



IMPLEMENTATION ACTION PLAN 2018





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Foreword

During 2016, the European Technology Platform (ETP) 'Food for Life' worked with five expert Scientific Working Groups to develop a Strategic Research and Innovation Agenda (SRIA). After a number of consultations and revisions, the final version of the SRIA was published in December 2016. The SRIA lays out a vision and strategy of how to transform the European food sector to become more successful in an increasingly globalized, competitive market. In the SRIA, specific actions are proposed to make this vision a reality.

Taking the SRIA as a starting point, the ETP 'Food for Life' subsequently developed the detailed Implementation Action Plan (IAP) presented in this document. The IAP defines how the action items listed in the SRIA should be executed, and what tools and instruments should be utilized to make this possible. Although the focus of the ETP Food for Life is primarily on food design and manufacturing, in defining the IAP we have taken a food systems approach. We have adopted the Food 2030 characterization of the food system which defines it as a system that (a) integrates the entire 'food value chain' from inputs, to primary production (agriculture, aquaculture & fisheries), harvesting, storage, processing, packaging, distribution, waste streams, to consumer intake – and back, (b) connects actors across sectors in the

food system and recognises it as part of a wider bio-economy that overlaps with other systems, e.g. health, energy, climate; and (c) connects production and consumption to food system outcomes in the domains of nutrition, climate, circularity, and innovation.

For the development of the IAP, we relied on the guidance of experts that constitute our ETP, and in addition brought in outside expertise, especially on implementation actions required to grow and support small and medium-sized enterprises (SMEs). Moreover, consultations and joint workshops were held over the course of 2017 to collect additional input, especially as pertaining to the contributions and interests of European Union Member States. We strongly believe that progress towards our formulated vision for the European food and drink sector will only be made through a joint effort of different public and private stakeholders, at different geographical levels and from different sectors of activity. Together, these actors are able to execute the proposed actions in a coordinated manner to bring about the urgently needed transformation.

We are convinced that the work of the ETP 'Food for Life' represents a unique opportunity for all interested parties in the European food chain to

increase their competitive strength and ensure the continuing well-being and welfare of consumers across Europe. Success will, however, require the long-standing commitment of all, and this Implementation Action Plan is therefore also a rallying call to support the proposed actions.

Prof. Dr. Gert Meijer, Chair

Prof. Dr. Jochen Weiss, Co-Chair



LONG-TERM OBJECTIVES OF THE ETP 'FOOD FOR LIFE' SRIA





2.1. Introduction

This Chapter is a brief synopsis of the Strategic Research and Innovation Agenda (SRIA) 2016, which can be accessed in full at the ETP website.¹ The purpose of this Chapter is therefore not to repeat the SRIA, but to highlight the strategic elements and actions in the SRIA, which form the foundation of the Implementation Action Plan (IAP) proposed in this document.

The EU food and drink industry is the largest manufacturing sector in terms of turnover

15.4%

and added value

12.8%

In addition, it is a key job provider and a direct employer of

4.24 million

people with jobs spread across all European Member States, mostly in rural areas; not counting the indirect but associated jobs.

2.2. ETP 'Food for Life' and the Future of the European Food and Drink sector

The European Technology Platform (ETP) 'Food for Life' mobilises stakeholders to help deliver solutions for the EU food and drink industry through research and innovation (R&I). After the publication of its 'Vision for 2020 and beyond' in 2005, the ETP 'Food for Life' has regularly developed R&I agendas and roadmaps in the food domain for actions at EU and national level to be supported by both private and public funding.

Until recently most R&I actions have successfully dealt with individual compartmentalised parts of the food system. However, it has been recognized that the societal challenges we currently face are interconnected. R&I in the food sector would therefore benefit from a more holistic, or 'systemic' approach, linking all elements and levels of the food system, i.e. from primary production to consumers, and fostering inter and transdisciplinary

collaboration and a wide stakeholder engagement. Such a food system approach is the narrative around which the ETP 'Food for Life' has designed its SRIA and IAP. The success of this exercise therefore relies on an effective collaboration with other partners of the rich European R&I landscape of initiatives, coming from sectors such as ICT/digitisation, agriculture, manufacturing, energy, transport, new materials, water, etc. and with the relevant research funding structures. In particular, better integration of the entire food chain linking agriculture, processing, retail and consumer is essential for a successful outcome of the IAP.

We believe that the whole food systems approach followed in the design of this IAP, especially in the concept for a public-private collaboration described in Section 3.5, can help foster the synergies between current and future initiatives and stakeholders,

¹ [European Technology Platform 'Food for Life' \(2016\). Strategic Research and Innovation Agenda.](#)



maximising efficiency gains and impacts. For this reason, we also welcome the efforts of the European Commission to engage R&I policy makers, farmers, industry, researchers, and society in an open dialogue on how to best pool and organise EU R&I resources in order to future-proof European food systems, as practised in the FOOD 2030 events held in 2016 and 2017.

The inclusion of a food-dedicated ETP as an important element in the EU innovation ecosystem is justified by the relevance of the sector and the challenges it currently faces. The EU food and drink industry is the largest manufacturing sector in terms of turnover (15.4%) and added value (12.8%). In addition, it is a key job provider and a direct employer of 4.24 million people² with jobs spread across all European Member States, mostly in rural areas; not counting the indirect but associated jobs. While there are many opportunities that could guarantee growth for years to come, there are also large threats that need to be addressed. The EU food and drink industry is now at a turning point due to economic, social

and environmental challenges. As a consequence the sector needs to think of new ways of working, and step up its efforts to meet consumer demands in relation to nutrition, health and sustainability.³

In its 2016 SRIA, the ETP 'Food for Life' has identified four critical global challenges for which the European food sector is required to develop solutions (Fig. 1).

Given this scenario, the ambition of the ETP 'Food for Life' is to bring about a step-change to foster a thriving European Food Ecosystem that builds on cultural diversity with consumers and industry working in partnership. The Food System of Tomorrow will use nature's resources in a responsible and sustainable manner, and be dynamic, flexible, fully transparent and accessible to all. Progress will be made by bridging modern social and natural science and technology approaches to benefit the greater public, making healthy and sustainable food alternatives not only effortless and affordable to all consumers, but also desirable and exciting.



Figure 1. Key challenges

CONSUMER ENGAGEMENT, CONSUMER BEHAVIOUR AND PERCEPTION OF FOOD

Consumers increasingly distrust the food sector as a provider of food solutions that they want or need. In addition to price, taste and appearance, new criteria such as sustainability or health are becoming more prominent in selection and consumption patterns.

SECTOR MATURITY

While the other three global challenges require significant investment in research, development and innovation, the maturity of the sector has brought about low profit margins along the chain. The past successes did not translate into increased resources to fuel future progress, but rather increasingly diminishing R&I investments. This makes finding the resources for the necessary changes, increasingly difficult.

DEMOGRAPHIC CHANGES

The global population is undergoing a rapid change, not only in terms of size, but also with respect to composition. It is estimated that by 2050, roughly 10 billion people will inhabit the planet with many of them having life expectancies that are longer than at any other time in human history.

RESOURCES

With the number of production of food becoming more difficult due to depletion of natural resources, competition with non-food uses, climate change and the global population continuing to increase, securing a continued supply of high quality raw materials will become one of the great challenges of the 21st century.



² [FoodDrinkEurope \(2017\) Data & Trends of the European Food and Drink Industry](#)

³ [FoodDrinkEurope \(2016\) A Competitive EU Food and Drink Industry for Growth and Jobs Ambitions for 2025: Priorities and policy Recommendations](#)



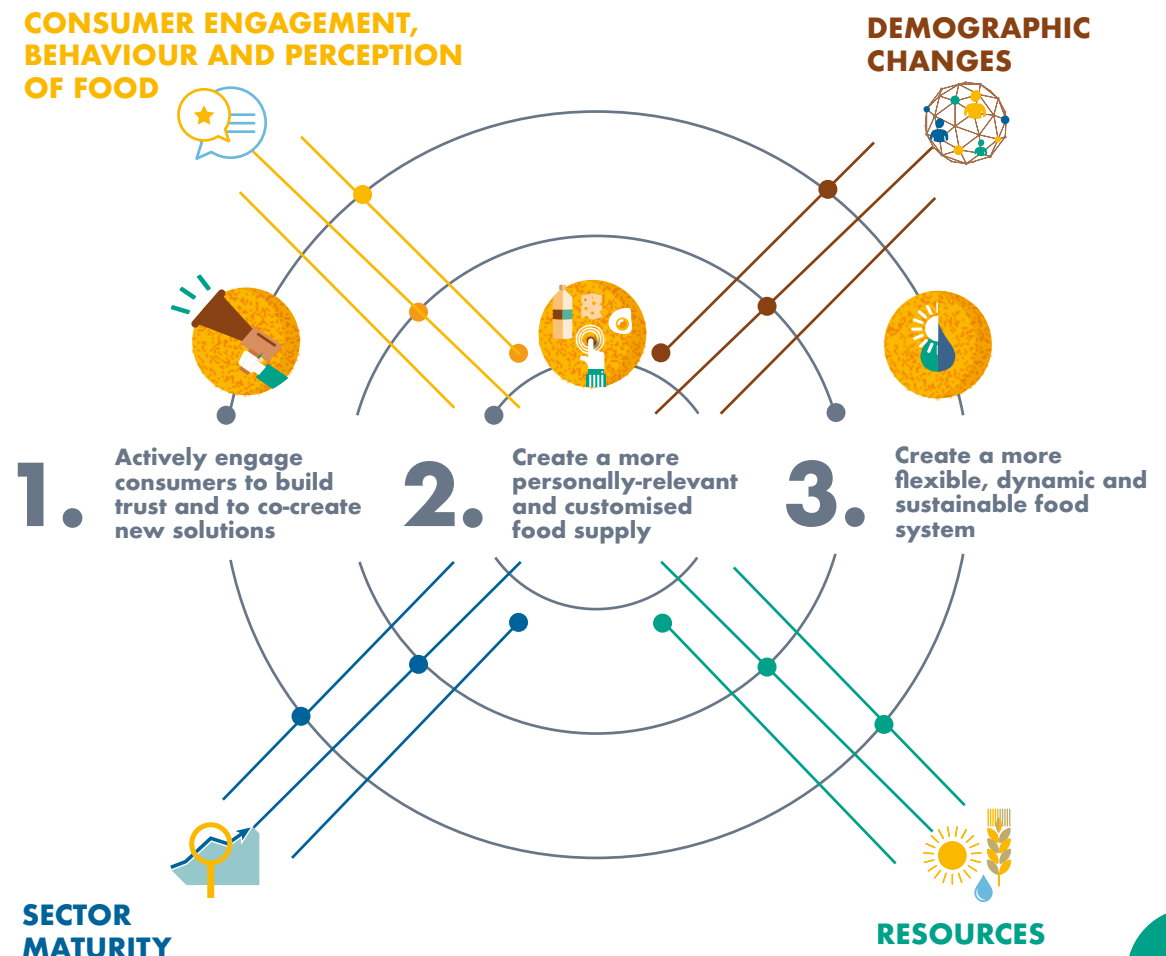
2.3. Overall Strategic Objectives defined by the ETP 'Food for Life'

In the 2016 SRIA, the ETP 'Food for Life' described the urgent need for increased private and public investments in R&I in order to secure Europe's role as a leading global provider for safe and healthy foods produced in a sustainable manner. To realise its ambition, the ETP 'Food for Life' has identified three strategic objectives that will allow the food and drink sector to move forward as a whole (Fig. 2).

The overall result will be a shift from a conventional mass production model to a more personalised and customised model involving and engaging consumers while simultaneously promoting flexibility and resource efficiency. In line with these objectives, the recent ETP 'Food for Life' SRIA highlighted 17 topics that are critical to the achievement of the three strategic R&I objectives (Fig. 3).

R&I Target 1, **Increase the engagement and involvement of consumers** centres on getting a better understanding of what consumers really expect and value when it comes to food (1.I). Based on this understanding, consumers could be engaged actively in the overall supply and preparation of their foods: leveraging modern data sciences, one can now communicate with individual consumers (1.II), or even explore completely new ways of producing and distributing foods (1.III). At the same time

Figure 2. ETP 'Food for Life' Strategic Objectives





it is important that individual consumers can easily find the information that they personally understand on, for example, sustainability (1.IV). Ultimately, the goal is to create a food system that can be customized to fulfil consumers' diverse expectations (1.V).

We obtain ever more insight into our needs, and we find that every individual has specific and differing needs. Technology also gives us more and more possibilities of customization to address specific individual's requirements. Therefore, **R&I Target 2, Providing the Basis for a More Personalized and Customized Food Supply**, aims at identifying needs and developing measures to fulfil them. For this, we need to better quantify and understand the appreciation of our food, in its wide spectrum of cultures and preferences (2.I), and to better identify the dietary requirements of European populations in their varying lifestyles, health status, cultures and environments (2.II).

Part of that information will be gathered via intelligent packaging leveraging Generation 4.0 technologies (2.III). This knowledge will be complemented by the use of modern sciences for the prediction of the complex behaviour of food in the digestive tract (2.IV and 2.V). Ultimately, all these dimensions have been incorporated in the Forerunner Project (2.VI), in which new concepts

and technologies are integrated to assure overall well-being of the individual consumer/citizen.

While the first two Targets focus on the consumer, the third R&I Target, **Developing a More Flexible, Dynamic and Sustainable Food System** is about ensuring food security in our future. This comprises both the discovery and exploration of new foods while making sure that these foods are good for us and our planet (3.II - on understanding the role of the food matrix, 3.III - on truly sustainable packaging concepts, 3.IV - on new raw materials, and 3.V - on 'un-refining' our current foods), and ensuring that all the food we consume will not be bad for us (3.I and 3.V on ensuring food safety, now and with new food sources).

The overall programme will contribute to meeting the Sustainable Development Goals (SDGs) (Table 1) and will position the European food industry as a strongly innovative sector, by embracing the unique diversity that we have in European culture, and at the same time making use of the better understanding that we are gaining on the immensely complex system that consists of humans, foods and environment to guarantee that the production of our food will be ensured for the long-term future.



Figure 3. SRIA topics

CONSUMER ENGAGEMENT FOR TRUST

1. Increase the engagement and involvement of consumers

- I. Improving Insights into Consumers
- II. Food and Me: Making Food an Activity
- III. Food Inventors: New Food Production and Delivery Models to Provide Better Access
- IV. Footprinting of Food: Consumer Engagement in Sustainability
- V. The Smart Food Grid: Modular Food Production and Distribution

PERSONAL RELEVANCE AND SUPPLY CUSTOMISATION

2. Providing the Basis for Personalised and Customised Food

- I. The Food I Love: Appreciation of Diversity in Food and Eating
- II. (Tr)Eat Me: Dietary Approaches for the Prevention of Non-Communicable Diseases
- III. Packaging 4.0: Intelligent and Communicating Packages
- IV. In Silico Food Design: Understanding Food Digestion
- V. The Ecology Inside Us: Food Meets Gut Microbiome
- VI. Foods for Tomorrow: Assure Consumer Health and Wellbeing

SUSTAINABILITY, FLEXIBILITY AND SYSTEM DYNAMICS

3. Developing a More Flexible, Dynamic and Sustainable Food System

- I. Getting It Right: Integrated Food Safety as a Unique Selling Point
- II. The Matrix Matters: Food structure for Better Health
- III. Coming Full Circle: Towards Sustainable Packaging Systems
- IV. It's All Food: Alternative Food Sources
- V. Check It: Next Generation Strategies for Food Safety Assessment
- VI. Simply Natural: Towards Less Refined, More Natural Food Ingredients



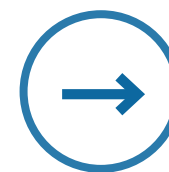
Table1. Link of specific SRIA topics and the Sustainable Development Goals (SDGs)
(Table kindly provided by Dr Gavin Milligan)

PILLAR	TOPIC IN THE SRIA	SUSTAINABLE DEVELOPMENT GOALS (SDGs)									
INCREASE THE ENGAGEMENT AND INVOLVEMENT OF CONSUMERS	IMPROVING INSIGHTS INTO CONSUMERS	4	9	11	12						
	FOOD AND ME: MAKING FOOD AN ACTIVITY	12	14	15							
	FOOD INVENTORS: NEW FOOD PRODUCTION AND DELIVERY	8	9	12	13	14	15				
	FOOTPRINTING OF FOOD: CONSUMER ENGAGEMENT IN SUSTAINABILITY	4	6	12	13	14	15				
	THE SMART FOOD GRID: MODULAR FOOD PRODUCTION AND DISTRIBUTION	7	9	11	12						
PROVIDING THE BASIS FOR A MORE PERSONALISED AND CUSTOMISED FOOD SUPPLY	THE FOOD I LOVE: APPRECIATION DIVERSITY FOOD & EATING	4	9	10	12	14	15				
	(TR)EAT ME: DIETARY APPROACHES FOR THE PREVENTION OF NON-COMMUNICABLE DISEASES	3	4								
	PACKAGING 4.0: INTELLIGENT AND COMMUNICATING PACKAGES	9	12	13							
	IN SILICO FOOD DESIGN: UNDERSTANDING FOOD DIGESTION	3	9	12							
	THE ECOLOGY INSIDE US: FOOD MEETS GUT MICROBIOME	3									
	FOODS FOR TOMORROW: ASSURE CONSUMER HEALTH AND WELLBEING	3	9	10	12						
DEVELOPING A MORE FLEXIBLE, DYNAMIC AND SUSTAINABLE FOOD SYSTEM	GETTING IT RIGHT: INTEGRATED FOOD SAFETY AS A UNIQUE SELLING POINT	3	9	12							
	THE MATRIX MATTERS: FOOD STRUCTURING FOR BETTER HEALTH	3	9	10							
	COMING FULL CIRCLE: TOWARDS SUSTAINABLE PACKAGING SYSTEMS	9	12	13							
	IT'S ALL FOOD: ALTERNATIVE FOOD SOURCES	2	4	9	14	15					
	CHECK IT: NEXT GENERATION STRATEGIES FOR FOOD SAFETY ASSESSMENT	3	4	9	12						
	SIMPLY NATURAL: LESS REFINED, MORE NATURAL FOOD INGREDIENTS	3	12	12							
		3									



IAP: THE PLAN AND ACTION OF THE ETP 'FOOD FOR LIFE'

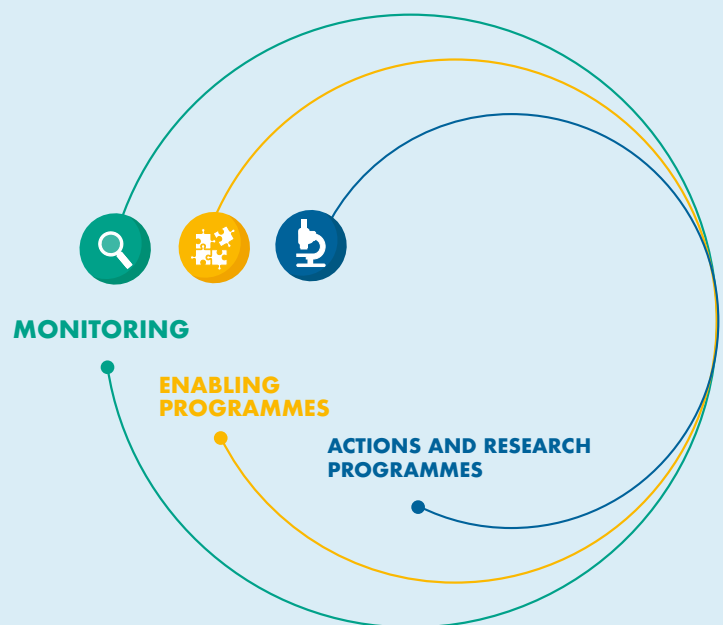




3.1. Introduction

The IAP maps out how the action items listed in Section 1.3 (and in more detail in the SRIA) can be realised most effectively. The IAP therefore takes up the three aforementioned R&I targets and their 17 topics and focuses on the modalities of actions specific to each topic (in this Chapter), their enablers (Chapter 4) and the monitoring of their progress (Chapter 5), as represented in Figure 4.

Figure 4 .Elements included in the IAP

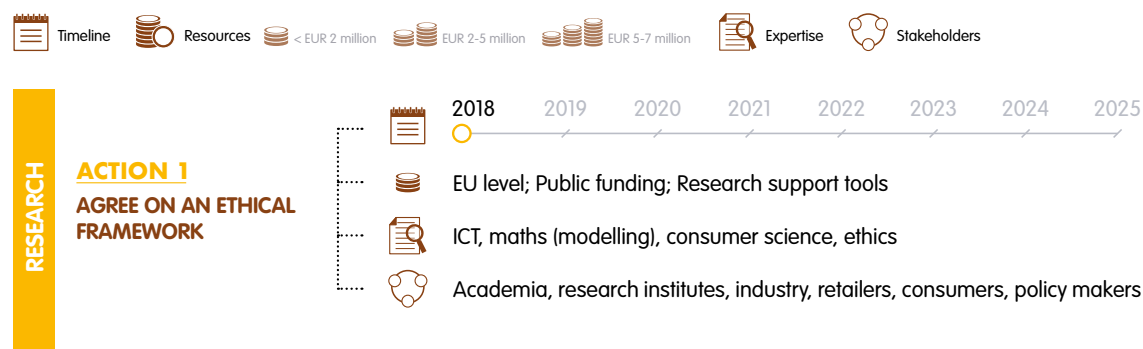


The Actions of the Research and Innovation Programme are detailed in Appendix 1 in form of a comprehensive table. There, specific Actions have been defined for each of the 17 Topics referred to in Section 1.3.

To illustrate the chosen tabular representation, an example of the illustration of an action is shown below in Figure 5. For each Action, a designated

Number ("X" in the Figure below), an R&I Type (indicated in 4 different colours; see Section 2.2), a Description, an Implementation timeline, required Resources and Expertise, and relevant Stakeholders to be engaged in the activity are depicted below.

Figure 5 (below). Action example as compiled in Appendix 1





3.2. Different Types of Actions

The experts of the ETP have identified 4 Types of action to realise the overall SRIA: Research, Innovation, Training and Education, Communication and Dissemination.

Synergies of training, education, communication and dissemination activities between the different topics have been exploited in designing several horizontal actions. Those activities require distinct approaches, but when effectively interlinked they will elevate the profile of the European food sector as a driver for European growth. To exploit these synergies several horizontal actions were designed to be worked out across individual themes.

In addition, in Section 4.5 we have focused on strengthening the role of small and medium-sized enterprises (SME) in the food system R&I space, since the sector is in fact largely composed of SMEs. The Actions identified in Section 4.5 have also been included in the Tables in Appendix 1.



RESEARCH

Actions ranging from basic to applied, pre-competitive research, the primary aim of which is to generate new scientific and technical knowledge.



INNOVATION

Actions with the aim of adopting, assimilating and exploiting the newly developed and discovered knowledge with the explicit goal of creating products, processes or services. Value creation through innovative start-ups could be a part of this as well.



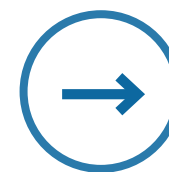
TRAINING AND EDUCATION

Actions to facilitate human resource developments and knowledge exchange by fostering mobility of researchers and innovators, developing novel educational programmes in Member States that go beyond the traditional offerings of academic institutions (e.g. with a focus on continuing and public education). Training and education are key components for the extension of knowledge and for its transformation into competitiveness through a well-trained, flexible and skilled workforce. It is important to leverage on new skills and entrepreneurship to take advantage of the huge opportunities.



COMMUNICATION AND DISSEMINATION

Actions focused on distributing and exchanging information to and with various audiences in forms that are appropriate to their needs. The aim is to engage effectively the multitude of stakeholders that make up the sector to foster greater mutual confidence and trust. The communication and dissemination elements of the ETP 'Food for Life' require a coherent and durable set of activities. An effective and bi-directional communication strategy relies on trust and confidence, and on the ETP 'Food for Life' having, and being perceived to have, independent credibility across all stakeholders. It is therefore key to establish a dialogue among the whole food system, consumers and policy makers, to explore together the potential of the research pathways described in the SRIA and in this IAP. For achieving an effective dialogue, scientific outcomes should be translated into simple and understandable messages and the communication strategy tailored to each specific group of stakeholders. In the medium term, a new stakeholder platform that truly brings together all concerned actors of the food system of the future will need to be created to facilitate this.

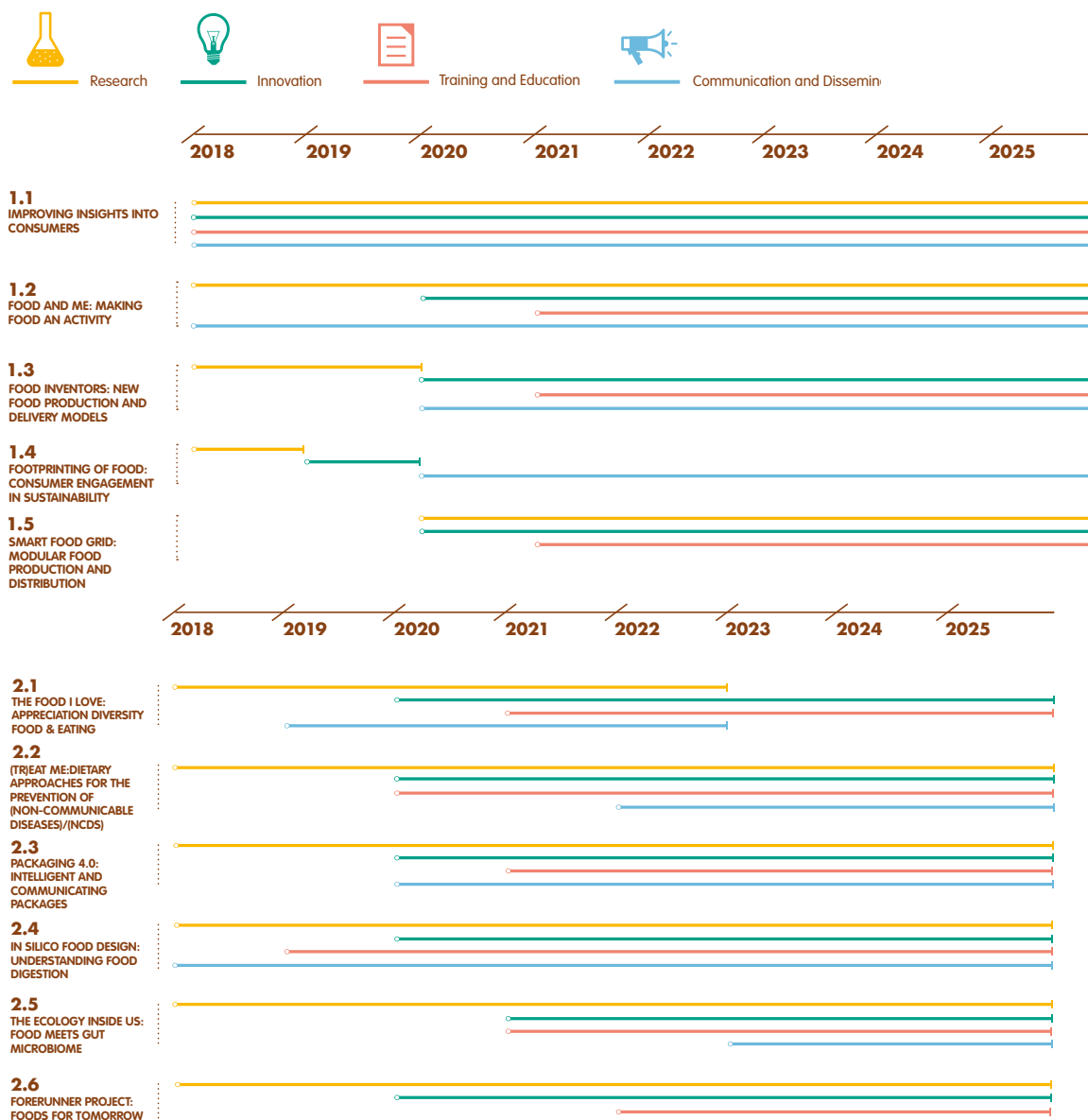


3.3. Implementation Timeline

While all actions are important, the experts of the ETP 'Food for Life' have given indications on the timescale necessary for the success of the action, prioritising those actions that were perceived as more urgent. Moreover, dependencies and synergies between projects have been considered.

