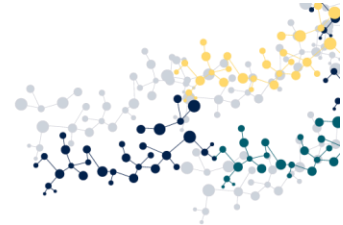


D2.3 Strategic vision and implementation roadmap





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ABSTRACT

The Biotech4Food project, funded by the EU, aims to advance circular agri-food value chains through biotechnological innovations. One of the objectives of the Biotech4Food project is to define a long-term vision and implementation roadmap that will describe actions and activities needed to further enroll biotechnology uptake into the agri-food industry. This strategy and implementation roadmap is designed and structured in a way to be adopted within the implementation roadmap of the Ingredients for a Circular Economy (I4CE) Thematic Smart Specialisation Partnership. In this way we guarantee that the results of the Biotech4Food project will be further elaborated in the future. Deliverable D2.3 sets the scope for the strategic visions and implementation roadmap. This deliverable will be presented in two stages, starting with a draft version by M12 and a final version by the end of the project.

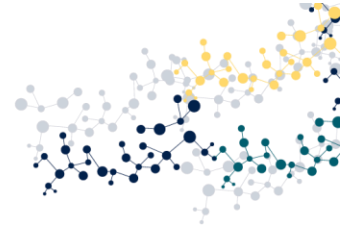
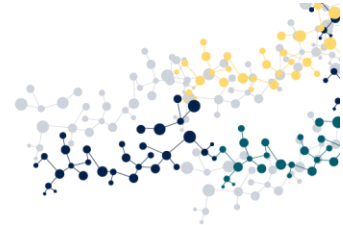


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1. METHODOLOGY

The strategic vision will act as guide within Biotech4Food and will form the basis for the broader strategic vision to be adopted in the I4CE Thematic Smart Specialisation Partnership. I4CE brings together 24 regions interested in initiating and exploring new value chains for the development of circular ingredients for the European agri-food industry. With the Biotech4Food project the focus is set on biotechnology implementation in the European food processing industries. Being a Thematic Smart Specialisation Partnership, I4CE follows a lifecycle that involves 5 phases. These phases can run simultaneously and be repeated whenever needed.

Learn: Regions and partnerships gather insights by mapping their ecosystems, identifying strengths, gaps, and opportunities. This phase lays the groundwork by fostering mutual understanding and building a knowledge base to understanding the ecosystem's capabilities and gaps.

Connect: This phase focuses on fostering partnerships and networks to encourage collaboration and knowledge exchange. Based on the mapping outcomes, regions collectively define a shared strategic vision. This step ensures alignment of goals, fostering collaboration around common innovation priorities.

Demonstrate: Innovative solutions are tested and showcased through pilot projects or demonstration activities. This phase aims to validate ideas, reduce risks, and prove feasibility in real-world settings. Concrete actions are planned, with regions leveraging funding mechanisms (e.g., EU Structural Funds, private investments) to implement the identified projects. Coordination ensures synergy across regional and inter-regional initiatives.

Commercialize: Innovations are brought closer to the market by creating business cases, securing investments, and fostering industry adoption. This step ensures that solutions have clear pathways to market entry.

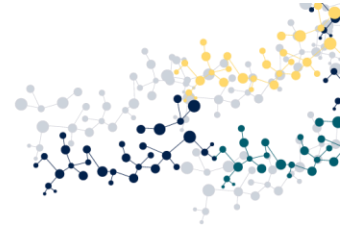
Scale-up: Successful innovations are expanded and deployed across regions and markets, enabling broad adoption and maximizing impact. This phase solidifies the long-term success and competitiveness of the ecosystem. Lessons learned guide adjustments and enhance the partnership's overall effectiveness.

The implementation roadmap describes the methodology on how the Biotech4Food project and afterwards the I4CE Partnership will exploit synergies and common assets between regions, potential cross-border and cross-sectoral collaborations.

To set up a strategic vision on how to implement biotech solutions in the agri-food industry all project partners have been involved to collect data and feedback.

