, 2019) to be able to tackle these challenges and contribute to the achievement of the Sustainable Development Goals (SDGs) and the Paris Climate Agreement (Caron et al. 2018). However, to be able to '**future-proof**' our food systems, meaning resilient, sustainable, responsible, diverse, competitive and inclusive (in line with the European Commission's (EC) FOOD 2030 framework), we need to **acknowledge the need for the adoption of a systems approach to Research and Innovation (R&I) for food system transformation**. This requires a better understanding of the interactions and dynamics between the different elements of food systems and the provision of research-based guidance for positive change and relevant metrics (FAO, 2018; FAO/WHO, 2018).

The need for a food systems approach

The three constituent elements of food systems already point to the complex nature of food systems. A **food system** can be described as an **adaptive** system that exhibits complex **dynamics** (Ingram, 2011; Zhang et al., 2018). As a system, food is connected to a variety of (policy) fields – including agriculture, environment, energy, health, education, infrastructure and planning. This means food systems are multi-functional, multi-factor and multi-actor. Therefore, there is increased recognition that **traditional models focused purely on food production or linear models such as *food supply or value chains*** are not appropriate to **represent such a complex system**. In this policy brief we adopt the EC FOOD 2030 Expert Group's (2018: 6) conceptualization: *"The food system incorporates all elements and activities that relate to the production, processing, distribution, preparation and consumption of food, as well as its disposal. This includes the environment, people, processes, infrastructure, institutions and the effects of their activities on our society, economy, landscape and climate"*. This definition goes beyond the division between **production-led** (including **sustainable intensification**) and **consumption-led approaches**, which is inadequate when aiming to stimulate the transformative capacity of a system, since each of these approaches proposes different sectoral strategies and stimulates relatively narrow R&I agendas (Sonnino et al., 2014; HLPE, 2014, 2017; FEC, 2018).

The complexity of food systems gives rise to **interdependencies** (such as **feedback loops, synergies** and **trade-offs**) between components within and between food systems and other societal sectors (such as health or energy). The competitiveness between land use for agricultural needs, social and economic needs, and the environmental impact resulting from that land use, is an example of an increasingly complex trade-off effect (EEA, 2017).

To transform complex systems such as food systems, it is necessary to better understand the technological, political, economic and social dynamics that shape the food system and to identify the **leverage points** where intervention will be most effective. The identification of these points necessitates a **systemic approach** in which multiple actors, governance levels and policy fields are taken into account (EEA, 2017; EC FOOD 2030 Expert Group, 2018). A holistic or systems approach means the inclusion of both **horizontal dimensions** (different fields of action, such as environment, health, infrastructure, and education) and **vertical dimensions** (all different stages of the food value chain) (Morgues et al., 2013). Only with a systems approach in which multiple actors are involved is it possible to **better anticipate unexpected and undesired side-effects** of (technological) interventions in other parts of the food system and to design portfolios of experiments that will reinforce each other (e.g. at different levels and with regard to different thematic fields).

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No774088

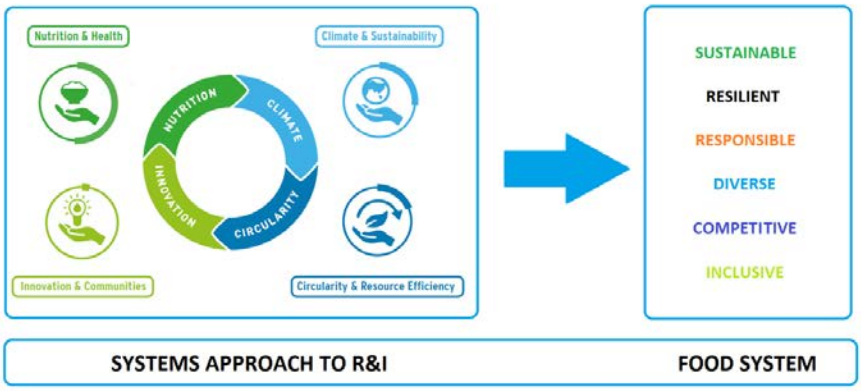

Figure 1. Conceptualization of the relation between a systems approach to R&I and future-proofing food systems.

