

SCALE^{UP}

community-driven
bioeconomy development

Report on 12 small-scale business models explored in the SCALE-UP regions

March 2025

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EXECUTIVE SUMMARY

This report aims to provide a general overview of the activities, results and lessons learned from the implementation of the SCALE-UP Innovation Support Programme (ISP). It hopes to shed light on current conditions in six regional markets for bio-based products and services, drawing on evidence and insights collected using a common framework to assist innovators that was implemented in a distributed manner to build regional capacity that will outlast the project. This deliverable covers Tasks 4.3 and 4.2 of the SCALE-UP Horizon Europe project.

The work of 12 regional Task Forces set up to assist selected innovators with market assessment and business model design work has highlighted the crucial role of structured innovation support in enhancing the market readiness of bio-based enterprises. A key finding is that, under the rapidly shifting political and social circumstances, market access remains a significant challenge for sustainability-oriented products and services that require premium pricing, emphasizing the need for strong marketing and sales strategies, negotiation skills, and supportive policies to promote sustainable consumption. The type of innovations joining the programme also underscored the growing influence of the Social and Solidarity Economy (SSE) in the bioeconomy transition, with half of the innovators either prioritising social and environmental objectives over profit maximisation, or incorporating elements of the SSE sector in their business model. To support these mission-driven enterprises, targeted mechanisms such as improved access to finance, legal guidance, and tailored capacity-building initiatives will continue to be needed in the future. From a programme implementation perspective, the experience of establishing the regional Task Forces showed the importance of preparation, adaptability, and stakeholder engagement to ensure effective innovation support. Additionally, the SCALE-UP ISP demonstrated the value of international collaboration in the EU, helping innovators to explore new markets and learning from each region to adapt standardised support services to local dynamics. Future programmes could benefit from and build on these lessons to increase the impact and efficiency of publicly funded innovation support programmes. Overall, iterative and incremental efforts in business strategy development, stakeholder engagement, structured, yet flexible support frameworks, and consistent long-term assistance can strengthen Europe's transition to a sustainable and circular bioeconomy.

Chapter 1 introduces the report presenting the most relevant and recent EU policy developments and efforts put in place to underpin the region's bioeconomy transition. It then presents the conceptual framework of the SCALE-UP project and the approach of the ISP, positioning them as concrete contributions to align efforts in six European regions towards achieving the goals of the EU Bioeconomy Strategy, its national counterparts, Regional Development Plans and Smart Specialisation Strategies for Research and Innovation. Chapter 2 gives a brief overview of the 12 innovations that were selected to participate in the ISP, with insights into the specific needs that they chose to tackle during the programme. Chapter 3 compiles synthesised results of the market assessment carried out in the six European regions and briefly presents against them the business idea and value proposition of the 12 innovations. It then showcases the insights collected from joint analysis of the business model canvas of each innovation. Chapter 4 presents observations emerging from the market assessments and other support activities that were carried out with the innovators, and then discusses the main practical lessons learned from the implementation of the ISP. Chapter 5 concludes the report and provides recommendations aimed at entities associated with the conception, development, funding and implementation of future assistance programmes for innovation in the European bioeconomy sector. Lastly, the annexes include a briefing documenting the set-up of the regional Task Forces, and six confidential synthesis reports providing detailed descriptions of the innovations, their strategic relevance for each region, the nine elements of their business model (Business Model Canvas), and considerations for the future.

Table of contents

1	Introduction.....	7
1.1	Elements of the EU framework to support the bioeconomy transition	8
1.2	SCALE-UP's positioning and its Innovation Support Programme	9
2	Overview of the bio-based solutions participating in the SCALE-UP Innovation Support Programme.....	11
3	Overview of the assessments	16
3.1	Market needs in six European regions and new bio-based offers to meet them	16
3.2	Key characteristics of the small-scale businesses explored	24
4	Discussion and main lessons learned	25
5	Conclusions and recommendations	28
	References	30
	Annexes	32

Figures

Figure 1. Visual representation of the conceptual framework guiding the work on the SCALE-UP project. Source: Gerdes et al., 2023.	9
Figure 2. The SCALE-UP Innovation Support Programme modular, flexible approach to innovation support. Source: own elaboration.	10
Figure 3. Task structure of SCALE-UP's work package on bio-based business models, value chains, and markets. Source: Nieto et al., 2023.	10
Figure 4. Top needs and priorities of the innovators selected to participate in the ISP. Source: own elaboration.	12
Figure 5. The six SCALE-UP regions: six regional markets assessed as part of the Innovation Support Programme. Source: SCALE-UP project.	16