This was done through various ways:

- An online survey answered by over 100 stakeholders focusing on the opportunities and challenges of implementation of biotechnology in the food industry (T2.1).
- In depth interviews with experts from the food industry, biotechnology suppliers and RTOs (T2.1).
- Multi-stakeholder brainstorm sessions organized in each region (T2.1).
- Value chain mapping in Biotech4Food (T2.3), highlighting existing strengths, gaps, and areas for collaboration across regions.
- In-house knowledge of clusters and internal meetings.



2. STRATEGIC VISION & IMPLEMENTATION ACTIVITIES

2.1. Challenges

Although the use of biotechnology in the food industry shows a lot of advantages, the implementation of biotechnology in the food industry still faces some challenges, which hinder its full integration and potential to transform the sector. These challenges fall into several categories, including technological, regulatory, financial, and societal obstacles.

Food industry is often quite traditional, and it is not always easy to implement new technologies. Furthermore, rapid advancements in biotechnology outpace the ability of many organizations to adopt them efficiently. The implementation therefore requires skilled personnel who are trained in advanced biotechnology techniques and their application in food production. This skills gap limits the industry's ability to innovate and scale new solutions.

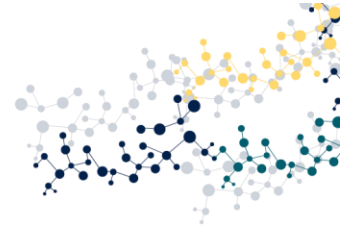
Another significant barrier is the European regulatory framework. In Europe, obtaining approval for novel foods is a lengthy and costly process. The regulatory landscape is also inconsistent across countries, creating additional confusion for businesses trying to comply with varying requirements. The strict regulations on genetically modified organisms (GMOs) in Europe further complicate the introduction of many biotechnological innovations, putting the region at a competitive disadvantage compared to other fast evolving regions like the United States or Singapore, where regulations are less restrictive.

All over Europe, the agri-food industry is typically a small and medium-sized enterprises (SMEs) driven sector. Even 'large companies' are, relatively speaking (in comparison with other sectors), quite small. The high costs associated with developing and scaling biotechnology solutions make them less accessible for many businesses, especially smaller ones. Start-ups and SMEs often struggle to secure the necessary funding to advance their research, pilot projects, and commercial production. The financial risks are compounded by market uncertainties, such as unpredictable consumer acceptance and doubts about the long-term profitability of biotech products.

Societal perceptions and market challenges further complicate matters. Misinformation and scepticism about biotechnological advancements, particularly regarding GMOs and lab-grown ingredients, contribute to consumer reluctance. Many consumers remain wary of these innovations due to a lack of clear and accessible information about their benefits and safety. This resistance is exacerbated by the higher production costs of biotech products, which make them less price-competitive compared to traditional alternatives.

Finally, collaborative and strategic gaps hinder the industry's progress. There is often insufficient alignment between research institutions and the food industry, delaying the commercialization of new innovations. Additionally, the lack of interregional cooperation prevents regions from sharing knowledge, harmonizing processes, and fostering cross-border initiatives that could accelerate the adoption of biotechnology in the food sector. In this aspect the limited access to pilot infrastructures and facilities to scale-up processes in and between the regions is hindering smooth progress in biotech applications.

To overcome these challenges, efforts must focus on creating awareness for all stakeholders, simplifying regulatory processes, improving access to funding and infrastructure, and enhancing public education about the benefits of biotechnology. Collaboration between research organizations, industry players, and policymakers is essential to create an innovation-friendly



environment. Promoting interregional cooperation and developing coordinated EU-wide strategies will also play a crucial role in unlocking the full potential of biotechnology for the food industry.

2.2. Ecosystem

The aim of the Biotech4Food project is to support and accelerate the implementation of biotechnology applications in the food industry. This will be achieved by connecting the food companies, biotech solution providers, RTO's, policy makers, clusters and other stakeholders to lower the barriers for agri-food companies to invest in R&D and access and implement new biotechnology solutions.

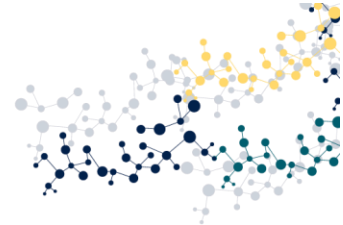
The ecosystem involved in biotechnology in the agri-food industry is complex and includes multiple actors with different fields of expertise. Effective collaboration between these stakeholders is essential to overcome challenges, drive innovation and successfully implement biotechnology in the agri-food industry.

