Updating Food Safety priorities through co-creation: insights and proposals from the 2nd EU Food Safety Forum

N Belc[1], PA Luning[2], NM Cito[3], A Moretti[3] and VMT Lattanzio[3]

[1] IBA Bucharest, 5th Ancuţa Băneasa Str.,2nd district 020323, Bucharest, Romania
[2]Wageningen University and Research,Food Quality and Design, Bornse Weilanden 9, 6708WG Wageningen, The Netherlands
[3]Institute of Sciences of Food Production, National Research Council of Italy, Via Amendola 122/O, 70126 Bari, Italy

Rationale

One of the pillars of the FoodSafety4EU project was the design of a coherent Food Safety Strategic Research and Innovation Agenda (SRIA), which prospects emerging food safety issues and addresses consumers' expectations, emerging technologies and policy priorities.
A detailed landscape and gap analysis was conducted, priorities were identified, and a future design of the SRIA was elaborated through a multi-actor participatory approach (*Figure 1*)

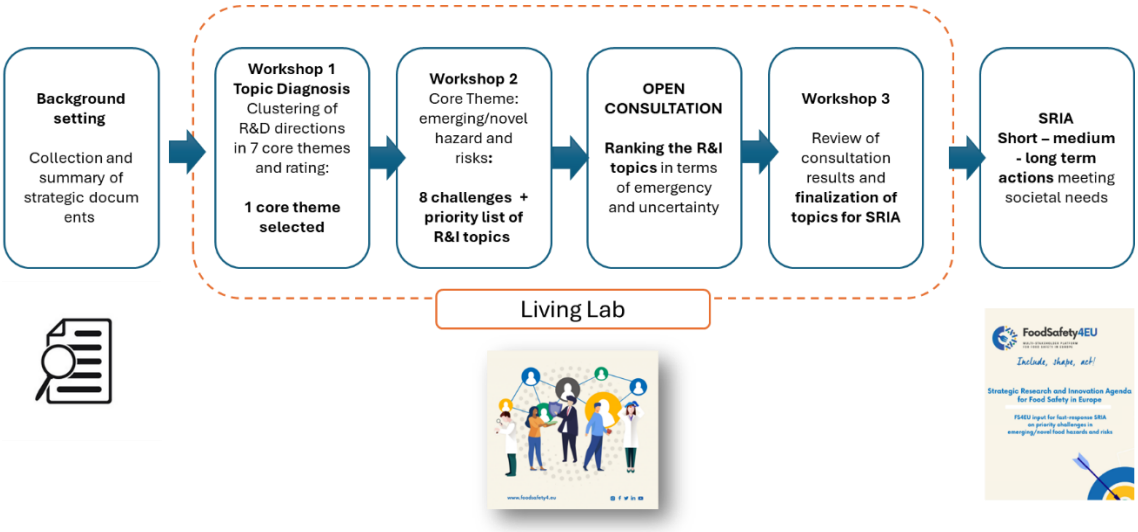

Figure 1 SRIA co-creation methodology applied in FoodSafety4EU

The identified food safety issues, challenges and research needs, as an outcome of the FoodSafety4EU project (in total 81), were further discussed in an interactive session in the first EU Food Safety Forum in Brussels. This resulted in a comprehensive list of eight challenges, each of which unfolded in a list of proposed action plans/measures (R&I topics) to be taken in the long, medium or short term: the so-called FoodSafety4EU SRIA.

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Updating the SRIA: co-creation session at the 2nd EU Food Safety Forum

The process of re-analyzing and re-organizing the 81 R&I topics under the eight challenges is illustrated in *Figure 2*. Starting from both the challenges and the associated topics — and considering the subject matter — it was observed that some topics exhibit limited but specific transversality, appearing under multiple challenges.

For instance, the topic of standardization was identified in Challenges 1, 7, and 8. As a result, one of the topic categories was defined as "Standardization/Harmonization." Following this same logic, all topics were re-grouped into ten new topic-based categories.

1. Standardization/Harmonization
2. Contaminants/Contamination Pathways
3. Hazard/Risk Assessment
4. New Food Sources
5. Food and Food Packaging Waste
6. Food Safety Management
7. Omics Technologies
8. Communication/Consumers/Food System Transparency
9. System Thinking/Integration and Multidisciplinarity
10. Data/Digital Solutions

The analysis also examined how many challenges contribute to each category (blue boxes). It was found that categories addressed between two and five challenges. The categories that addressed four or five challenges were highlighted in yellow, as they collectively encompass 55% of the R&I topics outlined in the FoodSafety4EU SRIA.

