

---

# Building Innovation Ecosystems for Biobased Value Chains: Higher Education and Research in the Chicory Sector of Hauts-de-France

Aliénor De Rouffignac<sup>1</sup>, Elodie Choque<sup>\*2</sup>, Stéphanie Gast<sup>1</sup>, and Blandine Laperche<sup>†1</sup>

<sup>1</sup>Laboratoire ISI/RII – Université du Littoral Côte d’Opale (ULCO) – France

<sup>2</sup>BioEcoAgro-Biologie des Plantes et Innovation – UMRT INRAe 1158 BioEcoAgro, IUT d’Amiens, Université de Picardie Jules Verne, 80039 Amiens, France – France

## Abstract

Despite the multiple and sometimes contradictory interpretations of the term *bioeconomy* (Vivien et al., 2019), one of the most widely accepted definitions refers to the production of renewable biological resources and their conversion into various products and bioenergy (Bugge et al., 2016). Aiming to replace fossil-based carbon with renewable carbon, the bioeconomy is structured around the creation or restructuring of biobased value chains.

The analysis of value chains has a long-standing tradition, from the French industrial economics approach of the 1980s, which introduced a *mesoeconomic* analysis through the concept of *filière*, to the extensive body of work on global value chains (De Marchi et al., 2020). However, in the context of the bioeconomy, the study of value chains at the territorial/local level is being renewed and deepened (Laperche et al., 2024).

Biobased value chains, built around biomass, encompass cultivation and harvesting stages, specific transformation processes, and the reintegration of waste and co-products—both upstream at the agricultural level and downstream in the production of high-value-added goods. To analyze their structure and economic (as well as environmental) impacts, traditional input-output analysis methods can be employed, incorporating sustainability aspects. However, to fully understand how these value chains emerge and function, it is crucial to examine more qualitative dimensions.

According to us (Laperche et al., 2024), a value chain can therefore be conceptualized as an *innovation ecosystem* (Granstrand & Holgersson, 2020; Baldwin et al., 2024), where a network of actors—drawing on shared or complementary knowledge and technologies—interacts to innovate, i.e., to design, produce, and commercialize a set of goods and services within a given territory, generating value at both individual and collective levels. These actors include producers (farmers, processors, manufacturers), public institutions, and researchers.

The key economic players in the transition towards the bioeconomy and the development of new value chains are often identified as companies providing technological solutions and public authorities that drive change through regulations and incentives (Gottinger et al., 2020; Pyka et al., 2021). However, the role of Higher Education and Research (HER) remains

---

\*Speaker

†Corresponding author: blandine.laperche@univ-littoral.fr

underexplored, despite its potentially crucial contribution to fostering territorial innovation, in conjunction with businesses, local authorities, and other stakeholders involved in the development of biobased value chains.

## Objective and Methods

This paper examines the role of HER in the emergence of biobased value chains and, more broadly, in the territorial transition towards the bioeconomy. Numerous studies in the economics and geography of innovation have highlighted the concept of *entrepreneurial universities* as pillars of economic growth, particularly within the framework of collaboration between academia, businesses, and public institutions—often referred to as the *triple (or multi) helix model* (Etzkowitz & Klofsten, 2005). Additionally, the need for sustainability transitions to be guided by *mission-oriented policies* and *responsible innovations* (Prochaska & Schiller, 2021; Barlatier et al., 2024; Liotard & Revest, 2024) reinforces the importance of HER's involvement in these transformations (Mobhe & Uzunidis, 2022).

Based on this premise, our research seeks to answer the following question: **How can Higher Education and Research contribute to the formation of an innovation ecosystem within biobased value chains?** To address this, we adopt a **qualitative approach** and a **reflexive perspective** (Attia & Edge, 2017). Our case study focuses on the **FermEndive project (2022-2025)**, which brings together researchers from various universities and a growers' association in the Hauts-de-France region. This project aims to valorize co-products from chicory production through a circular economy approach. Specifically, its objectives are: 1/**Developing a biobased plastic food packaging** from molecules extracted, produced (via fermentation), or modified (through enzymatic biocatalysis) from chicory co-products (field leaves, root sorting waste, peelings, rootlets). 2/**Creating a high-health-value food product** derived from the lactic fermentation of downgraded chicory.

Our methodology includes: an **analysis of grey and academic literature** on the evolution of this value chain and its need for transformation; a **review of literature** addressing the role of researchers in sustainable projects at the territorial level; **Interviews with FermEndive researchers** specializing in food and packaging sciences; **Discussions with other stakeholders** involved in chicory-related projects in the Hauts-de-France region.

## Expected Results and Paper Content

This study provides a **review of the role of HER in innovation ecosystems linked to biobased value chains**, as outlined in the existing literature. By analyzing the components of an innovation ecosystem—including actors, coordination and governance structures, and the types of innovation developed—we examine the potential contributions of HER in shaping biobased value chains. These contributions can be categorized as follows:

- **Scientific and technological contributions:** Multidisciplinary research teams identify the chemical and physical properties of plant co-products and assess their potential for valorization in biobased products.
- **Networking and coordination:** HER plays a key role in mapping and connecting actors along the value chain, from agricultural production to the development of finished goods—considering the value chain as an innovation ecosystem.
- **Innovation and sustainability-driven research:** Researchers contribute to the design of formulations and innovations that facilitate the creation or restructuring of sustainable local value chains (de Rouffignac et al., 2024).