We see the following relevant stakeholders in the ecosystem of biotechnology for the agri-food industry:

- Agri-food companies.
 - o Act as end-users of biotechnology. They integrate these into their production processes to improve product quality, competitiveness and sustainability.
 - o The many small and medium sized SME's often require additional support to navigate innovation ecosystems and access financing.
- Biotechnology solution providers.
 - o Development of tools, technologies and services required to implement biotechnology.
 - o Often act as intermediaries between RTO's and food companies, translating research into practical solutions.
- Universities, RTOs, pilot facilities
 - o Conduct fundamental research, develop innovative biotechnological solutions and offer testing and validation services through pilot facilities.
- Cluster organisations
 - o Facilitate effective innovation through collaboration, by acting as innovation platform that connect stakeholders, organize knowledge dissemination and ideate and coordinate research projects.
- Policy makers
 - o Design and implement regulatory frameworks that enable biotechnology in the food industry.

2.3. Steps towards implementing biotechnology in the food industry

Based on the lessons learned from previous projects and cross-sectorial collaborations, a 5-step model was developed guiding introduction of new relevant technologies in the agri-food industry: creating awareness, building a connected community, upskilling, training and research, development and validation, implementation and leverage creation. These 5 steps coincide with the 5 stages in the development of S3 partnerships. The biotechnology solutions we consider are



available at higher technology readiness levels and ready for demonstration or validation in an industrial environment.

STEP 1: CREATING AWARENESS & IDENTIFICATION OF STAKEHOLDERS

Creating awareness and identification of stakeholders is a continuous process during the whole technology integration and implementation process. The key aspects in this process are:

- Identification of ecosystem and the top players. This has been done in the ecosystem analysis and value chain mapping but is also a continuous process to identify new players. This is done with the support of the involved cluster organizations and other intermediary organizations.
- Identification of specialized clusters and other intermediary organizations (in different regions).
- Inform and convince these organizations to join forces.
- Mapping of joint challenges and opportunities for collaboration.
- Frequent meetings and activities to improve the Strategy and Implementation Roadmap, taking into account new developments and opportunities.
- The deployment of our strategy calls for the collaboration within the defined ecosystem, as well as with regional authorities and regional and national funding agencies.

STEP 2: A CONNECTED COMMUNITY

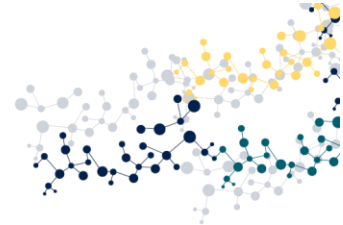
The objective is to bring companies and RTOs together with focus on the implementation of biotechnology solutions for the agri-food industry and in this way improve and increase the awareness. A trust zone will be built between the agri-food companies and the biotechnology solution providers, so the agri-food companies know which support and solutions they can obtain, and the solution providers understand the needs of the agri-food companies.

Activities will include the following:

- Setting up a B2Match platform which will be incorporated and maintained in the activities of I4CE (sustainability).
- Generation and support of innovative ideas, networking and partner matching between agri-food companies, biotechnology solution providers and RTO's. This will be done by the clusters and within follow-up projects in I4CE.
- Organisation of study-visits

STEP 3: UPSKILLING, TRAINING AND R&D

An important step in addressing the challenges that the agri-food industry faces for implementing biotechnology is knowledge build-up. This can be done by upskilling sessions and trainings but also to stimulate R&D at the companies itself and support collaborations with RTOs. This can be done by stimulating companies to participate in research projects, spread information about interesting calls both regional and interregional and support them in these innovation trajectories.



STEP 4: IMPLEMENTATION OF BIOTECHNOLOGY SOLUTIONS

Within the project already 15 biotechnology implementation projects in the food industry are set up. The value chain mapping, study visits, upskilling sessions and other contacts between companies and RTOs will result in the detection of other (interregional) implementation cases that can also benefit from the support and upskilling session organised within the Biotech4Food project and other projects within I4CE.

STEP 5: LEVERAGE

Integration, investments and realizations in the agri-food industry create visibility for all stakeholders and will help to attract new partners for newly defined implementation tracks.