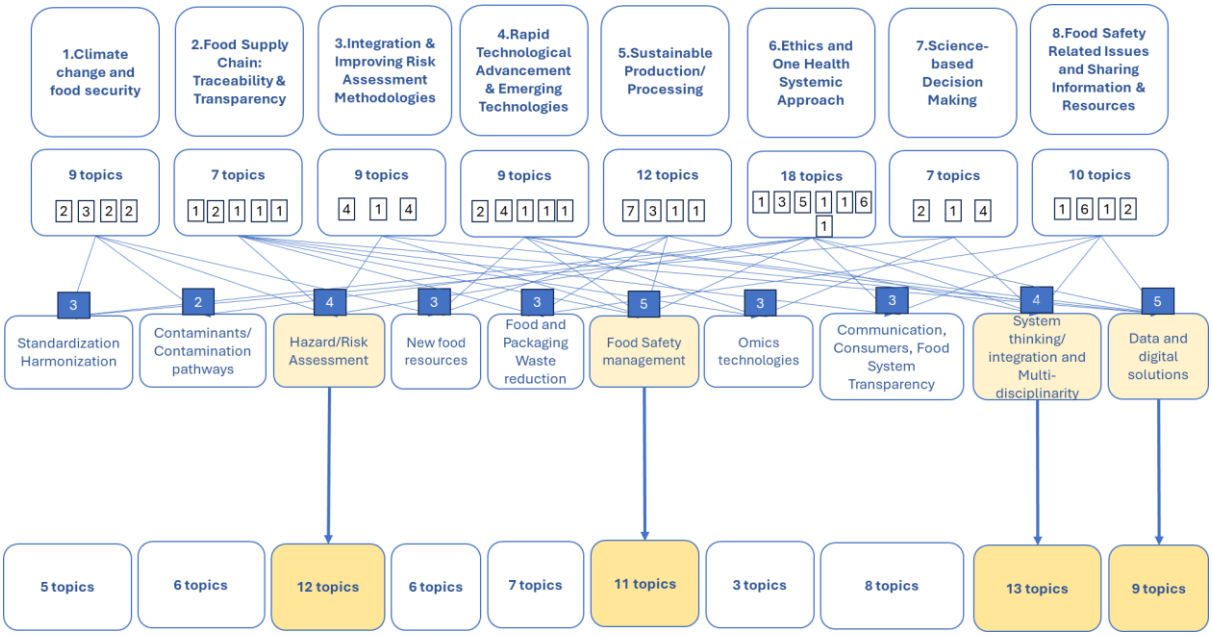

*Figure 2 SRIA topics re-organization from the original 8 challenges into 10 categories The **first layer** refers to the initially defined challenges. The **second layers** refers to the number of topics that were identified under these challenges. Both are the outcome of the co-creation process described in Figure 1. The **3rd layer** shows the newly defined topic categories. The **numbers in the blue boxes** refer to the number of challenges that are addressed in the newly defined category. The **lowest level** shows the total number of topics that were grouped under the new category. Find the first version of the SRIA here: https://doi.org/10.5281/zenodo.10471321*

For the co-creation session, held at the EU Food Safety Forum 2024, the four categories that covered most challenges but also most of the topics, were selected, specifically: 1) hazard/risk assessment, 2) food safety management, 3) system thinking/integration and multidisciplinarity, and 4) data/digital solutions. All of these were meant to be discussed in the context of climate change as illustrated in *Figure 3*.