This means systemic efforts to transform our food system need to take into account all three constituent elements of the food system, emphasizing the need to **(re)connect a diversity of actors**. For instance, a food systems approach would ensure that health professionals and nutritionists should be encouraged to put forward evidence for the development of agricultural research and policy programmes. These programmes should emphasize the need for a fundamental redesign of agricultural production systems and products which could create co-benefits for environment and health (Parsons and Hawkes, 2018). These changes in agricultural practices should be led by the needs of farmers and demand of citizens but should be accompanied by actors further downstream in the supply chain, such as processers and retailers (Meynard et al., 2017). New agricultural practices require innovative and new food supply chains with new ways of organization and social interaction (e.g. new contracts and logistical arrangements), referring to the necessity to **integrate social and technological dimensions of innovations**. It builds upon direct engagement of (local) economic actors and consumers to ensure markets are adapted or new markets are created and demand is stimulated equally via a **redesign of our food environments.** This also requires food to become an integral part of **spatial (urban) planning**, given the strong links between food systems and different planning domains such as community development and food security, health, and transportation (Fattibene et al., 2019).

A concrete example of a novel and cross-sectoral way of working towards food system transformation in which several linkages are taken into account is the **food policy council (FPC).** FPCs engage public, private and academic parties and seek to enhance the coherence of different policy domains in a particular city or region (Schiff, 2008). FPCs understand themselves as advisory committees to the local authority (municipality and/or province) and a platform for dialogue for decision makers, administrators, food supply chain actors, and consumers to strengthen the structure of a regional food supply on a long-term basis. FPCs can play a decisive role in **strengthening urban-rural linkages**, which is recognized as key for promoting future-proof food systems (Fattibene et al., 2019).

Another example is the development of concrete toolkits and frameworks (such as *City Region Food System Indicator Framework*) which helps cities in the transformation towards more sustainable city region food systems by applying a 'whole food system approach' (FAO & RUAF).

The need for a systems approach with new ways of interaction point to the important role of Research and Innovation (R&I) in supporting systemic food system transformation. However, **current and past R&I efforts fail(ed) to adequately respond to the urgent and systemic challenges related to food systems**. Most R&I investments in EU member states are still directed towards production processes and food security (SCAR, 2018). This means **current R&I efforts do not sufficiently recognize the interconnectedness of the different parts of the food system,** leading to undesired side-effects. According to the SCAR working group assessment the R&I input is too low and there are not enough projects related to food consumption, including household food waste, distribution processes, their interactions with production processes, and their impact on ecological, economic and social sustainability. In order to achieve food systems transformation there is an urgent need to directly engage consumers, citizens and economic actors to a greater extent, given their central role (SCAR, 2018)**.**

One of the main challenges within complex systems is related to increasingly problematic **power imbalances**. In food systems this refers, for instance, to the shift in power from primary producers to input providers (seed, fertilisers and pesticide manufacturers), food companies and retailers (Rayner et al. 2008; Sonnino et al., 2014; UNEP, 2016). Power imbalances can reinforce vested interests and status-quo configurations within societal systems (Avelino & Rotmans, 2009; Grin et al., 2010), and negatively impact small primary producers. Governments need to recognise this shift and identify policy levers that can be used to realise transformation towards healthy, low-carbon, and circular systems. In parallel governments should develop/integrate food system policies that are in line with societies' desires and needs boosting public awareness and stakeholders' engagement. A holistic approach that allows for the identification and analysis of power imbalances, and which is **inclusive,** involving the less powerful stakeholders in shaping policy

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No774088

pathways, is crucial. This is also important in order to allow for the input of many different perspectives and values into policy processes, allowing for successful implementation of transformative policies that are fully embraced by a broad range of societal actors.