Therefore, the inspirational videos, participation to European events and study visits to RTOs and frontrunner agri-food companies will be organized. Furthermore, the activities, news, events, testimonials, success stories and concrete results will be distributed and disseminated via newsletters, presentations, etc. This will enable the cross-fertilization and speed up the learning process.

2.4. Action points, definition of implementation activities

The in-depth analysis of the regional ecosystems and their stakeholders carried out in T2.1 and T2.2 have resulted in the description of a series of action points that answer specific challenges related to biotech uptake in the food sector. Some of these challenges will be addressed within the scope of the Biotech4Food project, others are situated outside the Biotech4Food project boundaries. The ones not covered by Biotech4Food are to be adopted into a wider implementation plan that will be included by the long-term implementation strategy of the I4CE partnership. Also, there are action points on a higher level where the Biotech4Food project and the I4CE partnership can only have an indirect effect via lobbying, writing policy recommendations and setting a good example.

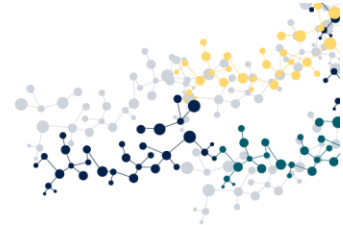
Supportive actions are grouped according to the origin of the challenge behind. This is a non-exhaustive list of proposed recommendations that will evolve in accordance with the developments of the industries in the regions.

2.4.1. LEGISLATION & REGULATION

An enabling EU legislation is crucial to the commercial success of novel foods in the EU. Harmonized regulatory frameworks facilitate uniform compliance. Distinct national regulations can complicate market entry and create competitive (dis)advantages among regions.

Underperforming regions in Europe often lack the regulatory expertise needed to navigate EU compliance processes. Capacity-building initiatives, including training and resources for local regulators, can enable these regions to participate effectively in the biotech landscape. This heavily depends on shared advocacy efforts, supported by dedicated biotechnology associations. Relevant actions:

- Provide information about the current legislation and support in how to set up a novel food application and to find other partners who can support companies in this (addressed within Biotech4Food).



- Encourage policy makers to simplify regulatory framework for both faster access to market and keeping up with the pace of change in science and technology.
- Develop process, product, and data standards that enable iterative improvement and integration and competition with traditional manufacturing processes.

2.4.2.FUNDING/ INVESTMENTS

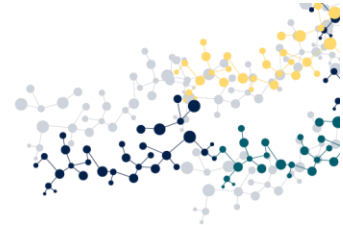
Access to financial resources such as EU grants, private investments, and regional subsidies is pivotal for scaling operations, e.g. cutting-edge research, advanced infrastructure, IP protection, and regulatory authorization, to

- Improve the visibility and alignment of different EU funding schemes and demonstrate how they can be integrated. Inform stakeholders about the possibilities for European/regional funding (addressed within Biotech4Food).
- Inform and educate companies on finding funding and set up matchmaking sessions with investors (addressed within Biotech4Food).
- Introduce a series of measures, such as financial incentives or tax reductions (national/regional), that could be used to help foster investments, whilst public procurement for industrial biotechnology-derived products could help create markets.
- Industry and venture capital alone likely cannot effectively move the needle in advancing the biotech without government support and public-private partnerships. Setup a distinct EU Biotech Investment Fund that could help pool resources from different financing mechanisms such as those available through the European Investment Bank and private funds and help leverage Commission contributions.
- Increase EU grants awareness and stimulate cooperation, attract foreign investments, de-risk investments.

2.4.3.STIMULATE INNOVATION

Regions with strong innovation ecosystems that foster cross-sector collaboration, knowledge sharing, and coordinated advocacy and internationalization efforts, gain a competitive advantage. Interaction between stakeholders and stimulation of knowledge exchange is beneficial to stimulate innovation and uptake of novel biotechnology practices. This advantage catalysed by ecosystem support from dedicated stakeholders like biotechnology and food innovation associations, startup accelerators and incubators.