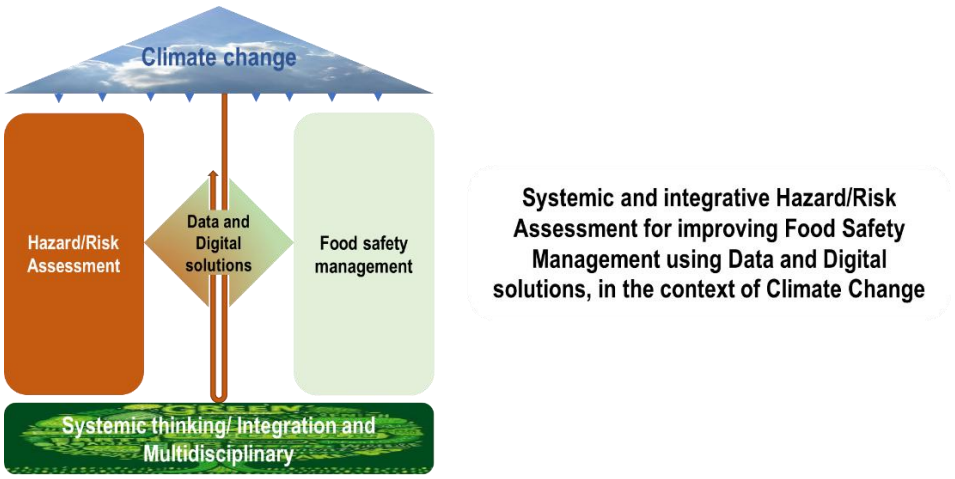

Figure 3: Framework for the elaboration of priority food safety research and policy topics in the co-creation session.

The interactive co-creation session aimed to outline proposals for calls addressing a combination of the topics from all four categories in the context of climate change (see the framework in *Figure 3*). The proposals had to target two different stakeholders:

- One proposal targets **policymakers** to support them in setting policy research priorities.
- The other proposal targets **academia and research** to support them in elaborating research ideas/aligning with other projects, and the current Research and Innovation framework.

The outcomes of the co-creation session were expected to update/refine the FoodSafety4EU SRIA priorities.

Co-Creation sessions' methodology

In the live co-creation session, the Forum participants were split into 4 groups.
Groups A1 and A2 had to target the policymakers/people familiar with legislation/enforcement/policy. This group included representatives from NGOs, as well.
Groups B1 and B2 had to target the researchers, i.e., representatives from academia, research institutes, and industry R&D.
To support the discussion within the groups, posters showing the topics that were clustered into the four selected categories (yellow blocks in *Figure 2*) were displayed.
The working session was organized as follows:

Part I [45 min] - Brainstorming and designing the proposal
Groups A1/A2 – targeted the policymakers/government – they were asked to brainstorm/discuss and outline an overarching policy proposal reflecting on possible advice/recommendations

regarding possible adjustments/changes in policies, f.i. prioritizing policy agenda, identifying bottlenecks, etc.
Groups B1/B2 - targeted the research community – they were asked to brainstorm/discuss and outline an overarching research proposal reflecting on what topics should be studied, and how (approaches), how these topics are interconnected, and what kind of expertise would be required.
The participants had to elaborate on topics that were clustered under the four categories (*Figure 3*), including hazards/risk assessment, food safety management, system thinking and data/digital tools.

Part II [35 min] - Presenting and underpinning the proposal and Q&A (plenary)
Groups A1/A2 and B1/B2 briefly presented and underpinned their proposal in a plenary session. The critical friends (in the audience) were invited to ask questions on usefulness, feasibility, fit with other initiatives, etc.

