CATALYSE Project - Grant Agreement 101136754

HORIZON-CL6-2023-FARM2FORK-01

Project Number 101136754

D5.1 – Chapter on the CATALYSE CoP for alternative dairy products

Co-funded by the European Union

Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Research Executive Agency (REA). Neither the European Union nor the grating authority can be held responsible for them. Project number 101136754.

Project funded by

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Federal Department of Economic Affairs, Education and Research EAER
State Secretariat for Education, Research and Innovation SERI

Swiss Confederation

UK Research and Innovation

This project has received funding from UK Research and Innovation (UKRI)

Project Documentation Sheet	
Project	Catalysing scientific innovation into food safety action
Acronym	CATALYSE
Gran Agreement nº	101136754
Call identifier	HORIZON-CL6-2023-FARM2FORK-01
Start date of the project	1 January 2024
Duration	36 months
Project Officer	Ciara Phelan
Coordinator	Daniela Bassi
Consortium partners	Università Cattolica del Sacro Cuore Universidade Católica Portuguesa International Life Sciences Institute European Branch AISBL Wageningen University Nofima AS Stichting EFFoST Federación Española de Industrias de la Alimentación y Bebidas Syreon Kutato Intezet Korlatolt Felelossegu Tarsasag Ruokavirasto Slovenska Polnohospodarska Univerzita V Nitre Association Nationale des Industries Alimentaires FoodDrinkEurope AISBL Flanders`Food Ag Nationale Securite Sanitaire de LAlimentation de LEnvironnement et Du Travail Public Organization Association of CheeseMongers and Cheese Sommeliers Eidgenoessisches Departement Fuer Wirtschaft, Bildung und Forschung Quadram Institute Bioscience

Deliverable Documentation Sheet	
Number of deliverable	D5.1
Title	Chapter on the CATALYSE CoP for alternative dairy products
Related WP	WP5
Lead Beneficiary	Agroscope
Author(s)	Agroscope
Contact email	helena.stoffers@agroscope.admin.ch; ghazal.nemati@agroscope.admin.ch
Type of the deliverable (specific activities or results, data management plans, ethics or security requirements, others).	DEM — Demonstrator, pilot, prototype
Dissemination level (Sensitive – Public)	Public
Due Date	31 – 07 - 2025 (M19)
Date of submission	30 - 08 - 2025
Status of the document	Final
Version	1.0 – Nemati- Looser- Stoffers Creation of document 2.0 – Revision by Agustina Sarquis 3.0 – Final document

Executive Summary

The transition to sustainable food systems has increased interest in plant-based alternatives. However, this shift presents major challenges related to food safety, production practices, innovation, and the transfer of knowledge into practical application. In particular, there are significant scientific gaps concerning plant-based alternatives regarding processing, quality of raw materials, nutritional value and analytical methods. Many established practices on milk-based products require revalidation or adaptation to meet the specific needs of alternative products.

This chapter presents the coordinated actions of the CATALYSE Community of Practice (CoP) and Agroscope to support a safe and effective transition to plant-based dairy alternatives. These efforts are built around three core strategies:

- **Collecting and curating existing knowledge**, including a continuously updated database of scientific resources.
- **Identifying knowledge gaps and reacting on future strategic research planning**, with a focus on microbiological risks, functionality, and product quality.
- **Bringing experts together** through stakeholder events and cross-sector collaboration to co-develop practical solutions and guide future directions.

By combining these approaches, the Catalyse CoP provides a solid foundation for knowledge-driven collaboration, supporting the development of safe, high-quality, and trusted plant-based dairy and meat alternatives in a sustainable and forward-looking manner.

INDEX

LIST OF ABREVIATIONS 5

1. Introduction 6

2. Methodology 7

2.1 Sharing knowledge: A curated set of articles and continuous screening using AI 7

2.2 Functional support: background Research and Innovation for Plant-Based alternatives. 7

2.3 Recent research: Insights from a study on *Bacillus cereus* in plant-based cheese alternatives 8

3. Future Activities 9

3.1 Prototyping and research: a master plan developed for next 4 years through several supporting projects for plant-based alternatives. 9

3.2 Building community of experts by ILSI: Guidance on spore-forming bacteria and risk mitigation. 9

3.3 Connecting and matchmaking through events: Stakeholder engagement activities, including the Swiss Food Research event. 10

4. Conclusions 11

LIST OF ABREVIATIONS

CoP: Community of Practice
SMEs: Small and medium-sized enterprises
WP: Work Package
BSL: Biosafety level

1. Introduction

The transition toward more sustainable food systems is driving growing interest in plant-based dairy alternatives. However, this shift brings significant challenges: ensuring microbiological safety, supporting artisanal producers, fostering innovations that enable the change, communicating through appropriate channels, and effectively matching innovations with users in the industry. Addressing these areas is essential for achieving a safe, acceptable, and successful transition to alternative products.