The result is a logical flow of events where some projects exploit immediate opportunities while others are timed due to those dependencies or implemented over longer periods due their inherent complexity. The Figure below depicts the timelines for each Type of Action for the Topics that form the main R&I Targets described in the SRIA.

Figure 6. Type of actions



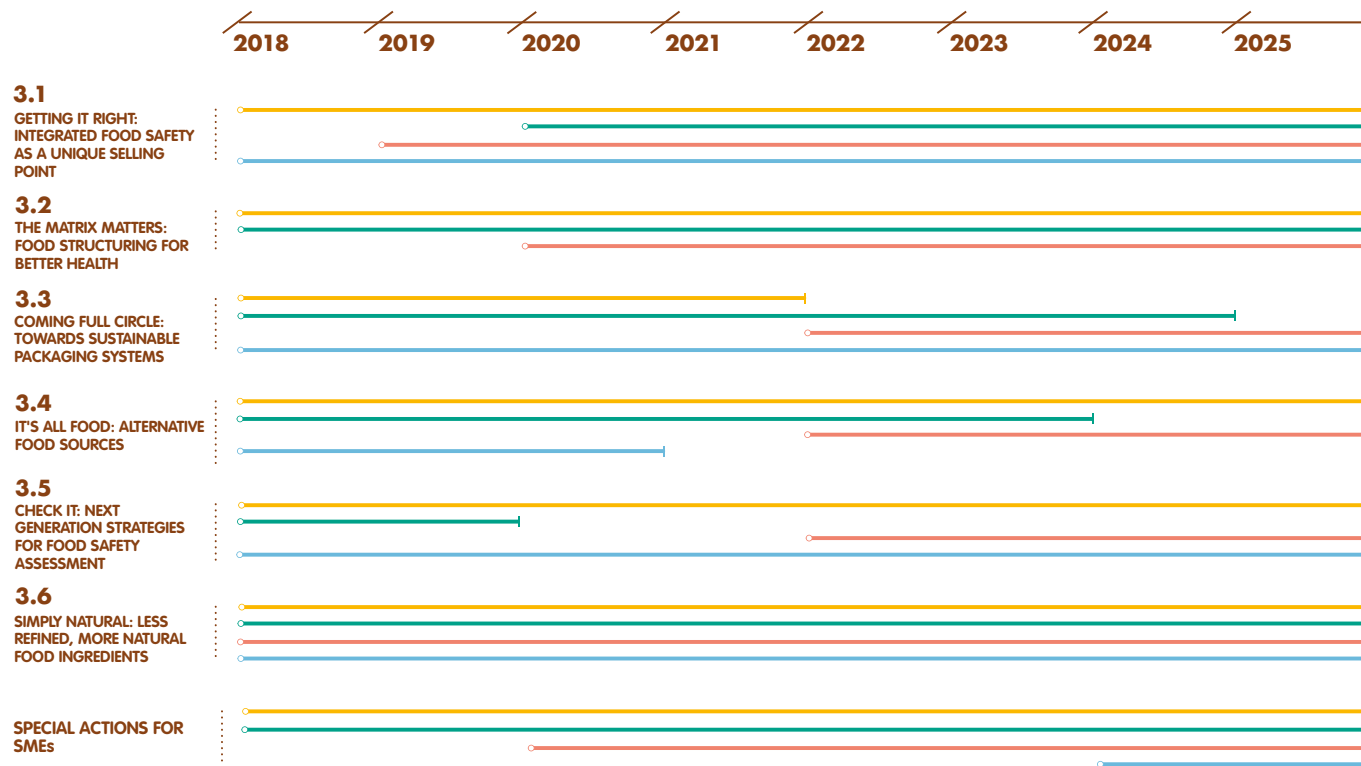


Figure 6. Type of actions

3.4. Analysis of Total Resource Needs

Since a significant part of the pre-competitive research identified has a strategic goal, it is expected that a large proportion of this work will be supported by the public sector in collaboration with private actors such as industry or investors, as appropriate. This support can materialise from novel funding instruments and sources but also from existing resources to be mobilised and directed more effectively.

The science necessary to achieve success requires inputs from several fields, including social, biological, physical, medical and ICT sciences. Research infrastructures will allow and encourage this transdisciplinary research, not only among scientists, but also among stakeholders.



ENABLING INSTRUMENTS





4.1. Introduction

In addition to the specific actions summarised in Chapter 1, and described in detail in Appendix 1, the success of this IAP will depend on several key enabling instruments and activities that need to be addressed or considered along all R&I targets and actions. In Chapter 4, key enablers that are of particular importance to the required integration of the food system are therefore listed.

Responsibility and Openness in Research and Innovation (RORI)

- Engagement
- Equal Opportunities
- Open Science
- Open Innovation
- Open to the world
- Ethics

4.2. Responsible and Open Research and Innovation

According to the European Commission, 'Responsible Research and Innovation' refers to proceeding in R&I in a way in which all relevant stakeholders representing social, ethical and economic concerns, including researchers, industry, policymakers and civil society are engaged.⁴ At the same time this approach should enable easier access to scientific results and knowledge, consider gender and ethics in R&I processes and enhance formal and informal science education.

To implement this in the food sector will also require a clear agenda on how to establish more openness within the sector itself. As reflected upon by the Research, Innovation and Science Policy

Experts high level group (RISE), 'Open Innovation', 'Open Science' and 'Open to the world' (the 3 O's) are the crucial mechanisms to be considered to ensure openness in a way that will positively impact innovation, growth and international competitiveness.⁵ Therefore, in order to tackle the challenges and opportunities outlined in the 2016 SRIA we suggest combining Responsibility and Openness in Research and Innovation (RORI) in one approach for the specific development needs of the food sector.

Within the food sector a RORI approach will make it possible to enhance the impact and acceptance of the R&I activities as well as to allow for a more

⁴ [European Commission \(2012\) Responsible Research and Innovation. Europe's ability to respond to societal challenges](#)

⁵ [European Commission \(2017\) Europe's future - Open innovation, open science, open to the world: reflections of the RISE High Level Group](#)



dynamic R&I environment, which, in line with our SRIA, will foster more co-creation and creative thinking. Furthermore, an early engagement of stakeholders can provide better focus, enabling identification of topics and the prioritization of their execution. RORI will be a cross-cutting approach that is implemented across all IAP activities and embrace several key enablers. This is essential to ensure that the main SRIA objectives create the intended shift from a more conventional mass production to a more personalised production model, engaging consumers while simultaneously promoting flexibility and resource efficiency.

As part of the RORI approach several key enabling elements needs to be addressed.

ENGAGEMENT

Engagement of all relevant stakeholders should be ensured through their early involvement, by creating an environment of trust, where stakeholders can talk freely and discuss challenges and opportunities without risking their own position, competitive advantage, etc. It is also important that all stakeholders see their own relevance and role in a given activity and feel actively involved and engaged. All IAP action modes will require a description of how to involve the relevant stakeholders, their role and importance for execution of the activity. It is also important that each individual stakeholder understands its relevance in transforming the R&I activities into societal solutions.

While all IAP activities seek to engage stakeholders in its broadest sense, a particular focus will be on the consumer as the understanding and the dialog with



the consumer is key to ensure the conversion from mass production to personalized and customized production. A more detailed description of consumer involvement is described in Section 3.3.

EQUAL OPPORTUNITIES

Equal Opportunities are particularly relevant in the food sector. The sector employs people covering the entire scale and range of educational backgrounds, from low to high level educations, employees from all socio-economic categories and from all parts of Europe and also from outside of Europe. Equal opportunities for employees need to be offered in terms of personal development and further education, gender, social status, location, age, etc. While these opportunities may be relatively easy to offer in large companies, they are more complicated to implement in SMEs where the resources and opportunities for personal

development are more limited. Therefore, the R&I IAP, among others, addresses the development of open structures that enable employees to transition more freely from one company to another, or from the private to the public sector, e.g. from a company to an academic or policy institution, and vice versa, and also suggest instruments for companies to collaborate more easily on personnel educational activities.

OPEN SCIENCE

Open Science responds to the social consensus that scientific discoveries and new knowledge are public and they must be made available to everybody in order to accelerate developments and to make citizens understand why investment in science is important. The establishment of a kind of Open Science ecosystem is important in order to build trust with society and maximise the impact

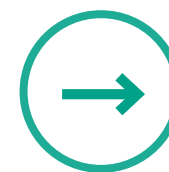


of research. It promotes new ways of conducting science in which many collaborate and contribute, aided by the use of digital technologies and new collaborative tools. As described by the RISE group, Open Science should at least include public accessibility and full transparency of scientific communication, public availability and reusability of scientific data, transparency in experimental methodology and complete scientific collaboration.

In order to create such an Open Science ecosystem relevant to the food sector, actions are needed at several levels. First, infrastructures, such as the future European Open Science Cloud, need to be established and their performance optimised for the food sector. This will require development of the proper e-infrastructures, digital tools and services and most probably also changes in the legal tools and policy requirements. Secondly, researchers involved in food

related research must be encouraged to engage with Open Science at all stages of their career. The European Commission is already trying to create a policy framework that will set common principles and rules by respecting European citizens' rights and by helping European companies to grow in a fair environment. Researchers should be encouraged to make their research data findable, accessible, interoperable and reusable (FAIR), and systems need to be put in place to ensure that they are soundly managed, which will require education in data administration and data integrity. Universities are encouraged to establish educational programmes to integrate this concept in the curricula of researcher's and research support staff, most probably as a life-long-learning element.

In addition, the current assessment of a researcher's output, which relies almost exclusively on scientific



publication and/or patent production, would need to be revised, as in an Open Science model other criteria, like the extent of knowledge used by other parties, becomes more important than a single point-of-exit-measure.

Finally, other aspects of a food researcher's activities, e.g. carrying out dialog with consumers, opening access to publications and knowledge transfer to stakeholders (Academia's third mission) will gain increasing importance. This change in the paradigm poses new challenges, such as the design of the right tools and training support for researchers to improve their communication skills, or solving possible technical interoperability and legal issues with respect to data sharing.

OPEN INNOVATION

Open Innovation has become more and more widely discussed in the EU and, over the last decade or so, many companies have developed strategies for open innovation. This tendency is equally reflected in the food industry. Open Innovation is defined as the use of purposive inflows and outflows of knowledge to accelerate internal innovation and expand the markets for external use of innovation, respectively. Although Open Innovation is in principle an agenda operated by companies, it has a strong influence on the public research agenda and also the way the food sector operates in general. Moving from conventional mass production to a more personalized and customized production model, the food industry



will benefit from a higher degree of open innovation where all stakeholders in the food system engage and interact across the entire sector. Therefore, several considerations related to research need to be made: First, how can public and private research be better integrated for the benefits of all? Second, how can data be shared between public and private companies? Third, how can networks be formed between private and public R&I staff creating a trustful environment that is beneficial for all? And fourth, how can Intellectual Property Rights (IPR) be shared and easily handled between different stakeholders and across countries, while at the same time essential IP and trade secrets are still kept within the individual companies?

In recent years, many larger food companies have adopted an open innovation strategy in their firm, whilst SMEs are lagging behind. Shortage of resources is certainly partly to blame, but the lack of competences and lack of trust also limit the ability of SMEs to allow knowledge to flow in and out of the company. SMEs (see Section 3.4) are a major and integral part of the food sector and it is essential that they are major beneficiaries of the ETP 'Food for Life' SRIA as they are essential gatekeepers of the overall its implementation. It is therefore important that initiatives are developed to facilitate the introduction of Open Innovation in food SMEs and the R&I IAP also contains means to address this issue.

OPEN TO THE WORLD

The ETP 'Food for Life' SRIA requires an Open to the World approach as without this many of the action items cannot be executed. The global food related



challenges identified require solutions to better engage consumers, as well as to solve increasing problems due to demographic changes, increasing competition for natural resources and an increasing "tiredness" of the sector due to its maturity. These challenges can only be solved if all stakeholders in the food area (researchers, citizens, policy makers, farmers, businesses, third sector organisations, etc.) work together across borders during the whole R&I process in order to better align their activities with their values, needs and expectations. The research carried out should not be seen as a standalone process for the benefit of only acquiring new knowledge. Rather, it is as an integrated part of a larger picture that can function as an enabler to provide advice for policy and decision making, including global governance, as well as being seen as a tool to build and improve relations between nations either to address shared problems or to provide mitigations.

ETHICS

Finally, ethical considerations are of the highest priority in all R&I activities carried out. All developments must be carried out in accordance to the highest ethical standards. A particular focus will be on the involvement of consumers in research and innovation activities. E-based infrastructures to create dialog with consumers and producers will require significant focus to be made on data protection, anonymity issues etc. Specific means needs to be addressed to solve these important ethical aspects across European borders. Development of specific governance structures to prevent harmful and unethical developments in R&I should be considered.

As part of the ethical issues, Research Integrity is also considered. Research Integrity is the basis that safeguards science against particular interests,



whether ideological, economic or political. A basic responsibility of the research community is to formulate the principles of research, to define the criteria for proper research behaviour, to maximise the quality and robustness of research and to respond adequately to threats to, or violations of, research integrity. These are all established in the European Code of Conduct for Research Integrity (revised in 2017)⁶, which makes clear this responsibility and to serves as a framework for self-regulation for the research community. The Code of Conduct is relevant and applicable to both publicly funded and private research and should, in principle, be adopted by all relevant stakeholders involved in the IAP. The Code aligns fully with the set of Principles for Research Conduct the food and drink sector published in 2015.⁷

In conclusion, in order to successfully implement the RORI approach several key enabling instruments and activities need to be addressed or considered. These instruments and activities need to be integrated, as much as possible, in the actions proposed in this IAP in order to maximise its impact. For example, by involving all stakeholders in research and improving the communication of research outcomes, we can spread awareness on the necessary changes, particularly those that affect lifestyles and behaviour. By delivering more societally relevant and acceptable outcomes, market uptake of R&I developments could be significantly increased. And only by fostering strategies and instruments addressing the 3 O's (Open Science, Open innovation and Open to the world) can research outputs be effectively made accessible to all stakeholders in the food sector.

⁶ [ALLEA \(2017\) European Code of Conduct for Research Integrity.](#)

⁷ [FoodDrinkEurope \(2015\). Set of Principles for Research Conduct.](#)



4.3. Consumer/Citizen Engagement

Consumers and civil society organisations (CSOs) are increasingly interested in the way their food is produced and actively seek information. Digital communication systems facilitate this information exchange by making the information easily accessible regardless of the time and place. Food, nutrition security and health are topics that have high potential to cause concern among consumers, and often the novel production methods are questioned by consumers and CSOs representing different citizens' interest groups. In order to gain acceptance for new technologies or products, the views of these various organisations and end-consumers should be better integrated

in the research agenda and innovation processes allowing consumers and citizens to become active agents in the development of the food supply system. This implies that consumers will gain a more prominent role as a driving force in R&I activities, such as research on new technologies, developing product solutions and business models. Enabling consumers and CSOs' engagement and thereby creating transparency and openness in R&I is also a way to increase trust in food supply system, which has been contested in recent years.



CONSUMERS AS ACTORS

Consumers' opinions or CSOs' views are typically probed at the late stages of R&I when technologies and solutions are close to adoption, although there is an acknowledged need to progress from this 'doing things for end-consumer' to 'doing things with end-consumer' and even further to 'things done by end-consumers' approaches. Improving consumers and CSOs' possibilities to take part in early stages of R&I processes would enable to avert from developing new solutions that are not acceptable to consumers and guide the processes towards solutions that respond to consumers' needs and desires. This input can relate to the way we define problems, set research questions, select theories and methodological approaches, collect and analyse data, and/or how to interpret the findings and draw the implications of the R&I, as different models are required at different stages of these processes. In problem definition and setting research questions, consumer engagement should reach the funding bodies. In individual research initiatives, the consumer/citizen engagement needs to be planned as part of the process: e.g. whether and how to engage consumers at planning stages and whether the engagement should be a continuous dialogue with same participants or include different actors at planning and interpretation stages. For research initiatives this requires strong social science components that complement research and innovation processes in a comprehensive manner. To promote consumer/citizen engagement, the research initiatives must include detailed plans how and at which stages the consumers and CSOs participate in the process. The engagement activities can widely differ between different types of research activities and they should support reaching the best outcomes.



Having a social science expertise included in research proposals facilitates the stakeholder engagement and resources specially allocated to this kind of tasks should be earmarked. Providing guidelines for consumer and CSO engagement will benefit scientists when planning their research activities.

OVERCOMING DIFFERENT WORLDVIEWS

One of the challenges in increasing consumer engagement is the different worldviews consumers and scientists have. Even well-educated consumers may lack basic understanding of the principles in which science works, which is important in creating a constructive dialogue between

consumers/citizens and scientists. Including principles of scientific thinking in school curricular for those who have vocational or other medium-length education would facilitate consumer/citizen engagement. Similarly, in science training, understanding the society and end-consumers worldview is important and training should include a module on stakeholder engagement: why and when it is important, and how it can be achieved. Consumers' understanding of what science can do and why evidence-based solutions are looked-for and scientists' understanding of what consumers deem important in their everyday life would help to build more positive attitude toward engagement among the different parties.

As science and stakeholder worldviews can differ widely, the engagement activities will be assigned



to parties who are experts in bridging the different viewpoints and can offer an impartial platform for presenting these viewpoints. The alternative option for funding these engagement activities is to have special funding tools that can be applied separately to support the on-going research. This would give flexibility to the ways stakeholders are engaged and enable the engagement of consumers in issues that rise during the research process, if the funding decisions can be made fast.

Consumers and citizens active in CSOs are diverse in their interests and finding the relevant party to engage with can be a challenge. Furthermore, even relevant parties have different viewpoints which need to be integrated and negotiated. This requires expertise that is often not in the science domain. Bridging the gaps between consumers' and scientists' worldviews in order to create dialogue requires time and willingness from both parties to overcome the communication challenge. Scientists may fear that the basic self-correcting autonomy principle in science will be compromised if research is opened to ordinary citizens allowing them to have a say in what is studied. From the consumer and stakeholder point-of-view, the challenge is to have the required knowledge on the content of the research in order to make a meaningful contribution in their engagement. The topics and issues where consumers and stakeholders are involved should be then framed in a way they can relate to, e.g. not in technical terms but in terms of the relevance of the research to consumers and stakeholders everyday life.

FACILITATING COMMUNICATION

Digital communication technologies are among the enabling forces for increased consumer/citizen engagement. They allow access to a vast amount of information, but they also enable two-way communication between consumers and scientists or innovators. Organising stakeholder workshops or focus groups is important in certain topics, but they are both expensive and difficult to organise due to the time required. Engagement methods using on-line platforms and digital communication are still rarely used in research activities and development of these methods together with digital communication experts would facilitate stakeholder engagement systems that could be used flexibly throughout the R&I processes.

As the channels enable two-way communication and dialogue, they can be used to elicit consumers' opinions, needs and wants and thereby support R&I that better responds to these needs and desires. This will also require a change in the way consumer insight has been seen as an input in research rather than co-creation activity that requires dialogue. Digital two-way communication permits to clarify any questions consumer may have and furthermore, these channels can be used in consumer-to-consumer (C2C) communication allowing consumer to respond to others' comments as well.

Thus, these channels empower consumers to form rapid consumer communities around specific topics and thereby even social movements that



Engagement methods using online platforms and digital communication are still rarely used in research activities and development of these methods together with digital communication experts would facilitate stakeholder engagement systems that could be used flexibly throughout the R&I processes.

can contribute to the research and innovation, or pressurise other actors in the food chain.

COVERING DIVERSITY

Finding the relevant and interested consumer and CSO groups can be a challenge. Consumers and CSOs may not be willing to invest their time in engagement, unless they can see the benefit of this engagement in terms of being heard and taken into account when research agendas are decided, research approaches discussed or findings implemented.

Finding the relevant groups can be facilitated by creating databases where different CSOs



and interest groups can register and express their interest to engage in R&I activities as stakeholders. The database should be vetted and relevant information about the goals, membership principles and numbers is included in the register to guarantee that they are open groups working on democratic principles. CSOs can be sensitive about linking their name with certain research activities even when they have an interest in the topic. Their willingness to engage often depends on whether they feel that their contribution is based on open interest, mutual respect and transparency rather than just used to warrant the research in question.

Creating follow-up systems where the consumer and CSO engagement is explicitly acknowledged and allowing to follow the further developments in the research will provide feedback to those who have been involved in earlier stages of research activities. This will require opening up the research process to external parties, which may be a challenge if intellectual property rights or ability to publish results in scientific journals need to be considered. When the innovation and research aims to find solutions for specific target groups (e.g. people with a certain disease or age group) the engagement must include representatives from these groups.

PROVIDING RESOURCES AND INCENTIVES

From the scientists' point of view stakeholder engagement is often considered as an add-on in the ordinary activities; not necessarily because scientists are unwilling or uninterested in the topic, but because

they are mainly rewarded on criteria that is related to scientific input. To facilitate consumer/citizen engagement, there should specific resources allocated to do this in research activities: this will enable scientists to contribute to the content of the dialogue without needing to learn and execute activities than are not their core expertise.

Participation of scientists in the engagement activities is a crucial part in constructive dialogue, but other resources can facilitate the practical organisation of



the engagement processes, whether face-to-face events, online communications, or even running continuous stakeholder platforms.

These resources should be made available as an essential part of the research projects, but retain flexibility in the use of these resources as the relevance of engagement evolves with research findings.

4.4. Digital Technologies as an Enabler for Transformation of the Food System

The development of new digital technologies has changed, and continues to change, the operations of many industrial sectors, amongst these also increasingly the agri-food sector. What began in the middle of the 20th century as a simple shift from doing operations and computations by mechanics and analogue electronics, to these being done by digitally-operating devices (initially vacuum tubes, then transistors, and eventually complex logical circuits with increasing miniaturization), eventually led to what we now call the 'digital revolution'.

The term suggests a scale of change similar to that of the earlier technologically-induced revolutions

such as e.g. the agricultural and industrial revolutions. Its effects are extremely broadly occurring at economic, social, cultural, and political levels, giving rise to an information or networked society and a new digital age.

As outlined in the ETP SRIA, the food sector is facing historical changes caused by various global drivers, such as an increasing world population (10 billion in 2050), an increasing shortage of food commodities, especially animal feedstocks, changes in consumer behavior (partially linked to digital technologies), especially in developed countries with new terms



giving importance such as regional, organic, 'free from', and an increased importance of food for the health and well-being of consumers. In order to meet these new requirements, the food value creation system relies on its actors (producers, processors, distributors, consumers) working together in a novel, networked way to collaborate effectively to develop new approaches and design principles.

The use of digital technologies is enabling this transformation to allow actors to address these challenges. For example, the translation of production systems into virtual spaces (the so-called digital twinning) makes it possible to adapt processes and material flows for foodstuffs to the emerging diverse and individual usage scenarios of the consumers while saving valuable resources. Informatics approaches allow also for an increased transparency and traceability of raw materials and the food produced thereof via e.g. the use of the blockchain technology that is currently used for the digital currency Bitcoin. A personalized transformation of raw materials through automated recipe design can make it possible to respond to individual needs. Digital transformation is thus transforming the way the entire sector works, and will therefore be an indispensable element of education, research and innovation in the future.⁸

New digital technology trends that in the near future are having an influence on the operation within the food systems are as follows:

⁸ [AIOTI \(2017\) Digital Innovation Hubs: democratising digital technologies in agriculture.](#)



BIG DATA OR MINING

An increasing amount of data is being generated at every point in the food system, from the farm to the fork and beyond. New ways of data collection by novel miniaturized sensors allow for a previously unprecedented recording and analysis of various operations and behavior of elements and actors within the food system. The analysis of these increasingly large data sets fueled by new approaches to data management, data reduction and data presentation yields a great many new insights that are not only of scientific, economic, but also of social importance. In this context, the protection of personal data and rights (ownership, accessibility) will play an increasingly important role.

DIGITAL TWINNING

The mapping and efficient controlling of processes, material flows and uses in the digital domain is just now beginning to be implemented in the food sector.

New developments in automation and data exchange in manufacturing technologies including cyber-physical systems, the Internet of things, and cloud computing allow not only for an increased efficiency when designing new products and processes but also offer an increased ability to record material tracks thereby improving transparency.



MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE

Probably the largest change that can be expected to come from digital technologies is the increasing ability of computing devices to intelligently analyze data i.e. to recognize patterns and to use this then to develop predictive capabilities. Deep learning algorithms are universal learning procedures which on a theoretical basis, given enough time and data, may lead to the discovery of any pattern.

Experts have thus predicted that almost half of all jobs in the industrial and service sectors may be lost over the next 20 years to these cognitive computing devices. At the very least, cognitive assistants serving as new support tools to humans will increasingly be deployed in all aspects of life. A simple example of this, the Alexa system from Amazon, is already taking root in many households. It is just a matter of time until such tools will also be implemented in many aspects of operations in the food system.

Actions laid out in this IAP will therefore increasingly involve the above mentioned digital technology approaches. Due to the rapid pace of development, it is however not yet clear which aspects of the food system will be more or less, and slower or quicker affected. Clearly, there are new business opportunities and models emerging and there is a significant potential for societal well-being to improve due to the use of digital technologies.

The food sector in particular has to pay attention that this is done in the right way not leading to

a concentration of power and control over the system, but to an increased transparency and choice. This calls for actions to be carried out, not only by industrial actors, but by many stakeholders including consumer and citizen representatives, policy makers, and regulators.

4.5. Specific Actions towards SMEs

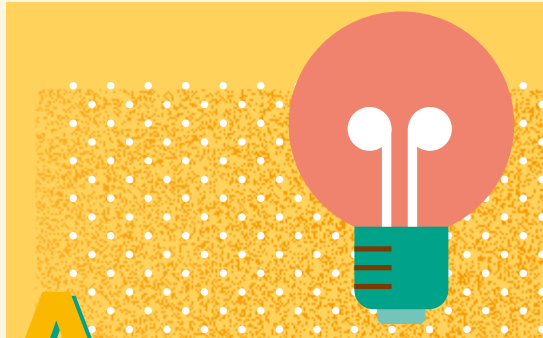
The disruptive, novel research and the new types of technology described in detail in the ETP 'Food for Life' SRIA and the IAP presented here, will have a beneficial impact on all food and drink companies, regardless their size. It is well recognised, however, that SMEs in the food sector face particular challenges in embracing R&I and it is considered essential that they are brought into the R&I cycle in a manner tailored to their specific needs. While their thematic needs are obviously likely to be very similar to those of large companies, their interests and priorities are strongly influenced and controlled by their limited resources, and their specific business and innovation cultures. It is often the case that SMEs are also often more vulnerable to the effects of their exposure to external factors.