Our study demonstrates that **universities play a decisive role upstream of value chain restructuring and innovations based on biobased co-products**. Initially considered waste, these co-products gain value through in-depth chemical analysis, which serves as a foundation for product innovation.

Furthermore, as leaders of research projects, university consortia also act as **mediators and**

**facilitators**, fostering the development of territorial innovation ecosystems. Their work is not limited to scientific advancements but extends to the structuring of stakeholder networks and coordination mechanisms.

Finally, the trajectory of regional biobased value chains is **deeply influenced by the choices made by research teams**, including their capacity to establish collaborative networks and to align their experimentation processes with sustainability criteria-criteria that are often neither predefined nor objective but rather shaped by researchers' perspectives and methodological frameworks.

Ultimately, the sustainability of biobased sectors **depends on the ability of HER to create synergies among stakeholders and to guide the restructuring of innovation ecosystems towards the construction of a truly sustainable regional bioeconomy.**

## Bibliography

- ATTIA, M & EDGE J. (2017) Be(com)ing a reflexive researcher: a developmental approach to research methodology, *Open Review of Educational Research*, 4:1, 33-45, DOI: 10.1080/23265507.2017.1300068.
- BALDWIN, C. Y., BOGERS, M. L., KAPOOR, R., & WEST, J. (2024). Focusing the ecosystem lens on innovation studies. *Research Policy*, 53(3), 104949.
- BARLATIER, P., GEORGET, V., PÉNIN, J., RAYNA, T. AND RAYNA, T. (2024) . The Origin, Robustness, and Future of Responsible Innovation. *Journal of Innovation Economics & Management*, No 43(1), 1-38. <https://doi.org/10.3917/jie.043.0001>.
- BUGGE, M., HANSEN, T., & KLITKOU, A. (2016). What Is the Bioeconomy? A Review of the Literature. *Sustainability*, 8(7), 691.
- DE MARCHI V., DI MARIA E., GOLONI R., PERI A. (2020), Nurturing International Business research through Global Value Chains literature: A review and discussion of future research opportunities, *International Business Review*, Volume 29, Issue 5, October 2020, 101708
- DE ROUFFIGNAC, A., GAST, S., LAPERCHE, B., VERNIER, M.F., (2024) " La durabilité de la bioéconomie et des filières biosourcées : outils et enjeux ", *Technologie et Innovation*, Vol .9 <https://www.openscience.fr/La-durabilite-de-la-bioeconomie-et-des-filieres-biosourcees-outils-et-enjeux>
- ETZKOWITZ H., KLOFSTEN- M., The innovating region: toward a theory of knowledge-based regional development, *R&D Management*, 243-255.
- LAPERCHE, B., DE ROUFFIGNAC, A., JULLIAN, N., (2024) " Les filières de production. Nouvelles analyses au prisme de la bioéconomie ", *Technologie et Innovation*, Vol 9, <https://www.openscience.fr/Les-filieres-de-production-Nouvelles-analyses-au-prisme-de-la-bioeconomie>
- LAPERCHE, B., LIMA, M., SEUILLET, E., TROUSSE, B (2019) *Ecosystèmes d'innovation : regards croisés des acteurs clés*, LHarmattan, Paris.
- LIOTARD, I., REVEST, V. (2024) . Grands Challenges et politiques publiques d'innovation : un état des lieux. *Innovations*, No 74(2), 5-25. <https://doi.org/10.3917/inno.074.0005>.
- UZUNIDIS D., MOBHE BOKOKO D. (2022), La recherche responsable : contexte, enjeux, dispositifs, *Technologie et Innovation*, vol.7, <https://www.openscience.fr/La-recherche-responsable-contexte-enjeux-dispositifs>

GRANSTRAND O, HOLGERSSON M., (2020), Innovation ecosystems: A conceptual review and a new definition, *Technovation*, Volumes 90–91.

GOTTINGER A., LADU L., QUITZOW R. (2020), Studying the Transition towards a Circular Bioeconomy-A Systematic Literature Review on Transition Studies and Existing Barriers, *Sustainability*, 12, 8990

PYKA A., ARIE E., ALVA-FERRARI A., URMETZER S., (2021), The Bioeconomy Transition Process – Sailing through Storms and Doldrums in Unknown Waters, *Journal of Innovation economics and Management*,

PROCHASKA, L., & SCHILLER, D. (2021). An evolutionary perspective on the emergence and implementation of mission-oriented innovation policy: the example of the change of the leitmotif from biotechnology to bioeconomy. *Review of Evolutionary Political Economy*, 2(1), 141–249.

VIVIEN F-D, NIEDDU M., BEFORT N., DEBREF R., GIAMPIETRO M. (2019), The Hijacking of the Bioeconomy, *Ecological Economics*, Volume 159, 189-197, <https://doi.org/10.1016/j.ecolecon.2019.01.010>

**Keywords:** chicory value chain, by, products valorization, Bioplastics, Novel food, Sustainability, Innovation Ecosystems, HER (higher education and research)