ANNEX 2 STRATEGY

UPDATE 2022

THE PARTNERSHIP

The Thematic Smart Specialisation Partnership 'Smart Sensors 4 Agri-food' builds on the expertise of 40+ partners (clusters and research centres) from 17 regions dedicated to support the digital transformation of the agri-food industry, help them make the leap towards Industry 4.0/5.0 and foster the evolution of the agri-food sector into an interconnected, sustainable, resilient, and smart agri-food system in Europe.

TARGET GROUP OF THE PARTNERSHIP

The agri-food system becomes more and more interconnected between different stakeholders (farmer, food processing industry, retailer, consumer/citizen). The need for more and improved tracking and tracing, higher quality standards, prevention of food losses and so on, increase the demand for smart sensor systems for in-line, non-destructive food analysis as well as smart data collection and management and other relevant digital solutions that address their concrete challenges. The ecosystem involved is complex and includes multiple actors with different fields of expertise (Figure 1) .
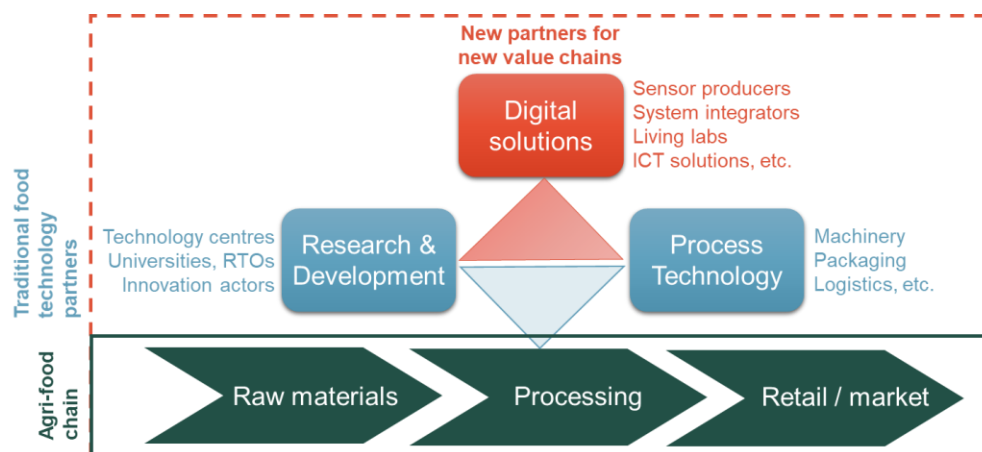

Figure 1 The ecosystem for digital innovation in the agri-food value chain.

With SS4AF, we strongly focus on the food processing industry and in particular the SMEs´ perspective. Their needs and challenges form the basis for the strategy of the partnership. To facilitate and enable the implementation of digital technologies that can provide solutions to the concrete needs and challenges of the food processing industry, other stakeholders play a crucial role, in particular the technical companies (machine manufacturers, digital solution providers).

The SS4AF Partnership connects agri-food clusters and digital and/or technology clusters with the common goal to assist their members to create the best approach possible in dealing with the digital (r)evolution that is taking place. Building on established contacts to the regional actors of the eco-system, the role of clusters is to provide support to their members and they can use the network to find the necessary expertise if it is not available in their own region. Clusters are the facilitators of the interactions between the different players in the digital innovation ecosystem and the first link of the different actors in their region. Via the SS4AF network the creation of a European-wide digital innovation ecosystem is facilitated, enabling connecting to technology centres, living labs, regional authorities and policy makers.

The SS4AF strategy and activities are designed to support the SMEs from the ecosystem for digital innovation in the agri-food sector and more specifically:

1. SMEs from the agri–food value chain pertaining to the food processing industry. This entails both SMEs directly engaged in food processing as well as machine manufacturers that provide equipment to the food processing companies.

2. Technology and digital solution provider SMEs that develop, produce and commercialize advanced technology products and digital applications. Specifically, companies that are innovators and providers of innovative digital solutions, products and services that have the potential to be applied in the food processing industry are targeted. Recent years have shown increasing levels of digital technology permeation throughout the food processing industry and a heterogeneous network of specialised digital solution and service providers forming throughout Europe with limitations, barriers and lack of support in cross-sector and cross-border technology transfer. Via the SS4AF partnership there is a wide link to this type of stakeholders that can be engaged when necessary.

THE CHALLENGES

The European agri-food industry is a key driver in the economic and societal transitions that we are currently undergoing. In order to remain the engine of prosperity, industry must lead the digital and green transitions.