R&I has played a crucial role in advancing our food systems and R&I frameworks themselves can serve as leverage points for accelerating sustainable transformation. However, to be able to deliver food transformation there is a **need for entire new R&I frameworks recognizing the urgency of system thinking in all R&I efforts.** The question then remains: **to what extent can R&I live up to its promise to serve as an effective leverage point and thus be fit for stimulating the transformation towards future-proof EU food systems?**

THE FIT4FOOD2030 PROJECT

GOAL

FIT4FOOD2030 is a **Coordination and Support Action (CSA)** funded through Horizon 2020. FIT4FOOD2030 supports the development and implementation of the European Commission's FOOD 2030 policy framework. To achieve its objectives, **FIT4FOOD2030** will create a sustainable, multi-stakeholder platform, mobilizing a wide variety of stakeholders at the level of cities, regions, countries, and Europe as a whole.

SCOPE AND ORGANIZATION

15 PARTNER INSTITUTIONS IN EUROPE

as well as 7 City Labs, 11 Policy Labs and 1 EU Think Tank.

COORDINATOR

ATHENA INSTITUTE | VRIJE UNIVERSITEIT (VU) AMSTERDAM

DURATION
3 years (11/2017-10/2020)

BUDGET
€4.0 million

Implications for R&I

R&I policies play a critical role in advancing the understanding of the complexity of food systems as well as in triggering change towards future-proof EU food systems. When considering transformation, R&I is of utmost importance in **identifying leverage points** and **systemic interdependencies,** and as such for identifying those strategic points where **government interventions** can be most effective in future-proofing EU food systems. A strong R&I framework based on a holistic and participatory approach involving all stakeholders may not only help to identify opportunities, but also to **identify vulnerabilities** in order to formulate resilience strategies (FAO, 2014).

In order to foster the transformation towards future-proof food systems, the EC (2017) aims to prioritize and integrate R&I on four *priority areas*, including: **(1) nutrition & health, (2) climate & sustainability** ('thematic' or 'sectoral' level) **(3) circularity & resource efficiency** ('objectives' level) **and (4) innovation & empowerment of communities** ('support' level). **Adopting such an integrated approach,** however, means recognizing that **traditional 'linear' R&I,** which studies properties of subsystems individually (e.g. crop yield, consumption patterns) – and then assumes that improving each subsystem will improve the complete food system – **has limitations** exactly because such approaches do not sufficiently take into account the trade-offs, externalities, uncertainties and systemic feedback loops (Zhang et al., 2018). EU food R&I should therefore be **responsible**, which means it should be **inclusive, transparent, intersectoral, multi-stakeholder, multi-factorial, interdisciplinary and transdisciplinary**[1] to generate the knowledge and innovation required to transform EU food systems. It needs to be **Responsible Research and Innovation (RRI)** (see figure 2), which clearly goes far beyond the linear model and requires a circular approach.

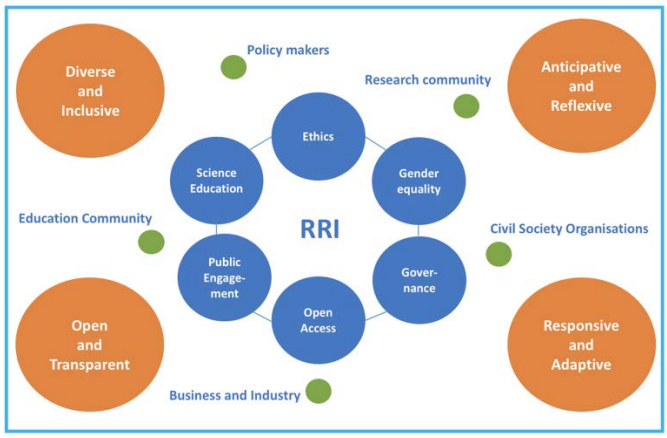

Figure 2. Responsible Research and Innovation (RRI). Model retrieved and adapted from RRI Tools (https://www.rri-tools.eu).