Hence, research based innovation activities that require less resources and enable faster implementation and return on investment (e.g. from TRL 5 and above) are typically more

relevant and applicable for food and drink SMEs, than those that need more resources, investment, a long return time and more complex knowledge beyond their core competence. In this scenario, SMEs usually prefer to follow successful examples and to learn from each other.

A group of experts of the ETP 'Food for Life', the European Collaboration of National Platforms and the European Federation of Food Science and Technology have identified a number of recommendations that would enable SMEs to better exploit the full potential that R&I offers. These are developed in detail in a separate document and are summarised below.





A.

MAKE CONSUMER, SOCIAL AND BUSINESSES SCIENCES ACCESSIBLE TO SMEs

The integration of consumer and social sciences into innovation and research activities is a challenge even for large companies with their own, dedicated personnel and resources.

Most SMEs simply do not have currently the mechanisms by which they can access this area of skill and knowledge that is so crucial to the type of R&I presented in the SRIA. The following measures will lower the barriers of entrance:

- Design training activities targeting SMEs on understanding and applying consumer and market analysis into their innovation activities;
- Provide incentives for SMEs to hire young people educated in consumer and social sciences to support their innovation activities;

- Offer consulting and coaching services to SMEs to expand and actively exploit their own innovation capacities in these areas;
- Establish and maintain a bi-directional dialogue between social scientists and SMEs based on a clear description of the capabilities and enabling functions of social sciences and the real needs of food sector users.

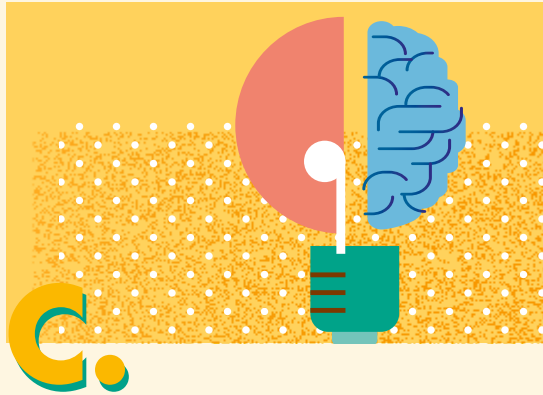


B.

PROVIDE FUNDING AND FINANCIAL TOOLS TAILORED TO SMEs

The size and relative vulnerability of SMEs often makes them reluctant to enter into the large scale and capital rich commitments required by many R&I programmes. Factors such as these, coupled with the societal imperative that this segment of companies be an active beneficiary of public R&D, means that specific tools be offered, once again to lower the barriers to access:

- Create specific financial tools dedicated to SMEs that are flexible, stable, fast and not so bound to fixed deadlines;
- Ensure the stability of successful funding schemes that allow SMEs to take more risks, cover all steps of the innovation process seamlessly and are differentiated to meet the different innovation behaviour and risk-taking capacity of diverse segments of SMEs. This should include public co-funding of bottom-up projects and collective research;
- Design complementary funding schemes at the national and European level and create mechanisms for their articulation;
- Enrich the database of the project proposals evaluators with more elements coming from industry;
- Develop training modules and easily accessible and understandable information that enable SMEs to understand the full range of the financing instruments. Ensure that intermediaries that can provide SMEs with all the necessary information for the existing opportunities are available and accessible - including financially;
- Provide fiscal incentives for SMEs to develop R&I activities and to hire staff with experience in project management.



CREATE SYNERGIES BETWEEN START-UPS AND SMES

Start-ups often have knowledge based technologies or approaches that require development in real company environments. SMEs could provide such environments with mutual and shared benefits providing that the pairing between the companies is optimised. Specific mechanisms need to be developed in order to accelerate the collaboration of these types of company:

- Organise platforms and matchmaking events that facilitate the collaboration between start-ups and SMEs with complementary competences;
- Provide easily understandable information to SMEs about innovative start-ups among users' and solution providers' communities;
- Establish neutral, trusted intermediaries at the national level who can match the problems and needs from SMEs with enabling concepts of service providers from other disciplines.



EXPLOIT COMPLEMENTARITIES WITH OTHER DISCIPLINES

Opportunities for innovation can come about from knowledge of other disciplines and other sectors and many companies make use of structured technological vigilance to identify possibilities. SMEs do not have the resources to make use of such developments individually and so conditions need to be created in order to give them access to this important route to innovation:

- Collect the problems and challenges of food and drink SMEs and the enabling functions of other disciplines, making use of the networking structures already in place;
- Design small, modular educational programs, gathered in easily accessible inventories that are kept up-to-date by maintaining a constant dialogue between users' and solution providers' communities;
- Establish a mandatory task for publicly funded R&I projects to convert non-competitive



information into a clear, understandable, user-friendly, concise educational formats focused on the aspects of benefits and practical applicability;

- Ensure an appropriate knowledge dissemination by intermediaries or suppliers, taking into consideration national and regional needs (e.g. language, culture);
- Design new facilitation instruments that combine the knowledge of the food sector with other disciplines for joint interest and benefits.



ACCELERATE THE DIFFUSION OF ENABLING SOLUTIONS TO SMES, AND CREATE ACCESS TO ENABLING FACILITIES, TOOLS AND SERVICES

Independent of the specific nature of the enabling solutions being made available to SMEs the need for specific and dedicated agencies and structures to manage and channel these remains.

The following structural changes are proposed:



- Establish mediator/facilitator organisations at national level that assist SMEs to find the appropriate solutions and to identify partners for jointly applying for National and European funds;
- Develop industry best-practice guides and inventories of successful cases to help SMEs understand the opportunities, benefits and principles of application of new methods. Ensure that these are available in accessible languages;
- Employ successful approaches for knowledge transfer to SMEs coming from other sectors of activity (e.g. FI-PPP);
- Facilitate collective research, marketing and chain management activities to help reduce the financial barrier for SMEs.



DEVELOP HUMAN RESOURCES THROUGH ENHANCED KNOWLEDGE TRANSFER AND TRAINING PROGRAMMS FOR SMES

The expressed ambition to make the execution and the outputs of the SRIA relevant and useful to SMEs will require significant investment in the development of

human resources capable of operating in the new knowledge-rich environment. Making the workforce appropriate for this environment will require a broad range of interventions:

- Design knowledge transfer instruments that deliver information in each local language and in a form that makes the science readily understandable and uses commonly-used terms;
- Create open experimental and pilot plant facilities and services with skilled staff for food applications for hire, or as contracted services;
- Establish intermediaries to make the exploitation process more effective. They will also be relevant for collecting users' needs, problems of the food industry SMEs on a targeted area and match them with the available knowledge and solutions;
- Foster the dialogue with SMEs, farmers producing food and other stakeholders relevant in R&I for the food sector, by combining conventional methods with new digital and collaborative tools;
- Implement new methods of operating multi-stakeholder platforms for R&I ensure a sound balance of stakeholders and protect intellectual property rights;
- Design and implement financial tools that support SMEs to hire staff with strong research background and capable to develop R&I projects and/or make use of their outputs;
- Train the existing staff of SMEs in skills necessary for all the steps of the R&I process;
- Provide financial and tax incentives to SMEs to create R&I departments;



- Facilitate staff mobility programmes (especially from Universities to SMEs and reversely, temporary placement of industry staff to research organisations).

The measures proposed here are required in order to bring the food sector SMEs to a position in which they can best participate in and benefit from the initiatives detailed in the SRIA.

Food SMEs have received a great deal of attention over the last years both in European and national programmes in order to ensure that they continue to play their crucial role in the agri-food ecosystem. However the disruptive research proposed in the SRIA will require all segments of the system to re-tool to a certain extent and it is crucial that SMEs receive particular attention in this respect.

As mentioned above, the participation of SMEs in the next phases of the development of the ETP was considered so important that a working group was convened with the European Collaboration of National Platforms and the European Federation of Food Science and Technology in order to develop detailed recommendations.

The reader with particular interest in this material is directed to the original report⁹ from which these considerations here are taken.

⁹ [ETP 'Food for Life'. NFTP and EFFoST \(2017\) Making Research and Innovation work for SMEs in the Food and Drink Sector](#)



4.6. Public-Private Collaboration

The ETP 'Food for Life' proposes to establish a public-private collaboration programme. The programme will aim to enable, encourage and empower every consumer in the EU to attain a

**safe
affordable
healthy
sustainable**

DIET
— in —
2030

There is a clear opportunity in establishing a new type of public-private collaboration as an instrument that could be used in the SRIA execution. The experience gained so far shows that public and private collaboration on R&I can help to overcome hurdles to growth by considering potentially limiting factors early on. A collaborative approach between public and private partners can prevent that research efforts are applied in a scattered and unstructured manner and that gaps or overlaps result from a fragmented research coverage. Moreover, awareness of ongoing efforts and incentives to translate them into tangibles is present from day one.

In addition, by bringing together different technologies and expertise from public and private partners across Europe, it will enable identification of technological barriers, gaps and synergies in the food sector. One of the main assets of the food and drink sector, but also a challenge, is its diversity, since it is spread across Member States and areas of activity. This restricts the exchange and pooling of knowledge and experience unless it is facilitated. Food and drink operators are also diverse in size, being 99% of them SMEs. A public-private collaboration must be highly inclusive for SMEs providing an opportunity to work in coalition

with major business operators and research organisations.

Throughout the years, the EU has actively supported research in the food and drink sector. This has led to the deepening of our knowledge in food-related topics, the establishment of research infrastructure and the foundation of networks that facilitate the sharing of information and best practices among the EU. The EU has gained a strong knowledge infrastructure and leading food companies have a strong research base in the EU. Europe is leading in the field of food and nutrition.

However, despite the progress made the EU is still not performing at its full potential. There is limited investment in research in the food industry compared to other industries; on average less than 5% of the revenues from the sales is invested in research and the top 10 companies invest about 1% of revenues in R&I. In addition, traditionally companies have focused on small innovations on product development, such as new flavours or new packages, which could be done through in-house research and which for years turned out to be a successful model. This situation has now reached a turning point. The food sector is one of the last industries that is now in a process of changing its innovation approach from a traditional all in-house



small steps model, to an open multi-partner model embracing step change innovations.

As part of the ETP 'Food for Life' SRIA an ambitious public-private collaboration programme will help to further boost this changing process. By establishing a structured partnership programme it will also ensure that the SMEs become a part of this process.

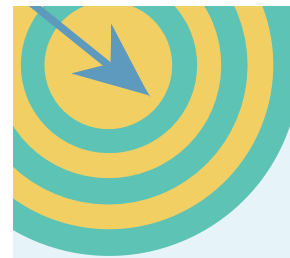
More specifically the ETP 'Food for Life' proposes to establish a public-private collaboration programme with the ambitious goal to ensure that all Europeans will have access to a balanced diet in 2030. The programme will aim to enable, encourage and empower every consumer in the EU to attain a safe, affordable, healthy and sustainable diet in 2030, which is produced with 40% less resources and half the food waste over the whole food chain. The three major areas of focus would be:

- Improving the trust and transparency between producers and consumers;
- Improving the energy balance while ensuring appropriate desired nutrient density;
- Maximising the efficiency in the use of our resources and reducing waste.

In order to achieve these ambitions we need the active involvement of all key stakeholders: farmers, manufacturers (large and small), retail, Academia, technological institutes, NGOs, consumers, governments and regulation authorities. Equally important will be that we leverage and align existing initiatives at local, regional, national or EU level. In

addition, the food sector will coordinate with other sectors of activity, such as technology providers, ICT developers and the bio-based (non-food) industries among others, as appropriate.

The programme we envisage will have several priorities (table below).



Priorities



Understanding and building consumer motivation, diversity and trust. Central here is to identify what people value in foods and food-related behaviour in different cultures in Europe and subpopulations (age, gender, lifestyle), and to identify what empowers and engages consumers in their dietary choices. This can be partly done through research into consumer behaviour, partially also by an open discussion amongst the different partners, and creation of active, two-way communication between consumers, producers and all other partners in the chain, using modern communication instruments and big data approaches.



Creating the right regulation and legal instruments both at European and national level to create incentives along the chain to come to the general availability of balanced diets. This may include regulations, but may also involve guidelines.



Understanding and enabling the use of new raw materials and alternative protein sources for foods that are genuinely sought after by consumers all over Europe. This will induce the development of a whole new economic



sector: that of sustainable, healthy and balanced protein foods that are inexpensive enough to make them overall very attractive to consumers throughout Europe.



Maintaining the current high-level safety standards for the food produced and consumed in Europe and globally. Public food safety crises create a high degree of concern among consumers, and cause huge economic losses. Increasing our knowledge of food safety and new emerging issues and risks is paramount to increase our ability to prevent, predict and respond to food safety incidents.



Specifying and quantifying the nutritional demands not just of average consumers, but of different groups in different regions over Europe. Food intake is very strongly influenced by tradition and cultural conventions. We should not fight these traditions, but rather build on them to create products that support balanced diets with great cultural diversity, which can be an attractive feature for consumers throughout all EU member states and bolster service and tourism industry in Europe.



Specifying and quantifying the use of resources, to make sure that better balanced diets are sustainable in the long term, do not reduce the access of non-EU people to healthy diets, and will be sufficiently inexpensive to be attractive to consumers to buy and continue buying.

The knowledge generated in the programme will allow us to:

- Make sure that every consumer in the EU can choose a safe, affordable, healthy and sustainable diet (micro- and macronutrient intake; energy balance) as a default option in 2030;
- Develop and execute a strategic approach that enables consumers' engagement with the food value chain and empowers consumers' to become active agents in developing new solutions for improving food choices;
- Develop and execute a strategic approach to effectively reduce food wastage over the whole chain (manufacturers, retail, consumers) by 50% and food losses by up to 30% in 2030 vs. 2015 (SDG 12.3);
- Develop and execute a strategic approach to effectively reduce the use of resources by up to 40% in 2030 vs. 2015;
- Develop and execute a strategic approach to effectively increase the sales of protein from alternative sources to European consumers by up to 50% in 2030 vs. 2015 (related to SDGs 12 and 14);
- Develop a deep understanding of what European consumers value in foods and food-related behaviour, as the common enabler for the previous 5 targets.

Achieving this ambitious plan is only possible through the establishment of a truly open and engaged public-private collaboration, which will contribute to strengthening the European industrial base, since food



businesses will be able to operate more efficiently. This will represent a new boost for jobs, growth and investment in the region and position Europe as a stronger actor at the global level.

Through new collaborative models the strong European food science and technology foundation is to be leveraged and translated more effectively into innovation and growth. This will lead to reinforcing EU's position as a major centre of excellence and the revalorization of research and will enable the European food industry to be more competitive on a global scale. In joining forces we not only stand a better chance to tackle the problems, but also we further empower the position of Europe as a leading innovation engine in the food and drink sector. Even if it might not be the ultimate solution that fully achieves all aforementioned targets, it will represent the first necessary step to link all what is needed to reach the ambition.

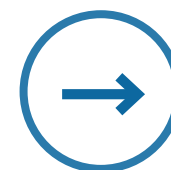
The programme of this public-private collaboration will be aligned with the ETP 'Food for Life' SRIA and IAP, and will have to be co-funded under the European Framework Programme for R&I, and therefore subject to its rules for participation and dissemination.

The activities of the platform will be based on a continual stakeholder dialogue between the private and the public bodies involved in the initiative. The research objectives are guided by the roadmap, developed by the research and industrial stakeholders and validated in a Europe-wide open consultation process.



MONITORING THE PROGRESS AND IMPACT





5.1. Introduction

In this section we suggest ways to assess the progress of the actions listed in this IAP and their impact, taking as a starting point our vision of an effective execution of the IAP when compared with business as usual.

5.2. Effectiveness of the IAP

BUSINESS AS USUAL

Although progress has been made, societal challenges are not fully addressed and solved. The ambitious SDGs have not been met and the occurrence of non-communicable diseases continues to rise.

Scattered research efforts across different EU, national and funding schemes and thematic areas with limited overall impact on the sector.

Short-term perspective of the funding schemes due to the annual-based nature of the research funding programmes.

Work programme topics decided annually lead to budget uncertainty and pulls back industry investments.

Lack of industry cooperation in research projects, due to the perceived lack of opportunities directly addressing their needs and requirements.

The stringency of regulatory procedures appears to have a direct and significant impact on the rate of return and viability of investing in the development of new products.

Projects commonly are stuck or slowed once the basic research ends, resulting in limited commercial exploitation.

Assessment of research results mainly relies on scientific quality and technical excellence.

EXECUTION OF THE IAP

✓ A major step towards the ETP vision for a future proof Food System.

✓ Reinforced synergies across Member States and research areas, by the development of coordination mechanisms and tools between the Member States and EU funding schemes e.g. Web Platform for the national and European funding projects, common research agendas, etc. Comprehensive, well-timed actions that together create impact.

✓ The multi-annual perspective of the IAP leads to a long-term continuity of the programme, hence diminishing the risk of fragmentation and development of technology gaps.

✓ The defined plan for a long-term horizon raises confidence in private sector investors and allows industry to make long-term investment plans.

✓ Industry (large companies and SMEs), jointly with research institutions and universities, participate in the definition of the ETP 'Food for Life' SRIA and IAP.

✓ By promoting an RRI perspective in the IAP activities, which aim at involving a wide set of stakeholders (e.g. consumers, policy makers, etc.), the market uptake of R&I developments could be increased.

✓ The actions suggested in the IAP address all stages of the R&I processes, from pre-competitive research to demonstration, ultimately bringing research outputs closer to market. In addition, proof of concept projects will be developed.

✓ Besides scientific/technical excellence, other dimensions of researchers' activities, with a special focus on Open Science, gain more importance.



5.3. Quality Control and Management Approach

Monitoring and assessing the progress of the actions listed in this IAP is critical for a number of reasons, including: (a) determining if the IAP implementation is on track; (b) providing a means for evidence-based reprogramming and rescheduling; and (c) stimulating further uptake of important achievements by specific projects.

With this aim, a set of key performance indicators (KPIs) should be identified in order to help assess the progress of the IAP, but in doing so, one has to take into account the different levels of effects produced over time. This needs to be coupled with a process that tracks sector changes over time (time-based snapshots) as well, to establish a correlation that will allow an examination of:

- The **outputs** produced by the projects;
- The effects these outputs are having for the project stakeholders, or **outcomes**;
- The broader effects arising for the broader ecosystem within which the projects operate, or **impact**.

The underlying idea is that the programme applies a set of resources in order to achieve its objectives through activities, which generate some immediate outputs, like scientific papers

or research prototypes, but also other immediate effects, such as new knowledge and skills for the participating organisations and individuals. By being adopted and used by the programme actors and stakeholders, these outputs give over short to medium term periods rise to the next level of effects, the outcomes or results that may refer to new innovation or technology paradigms. Different outcomes, when more extensively adopted, jointly contribute to broader impacts in the context of the larger eco-system, within which the programme operates, in a range of technological, scientific and socioeconomic areas.

The set of KPIs should be structured along these different levels of effects, namely:

- The outputs that are directly produced or supplied in the course of the actions supported by IAP, i.e. the projects under each action;
- The outcomes - or results that capture short to medium changes in the situations addressed by actions; and
- The impact that broadly defines the wider societal, economic or environmental cumulative changes brought about by the programme over a longer period of time.

It is important to note that some of these KPI measures are not only quantitative but also qualitative in nature to get an idea of the effectiveness of a certain measure reported by the corresponding KPI. The expected impacts of the individual actions are gathered in Appendix 2.

The table on the next page proposes a set of standard KPIs for the different levels of effects, enabling to assess the progress in the implementation of IAP in a structured way.



KPIs FOR OUTPUTS

A first set of KPIs measures the project outputs (Table 2). These can be categorized the in a similar way as the actions of the IAP:

- Scientific and technological: number of scientific papers/citations, patents;
- Innovation: new products, services, processes, business models;
- Training and education: new forms of training, HR skill increases;
- Entrepreneurial activities;
- Communication and dissemination: awareness of specific target groups on topics of importance, stakeholder activation.

KPIs FOR OUTCOMES

The projects also develop concrete exploitation plans, to be presented with the final report, specifying, how the project outputs will lead to concrete developments of economic / societal relevance. Such exploitation plans should specify expected increase in turnover, number of new markets and jobs and competitiveness. In this way, a second level of KPIs is developed, related to outcome.

At the end of the projects, these KPIs measure the expected outcomes. The possibility exists for projects

to be re-contacted sometime after (e.g. 2-4 years), in order to check how these exploitation plans have been implemented. New KPI values can be determined on the basis of actual figures, describing the actual outcomes. Explaining any differences between actual and expected KPIs will give a very valuable feedback to programming.

KPIs FOR IMPACT

The broader effects (impact) can be measured by:

- Stakeholder interviews/surveys that are designed to determine perceptions of key target groups; and
- Data analysis (e.g. policy documents and statistics providing evidence on the evolution of market trends, level of competitiveness and other larger scale effects).

These two methods enable to detect variations over certain periods of time. For surveys (e.g. Eurobarometer), it is necessary to conduct several waves, one prior to the Programme, one mid-term or close to completion, and one or more after completion, since the development of effects typically takes time, with change rates varying depending on the nature of the action that was giving rise to the change. In this way, one can determine changes for example in the perception of the public on issues related with safety, trust and availability of food.

REFINEMENT OF KPIs

The KPIs for outcomes and impact can be further adapted taking into account the specific impact dimensions defined in SRIA (please refer to Appendix 2 for more details). As an example of this adaptation, impact KPIs can take the following form:

- 30% reduction of food waste in 2030 when compared to 2015;
- 40% reduction in the use of resources (water/energy) in 2030 when compared to 2015.

In addition, the list shown in Table 2 should be complemented with KPIs referring to the composition of stakeholders and actions involved in IAP, for instance:

- Number of running projects;
- Number of participating organisations;
- Share of geographical coverage;
- Level of industrial participation in projects (above 50%);
- SME participation in projects (above 30%).



ANALYSIS OF KPIs

It is of a paramount importance, to ensure the credibility and reliability of the collected data, to use tools already available (Euromonitor, etc.) and that the very accurate and detailed analysis of the collected KPIs is performed from experts. The analysis of the KPIs it is expected to give valuable information on the following themes:

A. ECONOMIC GROWTH & BUSINESS PERFORMANCE

- The fate of the products, processes, services, patents, tools, developed by projects (the projects may generate products, services, etc. but how many of these are really reach to the market?)
- The real economic benefit for the EU generated by:
 - Turnover of the new products, services, patents;
 - New job positions;
 - Cost savings from new processes, technologies, methods, etc.;
 - Development of high skilled educated staff;
 - Leverage of new investments;
 - Development of new collaborations.
- The type of collaborations between the food sector stakeholders.
- The building of high or tailor-made skills on the food sector staff.

B. CITIZEN/CONSUMER INVOLVEMENT/ SATISFACTION

- Include consumer trust and satisfaction with food supply in Eurobarometer surveys with representative samples from EU countries and use

same items to measure the trust at constant intervals annually/bi-annually;

- Survey food industry about their R&I activities and involvement of consumers and external stakeholder in these activities at different stages.

C. SUSTAINABILITY

- The alignment with quantified targets set by the EU (e.g. targets for reduction of the energy efficiency, food wastage, unemployment, etc.);
- A reduction in the fluctuation and price inflation of resources indicating stable supplies.

C. RESEARCH & POLICY ENVIRONMENT

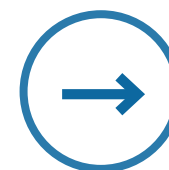
- The success of the different type funding schemes in relation to their ability to lead to products, processes, services, patents, tools, etc. with real economic benefit. This will contribute to the final evaluation of the funding schemes and to the development of corrective actions for their improvement or new targeted funding schemes;
- The success of the EU funding system to ensure the inclusion and the equal representation of all stakeholders within the food sector;
- The effectiveness of the knowledge transfer process from research providers to industry;
- The success of the SRIA to identify the real R&I needs of the food sector;
- The type of the funding schemes;
- The methods followed by ETP to identify the research priorities of the sector;

- The handling of the post-project period which is critical for the exploitation of the research results.

These KPIs will be monitored on the basis of a systematic follow-up of the actions considering the research priorities, challenges and the enabling technologies that they address. As a general rule, the follow-up will be based on data received by:

- The project reports, for the KPIs related to outputs;
- Periodic surveys organised in the framework of IAP, for KPIs related to outcomes and impact; and
- Policy papers, official statistics and other related publications for KPIs related to impact.

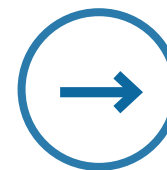
The Coordination and Support Action FIT4FOOD2030 , in which the ETP 'Food for Life' participates, supports the European Commission to further develop and implement the FOOD 2030 policy framework and its action plan. FIT4FOOD2030 will also be an essential tool to evaluate the impact of the R&I actions and to suggest impact assessment tools.



LEVEL OF EFFECTS

Table 2. KPIs for monitoring the progress of the IAP

	DIMENSIONS	PROPOSED KPIs
OUTPUTS	RESEARCH AND TECHNOLOGY OUTPUTS	<ul style="list-style-type: none"> Number of Publications in (high-impact) peer-reviewed journals per 1,000,000 EUR of research grants Number of large-scale pilots to test prototypes for new processes/food products/services Number of patent applications and number of patents granted Number of new processes/food products/services brought to the market Share of joint public-private publications Number of prototypes and testing activities Outreach of dissemination and promotion actions (e.g. degree to which target audiences have been reached)
	INCREASED SKILLS AND CAPACITY IN NEW SCIENTIFIC AND TECHNOLOGICAL DEVELOPMENTS	<ul style="list-style-type: none"> Share of resources in the EU receiving training formal and on-the-job training in the Programme advances Share of PhDs in related fields through participation in the programme New curricula developed Percentage of employer satisfaction Share of employees with initially sector-extrinsic experience Share of graduates creating own businesses Number of training programs promoting new knowledge/know-how and developing new skills for food professionals are established with participation of at least a number of participants across the EU Number of formal training programmes driven by the SRIA thematic priorities in EU Universities at undergraduate / graduate level in food engineering and related disciplines
	COMMUNICATION AND STAKEHOLDER ENGAGEMENT	<ul style="list-style-type: none"> Increased number of R&I projects with consumers as partners as indicated by participation in R&I activities, including early stages Raised level of food system knowledge in the general public (as assessed by surveys) Increase of vertical integration of stakeholder cooperation
OUTCOMES	NEW SCIENTIFIC AND TECHNOLOGY FIELDS AND INNOVATIONS ADOPTED BY COMPANIES AND INTRODUCED TO THE MARKET	<ul style="list-style-type: none"> Number of products designed from progress made in adjacent fields (material science, nanotechnologies, ICT) Number of approaches/methodologies to exploit Big Data for probing consumer insight and satisfaction Number of information systems for personalised consumer queries in the area of food sustainability and health Number of private companies introducing innovations Share of participating SMEs introducing innovations new to the company or the market
	ECONOMY GROWTH AND BUSINESS PERFORMANCE	<ul style="list-style-type: none"> Turnover of new products and services , patents and/or cost savings SMEs participating in the Programme under this initiative represent at least a number of participant organizations Number of innovative companies / start-ups are created, using Big Data for promoting interaction among consumers and food chain participants Increase (%) of private sector R&I investment increases at the end of the Programme Increased turnover share of European food industry from new products/services Increased share of European food industry added value Increased share of European food industry exports



OUTCOMES

STRONG RESEARCH AND BUSINESS NETWORKS DEVELOPING AND PROMOTING INNOVATIONS WITH AN EU (AND GLOBAL) OUTREACH

- Number of market alliances developed to promote new innovative products and services
- Number of new value chains created
- Number of new business models

HIGHLY TRAINED WORKFORCE

- New high-skilled profiles
- Number of jobs with increased qualifications

INCREASED PUBLIC AND PRIVATE R&D INVESTMENTS

- R&I investments in the food sector (GERD, BERD)¹⁰
- Share of project results taken up for further investments

IMPACT

EUROPEAN LEADERSHIP IN SCIENTIFIC FIELDS AND TECHNOLOGY AREAS

- Share of EU publications in top citation indices in new scientific and technology fields.