To address these challenges in food safety innovation, the CATALYSE project has developed a Community of Practice (CoP) dedicated to facilitate cross-sector collaborations, knowledge exchange, and the sharing of innovative solutions. In addition, insights from the CATALYSE Stakeholder-Engagement Strategy helped identify the main needs and priorities of food system actors, shaping the priority areas of the CATALYSE-CoP. Among the identified focus areas, one subarea is being develop about "*alternative dairy products*" to connect stakeholders, foster collaboration, educate actors across the food system, and generate new knowledge required to support this transition.

These activities facilitate expansion of the entire innovation and implementation pathway of the food system, starting from generating the foundational knowledge and protocols that enable small producer to transition safely, and progressing through research, prototyping, knowledge sharing, functional support, and stakeholder engagement.

Specifically, this "*alternative dairy products*" chapter or focus area presents the following key contributions:

- Sharing knowledge: A curated set of articles and continuous screening using AI.
- Functional support: background Research and Innovation for Plant-Based alternatives.
- Recent research: Insights from a study on *Bacillus cereus* in plant-based cheese alternatives.
- Prototyping and research: a master plan developed for next 4 years through several supporting projects for plant-based alternatives.
- Building community of experts by ILSI: Guidance on spore-forming bacteria and risk mitigation.
- Connecting and matchmaking through events: Stakeholder engagement activities, including the Swiss Food Research event.

These coordinated activities aim to provide the scientific, practical, and collaborative foundation needed for a safe and innovative transition toward plant-based dairy alternatives.

2. Methodology

2.1 Sharing knowledge: A curated set of articles and continuous screening using AI

To support knowledge exchange within the CoP, Agroscope prepared a selection of 30 articles and abstracts, which were made available in the database as a subarea of *Alternative dairy products* including content about contaminant, method of analysis, nutrition and control measures. These articles support to form the foundation for sharing insights on microbiological safety, innovation, and practical guidance in the field of plant-based alternatives.

Importantly, this collection, as all the CATALYSE database of knowledge, is a dynamic open-access space: it will be expanded and continuously updated using an AI-based semi-automated screening methodology that transforms dispersed food-safety innovations into a coherent, searchable knowledge developed in Work Package (WP) 3. This semi-automated update system through KNIME workflows with Large Language Model assistance ensures that the CATALYSE-CoP will offer to users rapid, high-quality access to emerging food-safety solutions in all the relevant areas, including novelty in dairy alternatives.

link of CoP: https://catalyse-cop.eu/

2.2 Functional support: background Research and Innovation for Plant-Based alternatives.

In addition, for this plant-based topic, all the consortium members bring further expertise, technologies, and resources that support and foster the transition to plant-based dairy alternatives. Some of these contributions are from Agroscope partner, which their long-standing experience in food fermentation, microbial cultures, analytical methodologies, and value chain development, directly align with and strengthen the objectives of the CATALYSE-CoP.

Key additional contributions include:

- **Hybrid Technology Development:** Agroscope has developed a hybrid cheese technology that combines traditional cheesemaking methodology with the inclusion of plant-based raw materials. This approach enables producers to develop innovative products that partially substitute animal-based ingredients with plant-based raw materials, thereby supporting more environmentally sustainable solutions with a reduced carbon footprint. The technology has been further developed in the SATW *Food 4.0* program (*HybPiKäs* project), providing a foundation for hybrid cheese innovation.
- **Vegan Surface Cultures and Fermentation Expertise:** This innovative culture, is developing to meet the needs of artisanal and SME producers during this transition, facilitates the safe and effective production of plant-based cheese alternatives. At the same time, research has been conducted on some available cultures that are able to function in plant-based alternatives, such as Agroscope vegan starter culture PDF.

  These cultures exemplifies CATALYSE-CoP role in bridging the gap between science and practice, ensuring that even small producers can maintain food safety, quality, and innovation for producing dairy alternatives.