Currently a **fragmented landscape of separated disciplines and sectors exists,** regarding both its policy and scientific dimensions. It has successfully dealt with individual compartmentalized parts of food systems such as agriculture, food safety and nutrition, but rarely takes an integrated perspective. Furthermore, the active involvement of **citizens, Civil Society Organizations (CSOs)** and users such as **farmers** and **consumers** (FEC, 2018; EC FOOD 2030 Expert Group 2018), as well as private sector actors, is rare and often has low priority. Not many researchers and policy makers value citizens' views, visions and local and traditional knowledge. There is a need for a better understanding of how to organize and stimulate stakeholder interactions during the research process as well as on how to interpret the outcomes of these interactions (FEC, 2018). In addition, the ways in which the great variety of (grassroots) initiatives could be aligned to stimulate the desired local and global transformation requires significant attention within research and policy. Moreover, the academic incentive structures and R&I funding programs often focus mainly on food production-oriented research (SCAR, 2018)

[1] Transdisciplinarity *"does not respect disciplinary boundaries, and problems are not formulated in strictly scientific terminology. Multiple stakeholders are involved in formulating a problem from the beginning, bringing heterogeneous skills and expertise to the problem-solving process."* (Klein et al, 2001: 49)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No774088

and/or do not support the use of inter- and transdisciplinary research approaches (FEC, 2018; EC FOOD 2030 Expert Group, 2018). There is no 'one size fit all' - solution for the transformation of food systems. Stakeholders need to adapt their food systems to local needs on the ground, without losing sight of the convergence of regional and global priorities (Caron et al, 2018). Finally, **private sector investments in such integrated R&I approaches are modest** and **fragmented, which requires alignment**. Many Member States (MS) fund research mainly through open calls instead of system-oriented calls that consider strategic relevance, making it more challenging to establish R&I priorities for FNS. Despite MS-driven programming initiatives, such as the Joint Programming Initiatives (JPIs)**,** there is still a need for appropriate tools and incentives to support the development of an appropriate **innovation culture** both within R&I policy programs, and food-related policies and regulations (EC FOOD 2030 Expert Group, 2018) as well as to connect them in an effective way.

We therefore need strategies for triggering a **double transformation in both food systems and the R&I system.**

Recommendations towards a R&I framework that is FIT4FOOD2030

EU R&I programs such as Framework Programme (FP) 7 and Horizon 2020 have contributed significantly to FNS. When it comes to fostering new coherent and overarching R&I agendas several more general transformations in the R&I system can lead to further dissemination of those achievements. This transformation would fit the broader goal of creating R&I strategies and funding schemes that foster **Open Science, Open Innovation, Open Access and Responsible Research and Innovation** by enhancing transparency, dialogue, inclusiveness of stakeholders and views that aim to foster learning and upscaling of practices. For creating these RRI strategies **there is the need for stimulating**

- **A paradigm shift within academia towards transdisciplinary research approaches.** This entails research that can help to understand and govern complex societal systems as well as system innovations within them by taking into account all different social, technological, ecological and political components and their interactions (Geels, 2002; Grin et al., 2010). National and EU funding agencies can help to foster this transdisciplinary approach (FEC, 2018).
- **Interaction between researchers, societal actors and policy and decision makers** to respond to societal developments and needs, to better understand the political economy of food, and to facilitate cross-fertilization between science and society. This is crucial to stimulate the transformative capacity and uptake of R&I frameworks, to inform decision makers, and to align diverse visions and perspectives. For example, including stakeholders like **farmers, consumers, private sector, and communities** in both the process of research agenda setting and research implementation (FEC, 2018; EC FOOD 2030 Expert Group, 2018).
- **The engagement of all stakeholders, shifting mindsets and approaches from mainstream linear models towards holistic approaches** that could be more appropriate to face food systems' complexity (EEA, 2017).
- **Public and independent R&I** to respond to market and system failures (since some issues of high public interest may not attract funding from private investors) as well as to address dominant and established pathways that are difficult to transform (FEC, 2018; FOOD 2030 Expert Group, 2018).
- **The identification and promotion of entrepreneurial opportunities for food system development,** with the involvement of the business sector as a driving force for change.
- **Investment in social science research.** Although the scientific contributions to advancing FNS as well as food safety, food health and (agricultural) productivity are crucial, investment in the social sciences is urgently required since they address the social, cultural, legal and political dimensions of food systems and are critical for transformative change.
- **Investments in social innovation initiatives** to strengthen connections between stakeholders and for example to reduce food losses and waste along the entire value chain (EC FOOD 2030 Expert Group, 2018)
- **Understanding** the connections and interactions of EU food systems with food systems outside Europe, especially those in Africa and the Mediterranean (EC FOOD 2030 Expert Group, 2018).
- **Capacity development** in food and nutrition R&I, especially in European regions with a lack of R&I (Gurinovic et al., 2016).