Tables

Table 1: Bio-based innovators participating in the SCALE-UP Innovation Support Programme	13
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Abbreviations

CAP	EU Common Agricultural Policy
CHP	Combined Heat and Power
EGD	European Green Deal
ELAN	Evolution du Logement, de l'Aménagement et du Numérique

Eol	Expression of Interest
EU	European Union
GDP	Gross Domestic Product
GHG	Greenhouse Gas
HoReCa	Hotel/Restaurant/Café
ISP	Innovation Support Programme
LR	Logging Residues
NDA	Non-Disclosure Agreement
NEIA	New European Innovation Agenda
OTP	Olive Tree Prunings
RE2020	Réglementation Environnementale 2020
RIS3	Research and Innovation Strategies for Smart Specialisation
RIV4BFS	Regional Innovation Valleys for Bioeconomy and Food Systems
SDG	Sustainable Development Goals
TF	Task Force (for market assessment and business model design)
TRL	Technology Readiness Level
WP	Work Package

1 Introduction

The bioeconomy concept presents an attractive framework for policymakers in Europe, as it holds the potential to foster innovations that match specific community needs with regionally available resources. It is expected to drive economic growth and job creation while contributing to climate and environmental sustainability through the efficient and eco-friendly use of natural resources. The SCALE-UP project brings together these principles from various EU-level policies to shape its conceptual framework (see Figure 1): the six priorities of the European agricultural fund for rural development, the rural orientation of the Common Agricultural Policy's (CAP) second pillar, along with national and regional frameworks, including national bioeconomy strategies, regional development plans, and Research and Innovation Strategies for Smart Specialisation (RIS3). According to the European Commission (2020), the bioeconomy serves as a catalyst for systemic transformation, addressing economic, environmental, and social challenges simultaneously. A sustainable and circular bioeconomy is important to address the wide range of challenges that communities across Europe are facing, including climate, biodiversity, energy, and food security (Council of the European Union, 2023).

A study by Ronzon et al. (2022) notes that between 2015-17, economic growth was stronger in EU bioeconomy services¹ than in the EU economy as a whole. Bioeconomy services accounted for 5.0-8.6% of EU GDP and 10.2-16.9% of the EU labour force during this period. The European Commission (2023) recognises the potential of the bioeconomy and innovative value chains for both industrial ecosystems and rural communities by: providing essential products, increasing competitiveness, diversifying incomes, and creating jobs in rural and coastal areas. Some studies (Mittra and Zoukas, 2020; Eversberg et al., 2022), however, call into the question the growth and impact potential surrounding the bioeconomy. They point to the negative correlation between jobs and growth, as well as the differing numbers between southern and eastern Europe (primarily biomass suppliers), and northern and western Europe (primarily processors), leading to a potential productivity gap (see also Vlad & Toma, 2022 for a detailed study of the bioeconomy sector in central and eastern Europe). As such, further research is needed into the economic potential of the bioeconomy in the broader context of a just transition.

Strategically implemented, the bioeconomy can contribute significantly to achieving the Sustainable Development Goals (SDGs) and advancing EU policies on economic development and competitiveness, sustainability, and social justice. A key aspect of this transition is the shift from fossil-based to renewable, bio-based resources, particularly in industrial production. The critical role of the bioeconomy in EU industrial policy is underlined by the EU Council in its Conclusions of the future of industrial policy (Council of the European Union, 2024). This transition is therefore anticipated to play a critical role in reducing greenhouse gas (GHG) emissions, playing an important role in climate change mitigation efforts (Spatial Foresight et al. 2017).

Moreover, supporting practical experience with the concept of bioeconomy can generate new perspectives necessary for the transition toward a circular economy. An ambitious and committed implementation of the concept entails a fundamental transformation across all economic sectors, affecting the production, processing, utilisation, and end-of-life management of biomass. This shift promotes the reuse, cascading use, and recycling of biomass and waste streams, facilitated by both technological and social innovations (Spatial Foresight et al. 2017). The European Commission therefore envisions the bioeconomy in a holistic and cross-cutting manner, requiring policy coherence to ensure not only the uptake of innovative bio-based solutions, but also the potential positive impacts towards achieving the targets of the European Green Deal (EC, 2023).