- **Analytical and Sensory Evaluation of Plant-Based alternatives:** comprehensive studies of plant-based drinks on the Swiss market, assessing their nutritional composition, sensory attributes, and evaluating consumer acceptance. This new knowledge and characterization of plant-based alternatives supports the development of safe, nutritious, and appealing alternatives.
- **Breeding and Value Chain Development for Oilseeds:** As part of its broader role in supporting Swiss agriculture, Agroscope evaluates and recommends rapeseed and sunflower varieties for cultivation in Switzerland. This ensures high-quality, locally sourced plant ingredients for use in plant-based alternatives and supports the development of sustainable supply chains.

These additional knowledge and innovations strengthen the CATALYSE-CoP and the wider food system by providing practical tools, novel technologies, and scientific expertise to help producers meet the challenges of the plant-based alternatives transition.

2.3 Recent research: Insights from a study on *Bacillus cereus* in plant-based cheese alternatives.

In CATALYSE-CoP, knowledge and research developed by the project's members is being included, with the aim of improving discussions and collaborations between researchers, innovators, policymakers, and industry employers. The goal is to facilitate networking and the implementation of food safety improvements from farm to fork.

An example of such a contribution is the research recently conducted by Agroscope partner: a study on the microbiological safety of plant-based cheese alternatives, focusing specifically on the behavior of *Bacillus cereus*.

The study analyzed the contamination of plant-based cheese alternatives with *Bacillus cereus* and potential mitigation strategies. The research aimed to address microbial safety concerns that may arise during production and storage of dairy-free products. A sunflower-seed-based paste was selected as the model system product.

The main goal of the project was to evaluate potential control measures by fermentation of the product using Agroscope acidification culture (to a pH of 4.9), which effectively inhibited the growth of *B. cereus*. In addition, during storage, the existing population of vegetative cells continued to decline and no associated increase in spores' formation was observed.

This research provides science-based solutions to enhance food safety, ensuring the production of safer, high-quality products, facilitating innovative, energy-efficient food safety strategies that maintain product quality while promoting sustainable processing practices.

This study will be shared "translated" in a simplified vocabulary in the CATALYSE-CoP *alternative dairy products* topic, to be accessible and understandable to all the users and stakeholders of the platform with the final goal of promoting knowledge and innovation in food safety ecosystems.

3. Future Activities

3.1 Prototyping and research: a master plan developed for next 4 years through several supporting projects for plant-based alternatives.

In the field of dairy alternatives, there remain significant gaps in scientific knowledge—particularly concerning raw materials, processing techniques, and analytical methods. Many existing practices require revalidation or adaptation to the specific characteristics of plant-based matrices. To tackle these gaps, Agroscope has launched a series of interdisciplinary research and prototyping projects, structured under its Master Plan 2029. These initiatives aim to support the development of safe, high quality, and innovative plant-based alternatives.

The Master Plan covers several priority areas, including ripening platforms for plant-based cheese alternatives, hybrid plant-protein alternatives, fermentation-based valorization of Swiss foods, innovations for mountain agriculture, protective surface cultures, knowledge transfer mechanisms, detection of staphylococcal toxins, the development of vegan raclette cheese, development of BSL2 & BSL3 pilot plant and Lab and challenge tests. Research activities are carried out at pilot scale using integrated risk assessment methods and practical interventions. A special focus is placed on supporting SMEs and artisanal producers in navigating the technical and safety challenges involved in transitioning to plant-based alternatives production.

Beyond food safety and functionality, these projects also generate critical data on cross-contamination risks, nutritional quality, digestibility, and the development of suitable fermentation cultures for plant-based alternatives. Together, these efforts contribute directly to the goals of the CATALYSE project by advancing applied research and developing practical solutions.

Through the CATALYSE-CoP, these research outcomes are shared and further leveraged. The CoP supports Agroscope by enhancing knowledge transfer, stakeholder engagement, and platform visibility, ensuring that the scientific results are accessible, actionable, and aligned with the evolving needs of industry and policy.

3.2 Building community of experts by ILSI: Guidance on spore-forming bacteria and risk mitigation.

Understanding and controlling spore-forming bacteria is critical for ensuring the microbiological safety of plant-based alternatives. A proposal has been submitted to ILSI Europe for developing a comprehensive guidance document for industries on spore-forming bacteria in food. This concern is becoming increasingly relevant for plant-based dairy alternatives, where microbial loads and spore counts can be significantly higher (up to 1000 spores/g instead of 1–10 spores/mL typically found in raw milk). As spores are very heat resistant a severe heat treatment is necessary. But such intense treatment has negative impact on several nutritional components and protein denaturation. Therefore, alternative inactivation and control measures are needed.