MORE JOBS IN AND HIGH-ADDED VALUE CONTRIBUTION OF FOOD SECTOR TO THE EU ECONOMY

- Growth rates and job creation in the food sector of the EU
- Increase (%) of the number of Full Time Equivalent positions in the food and drink industry

BETTER LIVING CONDITIONS AS A RESULT OF SUCCESSFULLY ADDRESSING KEY SOCIETAL CHALLENGES

- KPIs related to citizen satisfaction e.g. from Eurobarometer
- Citizen's health status as related to food intake
- Number of legislative actions creating incentives for availability and use of balanced diets
- KPIs to measure effects of healthier diets

CONSUMER ENGAGEMENT

- Number of consumer organisations participate in the Programme actions
- Increased share (%) of citizens showing trust in the European food industry
- Number of new products based on consumer insight
- Consumer satisfaction on quality of new foods.

INCREASED SUSTAINABILITY ASSOCIATED WITH A CIRCULAR FOOD PRODUCTION

- Reduction (%) of the energy footprint by the food sector energy
- Increase (%) of the recycling of by-products by the food sector

¹⁰ GERD, gross domestic expenditure on R&D; BERD, business enterprise expenditure on R&D



5.4. IAP Management and Follow-up

A Programme Management Team (with the participation of programming and funding bodies) will help undertake the implementation and follow-up of IAP. Management entails project procurement and actions related to monitoring, evaluation and impact assessment.

The proposed set of KPIs can be used to support management of IAP as briefly discussed here (table on the right).

PROCUREMENT

At the procurement phase, applicants are informed of:

- The expected impacts of each action (depending on the R&I target and topic the action belongs to, specified in the SRIA and in Appendix 3);
- The output indicators they are obliged to include in the project progress reports and the final project report;
- Their obligation to provide outcome and impact related information for a period of 3-5 years following project completion.

MONITORING

The Programme Management Team will collect on a regular basis (e.g. quarterly or biannually):

- The project portfolio characteristics: participants types and corresponding budget allocation for each R&I target, topic and action, enabling to determine the composition KPIs;
- The project outputs as specified in the project progress reports, enabling to determine the output KPIs.

These data are used to prepare regular monitoring reports that are focused on the project composition analysis and nature/volume of outputs produced.

EVALUATION AND IMPACT ASSESSMENT STUDIES

The widely accepted standards to be applied in evaluation/impact assessment are the five standard criteria as defined by OECD/DAC :

- Relevance – the extent to which the objectives set are pertinent to the needs, problems or issues to be addressed;
- Efficiency – a measure of how economically resources/inputs (funds, expertise, time, etc.) are converted to results;
- Effectiveness – the extent to which the objectives set are achieved, or are expected to be achieved, taking into account their relative importance;
- Impact – the positive and negative, primary and secondary long-term effects expected to be produced by a development intervention, directly or indirectly, intended or unintended;
- Sustainability – the extent to which the (positive) effects (are likely to) last after an intervention has ended.



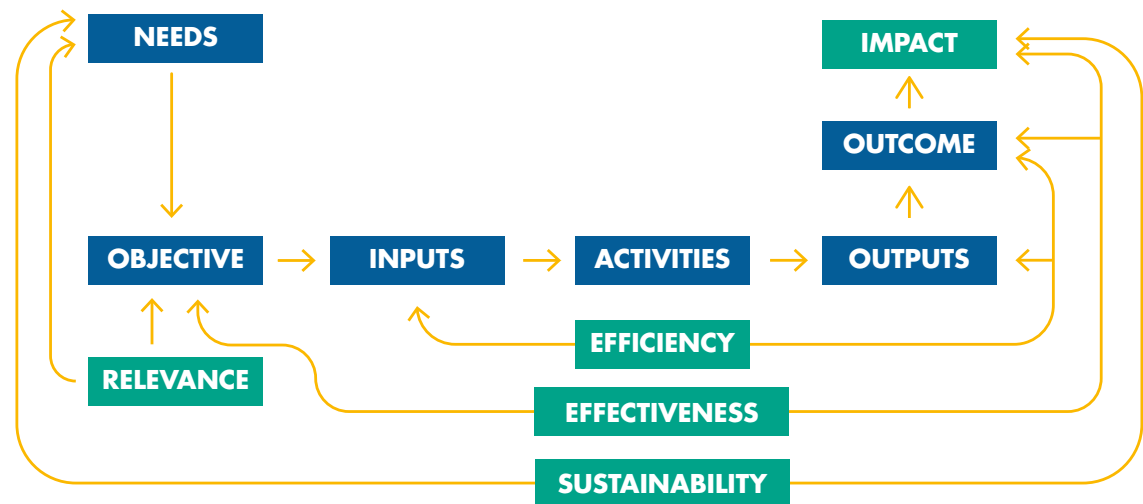
Figure 7 represents the relations between needs, objectives, activities and the different levels of effects (outputs, outcomes, impact) and how implementation progress is reflected by the evaluation criteria. As shown, the evaluation dimensions refer to different levels of effects, so it is important to have KPIs for each level of effect as proposed above.

Evaluations and impact assessments are carried on the basis of data collected through document analysis, surveys, and case studies. It is with these research methods that the outcome and impact KPIs can be determined, taking into account that these methods are meaningful if used sometime after the end of the corresponding actions.

As an example, the output KPIs that can be derived from project report data providing numbers of publications, technological achievements, patents, persons trained, etc. How these are converted to longer-term benefits can be determined by:

- Interviews/surveys/case studies with project participants after the end of the project (innovations to the market, higher R&I investments, increased economic performance, increased market shares, more qualified personnel);
- Stakeholder interviews/surveys (e.g. better customer awareness out of a series of dissemination actions or influence of programme on policy makers and related legislation);

Figure 7. Diagram of the relations between needs, objectives, activities and the different levels of effects

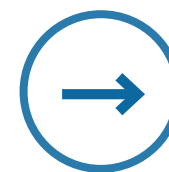


- Data analysis (e.g. of policy documents and statistics providing evidence on the evolution of market trends, level of competitiveness and other larger scale effects).

The Programme Management Team can also commission evaluation and impact assessment studies at critical stages of IAP.



APPENDICES



The following Table lists the suggested Actions to implement the SRIA. See Chapter 2 of the main file for more information on how to read this Table.



Timeline



Resources

< EUR 2 million

EUR 2-5 million

EUR 5-7 million



Expertise



Stakeholders

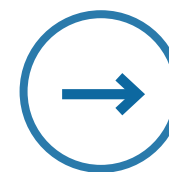
A. INCREASE THE ENGAGEMENT AND INVOLVEMENT OF CONSUMERS

TOPIC 1.1

IMPROVING INSIGHTS INTO CONSUMERS

During the last decades, the field of consumer science has grown and led to a better understanding of consumer and societal issues related to food and eating. Simultaneously, new technologies have become available and new tools have been developed. Furthermore, it has become possible to collect and store large amounts of data easily. This volume and type of data was previously unavailable. These developments are very promising as they can make new and deeper insights possible. However, the possibilities offered by these new developments have yet to be fully exploited.





RESEARCH

ACTION 4

USE THE INFORMATION FROM RETAILERS FOR RESEARCH PURPOSES



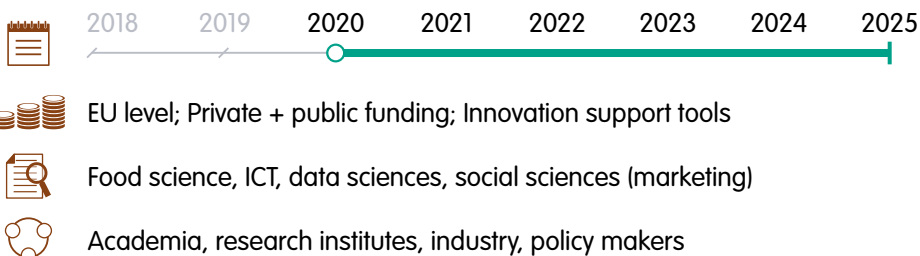
ACTION 5

DEVELOP PERSONAL DEVICES TO STUDY CONSUMER BEHAVIOUR



ACTION 6

DEVELOP TOOLS TO USE BIG DATA IN THE DESIGN OF NEW PRODUCTS AND IN PUBLIC DECISION MAKING

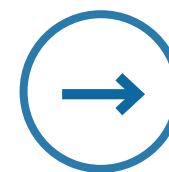


ACTION 7

DEVELOP A PROGRAM FOR CHANGING BEHAVIOUR - FOCUS ON WHOLE POPULATION

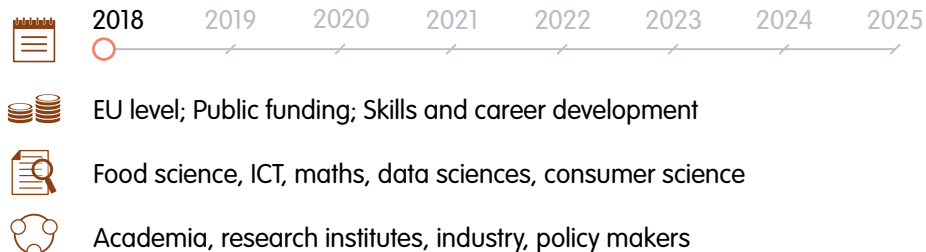


INNOVATION



ACTION 8

LEARN HOW TO DEAL WITH BIG DATA: WHERE TO FIND IT, HOW TO MAKE IT COMPARABLE



ACTION 9

MAKE CONSUMER AND SOCIAL SCIENCES ACCESSIBLE TO SMES



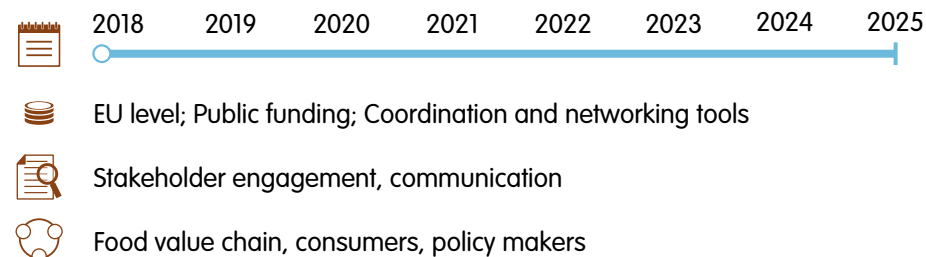
ACTION 10

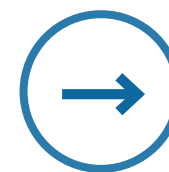
DEVELOP EDUCATIONAL PROGRAMMES INTEGRATING THE USE OF BIG DATA IN FOOD SCIENCE



ACTION 11

COMMUNICATE AND DISCUSS WITH RELEVANT STAKEHOLDERS





Timeline



Resources

< EUR 2 million

EUR 2-5 million

EUR 5-7 million



Expertise



Stakeholders

TOPIC 1.2

FOOD AND ME: MAKING FOOD AN ACTIVITY

Technological developments have led to unprecedented efficiency gains, but simultaneously to a situation in which consumers and food producers have little contact with, or understanding of, each other. This has contributed to the difficulty for food producers to read consumer preferences. From the consumers' side, the lack of understanding of how the food chain operates contributes to a lack of trust. Realigning consumers and the food chain requires engaging consumers and a change in the food industry, moving from developing products and services for consumers, to one in which they develop these with consumers.

RESEARCH

ACTION 1

DESIGN NEW FORMS OF COMMUNICATION CONSUMERS - FOOD PRODUCERS



2018 2019 2020 2021 2022 2023 2024 2025



EU level; Private + public funding; Research support tools



Food science, consumer science, ICT, communication



Academia, research institutes, industry, policy makers, consumers

ACTION 2

IMPLEMENT NEW BUSINESS MODELS FOR GENERATING AND DISSEMINATING CONSUMER INSIGHTS



2018 2019 2020 2021 2022 2023 2024 2025



EU / regional level; Private + public funding; Innovation support tools



Food science, ICT, data sciences, consumer science, ethics, math (modelling)



Academia, research institutes, industry, policy makers

INNOVATION

ACTION 3

DEVELOP NEW TOOLS TO BETTER UTILISE 'BIG DATA'



2018 2019 2020 2021 2022 2023 2024 2025



EU level; Private + public funding; Innovation support tools



Food science, data sciences, ICT, maths (modelling)



Academia, research institutes, industry, policy makers, consumers

ACTION 4

DEVELOP MODELS FOR ENGAGING CONSUMERS



2018 2019 2020 2021 2022 2023 2024 2025



EU / Regional level; Private + public funding; Innovation support tools



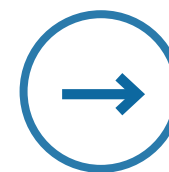
ICT, social sciences, communication



Academia, research institutes, industry, policy makers, consumers



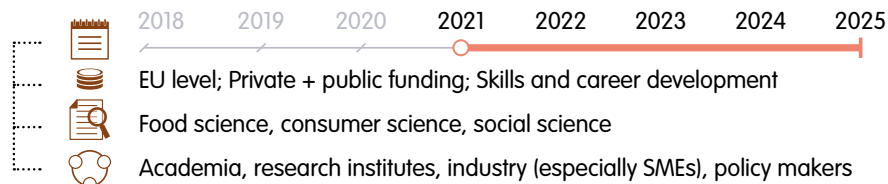
Topic 1.2



TRAINING / EDUCATION

ACTION 5

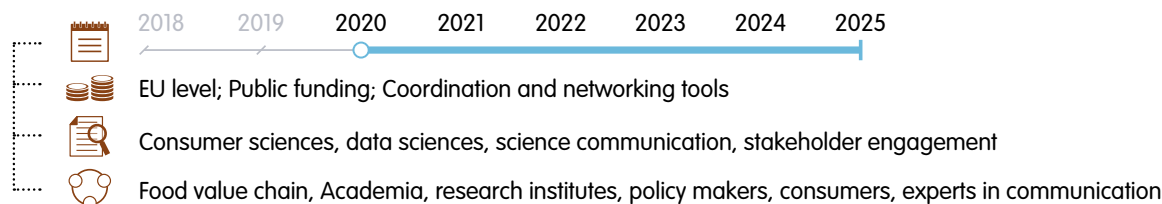
TRAIN THOSE WORKING IN PRODUCT DEVELOPMENT IN CONSUMER SCIENCES



COMMUNICATION / DISSEMINATION

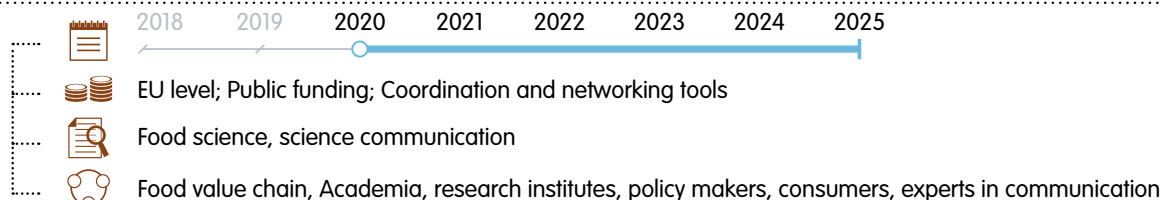
ACTION 6

TAILOR COMMUNICATION TO CONSUMERS



ACTION 7

TRANSLATE SCIENTIFIC OUTCOMES INTO SOMETHING SIMPLE AND UNDERSTANDABLE



ACTION 8

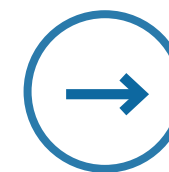
ENHANCE THE INTERACTION WITH CONSUMERS VIA SOCIAL MEDIA AND OTHER INTERNET PLATFORMS



ACTION 9

VALIDATE THE INFORMATION AVAILABLE





Timeline



Resources

< EUR 2 million

EUR 2-5 million

EUR 5-7 million



Expertise



Stakeholders

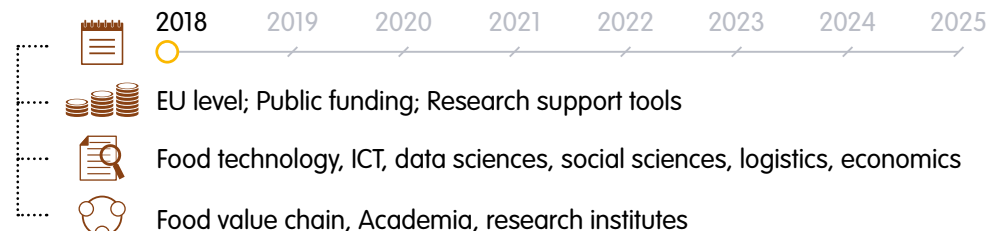
TOPIC 1.3

FOOD INVENTORS: NEW FOOD PRODUCTION AND DELIVERY MODELS

How people access and consume food is constantly changing, with new models of consumption on the rise leading to an increased diversity in the ways that consumers access, prepare, produce and consume food. New consumer-led channel models reflect a different type of engagement and involvement with food, characterizing consumers as co-producers or co-processors. Such new combinations of food production and delivery models have potentially large yet currently unknown implications for consumers, food companies and policy makers.

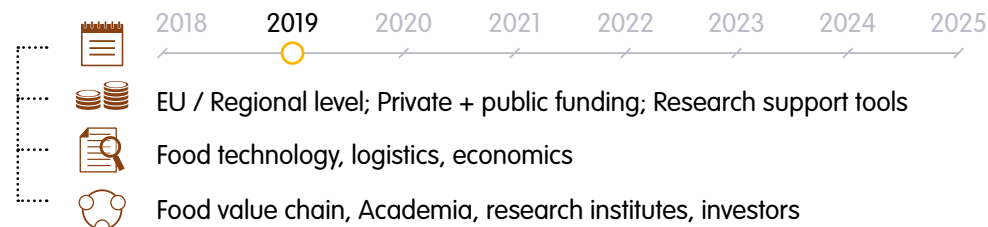
ACTION 1

IDENTIFY AND DESCRIBE DIVERSITY AND KEY FEATURES OF ALTERNATIVE PRODUCTION AND DELIVERY MODELS IN EUROPE



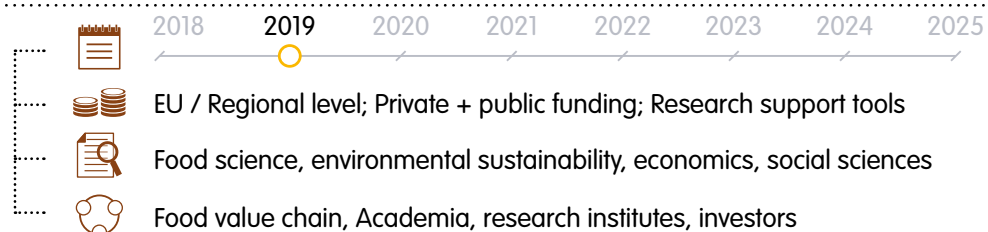
ACTION 2

ASSESS ECONOMIC AND INNOVATION POTENTIAL OF ALTERNATIVE MODELS



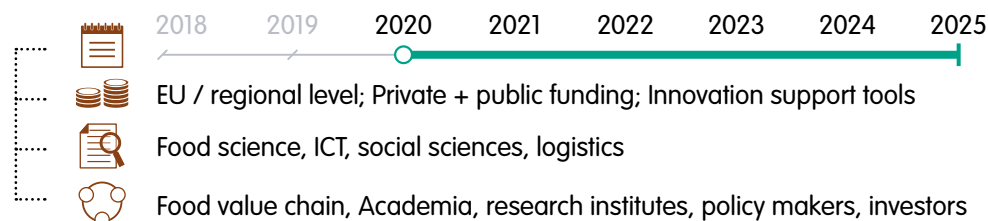
ACTION 3

ASSESS IMPLICATIONS FOR CONSUMERS AND OTHER DIMENSIONS OF THE FOOD CHAIN (INCL. SAFETY, SECURITY, WASTE) OF ALTERNATIVE MODELS



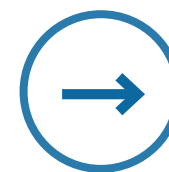
ACTION 4

DEVELOP THE ALTERNATIVE MODELS WITH MOST POTENTIAL



RESEARCH

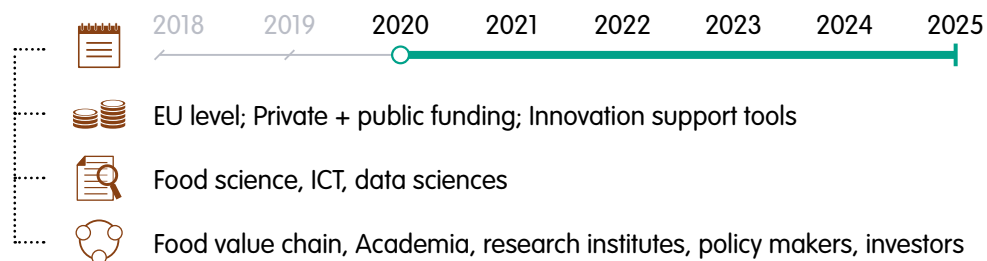
INNOVATION



INNOVATION

ACTION 5

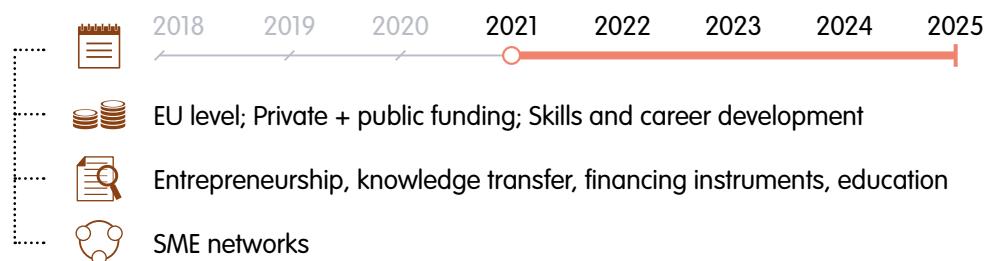
DEVELOP ICT TOOLS AND OTHER SUPPORT SYSTEMS



TRAINING / EDUCATION

ACTION 6

TRAIN AND EDUCATE SMES IN POSSIBILITIES FOR NEW BUSINESS CREATION

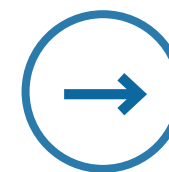


COMMUNICATION / DISSEMINATION

ACTION 7

PROMOTE CONSUMER UNDERSTANDING (RISKS & BENEFITS)





Timeline



Resources

< EUR 2 million

EUR 2-5 million

EUR 5-7 million



Expertise



Stakeholders

TOPIC 1.4

FOOTPRINTING OF FOOD: CONSUMER ENGAGEMENT IN SUSTAINABILITY

Food products are sometimes labelled with different kinds of indicators, many of which are related to specific aspects of sustainability. To achieve an optimal consumer engagement, they should be able to decide which information should be aggregated into personalized reports on food products, which would allow the individualization of sustainability data without causing information overflow. Although there are intellectual property, competitiveness and ethical issues to be considered, this approach will greatly increase the transparency of the food chain and build and foster consumer trust.

ACTION 1

MAP CONSUMER NEEDS



2018 2019 2020 2021 2022 2023 2024 2025



EU level; Public funding; Research support tools



Environmental sustainability, consumer science



Academia, research institutes, industry, consumers

ACTION 2

MAP OPEN SOURCE DATA FROM THE WHOLE VALUE CHAIN



2018 2019 2020 2021 2022 2023 2024 2025



EU level; Private + public funding; Research support tools



Food science, ICT, data sciences, environmental sustainability



Food value chain, Academia, research institutes

ACTION 3

MAP PRIVATE SOURCE DATA FROM THE WHOLE VALUE CHAIN



2018 2019 2020 2021 2022 2023 2024 2025



EU / Regional level; Private + public funding; Research support tools



Food science, ICT, environmental sustainability, industry commitment



Food value chain, Academia, research institutes

ACTION 4

ASSESS RELIABILITY AND ALIGNMENT OF DATA GENERATION



2018 2019 2020 2021 2022 2023 2024 2025



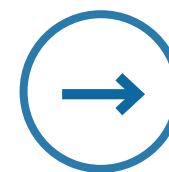
EU level; Private + public funding; Research support tools



ICT, environmental sustainability, food technology



Food value chain, Academia, research institutes



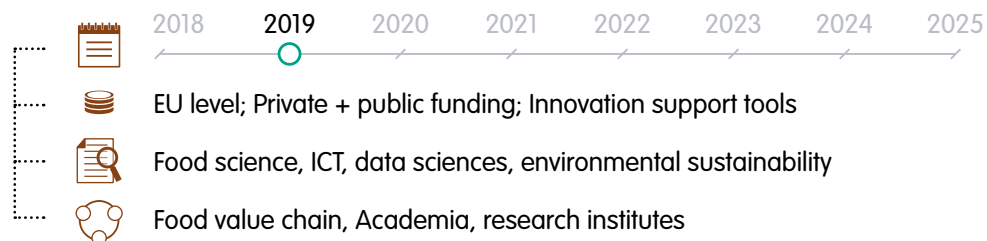
ACTION 5

**ESTABLISH AN AGENCY
RESPONSIBLE FOR SETTING UP
THE SYSTEM**



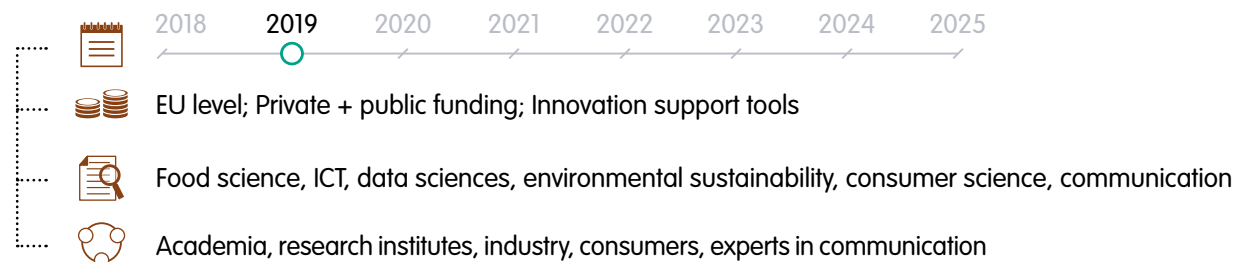
ACTION 6

**DEVELOP ALGORITHMS
AND DATA FLOW**



ACTION 7

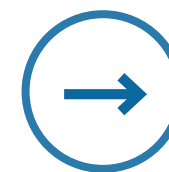
**DEVELOP A SYSTEM
ALLOWING FOR TWO-WAY
COMMUNICATION**



ACTION 8

**DESIGN NEW TOOLS FOR
COMMUNICATION**





Timeline



Resources

< EUR 2 million

EUR 2-5 million

EUR 5-7 million



Expertise



Stakeholders

TOPIC 1.5

THE SMART FOOD GRID: MODULAR FOOD PRODUCTION AND DISTRIBUTION

Food production and retail sales have become centralized due to economies of scale. This has made the consumer a recipient of products made, sometimes, far away. There is now a demand for personalization and customization rather than mass production. Therefore, flexible and agile processes are needed in order to allow a fast adaptation to changes in consumer demand. Modularization at various stages of the food value chain will also give the opportunity for new business models and will contribute to social, economic and environmental sustainability.