- Put success stories and good practices more in the spotlight to inspire other companies (addressed within Biotech4Food).
- Stimulate national and/or regional cluster organisations to be involved in interregional public-private partnerships, elaborating projects (like Biotech4Food) that promote biotech use and innovation (addressed within Biotech4Food).
- Investigate the scope for using novel biomass. An assessment of sustainable waste flows is needed. Technologies need to be developed to deal with the inherent variability of waste and residue products (addressed within Biotech4Food).
- Inform and educate companies about the new technologies or new possibilities with existing technologies (addressed within Biotech4Food).
- Stimulate innovation across disciplines (AI, ICT, etc) by accelerating their uptake in biotechnology together with academia and industry.



- Provide financial and tax incentives to companies investing into biotech innovative research.

2.4.4. CONSUMER PERCEPTION & ACCEPTANCE

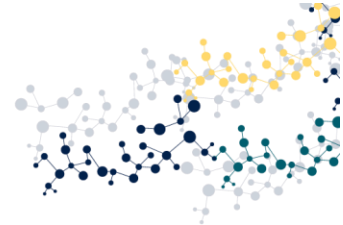
Consumer acceptance of biotech food products depends on perceived safety, health benefits, and ethical concerns. A lack of understanding about biotechnology can lead to scepticism or resistance. Acceptance varies heavily across regions based on cultural norms, dietary habits, and previous exposure to biotechnological innovations.

- Provide correct evidence-based information about the use of biotechnology in food products and showcase different products, such as products made with more traditional biotechnology like traditional fermentation to show that these newer products can also be safe and healthy (addressed within Biotech4Food).
- Targeted information campaigns to customers and end-users can help develop the market, but also to ensure maximum impact (should first ascertain people's understanding to identify the gaps to address).
- Define a coherent strategy to promote the development of biotech products in the EU and one which recognises the benefits that these products can bring without which, biotech products face a challenging route to market.
- Develop an EU wide campaign to improve public awareness and perception of biotech and biotech-derived products (special purpose website, information desk, promotional films, educational material and tools). Identify, leverage and build upon EU capabilities for pilot and demonstration facilities.
- Communicate to consumers (public) about the benefits of biomanufacturing, including for health, economy, environment, and security and build trust around practices and products.
- Engage with non-traditional voices, not within the boundaries of industry, to represent biotech could help demystify the industry. Use public figures, actors, etc. to undertake the actions.

2.4.5. INFRASTRUCTURE

Several regions lack adequate infrastructure for the development of biotechnology and companies encounter difficulties in industrial scaling. Besides the availability of infrastructures, easy and affordable access to these infrastructures is a hindering factor in biotechnology developments.

- Promote funding support for trials at dedicated pilot plant facilities (addressed within Biotech4Food).
- Provide information on possible sale-up facilities for companies and outsourcing of production (addressed within Biotech4Food).
- Set up fundings for companies to invest in infrastructure at pilot and demonstration scale to bring innovative European ideas to market. The I3 calls are a first example but there are other forms of funding possible and necessary for investments in scale-up.
- Try to set up a network between the different RTOs to set up centres of excellence. These centres of excellence could help to enable reproducibility through standardization and best practices for quality control, scaling, and analytics.



- Setting up funding support actions for trials at dedicated pilot plant facilities.

2.4.6.ACADEMIA/ INDUSTRY COOPERATION

Structural cooperation between academia and industry and a structured transfer of technology to the market will support biotechnology uptake. Building up technological knowhow is crucial to establish a solid biotechnology-based food sector. Academic research is necessary to develop evidence-based knowledge and experiences and is supportive to tackle other challenges dealing with regulation/legislation burden and hindering factors in consumer perception and acceptance.

- Stimulate collaboration between industry and public institutes. Sharing the possibilities that RTOs have to offer with industry (part of this document). Set up matchmaking events and invite experts of RTOs at training sessions (addressed within Biotech4Food).
- Industry, academia, and regulatory agencies could be proactive and more effective at sharing data and lessons learned, including for both successes and failures.
- A central portal for sharing resources, successes, and failures could improve communication across industry, academia, government, and the public.
- Creation of living labs and networks focused on biotech to accelerate food biotech uptake.

2.4.7.WORKFORCE

The biotechnology sector is very knowledge intensive and thrives in regions with a skilled workforce, excellent research institutions, and effective technology transfer initiatives. Skills development is consequently a necessary requirement for the establishment of biotechnology-based value chains.