Investing in creating such a coherent and integrated R&I strategy for EU food systems is not only **desirable and necessary** from scientific, societal and ecological points of view, it could also be **economically beneficial.** According to the EC FOOD 2030 Expert Group (2018) the EU R&I strategy for food systems needs **significant investment of over EUR 10 billion.** Such an investment – based on previous experiences with investing in food systems in the US for example – has a very **high expected return** on investments of more than 10 times the input (USDA-ERS, undated, and Fuglie et al., 2007, in EC FOOD 2030 Expert Group, 2018: 46). This requires strong coordination and alignment between R&I FPs and other funding programs such as the European structural and investment funds (ESIFs, which is essential to stimulate capacity building and awareness raising among a broad range of stakeholders related to food systems (EC FOOD 2030 Expert Group, 2018).

Transforming food system R&I policies towards a new RRI framework is necessary and urgent. In order to foster the transformation towards future-proof food systems we need to advance our understanding of the complexities of food systems. By taking this path we can contribute to **future-proofing EU food systems that work for all.**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No774088

Literature

- Avelino, F., & Rotmans, J. (2009). Power in transition: an interdisciplinary framework to study power in relation to structural change. *European Journal of Social Theory*, 12(4), 543-569.
- Caron, P., Ferrero y de Loma-Osorio, G., Nabarro, D., Hainzelin, E. Guillou, M., Andersen I, … Verburg, G. (2018). Food systems for sustainable development: proposals for a profound four-part transformation. *Agronomy for Sustainable Development*, 38(14). https://doi.org/10.1007/s13593-018-0519-1
- EC (2017). FOOD 2030: Future-Proofing our Food systems through Research and Innovation. European Commission, Brussels, Belgium.
- EC 2030 Expert Group (2018). A recipe for Change. An agenda for a climate-smart and sustainable food system for a healthy Europe. European Commission, Brussels, Belgium.
- EC (2019). EU Action on Antimicrobial Resistance. European Commission, Brussels, Belgium. https://ec.europa.eu/health/amr/antimicrobial-resistance_en
- EEA (2017). Food in a green light– A systems approach for sustainable food. European Environmental Agency, Copenhagen, Denmark.
- EEA, Water use and environmental pressures (Luxembourg: Publications Office of the European Union, 2018)
- EESC (2016). EESC Opinion: More sustainable food systems. Brussels, European Economic and Social Committee.
- FAO (2014). "Food systems and value chains: definitions and characteristics" taken from http://www.fao.org/climate-smart-agriculture-sourcebook/production-resources/module-b10-value-chains/chapter-b10-2/en/
- FAO/WHO (2018). Proceedings of the FAO/WHO international symposium on sustainable food systems for healthy diets and improved nutrition. Rome.
- FAO (2018). Outcome of the Regional Symposium on Sustainable Food Systems for Healthy Diets in Europe and Central Asia. Derived from http://www.fao.org/3/mw166en/mw166en.pdf
- FAO (2019). The State of the World's Biodiversity for Food and Agriculture, J. Bélanger $ D. Pilling (eds.). FAO Commission on Genetic Resources for Food and Agriculture Assessments. Rome 572. (http://www.fao.org/3/CA3129EN/CA3129EN.pdf). Licence: CC BY-NC-SA 3.0 IGO.
- Fattibene, D., Maci, G. and Santini, G. (2019). Feeding Cities. Putting food on the urban planning agenda. European Think Tanks Group (ETTG).
- FEC (2018). For whom? Questioning the food and farming research agenda. Food Ethics Council, London, United Kingdom.
- Fuglie, K.O. and P. W. Heisey (2007): Economic Returns to Public Agricultural Research USDA-ERS, Washington.
- Geels, F. W. (2002). Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study. *Research Policy*, 31(8-9), 1257-1274.
- Grin, J., Rotmans, J., & Schot, J. (2010). Transitions to sustainable development: new directions in the study of long-term transformative change. Routledge.