RESEARCH

ACTION 1

ASSESS IMPLICATIONS OF MODULAR AND LOCAL PRODUCTION AND DISTRIBUTION SYSTEMS



2018 2019 2020 2021 2022 2023 2024 2025



EU / Regional level; Private + public funding; Research support tools and specific actions towards SMEs



Food science, ICT, data sciences, logistics, economics



Food value chain, SME networks

INNOVATION

ACTION 2

DEVELOP SMALL-SCALE PRODUCTION / DISTRIBUTION SYSTEMS (EFFICIENT AND QUALITY-CONTROLLED)



2018 2019 2020 2021 2022 2023 2024 2025



EU / Regional level; Private + public funding; Innovation support tools and specific actions towards SMEs



Food science, ICT, logistics, economics



Academia, research institutes, industry (especially SMEs)

ACTION 3

DEVELOP STRATEGIES TO ENSURE END-USE ACCEPTANCE AND INVOLVEMENT



2018 2019 2020 2021 2022 2023 2024 2025



EU / Regional level; Private + public funding; Innovation support tools and specific actions towards SMEs



Food science, ICT, consumer science, social sciences



Academia, businesses, research institutes, policy makers, CSOs

ACTION 4

PROVIDE FUNDING AND FINANCIAL TOOLS TAILORED TO SMES



2018 2019 2020 2021 2022 2023 2024 2025



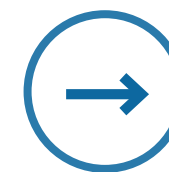
EU / Regional / National level; Private + public funding; Innovation support tools and specific actions towards SMEs



Financial tools, funding schemes, fiscal and tax incentives, economics

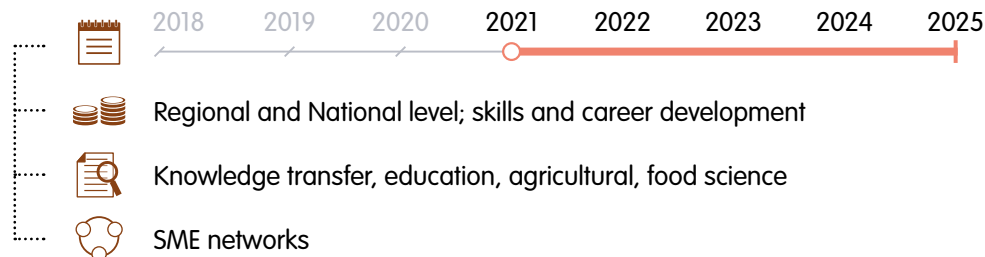


SMEs, financial experts



ACTION 5

TRAIN AND EDUCATE ON NEW BUSINESS OPPORTUNITIES FOR FARMERS AND FOOD PRODUCERS AND PACKAGING PROVIDERS



Timeline



Resources



< EUR 2 million



EUR 2-5 million



EUR 5-7 million



Expertise



Stakeholders

B. PROVIDING THE BASIS FOR A MORE PERSONALISED AND CUSTOMISED FOOD SUPPLY

TOPIC 2.1

THE FOOD I LOVE: APPRECIATION OF DIVERSITY IN FOOD AND EATING

Food consumption is central to human life, not only in terms of nutritional needs, but also in terms of social, emotional, enjoyment, and identity-related needs. Despite increasing similarities across Europe, the perceived value and satisfaction from food and eating shows intriguing and valuable, yet poorly understood, differentiation. Understanding and enhancing food appreciation will allow a better alignment of the food supply with the diversity of individual needs, increase consumer satisfaction and wellbeing, create and capture business value creation and improve policy level interventions.

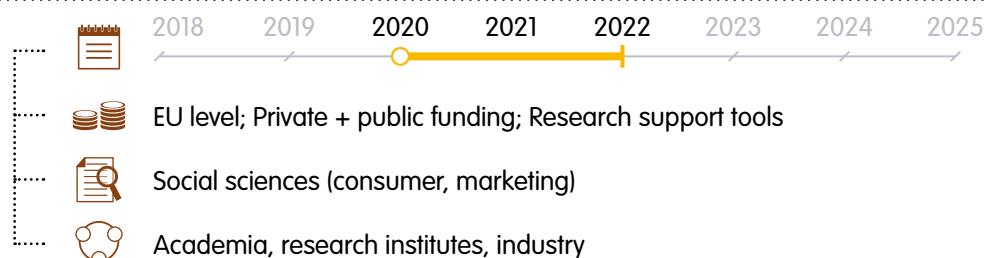
ACTION 1

MAP AND MODEL FOOD APPRECIATION CONCEPTS AND CRITERIA ACROSS EUROPE



ACTION 2

EXPLORE CONSUMERS INTERESTS IN DIVERSITY AND NEW CONCEPTS





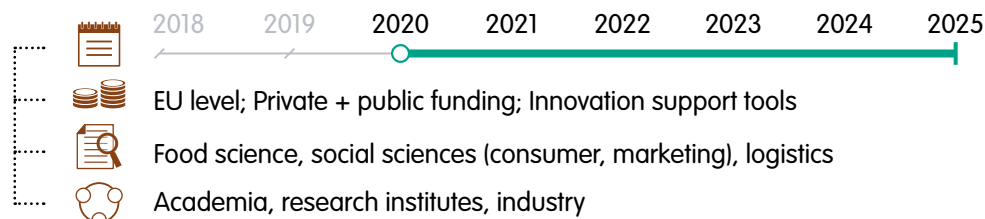
Topic 2.1



INNOVATION

ACTION 3

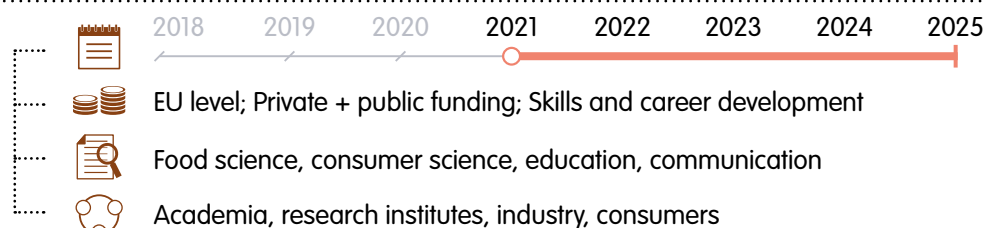
DEVELOP NEW PERSONALISED FOOD OFFERINGS AND DELIVERY MODELS



TRAINING / EDUCATION

ACTION 4

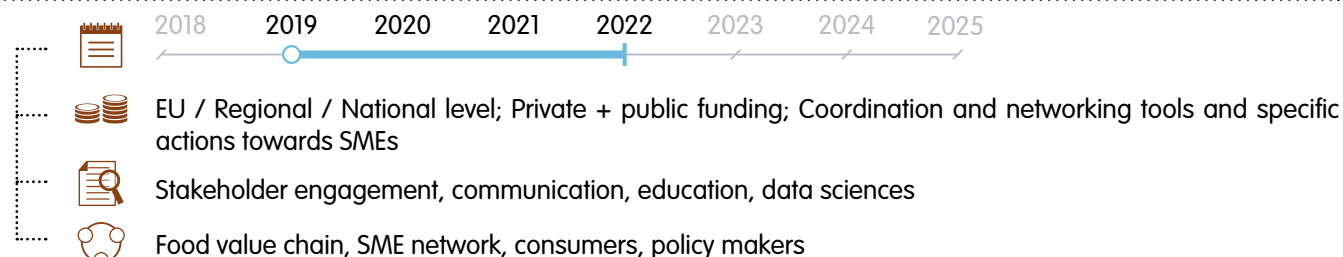
TRAIN AND EDUCATE CONSUMERS AND FOOD DEVELOPERS IN BENEFITS BROUGHT BY DIVERSITY OFFERINGS



COMMUNICATION / DISSEMINATION

ACTION 5

DISSEMINATE RESULTS TO SMES AND OTHER STAKEHOLDERS



TOPIC 2.2

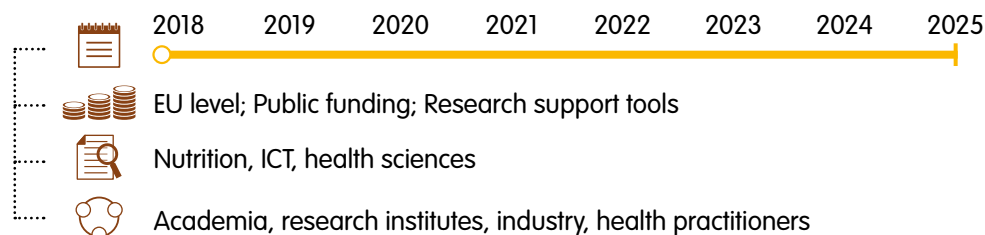
(TR)EAT ME: DIETARY APPROACHES FOR THE PREVENTION OF NCDs

Working methods and the age structure of the population in Europe have significantly changed over the last decades. It is recognized that the role of nutrition is crucial for health and directly related to the health cost of society. The common underlying causes and pathways of the comorbidities associated with many NCDs urge the need for targeted hypothesis driven long-term intervention studies, not solely focusing on accepted biomarkers, but also on functional intermediate endpoints or even hard endpoints.

RESEARCH

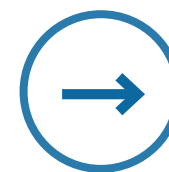
ACTION 1

BUILD EVIDENCE OF TARGETED BENEFITS OF SPECIFIC DIETS





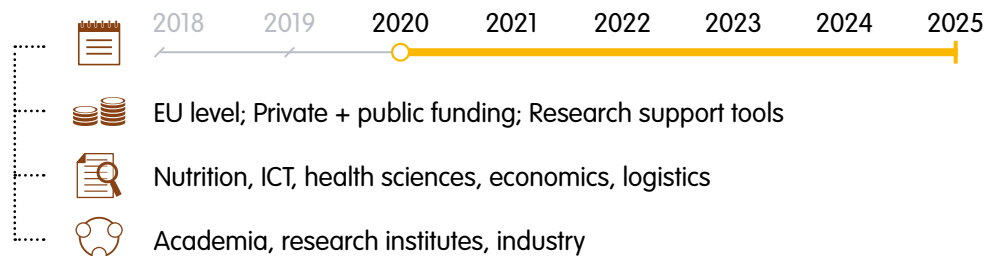
Topic 2.2



RESEARCH

ACTION 2

IMPROVE PREDICTIVE MODELS LINKING BENEFITS TO MARKERS



ACTION 3

DETERMINE CONSUMER DRIVERS FOR HEALTHIER CHOICES



ACTION 4

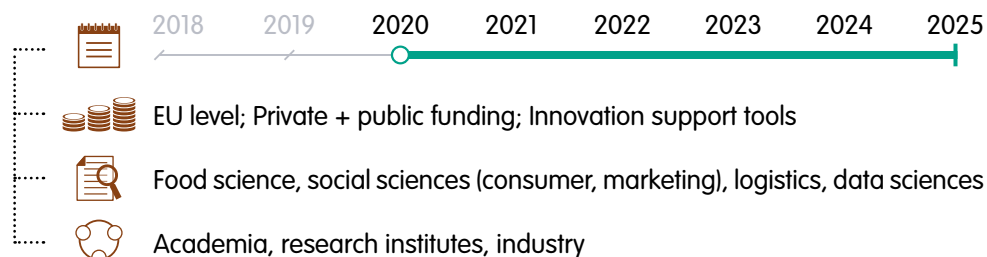
DEVELOP MODELS FOR CONSUMER BEHAVIOUR CHANGE

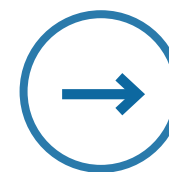


INNOVATION

ACTION 5

DEVELOP NEW PERSONALISED FOOD OFFERINGS AND DELIVERY MODELS

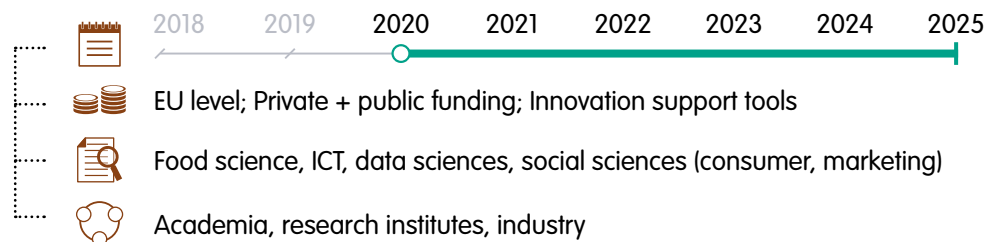




INNOVATION

ACTION 6

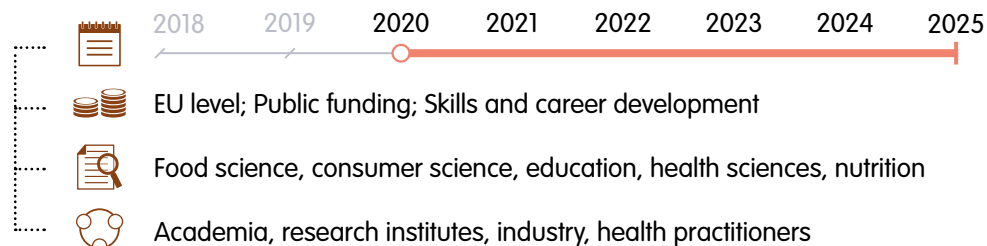
INTEGRATE FINDINGS FROM PERSONAL DEVICES



TRAINING / EDUCATION

ACTION 7

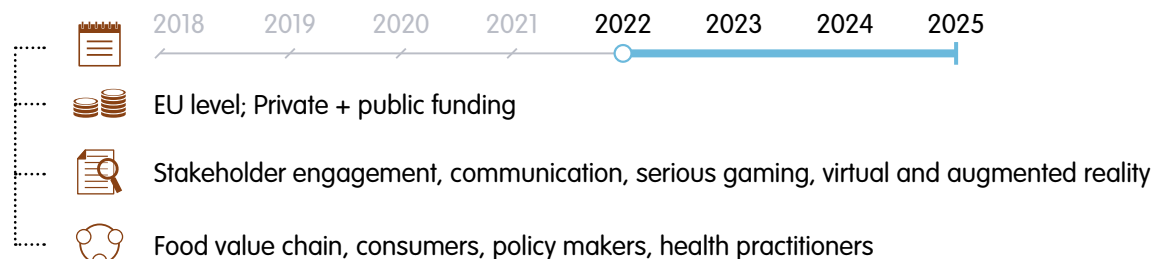
TRAIN AND EDUCATE HEALTH PRACTITIONERS



COMMUNICATION / DISSEMINATION

ACTION 8

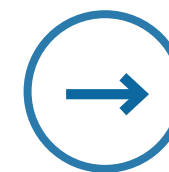
DEVELOP NEW WAYS OF COMMUNICATION ABOUT SUPPORTIVE INTERVENTIONS



ACTION 9

COMMUNICATE TO CONSUMERS ABOUT NEW DIETARY MODELS





Timeline



Resources

< EUR 2 million



EUR 2-5 million



EUR 5-7 million



Expertise



Stakeholders

TOPIC 2.3

PACKAGING 4.0: INTELLIGENT AND COMMUNICATING PACKAGES

Industry 4.0 denotes the concept of a manufacturing system with full integration of cyber and physical technologies, wherein machines and devices communicate with each other, as well as with users. In the context of a rapidly evolving digital world, one can envision packages providing an interface to implement an Industry 4.0 concept in the food systems arena. This involves the exploration of technologies that go beyond classical active and intelligent packaging approaches and allow full leveraging of digital connectivity.

ACTION 1

EXPLORE CONSUMER WISHES FOR INTELLIGENT PACKAGING



2018 2019 2020 2021 2022 2023 2024 2025



EU level; Private + public funding; Research support tools



Packaging, food science, ICT, data sciences, sensor technology, printing, nanotechnology, data management, marketing, consumer sciences, social sciences



Academia, research institutes, industry (SMEs)

ACTION 2

DELIVERY VERY INEXPENSIVE, MASS-PRODUCED SENSORY AND COMMUNICATION SYSTEMS TO USE IN PACKAGING



2018 2019 2020 2021 2022 2023 2024 2025



EU level; Private + public funding; Research support tools



Packaging, ICT, data sciences, material sciences, printing, nanotechnology, sensors, electronics



Academia, research institutes, industry

ACTION 3

DEVELOP ICT STRUCTURE TO LINK UP WITH INDIVIDUAL 'SMART' PACKAGES AND OTHER DEVICES, ALLOWING A DIVERSITY OF MANUFACTURERS AND PROTOCOLS



2018 2019 2020 2021 2022 2023 2024 2025



EU level; Private + public funding; Research support tools



Packaging, ICT, data sciences, material sciences, electronics, robotics, printing, nanotechnology, sensors, software development



Academia, research institutes, industry

ACTION 4

IMPLEMENT TOOLS AND PROCESSES TO MAKE RELEVANT INFORMATION ACCESSIBLE AND AVAILABLE



2018 2019 2020 2021 2022 2023 2024 2025



EU level; Private + public funding; Innovation support tools



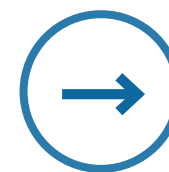
Packaging, food science, ICT, data sciences, media, printing, nanotechnology, sensors, software development



Academia, research institutes, industry

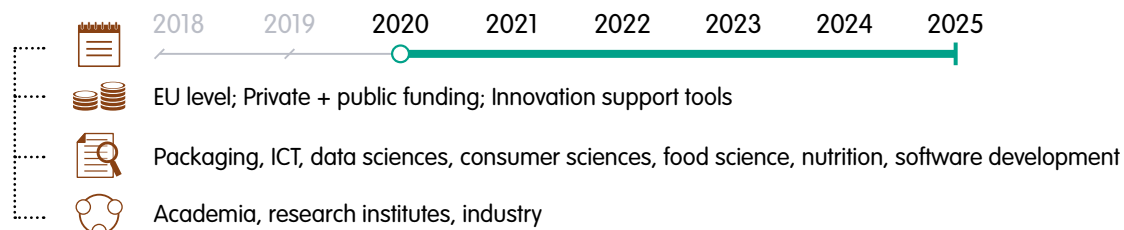
RESEARCH

INNOVATION



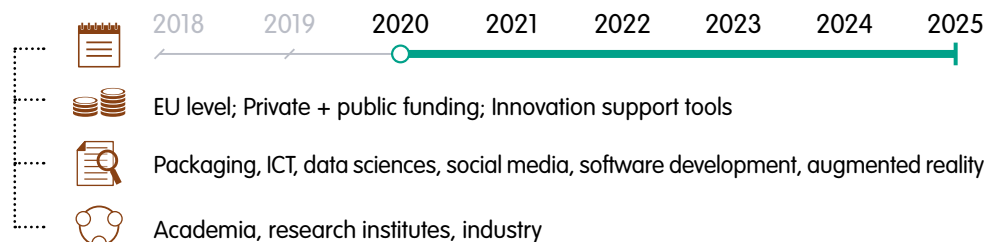
ACTION 5

COMBINE AVAILABLE IT TECHNOLOGIES TO DELIVER INFORMATION NECESSARY TO ENGAGE THE CONSUMER WITH HIS FOOD



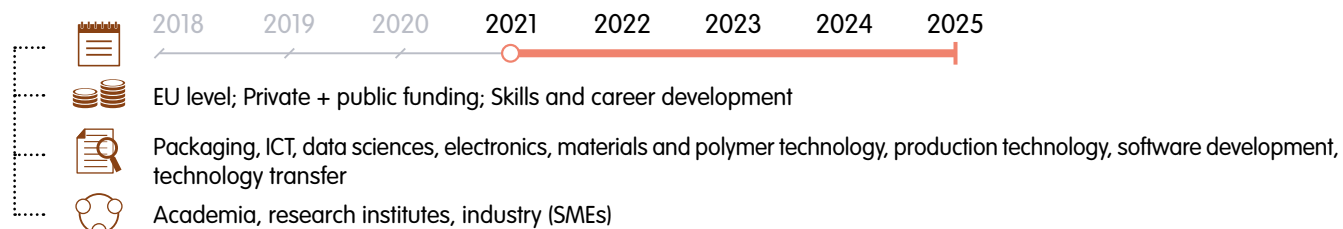
ACTION 6

CREATE LINK BETWEEN INTELLIGENT PACKAGING, ICT AND SOCIAL MEDIA, SMARTPHONES FOR CONSUMERS TO LATCH ON TO



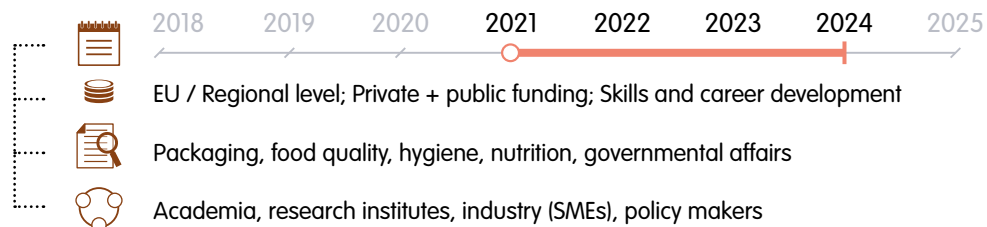
ACTION 7

TRANSLATE LARGE-SCALE SMART PACKAGING TECHNOLOGIES TO PRODUCERS OF NEW PACKAGING



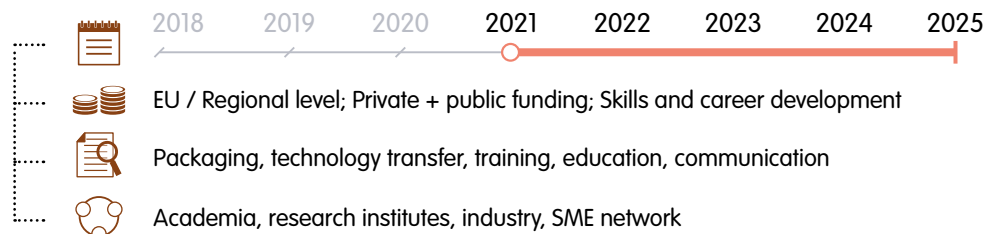
ACTION 8

TRAIN 'FOOD INSPECTORS'



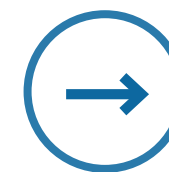
ACTION 9

TRAIN FOOD SME AND MAKE THEM AWARE





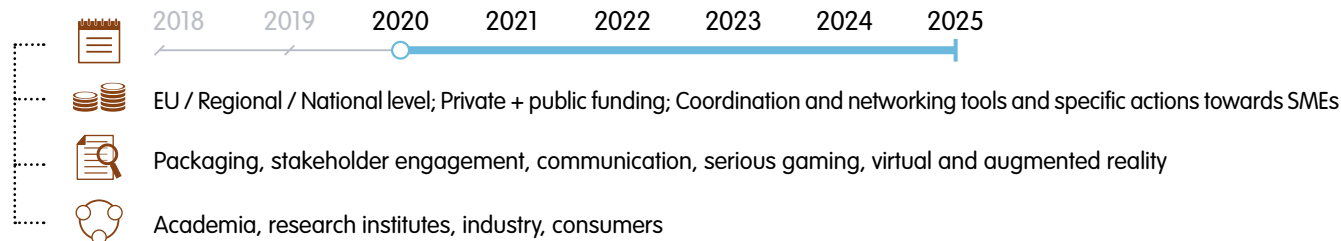
Topic 2.3



COMMUNICATION / DISSEMINATION

ACTION 10

COMMUNICATE POSSIBILITIES OF ACTIVE AND INTELLIGENT PACKAGING TO CONSUMERS



Timeline



Resources



< EUR 2 million



EUR 2-5 million



EUR 5-7 million



Expertise



Stakeholders

TOPIC 2.4

IN SILICO FOOD DESIGN: UNDERSTANDING FOOD DIGESTION

Nutrition and diet are essential for health and well-being. Increased intake of specific ingredients should lead to better health and quality of life. However, simply adding health promoting ingredients often does not work as the food matrix plays a key role in making specific ingredients available for our digestive system. Unrevealing the specific mechanisms that play a role during food digestion will enable us to understand how we can incorporate ingredients so that they will be taken up efficiently and, indeed, will have the desired health effects.