The Green Deal launched by the European Commission aims for a fundamental transformation of Europe and a key element in this policy is a fully sustainable food system as outlined in the farm-to-fork strategy. To achieve the goals set out in the farm-to-fork strategy, the transformation of the agri-food value chain and the entire food system towards smart data usage is a condition sine qua non. In other words: there is no Green Deal without Digital and as such, the agri–food sector in Europe (like other industry sectors) is facing a **twin transition challenge**: becoming greener and more sustainable by fully embracing digitalization.

Food processing companies, as an important segment of the manufacturing industry, are facing challenges to become even more efficient in their production processes, both in the use of resources as in utilizing raw materials as best and efficient as possible, but they also need to be flexible enough to respond to fast changing consumer demands and changes in global value chains. Furthermore, they need to work with the complexity of raw materials, being biological products, often showing large (seasonal) variations, and the transformation of these raw materials into a wide range of high-quality end products with a complex composition. The production process is influenced by various factors and the final product not only needs to be of high quality, tasty and competitive but also –and foremost – it has to be safe for human consumption. Additional challenges include increasing quality demands, traceability, a wider product variety, a constant pressure on costs and delivery times, personnel costs, difficulties to attract specialized personnel, etc. It is of paramount importance for the EU food processing companies to maintain or strengthen their local and international competitive position in global value chains and to be able to respond, in a flexible and efficient way, to fast changing consumer demands, the acceleration of the digital transformation and innovation of the processing system.

Industry 5.0 provides a vision of industry that aims beyond efficiency and productivity as the sole goals and reinforces the role and the contribution of industry to society. It places the wellbeing of the worker at the centre of the production process and uses new technologies to

provide prosperity beyond jobs and growth while respecting the production limits of the planet. It complements the existing 'Industry 4.0' approach by specifically putting research and innovation at the service of the transition to a sustainable, human-centric and resilient European industry. Industry 5.0 empowers workers, as well as addresses the evolving skills and training needs of employees. It increases the competitiveness of industry and helps attract the best talents. It is good for our planet as it favours circular production models and support technologies that make the use of natural resources more efficient. Revising existing value chains and energy consumption practices can also make industries more resilient against external shocks, such as the COVID-19 crisis and the war in Ukraine.

The COVID-19 pandemic further highlighted the need for flexibility and **resilience** and the importance of a high degree of digitalization of the agri-food industry, which can help companies to address COVID-19 impacts that have been felt in all segments of the agri-food value chain: The integration of innovative digital technologies throughout the production system and technological developments within the Industry 5.0 context, such as data analysis and artificial intelligence, offer great potential for real-time process and quality control of ingredients/products and an optimization of production processes to transform the production equipment to a flexible, responsive and adaptive system, while also taking into account the human centric aspect that includes training and skills development for workers as 'end users' of the digital solutions. To this end, the adoption and implementation of innovative digital solutions in the agri-food industry will enhance and support the economic resilience and adaptability of this industry.

Data driven digital solutions are expected to bring numerous benefits to the agri-food industry such as increased efficiency, flexibility and productivity, loss reduction, improved transparency, traceability and overall business performance, more information and added value for their customers, etc. At the same time, these digital solutions have the potential to disrupt the traditional agri-food industry by changing existing business models and potentially crowding out successful ones. For SMEs, which are the backbone of this industry, this poses a particular challenge and requires a step-by-step, sober approach.

OBJECTIVES AND METHODOLOGY

The aim of our Thematic Smart Specialisation Partnership (S3P) is to elaborate and implement a supportive business ecosystem between agri-food clusters and clusters representing technology and/or digital solution providers, relevant RTOs and other stakeholders, to facilitate digital innovation in the food processing companies as enabler to become more sustainable and more resilient. Starting from concrete challenges of the food processing companies, digital solutions that fit to their needs are developed and applied. More specifically, digital transformation in the agri-food industry will be facilitated and stimulated as a means to achieve a more sustainable and more resilient agri-food industry across Europe, turning challenges into opportunities.

Within the agri-food industry an acceleration of the digital transformation and innovation of the processing system is of paramount importance to maintain or strengthen their local and international competitive position and to be able to respond in a flexible and efficient way to fast changing consumer demands. Quality in every aspect is crucial. Awareness in food companies of the 'need to' and 'benefits of' digitalization is increasing. Integrating innovative

sensor technologies in the food production processes in combination with an optimized usage of available data offer significant opportunities towards real time process control, inline product quality control including raw materials and process optimization towards the most efficient use of resources.

Even though food companies understand the importance of digitalization and the hunger to digitalize is present, the path to digitalization, however, is not clear to many of them. One of the main bottlenecks to take the leap towards actual implementation is that in many cases the return on investment is not easy to calculate and often there is no immediate economic return as the added value of the investment is more future oriented.