- Develop a workforce which can maintain Europe's competitiveness in biotechnology in close collaboration with excelling academia.
- Ensure the biotech workforce is trained in critical skills, including data science and analytics, process engineering, quality management, technoeconomic analysis, life cycle assessment.
- Provide support funds to help develop biotech-specific teaching programs.

Figure 1 illustrates the ongoing implementation activities within the timeline of the Biotech4Food project and highlights the identified actions aimed at supporting biotechnology adoption in the agri-food innovation ecosystem. These activities target specific stakeholders within the ecosystem and require the involvement of various actors. Moving forward, these cross-cutting actions will be refined at a later stage to align with the thematic priorities outlined in Section 2.5 and can be used to set up actions to strengthen specific value chains. The presented list of activities will be continuously updated and renewed and is structured in a way it can easily be included in the strategy of the I4CE partnership that will further enrol the activities after the duration of the Biotech4Food project. Prioritisation and planning of activities will be done in consultation with the project Advisory Board and other actors and stakeholders in the food biotechnology innovation ecosystem.



Implementation activities Biotech4Food and beyond

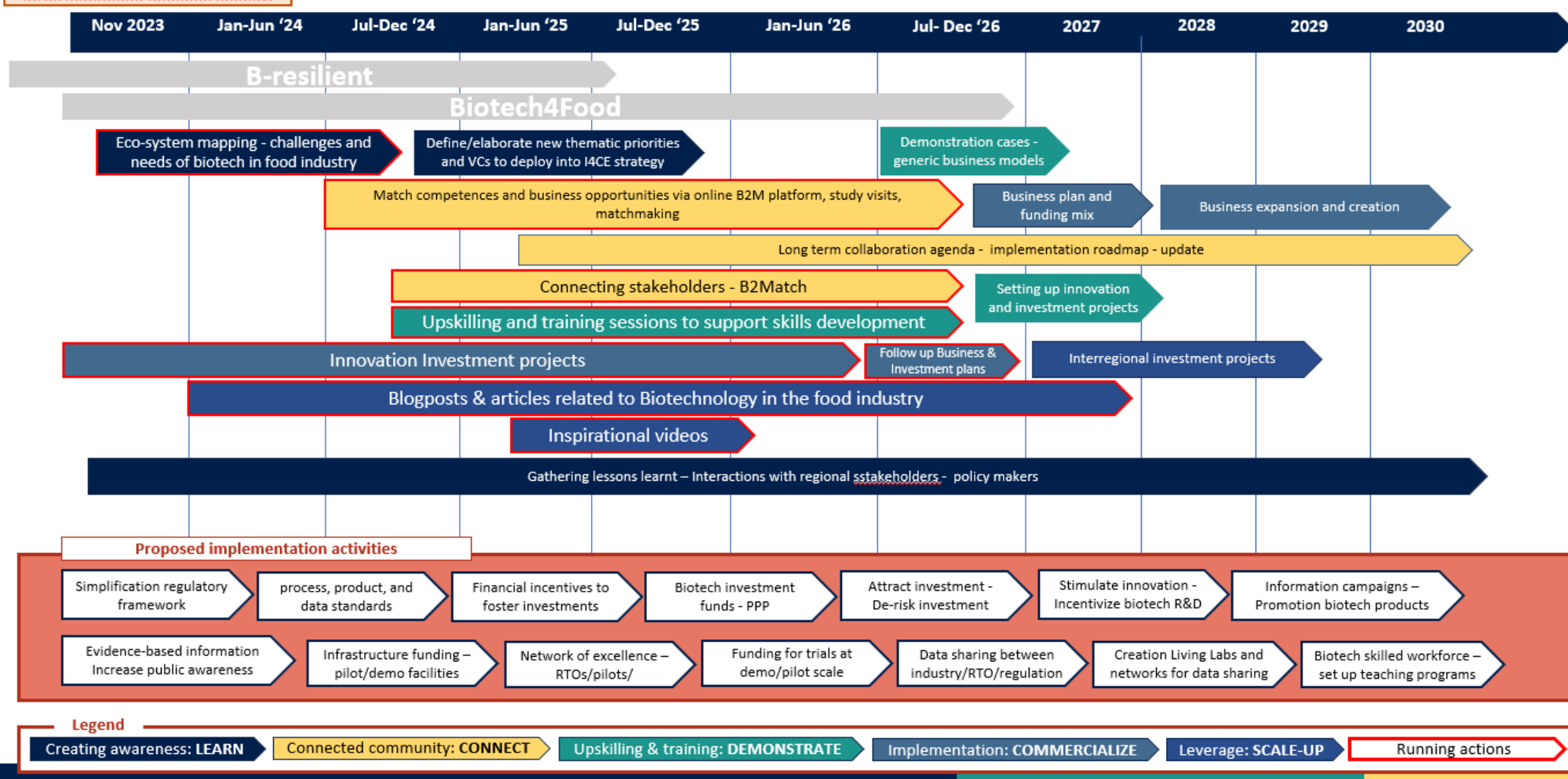
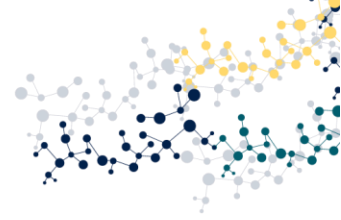