RESEARCH

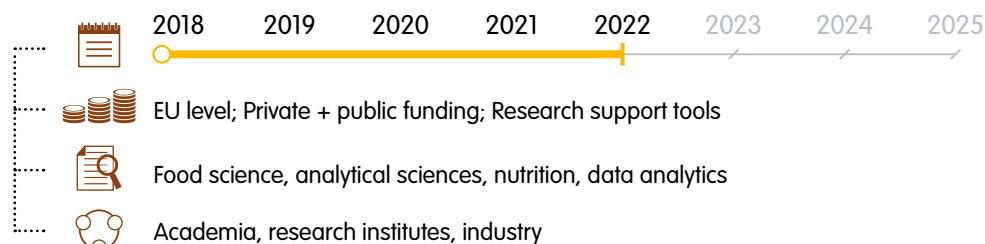
ACTION 1

DEVELOP DATA EXCHANGE PLATFORM 'OPEN SOURCE'



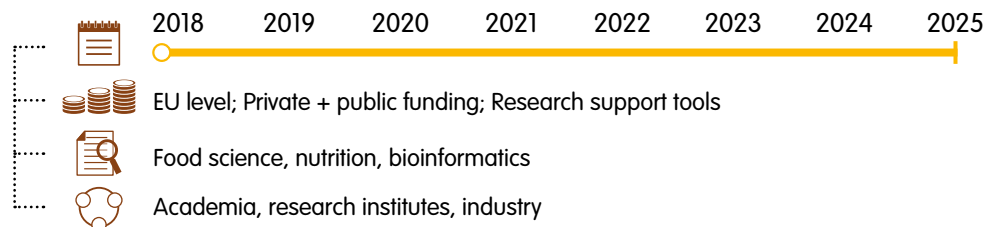
ACTION 2

DEVELOP TECHNIQUES FOR STUDYING MICRONUTRIENT DIGESTION



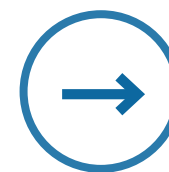
ACTION 3

EXECUTE MECHANISTIC IN SILICO MODELLING AND BIG DATA APPROACHES





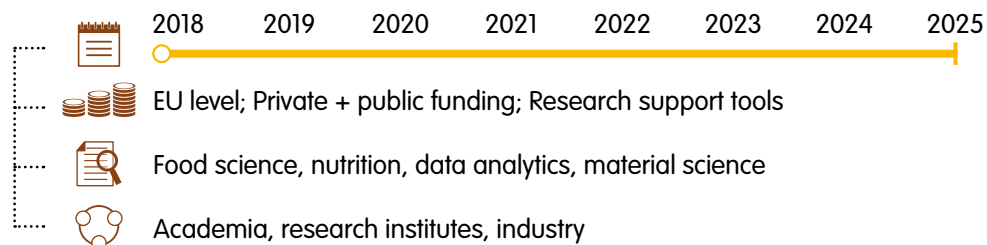
Topic 2.4



RESEARCH

ACTION 4

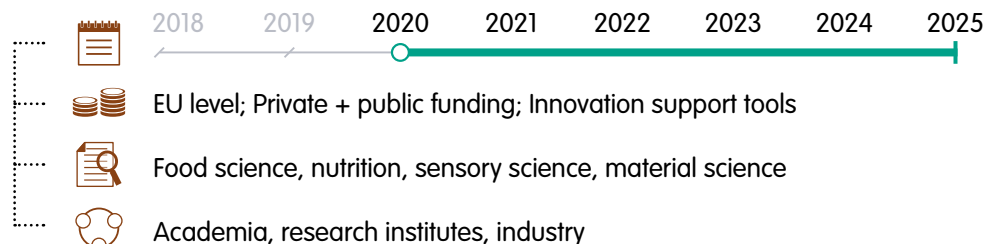
UNDERSTAND THE MATRIX INTERACTIONS



INNOVATION

ACTION 5

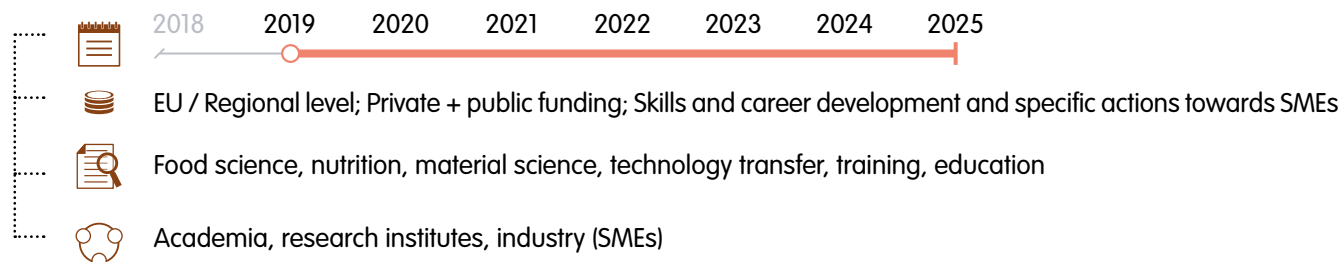
DEVELOP NEW FOOD CONCEPTS WITH IMPROVED FUNCTIONALITY BASED ON RESEARCH OUTCOMES



TRAINING / EDUCATION

ACTION 6

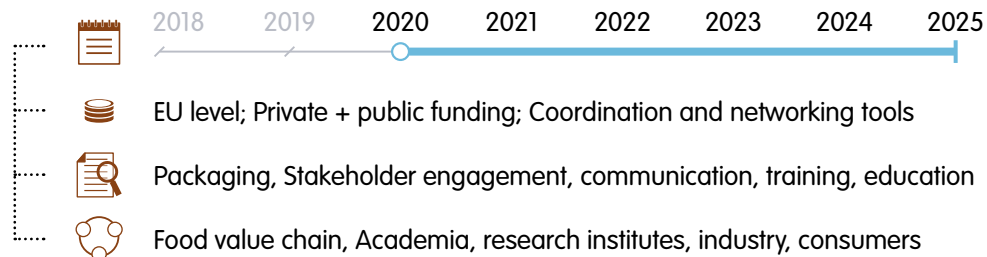
DEVELOP TRAINING TOOLS ON RESEARCH RESULTS TO SMES, FOOD COMPANIES, NUTRITION



COMMUNICATION / DISSEMINATION

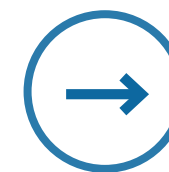
ACTION 7

DEVELOP COMMUNICATION PLANS TOWARDS DIFFERENT STAKEHOLDERS





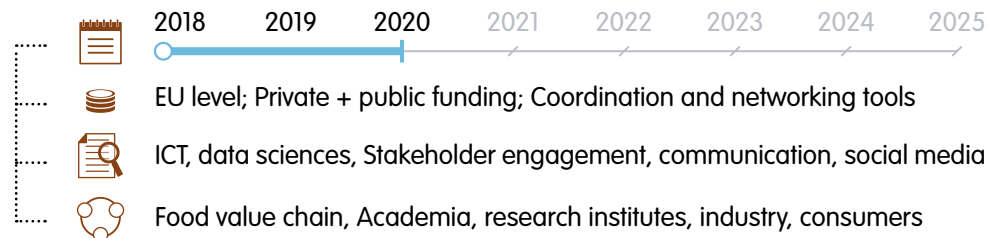
Topic 2.4



COMMUNICATION / DISSEMINATION

ACTION 8

ENABLE AND COMMUNICATE DATA EXCHANGE PLATFORMS



Timeline



Resources



< EUR 2 million



EUR 2-5 million



EUR 5-7 million



Expertise



Stakeholders

TOPIC 2.5

THE ECOLOGY INSIDE US: FOOD MEETS GUT MICROBIOME

Ingested foods and drinks are “processed” in the gut, which serves two essential functions: digest and protect. The gut-brain-microbiome axis is a complex ecosystem shaped by the genetic background of the host but also largely influenced by environmental conditions, including diet and living conditions. To maximize economic and consumer benefits of a microbiome-optimized nutrition, an integrated research approach of the gut ecosystem and a better understanding of the role of food and nutrition in the gradient from health to disease during different periods of life is needed.

RESEARCH

ACTION 1

DEFINE FOCUS (POPULATION, MICROBIOME, DISEASE/HEALTH, FOOD)



ACTION 2

DEFINE ‘PROPER’ METHODOLOGY



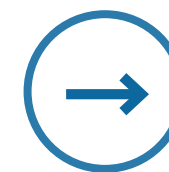
ACTION 3

IDENTIFY PATHWAYS (ECOSYSTEM)





Topic 2.5



RESEARCH

ACTION 4

PROVE CAUSALITY



INNOVATION

ACTION 5

DESIGN AND TEST FOODS -> MICROBIOME -> NCD + BRAIN



TRAINING / EDUCATION

ACTION 6

TRAIN, EDUCATE AND DEVELOP TRAINING TOOLS



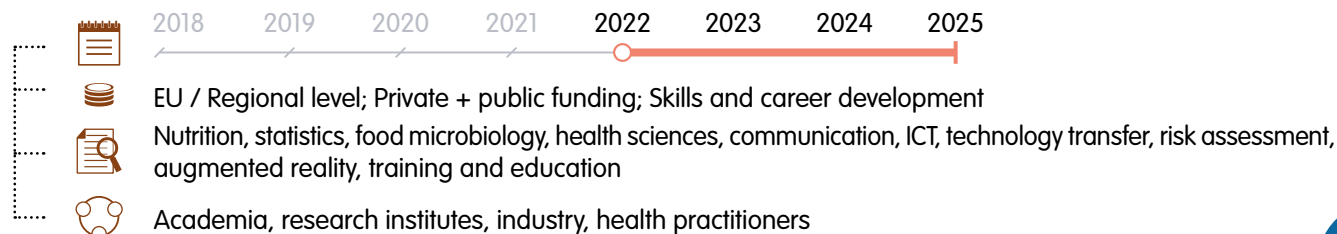
ACTION 7

TRAIN AND EDUCATE SMES



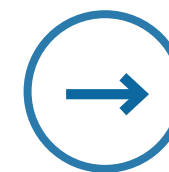
ACTION 8

TRAIN AND EDUCATE HEALTH PRACTITIONERS





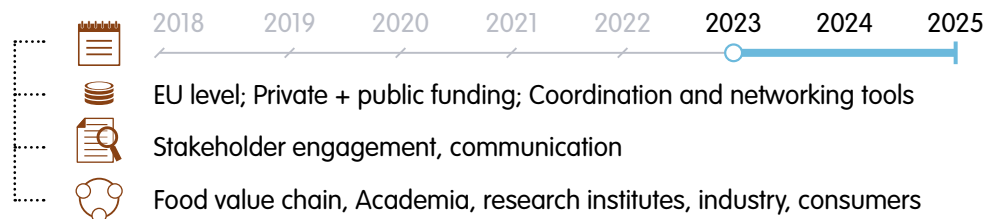
Topic 2.5



COMMUNICATION / DISSEMINATION

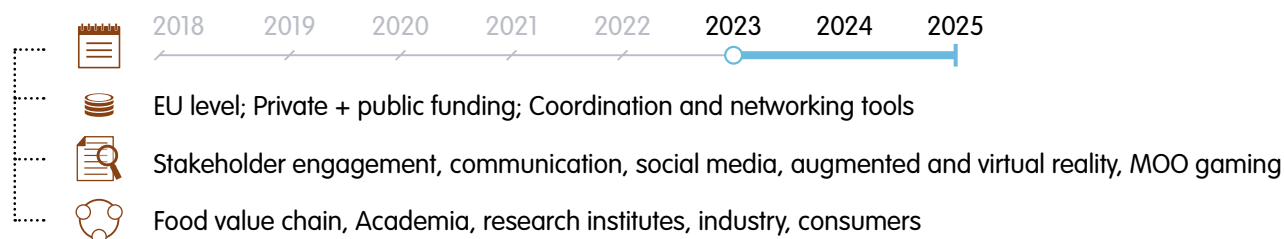
ACTION 9

FORMULATE AND DEVELOP COMMUNICATION PLANS



ACTION 10

PROMOTE PEOPLE TO UNDERSTAND AND USE



Timeline



Resources

< EUR 2 million

EUR 2-5 million

EUR 5-7 million

EUR 5-7 million

EUR 5-7 million



Expertise



Stakeholders

TOPIC 2.6

FORERUNNER PROJECT: FOODS FOR TOMORROW, NEW CONCEPTS AND TECHNOLOGIES TO ASSURE CONSUMER HEALTH AND WELL-BEING

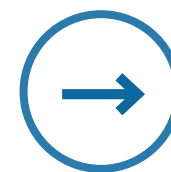
New approaches for sourcing, processing and manufacturing, and delivery systems for foods and food ingredients are constantly on the rise. These may be specifically intended to add or enhance nutrition and health benefits, to improve the nutrition status, and to reduce costs and/or environmental impact. The economic and consumer benefits of future innovation will be supported by research ensuring that the nutritional impact of newly introduced materials and treatments are understood and managed, and that new opportunities to improve the nutritional quality of foods are identified and exploited.

RESEARCH

ACTION 1

IDENTIFY AND EVALUATE CURRENT AND NEW SOURCES/PROCESSES





ACTION 2

ASSESS AND DEVELOP IMPROVED PREDICTIVE MODELS FOR EFFECTS ON CONSUMER HEALTH AND WELLBEING



2018 2019 2020 2021 2022 2023 2024 2025



EU level; Private + public funding; Research support tools



Nutrition, data sciences, food science, maths (modelling), health sciences



Academia, research institutes, industry

ACTION 3

ANALYSE THE IMPACT OF NEW SOURCES AND PROCESSES IN TERMS OF SUSTAINABILITY



2018 2019 2020 2021 2022 2023 2024 2025



EU level; Private + public funding; Research support tools



Food technology, process engineering, ecology, Life Cycle Assessment, environmental sustainability, nutrition



Academia, research institutes, industry

ACTION 4

UNDERSTAND SOCIETAL ACCEPTANCE OF NEW SOURCES AND PROCESSES



2018 2019 2020 2021 2022 2023 2024 2025



EU level; Private + public funding; Research support tools



Consumer science, social sciences, psychology, food science, biology



Academia, research institutes, industry, consumers

ACTION 5

CHARACTERISE THE NUTRITIONAL AND SENSORY ATTRIBUTES, SATIETY AND ALLERGENS



2018 2019 2020 2021 2022 2023 2024 2025



EU level; Private + public funding; Research support tools



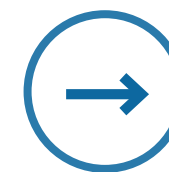
Nutrition, health sciences, toxicology, sensory analysis



Academia, research institutes, industry



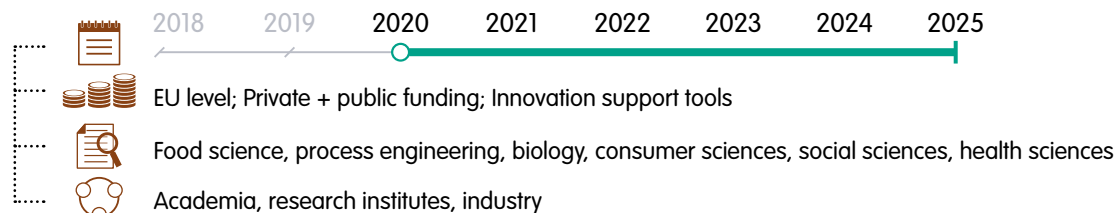
Topic 2.6



INNOVATION

ACTION 6

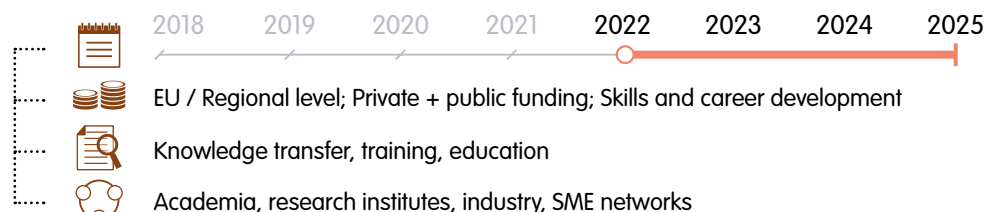
EXPLOIT NEW SOURCES OF FOOD, PROCESSING APPROACHES



TRAINING / EDUCATION

ACTION 7

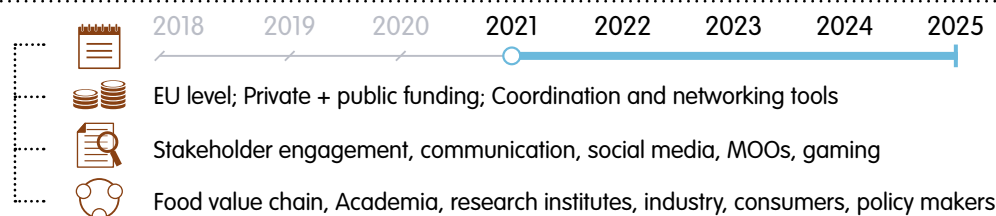
DEVELOP SPECIFIC KNOWLEDGE TRANSFER TOWARDS SMES



COMMUNICATION / DISSEMINATION

ACTION 8

TAILOR COMMUNICATION STRESSING THE CURRENT LACK OF RESOURCES



Timeline



Resources

< EUR 2 million

EUR 2-5 million

EUR 5-7 million



Expertise



Stakeholders

C. DEVELOPING A MORE FLEXIBLE, DYNAMIC AND SUSTAINABLE FOOD SYSTEM

TOPIC 3.1

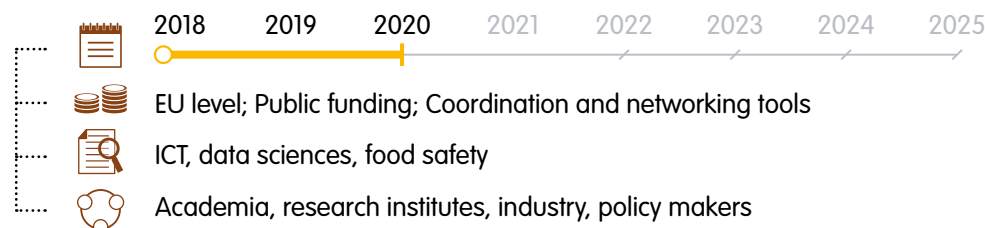
GETTING IT RIGHT: INTEGRATED FOOD SAFETY AS A UNIQUE SELLING POINT

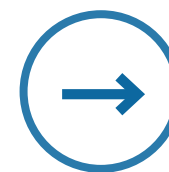
Cutting-edge technologies in the field of "Omics", in combination with powerful computing capability, create tremendous volumes of data that need to be analysed. Within the food safety and quality area, there is great potential for the generation and utilization of this to obtain new biological insights, which will eventually lead to better approaches to mitigation and/or elimination of biological and chemical risks.

RESEARCH

ACTION 1

CREATE A NETWORKING ACTIVITY ON DATA EXCHANGE OF/AND COMPLEX FOOD DATA

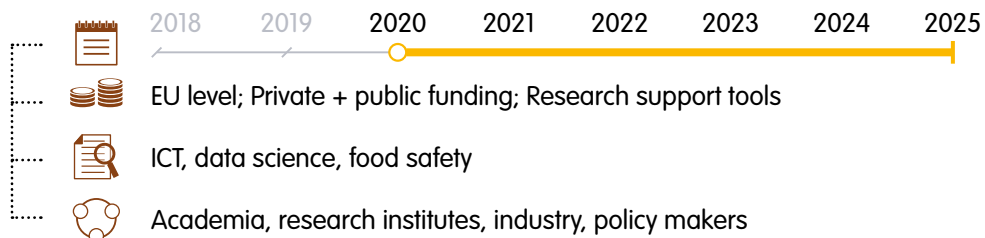




RESEARCH

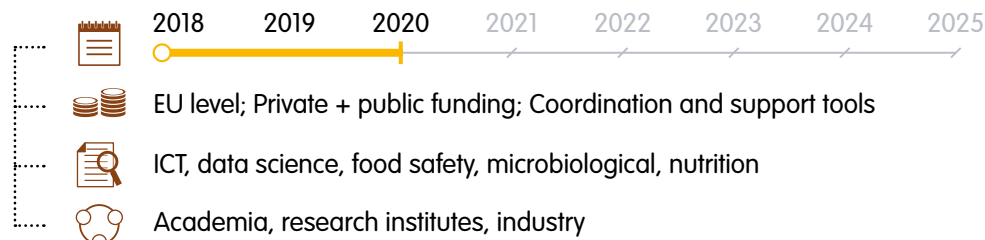
ACTION 2

CREATE AND OPERATE A VIRTUAL CENTRE FOR COMPLEX FOOD DATA



ACTION 3

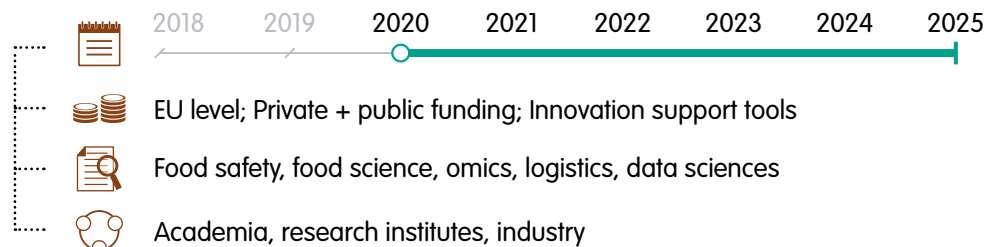
EXPLOIT THE POTENTIAL OF BIG DATA ANALYTICS TO DEVELOP INSIGHTS INTO MICROBIAL AND CHEMICAL CONTAMINANTS IN FOOD SYSTEMS



INNOVATION

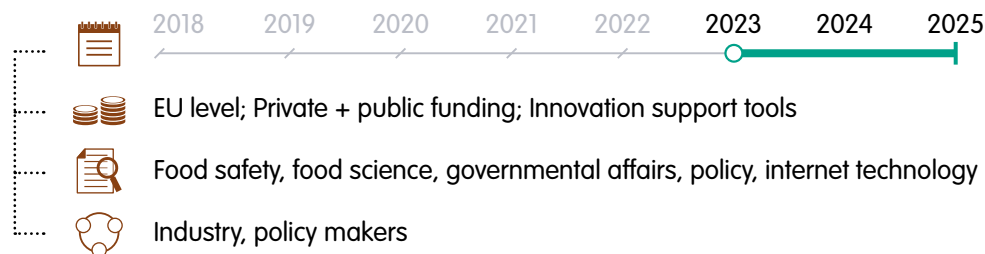
ACTION 4

APPLY -OMICS TECHNOLOGIES TO INCREASE TRACEABILITY AND TO DEVELOP NEW METHODS



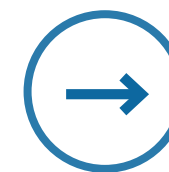
ACTION 5

DEVELOP A FRONT-END FOR INDUSTRIES TO USE AFTER INTEGRATED SAFETY ASSURANCE





Topic 3.1



TRAINING / EDUCATION

ACTION 6

ENSURE NEW GENERATION OF ACTORS
TO IMPLEMENT RESEARCH AND USE



ACTION 7

TRAIN AUTHORITIES IN USING NEW
TOOLS AND PREDICTIVE DATA



COMMUNICATION / DISSEMINATION

ACTION 8

INVOLVE AND ENGAGE CONSUMERS IN
METHODS AND PROCEDURES



Timeline



Resources



< EUR 2 million



EUR 2-5 million



EUR 5-7 million



Expertise



Stakeholders

TOPIC 3.2

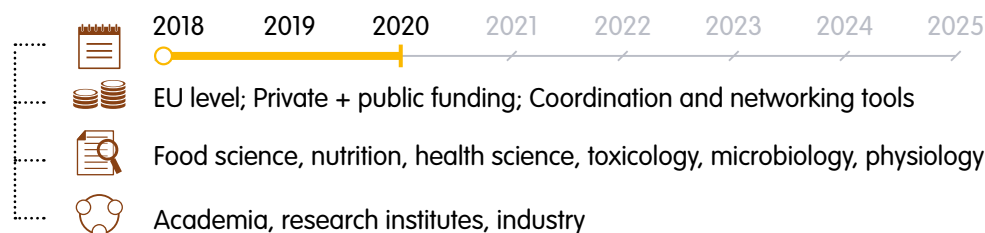
THE MATRIX MATTERS: FOOD STRUCTURING FOR BETTER HEALTH

There is a growing consumer awareness of the possible role of food as a direct source of health. In a more technical sense, simply adding beneficial ingredients is often insufficient, due to the key role the food matrix plays in making specific ingredients either available or unavailable (the latter in the case of caloric control) to our digestive system. A deliberate creation of food structures that maintain the nutritional function of ingredients will ensure that uptake is more efficient, and that the ingredients will indeed have the desired health effects.

RESEARCH

ACTION 1

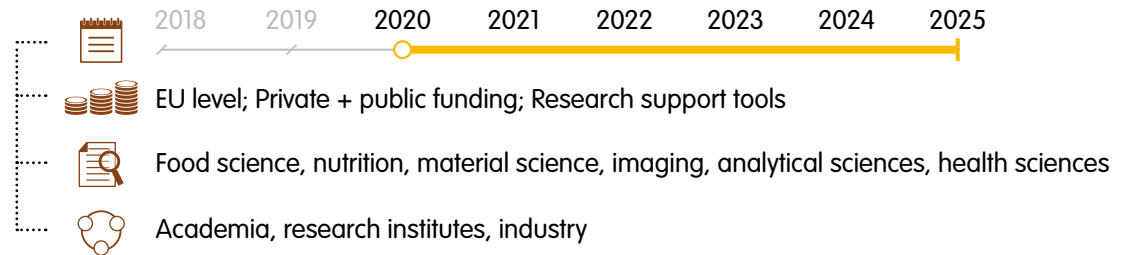
SCREEN FOR ISSUES OF BIOAVAILABILITY THAT
ARE RELEVANT TO COMBATING NCDS





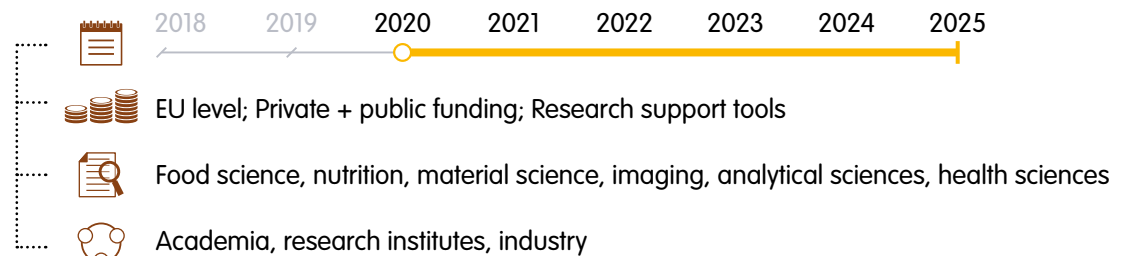
ACTION 2

DEVELOP QUANTITATIVE INSIGHT IN THE ROLE OF THE MATRIX IN NUTRIENT BIO AVAILABILITY



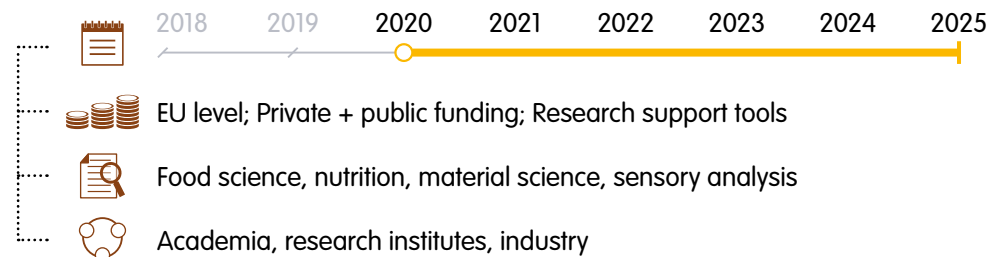
ACTION 3

DEVELOP QUANTITATIVE INSIGHT IN THE DIGESTION/DISINTEGRATION OF FOOD MATRICES



ACTION 4

DEVELOP MORE NATURAL MATRICES FOR BETTER NUTRIENT UPTAKE, TO FACILITATE CONSUMER ACCEPTANCE SENSORY PROPERTIES



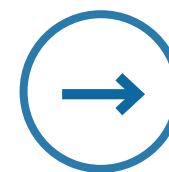
ACTION 5

USE KNOWLEDGE OF THE ROLE OF THE MATRIX IN DIGESTION FOR THE DESIGN OF FOODS TO COMBAT NCDS





Topic 3.2



RESEARCH

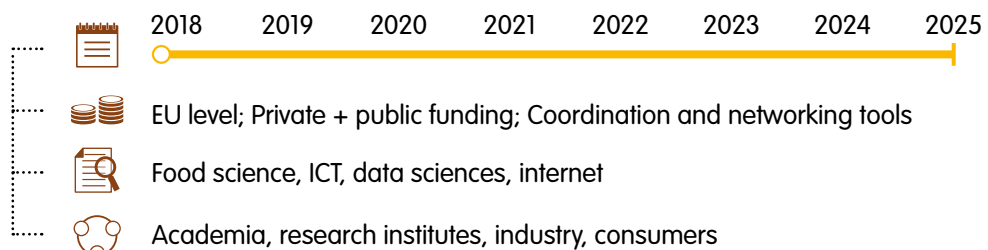
ACTION 6

**DEVELOP PREDICTIVE INSIGHT IN
RELATION BETWEEN MATRIX STRUCTURE
AND SENSORY PROPERTIES**



ACTION 7

**CREATE AN OPEN SOURCE PORTAL FOR
DIGESTION AND CONSUMER GUIDANCE**



INNOVATION

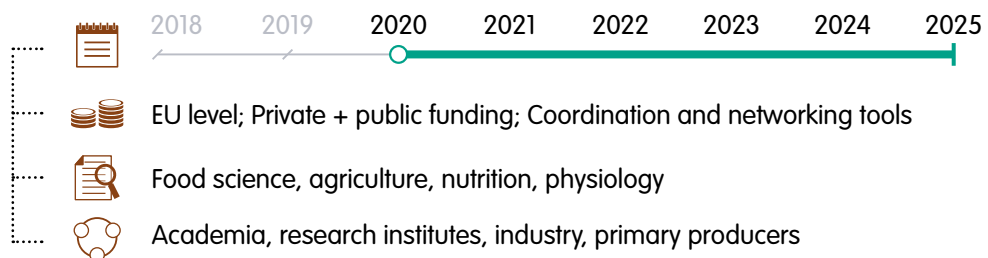
ACTION 8

**PROSPECT ALTERNATIVE INGREDIENTS
AND PROCESS METHODS**



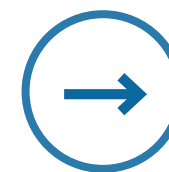
ACTION 9

**LINK UP PRIMARY PRODUCERS AND FOOD
PROCESSORS TO GENERATE THE BEST
MATRIX-NUTRIENT SYSTEMS FOR
COMBATING NCDS**





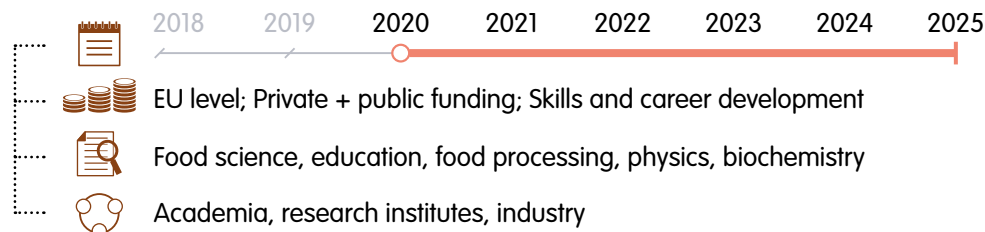
Topic 3.2



TRAINING / EDUCATION

ACTION 10

GENERATE NEW GENERATION OF FOOD DIGESTION ENGINEERS (INTEGRATE BIOLOGY, COLLOID SCIENCE, PROCESSING, PHYSICS, BIOCHEMISTS)



Timeline



Resources

< EUR 2 million

EUR 2-5 million

EUR 5-7 million



Expertise



Stakeholders

TOPIC 3.3

COMING FULL CIRCLE: TOWARDS SUSTAINABLE PACKAGING SYSTEMS

The primary role of food packaging is to protect the quality and integrity of food products. Packaging typically also contains a lot of information relevant to the consumer and the supply chain players. At the same time, it is often perceived as generating unnecessary waste and polluting the environment. Therefore, packaging solutions must be adapted to new trends in order to yield the best performance in protecting food with minimal use of resources.