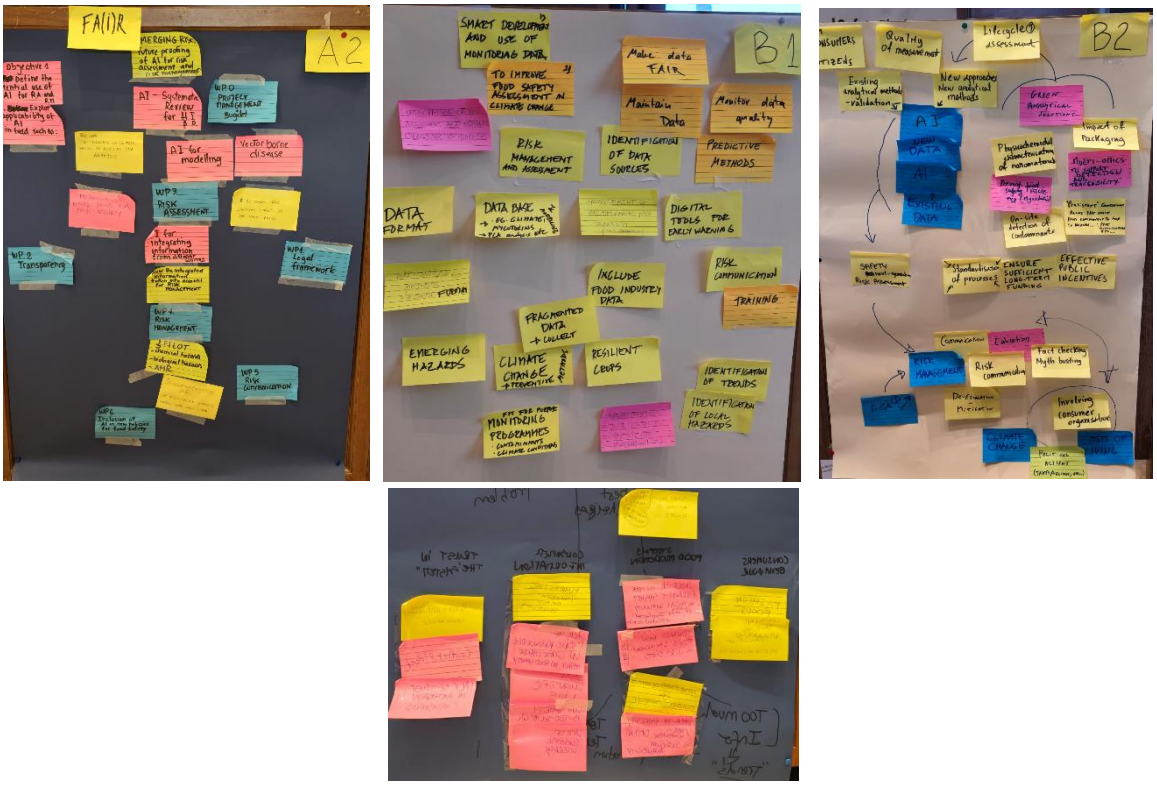

Figure 4: Overview of the participants contributions (groups A1, A2, B1, B2 in four independent flip charts) collected in Part I of the co-creation session

The outcomes of each group were then further elaborated into four proposals for priority setting of R&I topics, which also include the envisaged areas for policy recommendations.

Proposed research outline created by group A1 - target policymakers/government

Title: Enhancing food safety through **Data-Driven Risk Management** and **Climate Resilience.**
This topic focuses on leveraging data-driven approaches to enhance risk assessment and management in food safety, particularly in the context of climate change.
Scope: to improve the integration of monitoring data and develop predictive methods to address emerging hazards, in the context of climate change, by acting on the following key areas:
Data Management and Integration, including monitoring data quality and maintaining comprehensive databases (e.g., climate, mycotoxins, PCA analysis). Integration of food industry data into risk assessment frameworks to enhance accuracy and relevance.
Improved Risk Assessment and Management by integrating climate change impacts on contaminants such as mycotoxins, acrylamide, pesticides, and microbiological hazards. This requires enhanced cross-sectional cooperation among stakeholders.
Climate Resilience, Emerging Hazards and Trend Identification: investigate resilient crops that can withstand climate-induced stressors. Analyze the impact of climate conditions on contaminants to develop fit-for-purpose monitoring programs and intervention strategies

Proposed Actions

- **To develop and maintain integrated data systems**: enhancing risk assessment capabilities by fostering the adoption of harmonized data formats and setting comprehensive and FAIR principle compliant databases (e.g., climate, mycotoxins, PCA analysis). Integrate food industry data into risk assessment frameworks to enhance accuracy and relevance.
- **To develop and/or feed predictive risk management tools** by the deployment of advanced predictive methods and early warning systems to identify emerging hazards and trends. Focus on digital tools and early warning systems to detect trends and local hazards in real-time.
- **To enhance cross-sectional cooperation** among stakeholders to ensure effective risk management strategies.
- **To contribute to a more climate-resilient food system** by i) developing resilient crops and adapting monitoring programs to climate conditions; ii) providing methodologies to identify emerging hazards and trends in food safety risks, e.g. predictive methods using bioinformatics tools, including whole-genome sequencing (WGS) databases, to identify emerging hazards. Utilize data analytics to predict potential risks associated with climate change.
- **To develop policy recommendations**: proposing new/improved frameworks for integrating data-driven risk assessment into food safety policies.