To accelerate the digital transformation of the agri-food sector and by doing so also the Green Transition, there is a clear need for financial and advisory support that will take away the barriers and hurdles for SMEs in the ecosystem for digital innovation in the agri-food value chain to take the leap towards embracing, implementing and investing in as well as to bring-to-market innovative digital solutions tailored to the needs of the agri-food SMEs. Only through pilot applications the "added value" for companies can be validated and environmental impacts can emerge.

KEY PILLARS OF THE SS4AF METHODOLOGY

The challenges and needs of the agri-food SMEs with regard to digitalization in the agri-food value chain as well as technical thematic priorities have been mapped in the Innosup-1 project S3FOOD (see also SS4AF_challenges_thematic priorities.docx – will be uploaded to SS4AF website). These serve as key pillars of our methodology:

SPECIFIC CHALLENGES OF THE AGRI-FOOD INDUSTRY:
1. Improved resource efficiency
2. Improved quality control
3. Sustainable food production & product
4. Better food safety

THEMATICAL TECHNICAL PRIORITIES:
1. Sensors to monitor real-time critical control parameters
2. Sensor integration and implementation
3. Smart data management
4. Connectivity within food companies and in the agri-food value chain

Taking into account the key element of each successful transformation process – the people involved! – a 5th thematical priority was added, making also the link to industry 5.0:
5. Human centric transformation and implementation strategy

The combination of concrete challenges and thematical, technical priorities form the central theme of all activities rolled out in the framework of the SS4AF partnership. The continuous collaboration between the clusters (or innovation actors providing similar services) and RTOs will create a trust zone between the involved sectors, companies and also regions.

Furthermore, the Partnership will make efforts to secure funding for the work and ensure that the objectives of the Partnership are reached. Next to the investment projects, we will engage in other regional and European projects, to further elaborate our Partnership and roll-out our Strategy and Implementation Roadmap. Projects will be set-up in a transparent and non-

discriminative way within the Partnership, taking into account the rules and guidelines of the respective program and call text.

The digital innovation ecosystem in the agri-food industry

The agri-food digital innovation ecosystem (Figure 2) is regarded as being composed by 3 main stakeholder groups:

1. Actors constituting the core of the agri-food production chain (primary production, food processing, retail, etc.);
2. Process technology supply partners, such as providers of production machinery, packaging, logistics, raw materials supply control, etc.;
3. Research and development partners, such as technology centers, universities, RTOs, etc.
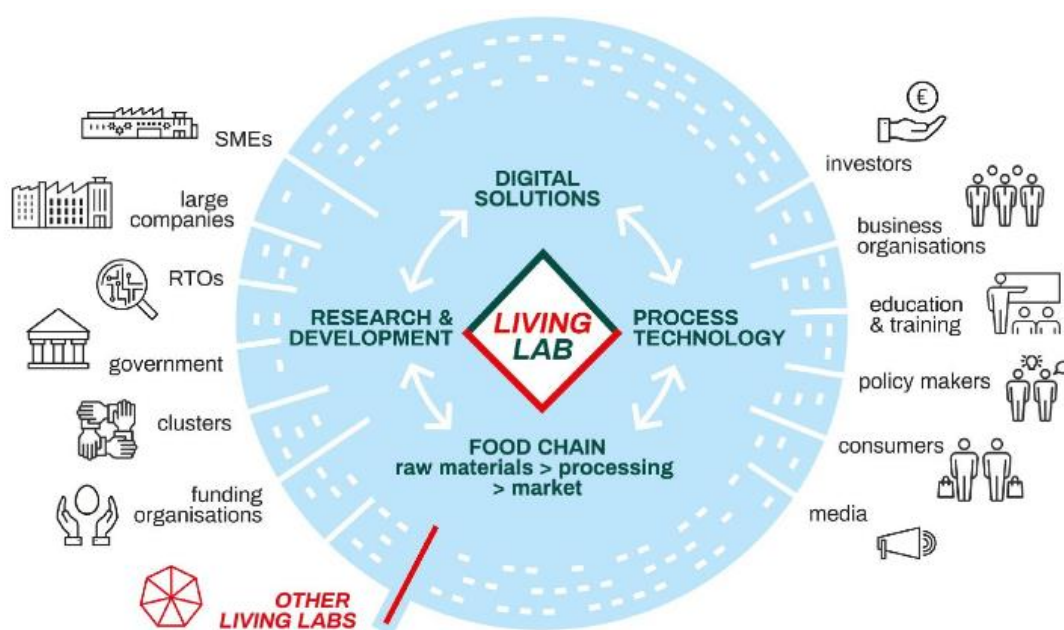

Figure 2 Schematical representation of the ecosystem for digital innovation in the agri-food industry

The relatively recent and 'new' partners in the conventional agri-food digital innovation ecosystem are providers of digital-based solutions, such as novel sensors, systemic integrations, process management and optimization solutions, etc. The recent boom in digital-based innovations for the agri-food industry has placed providers of such solutions as enablers of the creation and exploitation of new value chains, as well as vital actors in the continued optimization of pre-existing value chains. This ongoing growth of the agri-food innovation ecosystem is spearheaded by innovation enablers (such as living labs).