This activity aims to:

- Identify foods of concern for pathogenic and spoilage spore-formers.
- Distinguish between pathogenic, spoilage, and beneficial *Bacillus* and *Clostridium* species.
- Analyze the contribution of raw materials and processing steps to risk mitigation.
- Highlight data gaps and propose risk mitigation strategies.

This work will be shared in CATALYSE-CoP and is timely for our stakeholders given the increasing microbial loads observed in plant-based alternatives and the unique challenges posed by minimal processing, which is an interesting topic to discuss and foster collaboration for finding innovative solutions inside CATALYSE ecosystem.

3.3 Connecting and matchmaking through events: Stakeholder engagement activities, including the Swiss Food Research event.

Facilitating connections between research, industry, policy, and innovation actors is a cornerstone of the CATALYSE project approach. Achieving a safe and innovative transition to plant-based dairy alternatives requires not only generating knowledge but also ensuring that this knowledge reaches and engages the right stakeholders, from SMEs and start-ups to large producers, regulators, and researchers.

To enable these connections in Switzerland, Agroscope made partnership with organizations that specialize in fostering collaboration and transferring innovation into practice. One key partner in Switzerland is Swiss Food Research, an independent innovation network dedicated to advancing the Swiss agro-food system. It brings together more than 200 members, including academia, industry, start-ups, and policy makers. Its mission is to accelerate innovation *from idea to application*, offering expertise in identifying emerging trends, connecting partners along the value chain, supporting funding applications, and translating research into marketable solutions.

This collaborative and practical approach directly complements the goals of the CATALYSE-CoP in direction of providing scientific, functional, and organizational support to SMEs and other stakeholders navigating the transition to plant-based alternative production. By engaging with Swiss Food Research, CATALYSE can leverage their networks, expertise, and innovation infrastructure to ensure that research results (such as the *B. cereus* study) reach the industry actors who can apply them effectively.

As a concrete step in this collaboration, CATALYSE, Agroscope and Swiss Food Research are co-organizing an Event in Bern in November 2025, This event will:

- Introduce the CATALYSE-CoP as a cross-sector platform for collaboration and innovation.
- present Agroscope's project conducted in alternative plant-based alternative challenges.
- Showcase ongoing research results and practical solutions, in Swiss food research networks.
- Use the trusted and neutral position of Swiss Food Research to foster open dialogue, practical matchmaking, and actionable outcomes for all participants.

Through this partnership and the upcoming event, CATALYSE, Agroscope and Swiss Food Research aim to strengthen the connections between knowledge creators and users, ensuring that safe and innovative practices in plant-based dairy alternatives are effectively implemented across the food system.

4. Conclusions

The transition to plant-based alternatives represents a significant opportunity to build a more sustainable food system. However, it also exposes many gaps and challenges that cannot be solved by individual actors alone. Food safety, quality, and innovation in plant-based alternatives require a collective effort to bring together all available expertise, knowledge, and competencies.

Current knowledge on plant-based alternatives is fragmented and often insufficient to fully address the unique risks and complexities of these products. This gap highlights the urgent need for a dedicated community of experts and practitioners who can collaborate to strengthen the scientific and practical foundations of the field, as CATALYSE-CoP. Such a community would play a vital role in the following areas:

- Reviewing and synthesizing existing evidence into clear, actionable guidance for industry stakeholders
- Identifying and prioritizing critical research needs while jointly developing proposals for future projects
- fostering open, ongoing dialogue between academia, industry, and policymakers to ensure that knowledge is shared effectively and translated into meaningful innovation and regulation.

Initiatives like the CATALYSE-CoP illustrate the value of this approach: by fostering a trusted and open platform for exchange, they enable actors across the food system to combine their efforts, align on best practices, and accelerate safe and innovative solutions.

To sum up, the deliverable D5.1 *Chapter on the CATALYSE-CoP for dairy alternatives* was achieved presenting the actions of the CATALYSE-CoP and Agroscope to support transition to plant-based alternatives, through continued collaboration, events, and knowledge curation, to help bridge these gaps and bring the necessary expertise and initiatives to ensure a safe, sustainable, and acceptable transition to plant-based dairy alternatives.

HISTORY OF CHANGES		
Version	**Publication date**	**Change**
1.0	23.07.2025	▪ Initial version