Figure 1: Implementation activities Biotech4Food and beyond



2.5. Thematic priorities in Biotech4Food

Based on the processed information obtained under T2.1 and T2.2 and the value chain mapping, different thematic priorities were defined that will serve as the framework for all activities that will be deployed in the framework of Biotech4Food but are also one of the main thematic priorities for the I4CE partnership and the implementation activities linked to its operation and other projects. The thematic priorities are defined on various levels. The first level is technology-based priorities. The second is ingredient-based priorities. The implementation projects within the project are linked to these thematic priorities and the chosen value chains are in line with these priorities. Next to this, Biotech4Food will also focus on Business management thematics and soft skills.

2.5.1. THEMATIC PRIORITY 1: TECHNOLOGIES

2.5.1.1. FERMENTATION

Europe can be a leader in fermentation-based industries, making it an ideal location to leverage advanced fermentation technologies for economic growth. Traditional fermentation is method that has been used for centuries to produce staple foods like bread, cheese, yogurt, and beverages such as beer and wine, relying on microorganisms to enhance flavour, texture, and shelf life. Next to this more traditional use of fermentation it can also play an important role in the production of biomass and functional ingredients. Biomass fermentation is used to cultivate microbial biomass (e.g., yeast, fungi, or algae) as for example a sustainable protein source. The use of precision fermentation can leverage engineered microorganisms to produce specific food components, such as dairy proteins for animal-free cheese or enzymes for improved food processing. Fermentation enhances the nutritional profile of foods by increasing bioavailability of vitamins, producing probiotics, and reducing antinutritional factors like phytic acid. Across all fermentation types, microbial activity is key to creating complex flavours and aromas.

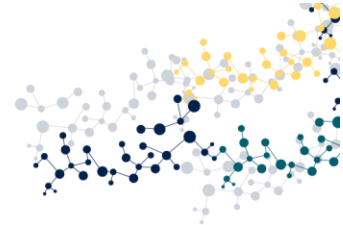
Fermentation aligns with Europe's Green Deal by promoting sustainable production methods for food, biofuels, and biodegradable plastics. Different regions involved in the project boast a high concentration of skilled researchers and institutions specializing in microbiology and biotechnology, ensuring strong support for innovation. There can be a spill-over effect to the less developed regions if we focus on interregional connections and cooperations.

Fermentation processes often utilize renewable resources and waste products, directly contributing to Europe's goal of a circular economy and the main focus of the I4CE partnership. Advancing in fermentation technology can drive new solutions for probiotics, pharmaceuticals, and functional foods, aligning with Europe's focus on improving public health. There is an increasing consumer demand for sustainable and fermented products.

Europe's rich history in fermentation, from traditional winemaking to cheese production, provides a unique cultural foundation to inspire modern technological advancements.

2.5.1.2. ENZYMATIC TREATMENTS

The activities within Biotech4Food but also within I4CE will also focus on the technology of enzymatic treatments. This is a strategic choice due to their potential for innovation and sustainability. Enzymes offer cutting-edge solutions to improve food processing, quality, and nutritional value, while reducing the reliance on harsh chemicals and energy-intensive methods. This aligns perfectly with Europe's sustainability goals and green economy ambitions.