Living labs for digital innovation in the agri-food industry are innovation driven organizations that facilitate and foster collaborative innovation between different stakeholders in the industry 4.0 ecosystem to develop, improve, test and validate digital solutions for specific challenges in the agri-food industry. These living labs are at the center of this ecosystem and can play an important role in connecting the supply side of technological and digital solutions with the demand side in the agri-food industry. All stakeholders involved create the necessary environment to facilitate the implementation, dissemination and exploitation of innovative

solutions. Beside a win-win situation for all, this also leads to more resilient and sustainable SMEs within the agri-food industry. SS4AF sets out to connect already existing, comparable living labs, staffed with competent, multidisciplinary teams, from different European regions. Starting from the specific needs and challenges of the agri-food SMEs, it is our strong believe that the living labs offer the ideal environment to get introduced to new technologies and experience first-hand the potential, opportunities and added value they have in store for specific applications. Competition and duplication within EU regions limit the development of critical scale. It is clear that collaboration between complementary EU regions is more effective, efficient and sustainable than competition.

Also, the start-up and scale-up community will be involved in our ecosystem and new tech companies with fresh and innovative ideas and developments will be closely followed-up by our Partnership.

A special role is also foreseen for the universities and RTOs. Several RTOs are Regular Member of our Partnership or are Associated Organization. They clearly reinforce our community and feed new technologies and digital solutions, available at a lower TRL, into our agri-food system. Our community can be engaged to validate these new technologies and digital solutions and provide feedback for the RTOs.

Overall concept: 5 steps to success

Based on the lessons learned from previous projects and cross-sectoral collaborations, a 5-step model was developed: creating awareness, building a trust zone, evaluation and validation, implementation and leverage creation. These 5 steps are described in more detail here [SS4AF_innovation funnel.docx– to be uploaded to SS4AF website once approved].

SS4AF VALUE PROPOSITION

Via the activities and projects of our Partnership, the network of living labs and linked services, we strongly believe we can better support our agri-food companies and engage them to make the leap towards Industry 5.0 and becoming more sustainable and resilient. If specific knowledge and expertise is not available in the companies' region, they can be put in contact with companies/RTOs/living labs/etc. from another region within our Partnership where this knowledge or expertise is readily available. The Partnership and the bond of trust that exists between the different member organizations will facilitate the exchange of knowledge and results in a larger and stronger supportive ecosystem for the agri-food companies.

We add value to

1. Clusters and innovation actors:

On cluster level the need for cross sectoral collaboration forms the core of all activities that are being developed. The SS4AF Partnership connects food clusters and digital and/or technology clusters with the common goal to assist their members to create the best approach possible in dealing with the digital (r)evolution that is taking place.

The major role of clusters is to provide (business) support to their (company) members and they will be able to use the network to find the necessary expertise if it is not available in their own region. Clusters can also provide support to the Living Labs to connect to other

stakeholders and as such play a pivotal role in this network. Clusters will be facilitators (orchestrators) of the interactions between the different players in the digital innovation ecosystem and the first link to the Living Labs in their region.

Via the SS4AF network the creation of a European-wide digital innovation ecosystem is facilitated in which industry 4.0 conversion of the agri-food sector can be fostered and accelerated. Clusters - initially the SS4AF partners - will have access to the network stakeholders within the ecosystem. Specific initiatives around the 4 thematic priorities of S3FOOD can be developed around the network.

2. Policy makers and lobby organizations (See also 'advocacy and lobby strategy')

Competition and duplication within EU regions limit the development of critical scale in Europe. Collaboration between complementary EU regions is more effective, efficient and sustainable than competition. The SS4AF Partnership and its network of Living Labs has been created in support of the regional strategies on digitalization of the industries and the uptake of industry 4.0 principles in the agri-food industry. All parties of the digital innovation ecosystem are engaged in this network to define the essential investment priorities, on a regional, interregional and European scale. Regional funding bodies will benefit of the decision-making support.

Next to the food processing industry, which is the main target group of our Partnership, the ecosystem of technology and digital solution providers, RTOs, etc. will also clearly gain from and capitalize on this collaboration (see above). As Partnership, engaging organizations active in the different sectors, we always strive for a win-win and look for new opportunities to further strengthen our Partnership and the food processing industry in general.

3. SMEs:

SS4AF offers indirect support to SMEs (food processing companies, technology providers, digital solution providers) via improved and new support structures that clusters and other innovation actors can deploy.