- Gurinović, M., Milešević, J., Novaković, R., Kadvan, A., Djekić-Ivanković, M., Šatalić, Z., … Glibetić, M. (2016). Improving nutrition surveillance and public health research in Central and Eastern Europe/Balkan Countries using the Balkan Food Platform and dietary tools. Food Chemistry, 193, 173–180.
- HLPE, (2014). 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.
- 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.
- IPBES, Summary for Policymakers of the Regional Assessment Report on Biodiversity and Ecosystem Services for Europe and Central Asia, M. Rounsevell, M. Fischer, A. Torre-Marin Rando, and A. Mader (eds.) (Bonn: IPBES secretariat, 2018).
- Ingram, J. (2011). A food systems approach to researching food security and its interactions with global environmental change. *Food Security,* 3(4), 417-431.
- Klein, J. T., Wentworth, J., & Sebberson, D. (2001). Interdisciplinarity and the prospect of complexity: The tests of theory. Issues in Interdisciplinary Studies, 19, 43-57.
- Meynard, J., Jeuffroy, M., Bail, le, M., Lefèbre, A., Magrini, M., & Michon, C. (2017). Designing coupled innovations for the sustainability transition of agrifood systems. Agricultural Systems, 157 (2017) 330–339. http://dx.doi.org/10.1016/j.agsy.2016.08.002
- Moragues, A.; Morgan, K.; Moschitz, H.; Neimane, I.; Nilsson, H.; Pinto, M.; Rohracher,H.; Ruiz, R.; Thuswald, M.; Tisenkopfs, T. and Halliday, J. (2013) Urban Food Strategies: the rough guide to sustainable food systems. Document developed in the framework of the FP7 project FOODLINKS (GA No. 265287)
- Parsons, K. and Hawkes, C. (2018). Policy brief 31. Connecting food systems for co-benefits: How can food systems combine diet related health with environmental and economic policy goals? WHO (acting as the host organization for, and secretariat of, the European Observatory on Health Systems and Policies). In support of the Austrian Council Presidency 2018.
- Rayner, G., Barling, D., & Lang, T. (2008). Sustainable food systems in Europe: policies, realities and futures. *Journal of Hunger & Environmental Nutrition*, 3(2-3), 145-168.
- RRI Tools. https://www.rri-tools.eu
- SCAR (2018). Assessment of Research and Innovation on Food Systems by European Member States Policy and Funding Analysis by Standing Committee on Agricultural Research (SCAR) Strategic Working Group on Food Systems. European Commission, Brussels, Belgium.
- Shrimpton, R. & Rokx, C. (2012). The Double Burden of Malnutrition. A Review of the Global Evidence. The International Bank for Reconstruction and Development / World Bank. 1818 H Street, NW Washington, DC 20433.
- Sonnino, R., Moragues Faus, A., & Maggio, A. (2014). Sustainable food security: an emerging research and policy agenda. *International Journal of Sociology of Agriculture and Food,* 21(1), 173-188.
- UNEP (2016). Food Systems and Natural Resources. A Report of the Working Group on Food Systems of the International Resource Panel. Westhoek, H, Ingram J., Van Berkum, S., Özay, L., and Hajer M. Nairobi: United Nations Environment Programme (UNEP).
- USDA-ERS (undated): Economic Returns to Public Agricultural Research, Agricultural Research and Development / AER-735. Undated, downloaded from AgEconSearch 15.4.2018
- WHO (2017). Incentives and disincentives for reducing sugar in manufactured foods. An exploratory supply chain analysis.
- WHO (2018). Global Health Observatory data. Geneva,World Health Organization. http://www.who.int/gho/en
- V. Silva, H. G.J. Mol, P. Zomer, M. Tienstra, C.J. Ritsema, V. Geissen, "Pesticide residues in European agricultural soils – A hidden reality unfolded," Science of The Total Environment 653, (2018): 1532-1545.
- Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., … Murray, C. J.L. (2019). Food in the Anthropocene: the EAT-Lancet Commission on healthy diets from sustainable food systems. The Lancet. 10.1016/s0140-6736(18)31788-4
- Zhang, W., Gowdy, J., Bassi, A.M., Santamaria, M., DeClerck, F., Adegboyega, A., … Wood, S.L.R. (2018). Systems thinking: an approach for understanding 'eco-agri-food systems'. In TEEB for Agriculture & Food: Scientific and Economic Foundations. Geneva: UN Environment.