RESEARCH

ACTION 1

DEVELOP ECONOMICALLY VIABLE BIO-BASED PACKAGING MATERIALS WITHOUT COMPETING WITH FOOD



INNOVATION

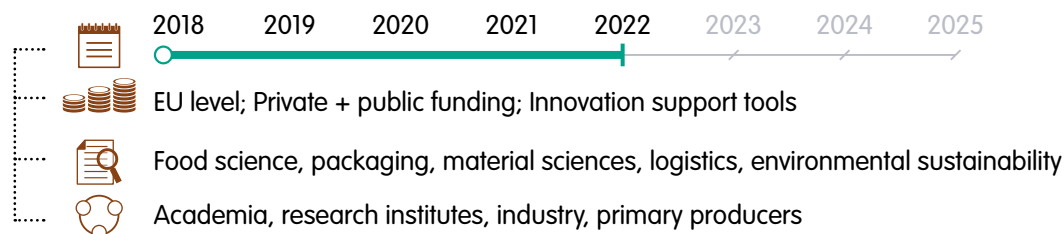
ACTION 2

DEVELOP TECHNOLOGIES FOR RE-USING AND RECYCLING PACKAGING MATERIALS AT THE END OF THE LIFE CYCLE



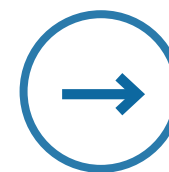
ACTION 3

DEVELOP PACKAGING MATERIALS, TECHNOLOGIES AND CONCEPTS WITH THE RIGHT FUNCTIONALITY AND DELIVERING SUPERIOR ENVIRONMENTAL PERFORMANCE IN THE TOTAL LIFE CYCLE





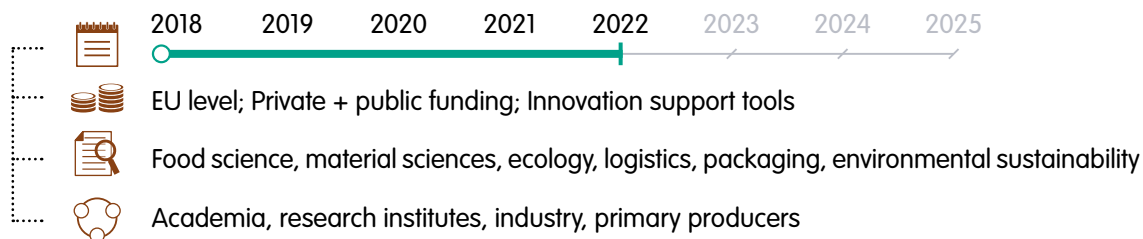
Topic 3.3



INNOVATION

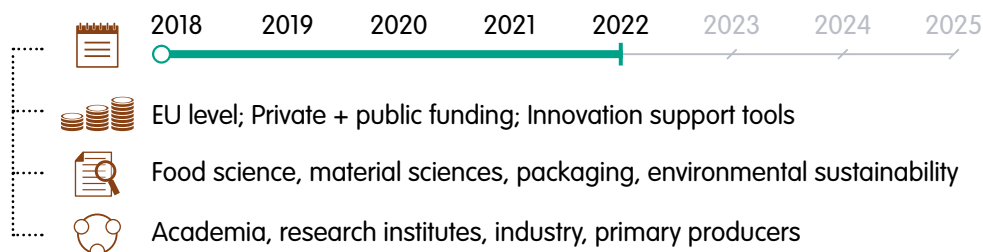
ACTION 4

GENERATE PACKAGING CONCEPTS THAT CAN REDUCE FOOD WASTE



ACTION 5

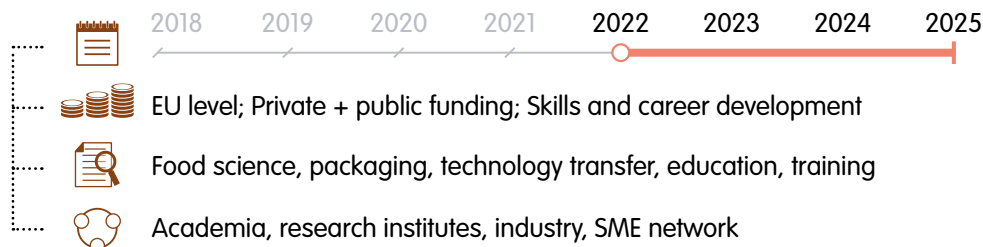
MAXIMISE PACKAGING PERFORMANCE IN TERMS OF SHELF LIFE AND PROTECTION, STABILITY TO REDUCE WASTE AND ENHANCE RE-USE



TRAINING / EDUCATION

ACTION 6

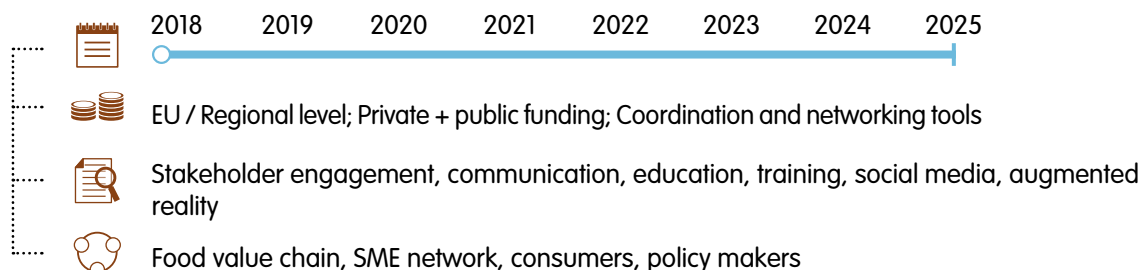
TRAIN AND EDUCATE SMES

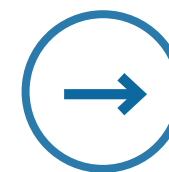


COMMUNICATION / DISSEMINATION

ACTION 7

GAIN ACCEPTABILITY AND TRUST: PACKAGING TO INFORM AND ESTABLISH A DIALOGUE WITH CONSUMERS





Timeline



Resources

< EUR 2 million

EUR 2-5 million

EUR 5-7 million



Expertise



Stakeholders

TOPIC 3.4

IT'S ALL FOOD: ALTERNATIVE FOOD SOURCES

The availability of food from environmentally-sustainable sources is a pre-requisite for feeding a growing population and preserving resources. New raw materials and processes to convert them into food products/ingredients need to be identified. Some examples are algae, seaweed and krill, and terrestrial non-chordate phyla. A third source of food remains also relatively untapped, i.e. food grown directly from waste, or manufactured through direct use of side streams. Overall, these approaches could alleviate raw material shortages provided that rigorous measures are in place to prevent challenges from a safety or quality perspective.

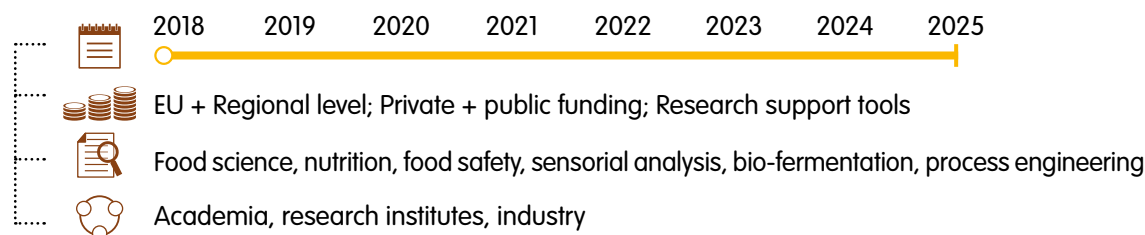
ACTION 1

IDENTIFY NEW SOURCES FOR FOOD MATERIALS



ACTION 2

EXPLORE UNDERUTILIZED FOOD SIDE STREAMS AS NEW SOURCE OF FOOD MATERIALS



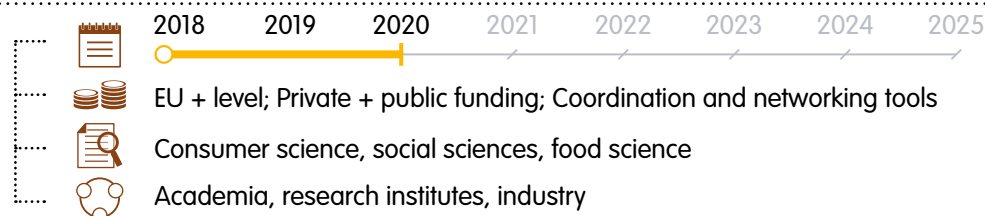
ACTION 3

EXPLORE USE OF FERMENTATION AND OTHER BIOCONVERSION ROUTES TO CONVERT WASTE OR NON-FOOD MATERIALS INTO SOURCES OF FOOD



ACTION 4

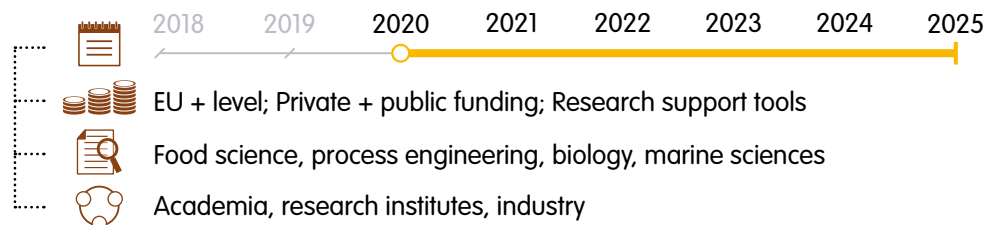
EXAMINE WHAT INFLUENCES ACCEPTANCE BY CONSUMERS



RESEARCH

ACTION 5

DEVELOP NEW FRACTIONATION METHODS TO EXTRACT AND ISOLATE FOOD INGREDIENTS FROM UNCONVENTIONAL SOURCES



INNOVATION

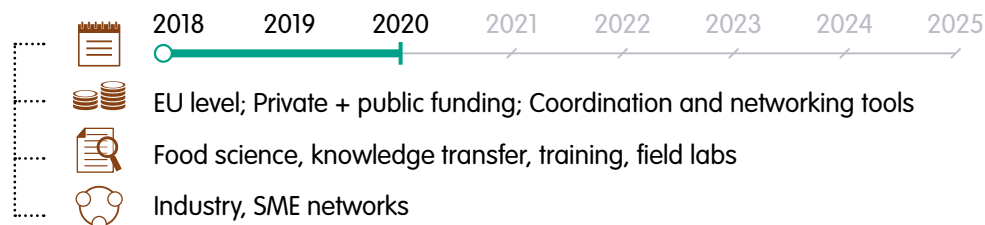
ACTION 6

DEVELOP NEW END-PRODUCTS THAT INCORPORATE INGREDIENTS FROM UNCONVENTIONAL SOURCES



ACTION 7

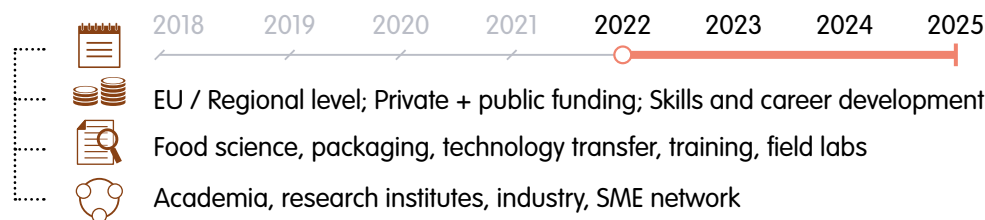
CREATE CONSORTIA OF SMES



TRAINING / EDUCATION

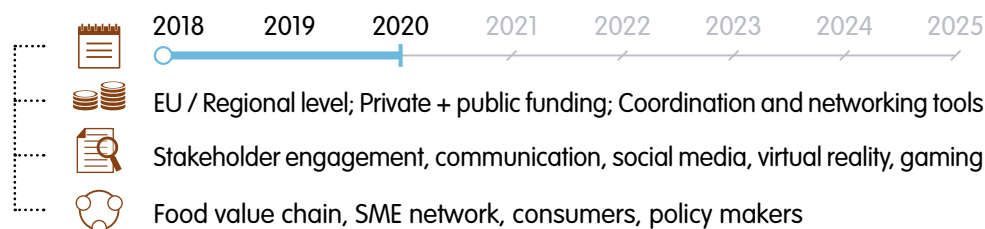
ACTION 8

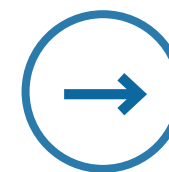
TRAIN AND EDUCATE SMES

COMMUNICATION /
DISSEMINATION

ACTION 9

ENGAGE CONSUMERS AND FINDING NEW, UNCONVENTIONAL SOURCES OF FOOD MATERIALS





Timeline



Resources



< EUR 2 million



EUR 2-5 million



EUR 5-7 million



Expertise



Stakeholders

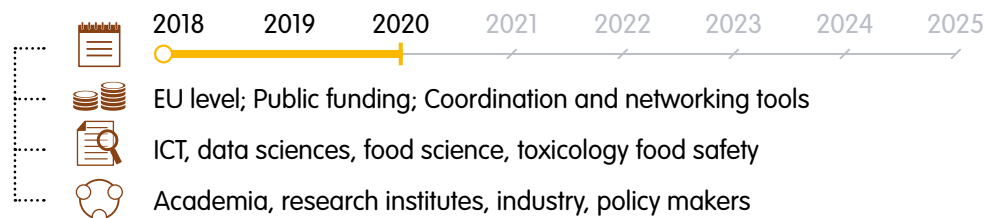
TOPIC 3.5

CHECK IT: NEXT GENERATION STRATEGIES FOR FOOD SAFETY ASSESSMENT

The capacity to assess the risk that a food-borne hazard of any type presents to the consumer is fundamental. Risk is the basis for taking intervention measures and applying resources across the food system. In recent years, toxicology has undergone a paradigm shift in approach, steered by the rapid advances in science and technology and the emergence of Big Data. The integration of all these techniques into food safety strategies will permit new ways of approaching key aspects of exposure assessment in the risk assessment process.

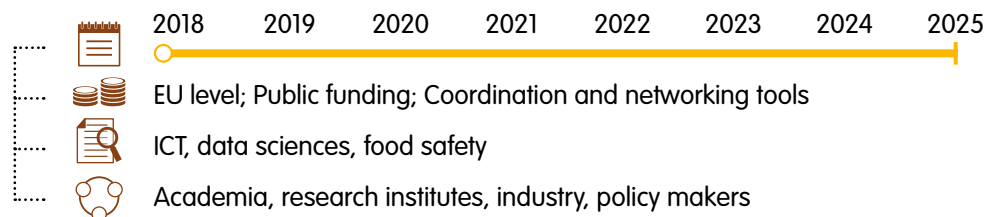
ACTION 1

CREATE A NETWORKING ACTIVITY ON DATA EXCHANGE OF/AND COMPLEX FOOD DATA



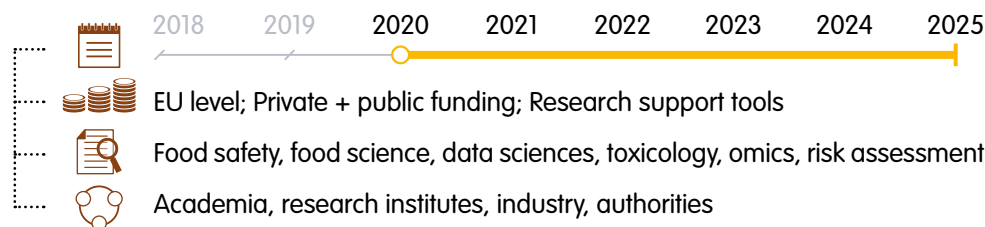
ACTION 2

CREATE A VIRTUAL FOOD SAFETY INSTITUTE



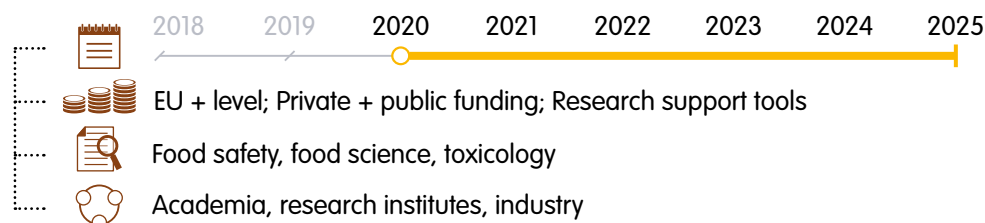
ACTION 3

MAKE OMICS AND COMPLEX ANALYTICAL (NON-TARGETED) DATA RELEVANT TO RISK ASSESSMENT - FUTURE PROOF



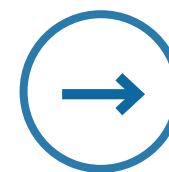
ACTION 4

ASSESS CHEMICAL SAFETY IN COMPLEX MATRICES





Topic 3.5



RESEARCH

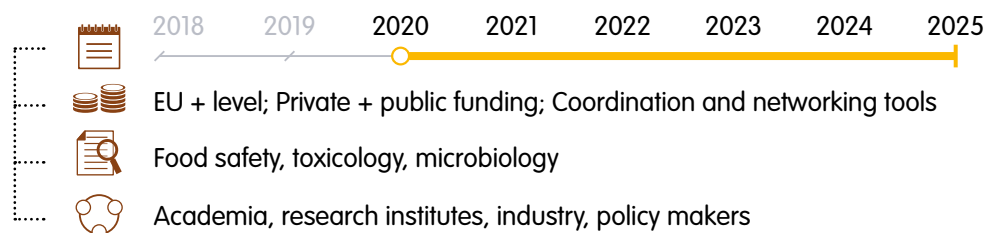
ACTION 5

INTEGRATE ALL DATA ANALYTICAL, FOOD CHAIN, CONSUMER, PUBLIC HEALTH GENERATED IN RISK ASSESSMENT



ACTION 6

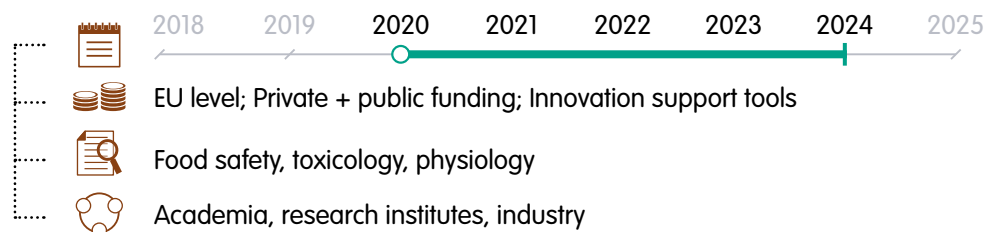
BRING TOGETHER APPROACHES TO REDUCE AND THEN ELIMINATE ANIMAL TESTING



INNOVATION

ACTION 7

DEVELOP TOOLS TO EVALUATE ALLERGENIC POTENTIAL OF NEW INGREDIENTS



ACTION 8

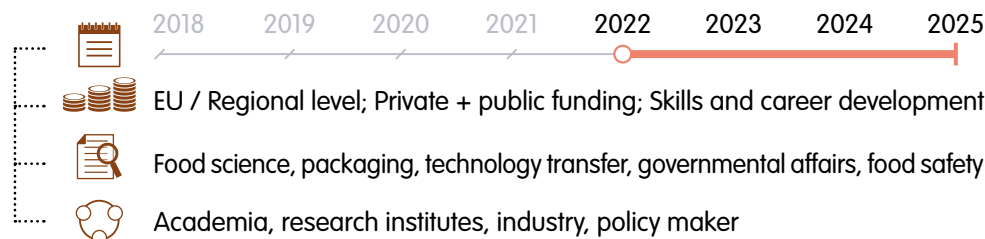
DEVELOP RAPID RISK ASSESSMENT TOOLS AND METHODS



TRAINING / EDUCATION

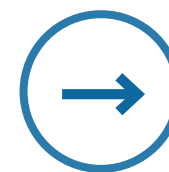
ACTION 9

TRAIN AUTHORITIES TO USE DATA AND TOOLS FOR ENHANCING PREDICTIVE SECURITY





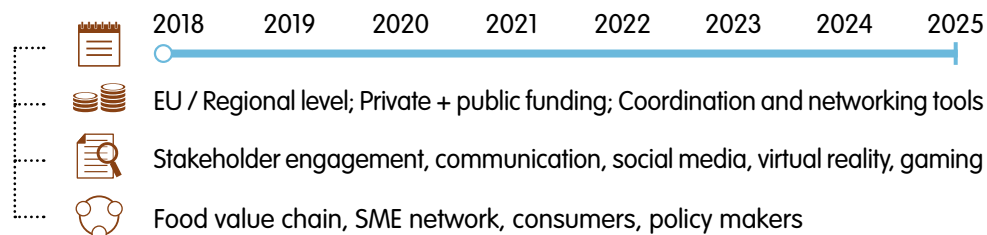
Topic 3.5



COMMUNICATION / DISSEMINATION

ACTION 10

INVOLVE AND ENGAGE CONSUMERS IN METHODS AND PROCEDURES



Timeline



Resources



< EUR 2 million



EUR 2-5 million



EUR 5-7 million



Expertise



Stakeholders

TOPIC 3.6

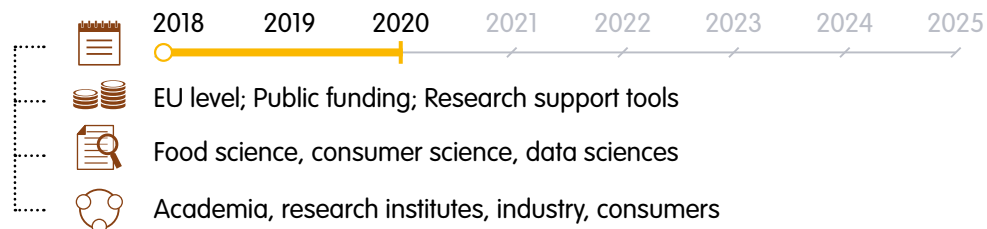
SIMPLY NATURAL: TOWARDS LESS REFINED, MORE NATURAL FOOD INGREDIENTS

In the past decades, the production of ingredients has become highly optimized to meet purchaser demands. Plant-based ingredients are often highly purified, which makes them universally applicable in many products. There is, however, an opposing consumer pull for natural ingredients due to perceived beneficial effects on health. While many less refined ingredients have excellent properties, they often differ from those of highly refined ingredients. Innovation in the use of less refined ingredients to allow manufacture of healthy, tasty and attractive products for consumers is therefore needed.