Proposed research outline created by group A2 - target policymakers/government

Title: Advancing food safety and risk analysis through **innovative analytical approaches and data management**
Scope: to improve resilience to food safety risks by developing new analytical approaches, integrating digital tools, to address emerging challenges such as climate change impacts, the environmental impact of food safety measures, and the role of packaging in the sustainability transition. Priority areas to be addressed are:

Analytical Methods and Quality Assurance: by fostering the adoption of green analytical solutions for food safety testing that minimize environmental impact.
Data Management: focusing on the improvement of bioinformatics tools and expanded availability of whole-genome sequencing (WGS) databases to support risk assessment.
Improved Risk Assessment and Management by enhancing predictive methods, integrating multi-omics approaches for detection and traceability across the food supply chain, and implementing digital tools for on-site detection.
Risk Communication and Consumer Education and Engagement to build trust and address misconceptions through fast-checking tools (e.g., myth-busting initiatives).
Policy Actions: supporting data generation and sharing.

Proposed Actions

- To develop and release a suite of **validated green analytical solutions** for food safety testing, improved physicochemical characterization techniques for **nanomaterials in food packaging** and production, new **life cycle assessment (LCA)** approaches tailored for food safety applications, providing a more comprehensive understanding of the environmental footprint of food products and processes.
- To integrate the latest advances in **analytics, bioinformatics and digitalization in risk assessment and management**: by i) applying advanced predictive models for early identification of contaminants (mycotoxins, acrylamide, pesticides, and microbiological hazards); ii) exploiting multi-omics platforms to enhance detection capabilities and traceability across the food supply chain; iii) building network of digital tools for on-site contaminant detection, enabling rapid response to potential food safety threats.
- To **boost bioinformatics tools** through optimized food safety applications, facilitating more efficient analysis of complex **datasets,** e.g. expanded and standardized whole-genome sequencing (WGS) databases for major food pathogens and contaminants, supporting more accurate and rapid risk assessments. To improve and feed food safety databases by collecting fragmented data from diverse sources (e.g., climate data, industry records, research findings), enabling better trend analysis and early identification of emerging hazards.
- To exploit the above tools and approaches in designing **climate-adaptive (fit-for-purpose) monitoring programs** that account for the changing dynamics of contaminants in food systems due to climate change, ensuring long-term relevance and effectiveness of food safety measures.
- To change **food attitude and behavior** through educational programs focused on food safety issues, sustainability practices, and climate change impacts.
- **To develop policy recommendations** for integrating new analytical methods, up-to-date risk assessment tools, and data management systems into existing regulatory frameworks. Propose strategies for ensuring the long-term sustainability of improved food safety measures, f.i. exploring political options such as taxation models or incentives to mitigate risks associated with cost-of-living pressures while maintaining food safety standards.