By optimizing production processes, enzymatic treatments not only reduce costs and waste but also provide competitive advantages for European industries. They contribute to food security by enhancing the preservation, yield, and shelf life of products, ensuring a stable food supply.

Moreover, enzymes allow for the customization of food textures, flavours, and nutritional profiles, catering to diverse consumer preferences and dietary needs. They also facilitate by-product valorization, transforming these into valuable ingredients, which is in line with the mission of I4CE.

Enzymatic treatments enable the creation of functional foods, such as lactose-free dairy and low-sugar alternatives, meeting the growing demand for health-conscious options. This approach aligns with European policies promoting bio-based industries and leverages the region's strong expertise in enzymology. Additionally, with increasing consumer interest in clean-label products, enzymatic treatments provide natural alternatives to synthetic additives, resonating with modern market trends.

2.5.2. THEMATIC PRIORITY 2: INGREDIENTS

The abovementioned technologies can be used for the production of different kind of components. Within Biotech4Food, we focus on two main categories : nutritional and functional ingredients. Within I4CE, there is an extra focus on the circular aspect of the final products and the valorization of by-products.

2.5.2.1. NUTRITIONAL INGREDIENTS

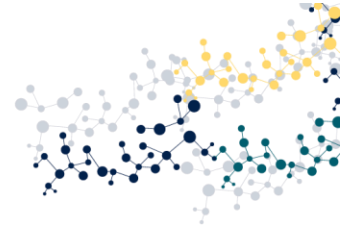
Nutritional ingredients in food are the components that provide energy, support bodily functions, and contribute to overall health. They are typically categorized into the following groups: proteins, lipids, fibres, carbohydrates, minerals and vitamins. These contain a broad group of components. Within Biotech4Food, the main focus is on the macronutrients namely proteins and alternative proteins, carbohydrates and fats. On which ingredients we focus within Biotech4Food is linked to the production process and thus linked with our first priority about technologies.

2.5.2.2. FUNCTIONAL INGREDIENTS

Functional ingredients are bioactive components used to manufacture functional food products (Food & beverage which provide an extra health benefit to the consumer beyond basic nutrition requirements). Food additives contribute to influence taste & flavour, texture, freshness, appearance & colour, and acts as technical agent. Within Biotech4Food the focus is on polysaccharides, antioxidants, amino acid, prebiotics and probiotics. Here is also a clear link with the production of these ingredients and the priority technologies.

2.5.3. THEMATIC PRIORITY 3: BUSINESS MANAGEMENT AND SOFT SKILLS

Focusing on business management skills and soft skills is crucial for successfully implementing biotechnology in the food industry, as technical innovation alone is not enough to ensure market adoption. Understanding market trends and business opportunity identification allows project participants to align biotechnological solutions with current and future consumer demands, ensuring relevance and competitiveness. Identifying public and private funding opportunities is



essential for securing the financial resources necessary to develop and scale innovations, especially in an industry with high research and development costs.

Having regulatory literacy ensures that companies are aware if they need to apply for a novel food application, what this procedure entails and where they can find the support that they need. It is also important that products comply with complex legal frameworks, such as food safety and labelling regulations, which are critical for commercialization in diverse global markets.

Smart business planning and modelling provide the foundation for structuring viable and sustainable ventures, ensuring long-term success. Intellectual property management and strategies safeguard innovations prevent misuse, and create additional revenue streams through licensing or patents. A focus on business continuity planning prepares organizations for unforeseen challenges, ensuring resilience and adaptability in volatile markets and developing the skills to approach and engage investors is vital for attracting the financial and strategic support necessary for scaling biotechnological solutions.

Soft skills foster collaboration and effective communication, which are indispensable for multidisciplinary teams working on complex projects. They also enable professionals to build and maintain networks, connecting with key industry players and thought leaders. This will foster interregional collaborations and connections between more developed and less developed regions.

Moreover, strong management skills contribute to strategic decision-making, helping teams prioritize activities and allocate resources effectively. These skills are necessary to understand and respond to consumer preferences, market gaps, and competitive landscapes, creating a product that resonates with end-users. The ability to integrate both technical expertise and business acumen accelerates the transition from research to market-ready innovations. Finally, equipping professionals with these competencies ensures that the implementation of biotechnology in the food industry not only succeeds technically but can also thrive commercially, achieving maximum impact.