RESEARCH

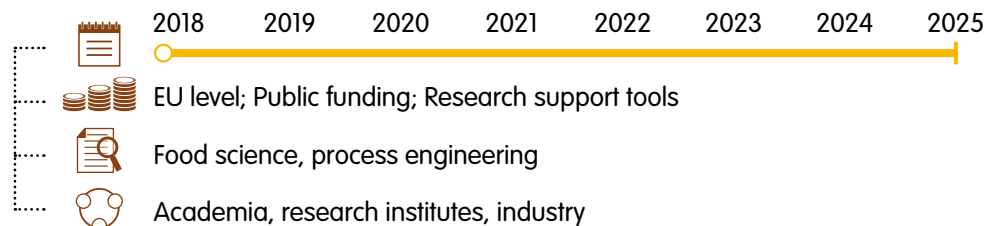
ACTION 1

UNDERSTAND HOW CONSUMERS PERCEIVE NATURALNESS WITH FOOD ORIGIN AND PROCESSING



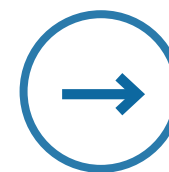
ACTION 2

DEVELOP NEW METHODS TO PRODUCE MINIMALLY PROCESSED FUNCTIONAL INGREDIENTS



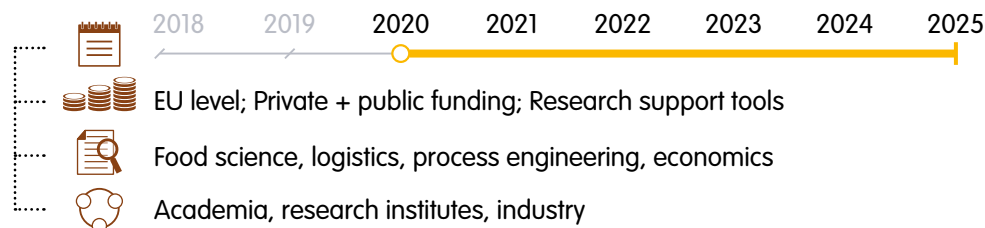


Topic 3.6



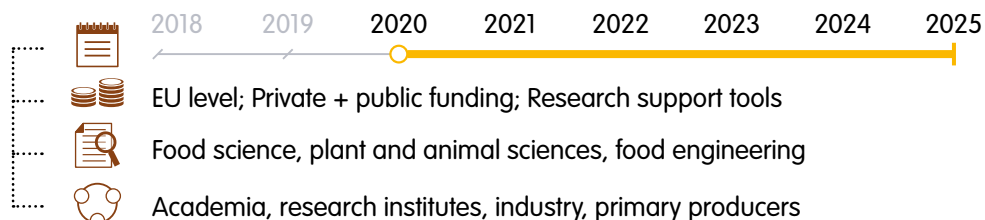
ACTION 3

DEVELOP SCALED-DOWN PROCESSES TO ALLOW MINIMALLY PROCESSED INGREDIENT PRODUCTION TO BE DISTRIBUTED OVER THE CHAIN



ACTION 4

DEVELOP CROP CHARACTERIZATION FOR OPTIMAL MINIMAL PROCESSING INTO FUNCTIONAL INGREDIENTS



ACTION 5

EXPLORE SENSORY AND TECHNICAL FUNCTIONALITY OF MINIMALLY PROCESSED INGREDIENTS



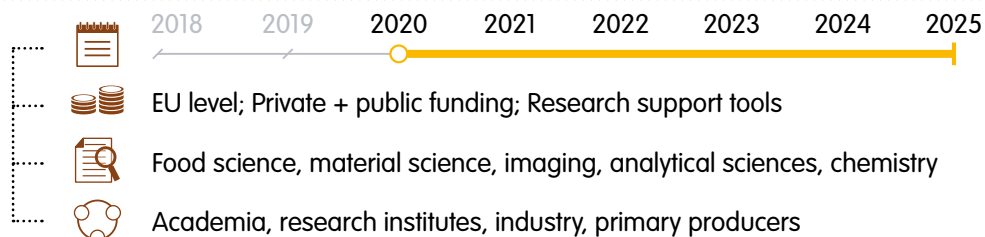
ACTION 6

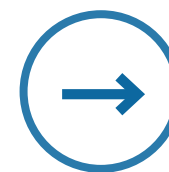
UNDERSTAND INTERACTIONS BETWEEN MINIMALLY PROCESSED INGREDIENTS THAT YIELD THEIR PROPERTIES AND MAKE USE OF IT



ACTION 7

CREATE UNDERSTANDING OF RAW MATERIAL MATRIX PROPERTIES

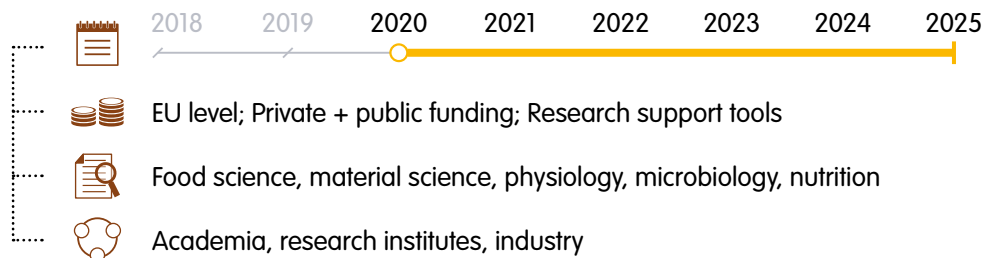




RESEARCH

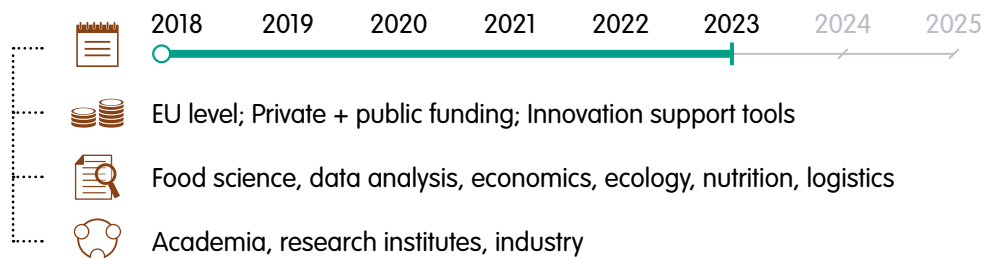
ACTION 8

EXPLORE BIOAVAILABILITY AND PHYSIOLOGY



ACTION 9

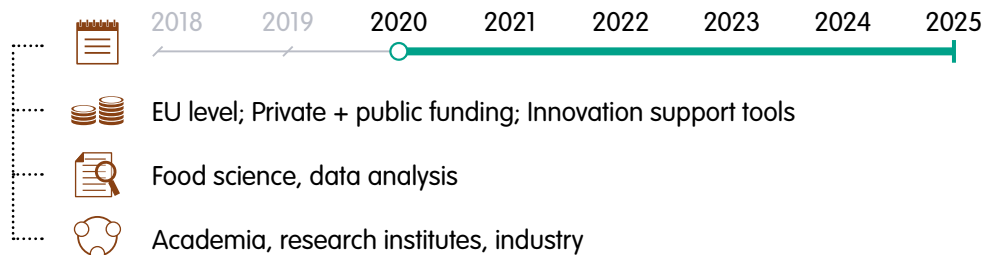
COMPARE FULL CHAINS OF CONVENTIONAL INGREDIENTS WITH FUNCTIONAL, MINIMALLY-PROCESSED INGREDIENTS



INNOVATION

ACTION 10

DEVELOP AN INVENTORY AND MAP COMPLEMENTARY FUNCTIONAL INGREDIENTS TO REDUCE DECLARATION LISTS



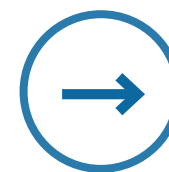
ACTION 11

EXPLORE FOOD SAFETY ASPECTS OF GENTLE, MINIMAL PROCESSING



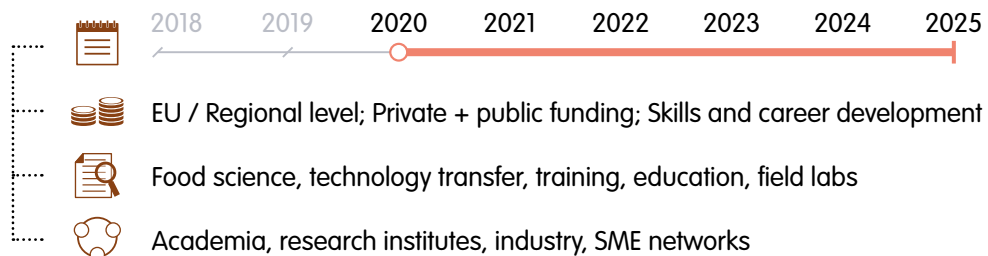


Topic 3.6

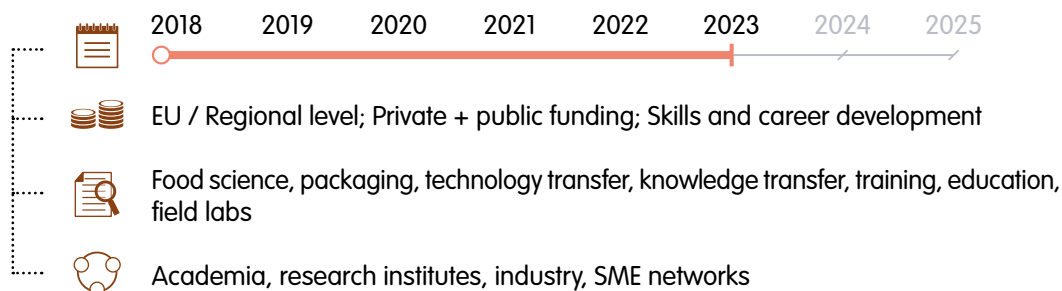


TRAINING / EDUCATION

ACTION 12 **TRAINING AND EDUCATE SMES**

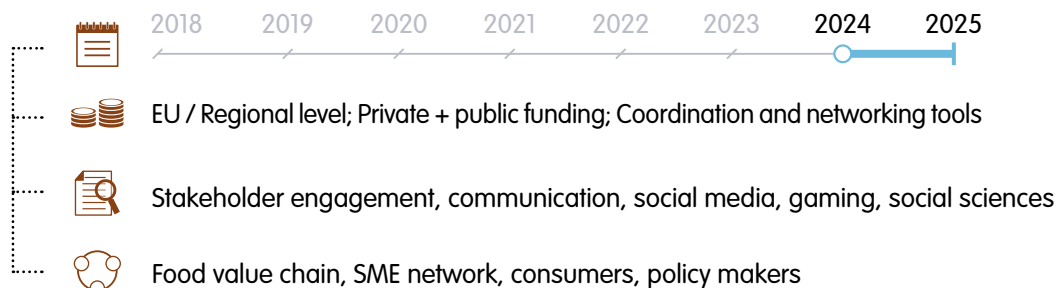


ACTION 13 **FORM CONSORTIA OF SMES**

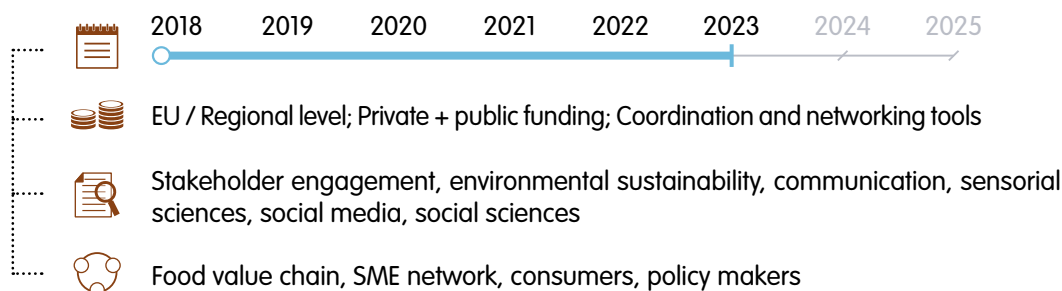


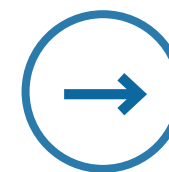
COMMUNICATION / DISSEMINATION

ACTION 14 **DEVELOP COMMUNICATION STRATEGY AND EXECUTE TO COMMUNICATE BENEFITS OF MINIMAL PROCESSING**



ACTION 15 **EXPLORE AND UNDERSTAND THE ATTITUDE OF CONSUMERS TO PRODUCTS WITHOUT E NUMBERS, AND HOW TO PROVIDE CLEANER-LABELED FOODS SUSTAINABLY PRODUCED**





D. SPECIAL ACTIONS FOR SMES

A number of vertical actions that would enable SMEs to better exploit the full potential that R&I offers.

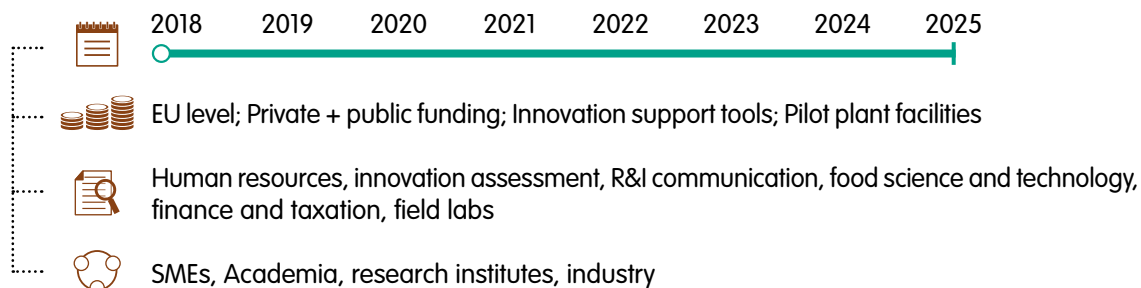
RESEARCH

ACTION 1 **CREATE SYNERGIES BETWEEN START-UPS AND SMES**



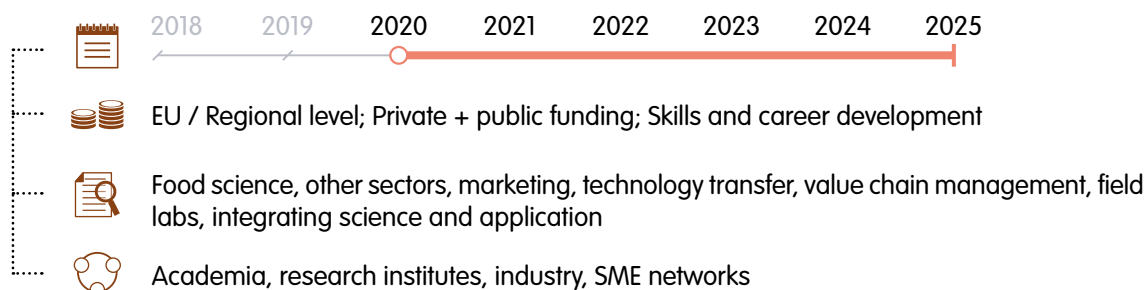
INNOVATION

ACTION 2 **ENABLE INNOVATION FOR SMES**



TRAINING / EDUCATION

ACTION 3 **TRANSFER ENABLING SOLUTIONS TO SMES**

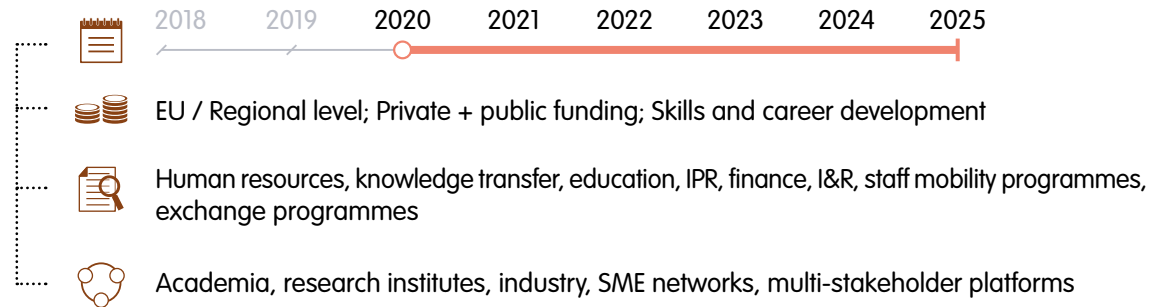




TRAINING / EDUCATION

ACTION 4

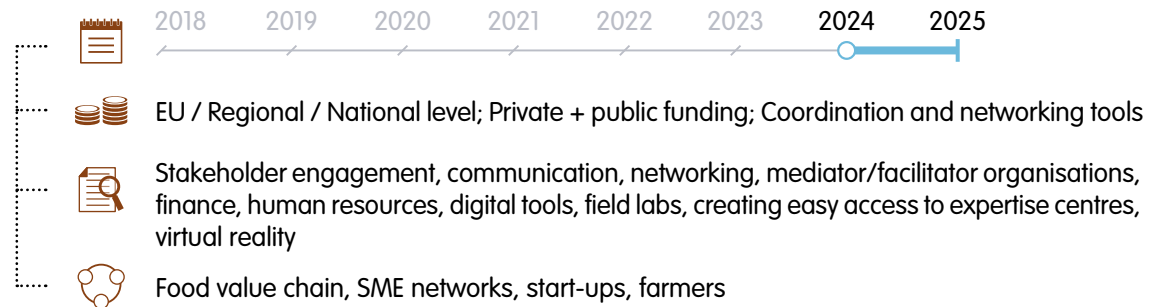
DEVELOP HUMAN RESOURCES FOR SMES

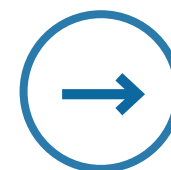


COMMUNICATION / DISSEMINATION

ACTION 5

DEVELOP COMMUNICATION STRATEGY ABOUT ENABLING FACILITIES, TOOLS AND SERVICES





The following Tables list the impact of the individual actions suggested by the experts of the ETP 'Food for Life', as described in the SRIA.

R&I TARGET/ACTION

IMPACT DIMENSIONS

R&I TARGET 1

INCREASING THE ENGAGEMENT AND INVOLVEMENT OF THE CONSUMERS

- Decentralized innovation ecosystem allowing for completely new business models in the food sector
- Transformation from a mass market oriented production system to a more decentralized, consumer-run system
- Alignment in goals of consumers and food solution providers.

TOPIC 1.1

IMPROVING INSIGHTS INTO CONSUMERS

- A standardized selection of key consumer science tools in order to generate more effective consumer insights leading to higher success rates of new product launches and closer alignment with consumer and societal needs
- Development of important new tools based on (new) technologies in adjacent fields.
- Innovative and standardized approaches to collecting, managing and analysing Big Data which will enable deeper consumer insight and sharing of data.
- Improved possibilities to pool data from different studies and sources in order to conduct more powerful analyses and to avoid duplication of efforts.
- Increased speed and effectiveness of consumer insight generation, resulting in more effective product and service development.
- Improved consumer engagement.
- Evidence-based recommendations for education programs increasing the skill and competence set needed to apply existing and new tools and Big Data in the food industry.

TOPIC 1.2

FOOD AND ME: MAKING FOOD AN ACTIVITY

- New forms of communication between consumers and food chain participants in the form of social media platforms, app-based solutions, and integrated solutions in the kitchen.
- New data streams both to and from consumers that can be used to generate insights into consumer preferences and their developments.
- Business start-ups that deal with the generation and analysis of consumer data and with the dissemination of results to food chain participants.
- New sources of consumer insights that both large and small food producers can exploit in the new product development process.
- Increased success rate in new product launches, especially for healthier products and products based on more sustainable production methods.



TOPIC 1.3

FOOD INVENTORS: NEW FOOD PRODUCTION AND DELIVERY MODELS TO PROVIDE BETTER ACCESS

- Credible inventory of consumer acceptance, trust and satisfaction and consumption behaviour impacts (health, safety, sustainability and waste) of the new and increasingly diverse production and delivery models.
- A map of the economic opportunities that the new production models represent, including, but not limited to, home appliances, ingredient and raw material supply and service solutions.
- Proposed sustainable business models for new-channel configurations allowing consumer or community driven food provision.
- Specific, critical issues of public interest or risk for consumers identified for these new approaches, including those in areas such as public health, food security and food waste issues.

TOPIC 1.4

FOOTPRINTING OF FOOD: CONSUMER ENGAGEMENT IN SUSTAINABILITY

- A practical information system for personalized consumer queries in the area of food sustainability and health.
- Coverage of the consumer population by such system.
- Coverage of the relevant agro-food chain players.
- Number of new data-centric agro-food businesses.
- A measurable increase in the trust level in the agro-food system.

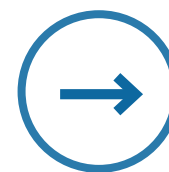
TOPIC 1.5

THE SMART FOOD GRID: MODULAR FOOD PRODUCTION AND DISTRIBUTION

- Reconfigured distribution channels and delivery modes (family and small businesses).
 - Degree of food sovereignty – self-sufficiency.
 - Reduced the carbon footprint.
 - Sustained biodiversity of local ecosystems.
 - Improved sustainability of local farms (rural areas) and local operations.
 - Enhanced process efficiency.
 - End-user acceptance of new productions and distribution modules.
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Target 2



R&I TARGET/ACTION

R&I TARGET 2

PROVIDING THE BASIS FOR A MORE PERSONALIZED AND CUSTOMIZED FOOD SUPPLY

IMPACT DIMENSIONS

- Societal strategy that ensures that consumers can eat the food needed to live life to the fullest extent and have the means to do so.
- New knowledge that industry can use in the design of new intrinsically healthy and desirable products that fit into specific lifestyles and provide well-being to consumers.
- Detailed description of the effects of diet and lifestyle on the development of Non Communicable Diseases (NCDs) enabling specific strategies to be designed, developed and communicated in order to attain positive changes.
- Knowledge of the effects of foods on the human microbiome can be employed in positively affecting health via food and diet, bringing a new generation of ingredients and foods from alternative sources that are both sustainably sourced and welcomed by the consumer.

TOPIC 2.1

THE FOOD I LOVE, APPRECIATION OF DIVERSITY IN FOOD AND EATING

- Insight into the similarities and diversity across Europe in what consumers value in food and eating behaviour (mapping diversity in of food appreciation).
- Assessment of the impacts of food appreciation on current food consumption practices in terms of consumers' health, sustainability, trust and food waste.
- Identification of the economic potential of product and service innovation to better answer the diversity in consumer satisfaction at an individual or group level.
- Identification of the opportunities for better food and eating appreciation in out-of-home situations, including institutional environments, and its impact on health and wellbeing.
- Evidence-based recommendations for education programs to increase understanding and recognition of diversity in food appreciation within European culture.

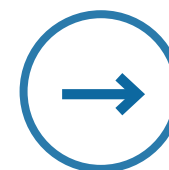
TOPIC 2.2

(TR)EAT ME, DIETARY APPROACHES FOR THE PREVENTION OF NON-COMMUNICABLE DISEASES

- Availability of new, well-accepted and effective, sustainable dietary approaches to prevent NCDs and their related comorbidities.
- Availability of behaviour change models to prevent NCDs and their related comorbidities.
- Availability of an efficient integrated toolbox for identifying the most promising foods to be tested in specific population groups.



Target 2



TOPIC 2.3

PACKAGING 4.0; INTELLIGENT AND COMMUNICATING PACKAGES

- Technologies which are relevant and directly applicable to business end use.
- Technology must be quickly and easily accessible, and its application by the consumer intuitive and acceptable.
- Technology must be affordable and deployable on a large scale.
- Technology must be compatible with packaging materials and formats and should be food application safe.
- Technology must be compatible with recycling packaging.

TOPIC 2.4

IN SILICO FOOD DESIGN; UNDERSTANDING FOOD DIGESTION

- Increased understanding of micronutrient functionality. This may lead to a new generation of ingredients capable of better addressing malnutrition (e.g. hidden hunger).
- Outcome of in silico modelling. This can reduce costs by limiting the extent of intervention studies. It may also reduce the number of animal studies required, thereby addressing animal welfare issues.
- Executed Big Data approaches. These will lead to new insights with respect to synergistic or antagonistic actions of ingredients.

TOPIC 2.5

THE ECOLOGY INSIDE US: FOOD MEETS GUT MICROBIOME

- Provision of a convincing description of the microbiota function, its impact on health parameters and cause-effect mechanisms proposed or elucidated to underpin meaningful health effects for dietary interventions acting via microbiota.
- Development of a methodology to align preclinical research with small human intervention studies in order to 'validate' preclinical assays.
- Building of coherent cases and performing sound experimental studies that address the impact of food structure, function and microbiota on the different components of the gut ecosystem.
- Identification of characteristics of the gut ecosystem (e.g. key microbiota consortia) that can be used to stratify subjects especially for the small scale human studies.
- Meaningful estimates of the health impact of dietary interventions that act via modulation of the microbiota.

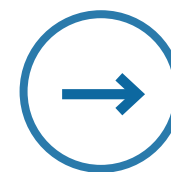
TOPIC 2.6

FOODS FOR TOMORROW: NEW CONCEPTS AND TECHNOLOGIES TO ASSURE CONSUMER HEALTH AND WELLBEING

- Standardized approaches and methodologies to characterize nutritional attributes of outcomes / raw material / foods generated by using new food sources and new processing.
- Validated improved predictive models for effects of (new) processing methods on the retention and transformation of nutrients, and impact on the digestion and bioavailability of micronutrients and macronutrients, and physiological effects.
- Consumer acceptance of new and alternative food sources including the valorisation of under-utilised side streams.
- Validated methods for evaluating the environmental implications of effects of large-scale changes in the supply chain.
- Advances in knowledge of new dietary approaches and promising foods that can be implemented by consumers on a daily basis as part of a sustainable diet.



Target 3



R&I TARGET/ACTION

IMPACT DIMENSIONS

R&I TARGET 3

DEVELOPING A MORE FLEXIBLE, DYNAMIC AND SUSTAINABLE FOOD SYSTEM

- A decrease in the environmental impact of food production
- European food is recognised as being completely reliable.
- Increased trust in the food production chain may make people open to trying out new products and products from new raw materials.
- Europe is the prime trusted region in the world for innovative, sustainable, tasty and healthy food.

TOPIC 3.1

GETTING IT RIGHT: INTEGRATED FOOD SAFETY AS A UNIQUE SELLING POINT

- A decrease in the number of food-borne disease incidences.
- A measurable decrease in food waste (or a measurable efficiency increase of the food system due to less food being lost due to microbial spoilage), and an increased use of side streams.
- An increase in the availability of 'more gently' processed food products.
- Availability of new reliable, predictive models to forecast risk areas and hazard points.

TOPIC 3.2

THE MATRIX MATTERS: FOOD STRUCTURE FOR BETTER HEALTH

- Consumers perceived health benefits due to reduced negative impact of primary processing, optimized bioavailability and enhanced health active substances.
- Consumers preferred food options enabling a lower caloric intake, thus facilitating a healthier lifestyle.
- Increased pool of skilled and knowledgeable European food processing engineers.
- Europe as a food brand: revenues from export of food products and technologies.

TOPIC 3.3

COMING FULL CIRCLE: TOWARDS SUSTAINABLE PACKAGING SYSTEMS

- Reduced food losses and waste.
- Reduced leakage of packaging into environment.
- Reduced packaging-driven environmental impact.
- Improved recyclability of material and infrastructure.
- Decreased proportion of packaging materials not re-cycled or valorised.



Target 3



TOPIC 3.4

IT'S ALL FOOD: EXPECTED IMPACT ALTERNATIVE FOOD SOURCES

- Creation of intellectual property and new businesses.
- Number of viable new raw materials identified.
- Economic feasibility demonstrated.
- Consumer acceptance of new raw materials and production processes has been assessed.

TOPIC 3.5

CHECK IT: NEXT GENERATION STRATEGIES FOR FOOD SAFETY ASSESSMENT

- Quicker, less expensive routes for the assurance of food safety.
- A better understanding of human metabolic pathways and interactions that will allow the prediction of the safety of a food or new components by using in silico models.
- New methods that will enable the minimization or even elimination of animal testing without compromising on food safety.
- Integrated strategies in foodomics, including advanced analytical techniques and bioinformatics which will integrate food safety assessment into a better overall understanding of nutrition.
- More precise methods for the microbiological safety assessment of foods based on the real risk presented by an organism and not only its wider taxonomic status.
- Transparency will increase consumer trust in the food value chain.

TOPIC 3.6

SIMPLY NATURAL: TOWARDS LESS REFINED, MORE NATURAL FOOD INGREDIENTS

- A new class of more natural food ingredients which will support the development of potentially health-promoting food based on preservation of natural functionalities and improved possibilities for individualized food and will have a potentially positive impact on public health systems.
- An increased integration of primary producers in the food production chain which will increase the livelihood opportunities of farmers by increasing the value of crops.
- A renewed focus on the functionality derived from many diverging raw material structures will shift agricultural practices towards an increased valuation of crop biodiversity rather than just yield.
- Support for new job creation and job retention in rural areas will be achieved through down-scaling of processing methods, which will be of particular importance to Eastern Europe, fostering an increased modernization of agro-food chain production methods.
- Consumer trust in the agro-food-industry through generation of a more transparent food system with minimally processed food ingredients and more cleanly labelled food.
- A more sustainable use of raw materials, energy and water, thus positively impacting the environmental effects of food production.



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