FIT4FOOD2030 EU Think Tank Members

João Breda (M) (Portugal)
- World Health Organization (WHO), Head of European Office for Prevention and Control of Noncommunicable Diseases
- WHO Regional Office for Europe, Programme Manager Nutrition, Physical Activity and Obesity

Jean Cahill (F) (Ireland)
- Dublin Institute of Technology (Ireland), Head of Enterprise & Research Development, Food and Health Sciences
- Horizon 2020 SWAFS (Science with and for Society) Expert Advisory Group Member

Carolin Callenius (F) (Germany)
- University of Hohenheim (Germany), Managing Director of the Hohenheim Research Center for Global Food Security and Ecosystems

Patrick Caron (M) (France)
- CIRAD, the French Agricultural Research Centre for International Development (France), Director General
- Steering Committee of the High Level Panel of Experts (HLPE) of the United Nations (UN) Committee on World Food Security, Chair

Zoya Damianova (F) (Bulgaria)
- Applied Research and Communications Fund (ARC Fund) (Bulgaria), Program Director

Margaret Gill (F) (UK)
- Aberdeen University (UK), Professor of Integrated Land Use
- Independent Science for Development Council of the CGIAR, Interim Chair

Mirjana Gurinovic (F) (Serbia)
- University of Belgrade (Serbia), Senior Researcher
- Symposium Coordinator at FAO Regional Office for Europe, for the joint FAO/WHO Regional Symposium on Regional Symposium on Sustainable Food Systems for Healthy Diets in Europe and Central Asia

Liisa Lähteenmäki (F) (Denmark)
- Aarhus University (Denmark), Professor of Consumer Behaviour and Food Choice

Tim Lang (M) (UK)
- City University London (UK), Professor of Food Policy and founder of the Centre for Food Policy

André Laperrière (M) (Canada)
- Global Open Data Initiative for Agriculture and Nutrition (UK), Executive Director

Carlo Mango (M) (Italy)
- Fondazione Cariplo (Italy), Research Director

John Ryder (M) (UK)
- Food and Agriculture Organization of the United Nations (FAO), Fisheries and Aquaculture Department, Chief of Products, Trade and Marketing Branch (FIAM)

Roberta Sonnino (F) (Italy)
- Cardiff University (UK), Professor and Director of Impact and Engagement in the School of Geography and Planning

Gerda Verburg (F) (Netherlands)
- Scaling Up Nutrition (SUN) Movement, Coordinator
- Former Minister of Agriculture, Nature and Food Quality, the Netherlands

Henk Westhoek (M) (Netherlands)
- PBL Netherlands Environmental Assessment Agency

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No774088