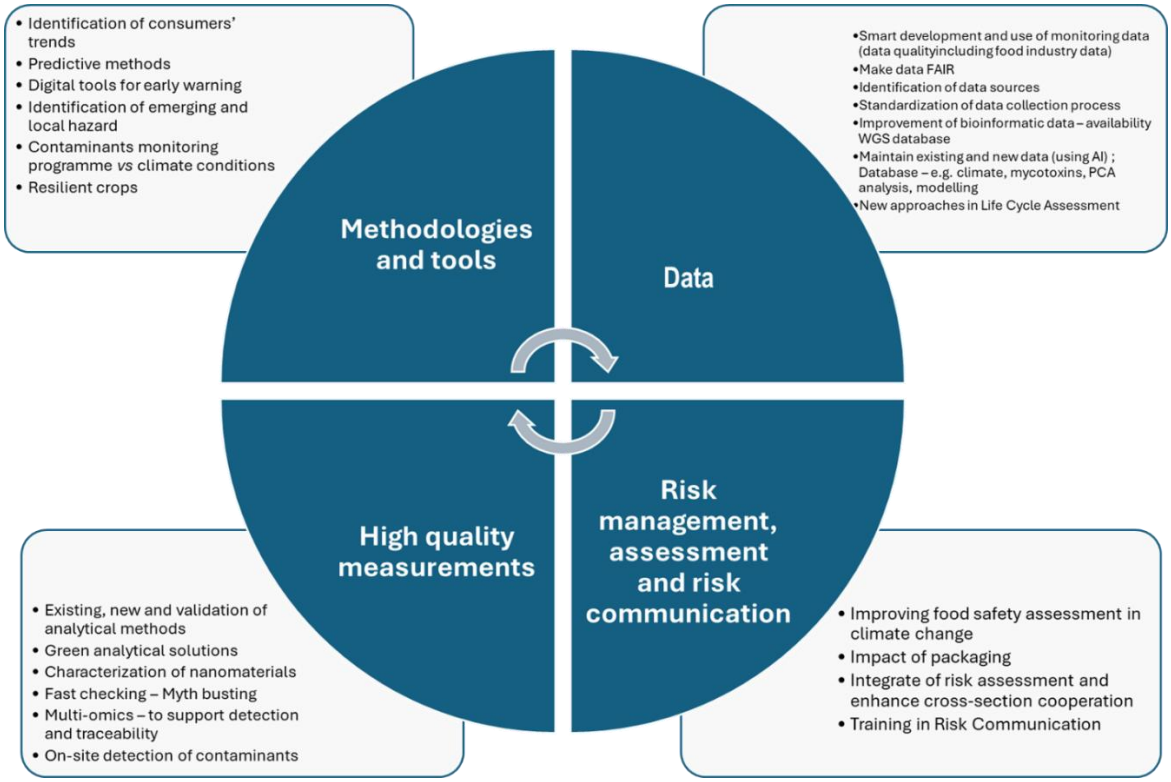

Figure 5 Summary of schemes of the proposed research created by groups A1 and A2 -target policymakers/government

Proposed research outline created by group B1 - *target academia and researchers*

Title: Enhancing the **relationship between food production systems and consumers** to address food safety challenges in the context of sustainability, transparency, and trust.
Scope: to deliver innovative research and solutions to bridge the gap between food production systems and consumer expectations, focusing on:
Sustainable and Healthy Diets: through the deployment of food production technologies that promote sustainable, diverse, and healthy diets while ensuring physical and economic accessibility.
Transparency and Traceability to foster innovative food production systems by rebuilding consumer trust by addressing concerns over conflicting interests, policy ignorance, and marketing practices.
Consumer Behavior and Literacy: to overcome consumer attitude towards "fashion foods" and inertia regarding adopting sustainable practices by enhancing public knowledge about climate change impacts on food safety and improving scientific literacy on these topics.
Trust in Authorities: to address declining trust in food safety systems by fostering collaboration among policymakers, scientists, food producers, and consumers.

Proposed Actions

- Development of **innovative solutions** for sustainable food production systems that meet consumer demands for health, diversity, and affordability.

- Implementation of enhanced **transparency mechanisms** in food systems to improve traceability and rebuild consumer trust.
- Effective **communication and engagement strategies** tailored to diverse **consumer** categories to overcome inertia in changing dietary choices.
- Strengthened collaboration across stakeholders, including authorities, for a **more inclusive and trustful decision-making process**,
- To develop **policy recommendations** to align food production systems with sustainability goals while addressing societal concerns.

