



POLICY BRIEF 1

A SYSTEMS APPROACH TO RESEARCH AND INNOVATION FOR FOOD SYSTEM TRANSFORMATION

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Members: João Breda, Jean Cahill, Carolin Callenius, Patrick Caron, Zoya Damianova, Margaret Gill (*chair*), Mirjana Gurinovic, Liisa Lähteenmäki, Tim Lang, André Laperrière, Carlo Mango, John Ryder, Roberta Sonnino, Gerda Verburg and Henk Westhoek.
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Secretariat:
VRIJE UNIVERSITEIT (VU) AMSTERDAM
fit4food2030.eu | #FOOD2030EU
Contact: info@fit4food2030.eu

KEY MESSAGE

We need to strengthen the **systems approach to Research and Innovation (R&I)** in order to help policy and decision makers to foster the transformation of EU food systems, in line with societies' needs.

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

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 obesity, malnutrition, hunger, climate change, scarce resources and high levels of waste 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.

Introduction and Background

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 a **systems approach to Research and Innovation (R&I) in order to foster the transformation of food systems**.

Our food systems face many challenges. In the context of changing world demographics and climate change, food production processes are far from being sustainable. Consumption patterns significantly affect the health and well-being of citizens, while agriculture contributes heavily to pollution, greenhouse gas emissions, land-degradation and loss of biodiversity (EEA, 2017; FEC, 2018). In order to tackle these challenges and contribute to the achievement of the Sustainable Development Goals (SDGs) and the Paris Climate Agreement (Caron et al. 2018), it is essential to make food systems 'future-proof', meaning resilient, sustainable, responsible, diverse, competitive and inclusive (in line with the European Commission's (EC) FOOD 2030 framework). This requires a better understanding of the interactions and dynamics between the different components of food systems and the provision of research based guidance for positive change and relevant metrics (FAO, 2018; FAO/WHO, 2018). Moreover, it requires a change of perspectives and mind-sets (values, goals and views) by stakeholders directly and indirectly involved in food systems (EEA, 2017: 45).



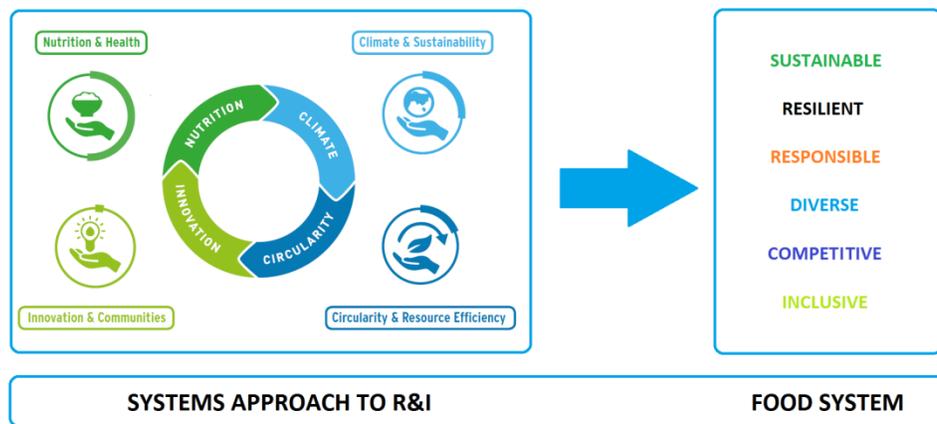


Figure 1. Conceptualization of the relation between a systems approach to R&I and future-proofing food systems.

What is a food system?

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. Therefore, there is increased recognition that **traditional models focused purely on food production or linear models such as food chains, value chains, or food cycles** 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 gives rise to **interdependencies** (such as **feedback loops, synergies and trade-offs**) between components within and between food systems and other societal systems. As a consequence, there can be unexpected and undesired **side-effects** of specific interventions (Ingram, 2011; EEA, 2017; EC FOOD 2030 Expert Group, 2018). 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). Recognition of and potential solutions to solve the complex interactions between components of a food system, requires novel and multi-objective approaches to transforming food and agriculture as well as actors’ capacity to adapt to changes.

Given the sustainable development challenges and the capacity of food systems to address these challenges, we need to transform the current food systems urgently (Caron et al., 2018). To transform complex systems however, it is necessary to fully 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). R&I can play an important role in supporting this systemic transformation. Currently, however, most R&I investments in EU member states are still directed towards production processes and food security (SCAR, 2018). 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 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. 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, 7 Policy Labs and 1 EU Think Tank.

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DURATION	BUDGET
3 years (11/2017-10/2020)	€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.

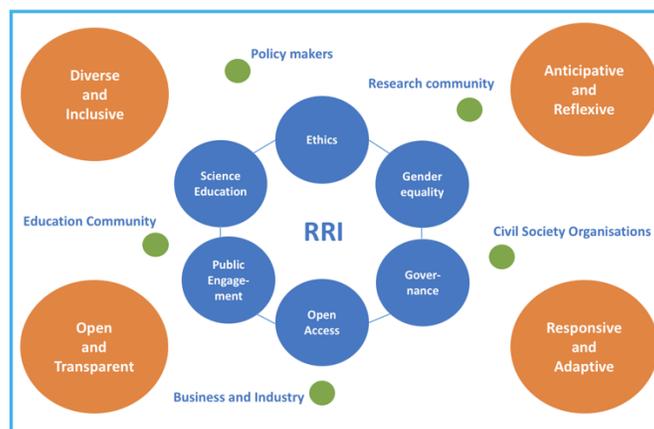


Figure 2. Responsible Research and Innovation (RRI). Model retrieved and adapted from RRI Tools (<https://www.rri-tools.eu>).

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

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)



(SCAR, 2018) 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, and facilitate cross-fertilization between science and society to stimulate the transformative capacity and uptake of R&I frameworks as well as alignment of 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.**



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.
- EEA (2017). Food in a green light– A systems approach for sustainable food. European Environmental Agency, Copenhagen, Denmark.
- 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>
- 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.
- 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.
- Ingram, J. (2011). A food systems approach to researching food security and its interactions with global environmental change. *Food Security*, 3(4), 417-431.
- 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.
- 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
- 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.