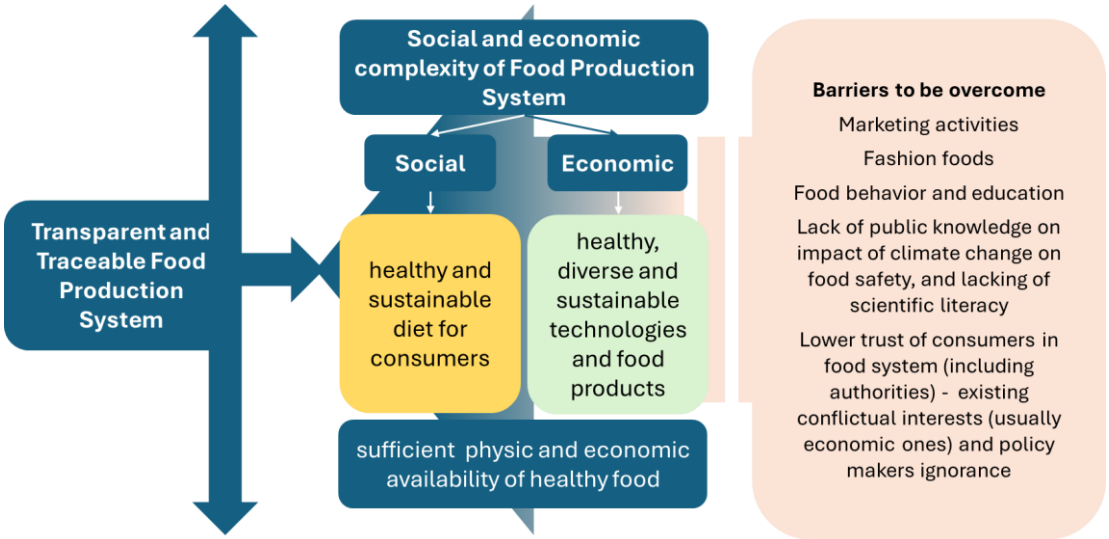

Figure 6 Scheme of the proposed research created by group B1- target academia and researchers

Proposed research outline created by group B2- *target academia and researchers*

Title: Harnessing **artificial Intelligence for enhanced food safety risk analysis** (assessment, management and communication). This topic focuses on leveraging artificial intelligence (AI) in food safety risk analysis by addressing emerging challenges in food safety, including climate change impacts, novel food sources, and the complexity of the supply chains.
Scope: to explore the application of AI in the following areas:
Risk Assessment by integration of AI-powered tools to analyze and predict risks associated with chemical hazards, biological hazards, and antimicrobial resistance (AMR).
Risk Management through integrated AI systems for real-time monitoring and decision-making.
Risk Communication by implementing AI-driven communication tools to effectively convey complex scientific information about food safety risks to diverse audiences.
Transparency and Traceability: leveraging AI and blockchain technologies to enhance transparency and traceability across the food supply chain; building consumer trust by ensuring accountability through data-driven insights and communication.
Policy Integration by proposing new frameworks for incorporating AI into new policies for food safety, including incentive models to accelerate adoption across the food value chain.

Proposed Actions

- **To develop advanced AI tools for risk assessment** that integrate diverse datasets to predict and manage emerging food safety risks effectively. Utilize AI for systematic reviews and integration of diverse data sources (e.g., climate data, vector-borne disease patterns) to identify emerging risks. Model chemical threats in the food value chain using AI to enhance predictive capabilities.
- **Improve/optimize the risk management systems** by integrating AI systems for real-time monitoring and decision-making; testing the integrated systems through pilot studies addressing chemical hazards, biological hazards, and AMR.
- To build **enhanced AI-enabled communication mechanisms** improving public understanding of food-related risks and providing access to traceable and accountable food systems.
- To develop **policy recommendations** for integrating AI into regulatory frameworks to future-proof risk assessment and management practices.
- Innovative applications of AI in assessing novel foods' safety and addressing climate-induced changes in agriculture.

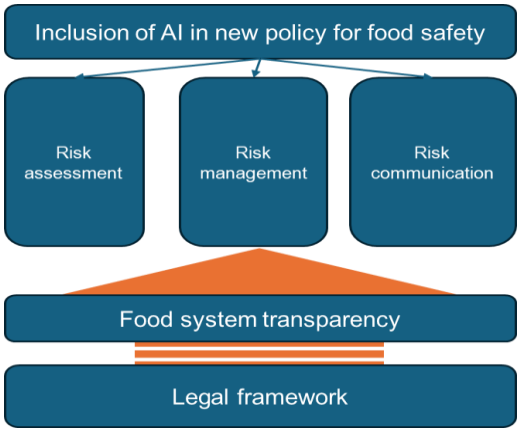

Figure 6 Scheme of the proposed research created by group B2- target academia and research

Conclusion

The active engagement of a wide variety of motivated stakeholders attending the Forum personally and the informal setting were key to the success of this co-creation session. By bringing together diverse perspectives and expertise from experts and stakeholders across the food system, the Forum fostered a collaborative environment where shared challenges could be openly addressed and pathways for innovative solutions development proposed.

These outcomes reflect the urgent need to address food safety challenges in the context of climate change, leveraging advanced data management, innovative analytical approaches, and enhanced stakeholder collaboration. The proposals developed during this session will help guide future research priorities and policy actions, ensuring that Europe's food safety system remains resilient, adaptive, and aligned with societal needs.