In its 2024 Communication "Building the future with nature: Boosting Biotechnology and Biomanufacturing in the EU", the European Commission highlighted the importance of the bioeconomy in securing the EU's competitiveness and resilience. The Commission recognised the need to update EU policy in view of the bioeconomy's industrial dimension and links to biotechnology and biomanufacturing. As such, a review of the Bioeconomy Strategy is planned in 2025 (EC, 2024). This

¹ The updated EU Bioeconomy Strategy (2018) broadens the scope of the bioeconomy to include related service activities, defining a bioeconomy that: "includes and interlinks: land and marine ecosystems and the services they provide; all primary production sectors that use and produce biological resources (...); and all economic and industrial sectors that use biological resources and processes to produce food, feed, bio-based products, energy and services" (EC, 2018)

is further echoed in Mario Draghi's 2024 report on European competitiveness, which underlines the need for a competitiveness strategy to address the challenges of technological advancement and demographic shifts, both of which are especially relevant to European regions working to develop sustainable bioeconomy sectors (Draghi, 2024).

1.1 Elements of the EU framework to support the bioeconomy transition

The efforts to roll out a bioeconomy in the European Union are coordinated via the EU Bioeconomy Strategy and its associated Action Plan. These were updated in 2018 and prioritise the development of new business models with a view towards bringing the potential economic benefits to rural regions. A sustainable bioeconomy is also seen as a key dimension of the EU's Long-Term Vision for Rural Areas and the EU Rural Action Plan through the development of cohesion in rural areas, as well as the promotion of social fairness and the just transition (EC, 2023).

In 2022, the European Commission published a progress report on the implementation of the EU Bioeconomy Strategy and its action plan (EC, 2022a). This was produced at the request of the Council of the European Union in light of the new policy context surrounding the European Green Deal, and to identify any gaps or room for improvement in the Bioeconomy Strategy. The progress report shows that the actions are on track to achieving the strategy's main objectives, namely: an increasing number of national and regional bioeconomy strategies, progress on bioeconomy deployment in Central and Eastern Europe, and the mobilisation of private investments in research and innovation. However, the report also identifies some gaps in the action plan, including the need for more focus on how to improve land management and biomass demand to meet environmental and economic requirements. Additionally, there is a need to develop more sustainable consumption patterns to ensure environmental integrity. The EU Council's conclusions on the potential of the bioeconomy (2023) therefore recommend an update to the Bioeconomy Strategy, as well as an in-depth assessment of actions being taken at EU level. They also recommend better integration of the bioeconomy into other policy areas and improved knowledge transfer towards less developed regions and rural areas. A review of the EU Bioeconomy Strategy will be completed by the end of 2025 (EC, 2024).

In 2022, the European Commission launched the "New European Innovation Agenda" (NEIA) which aims to push Europe to the cutting edge of technical innovations and start-ups responding to societal challenges (EC, 2022b). This is operationalised across five flagship initiatives and 25 targeted actions. One of these actions calls for the establishment and connection of "regional deep tech innovation valleys" (RIVs). In this context, and with the support of Member State input, the European Commission presented a concept note on "Regional Innovation Valleys for Bioeconomy and Food Systems" (RIV4BFS) (EC, 2023a). The RIV4BFS will support and accelerate the deployment of the bioeconomy in European regions (with a particular focus on Central and Eastern Europe) across specific goals, for example transitioning to a zero plastic textile system or living within local biosphere limits. Importantly, the RIV4BFS consider all three pillars of sustainability: **environment**, by managing land and resources within ecological boundaries; **economic**, through sustainable value chains and consumption; and **society**, by considering equity and inclusion towards a just transition. To this end, the RIV4BFS should be based on regionally sourced and sustainably produced biomaterials through the involvement of primary producers, industry, and consumers. In total, the European Commission has committed EUR 170 million towards the development of the Regional Innovation Valleys, with the goal of building 100 RIVs, as set out in the NEIA.

In addition to the funding committed towards the development of the Regional Innovation Valleys, EU research funding on bioeconomy topics continues to be important, with the Horizon Europe program (2021-27) having already invested EUR 900 million into projects on "Circular economy and bioeconomy sectors" from its Cluster 6 on "Food, bioeconomy, Natural Resources, Agriculture and Environment" (EC, 2023b).

While a supportive policy environment and targeted research & innovation programmes provide helpful enabling conditions for the development of the bioeconomy, a successful transition requires that significant attention be given to the financial feasibility and market readiness of business efforts to develop bio-based products and services (Reim et al., 2019). As such, dedicating sufficient time and resources to innovation management and market entry can assist entrepreneurs to reflect and refine

key aspects of their business models such as value proposition, creation, delivery, and capture as a means of improving their economic viability (Reim et al. 2019).

1.2 SCALE-UP's positioning and its Innovation Support Programme

The SCALE-UP project aims to enhance the capacity and expertise of multi-actor partnerships to accelerate the development of market-ready bio-based products and services while facilitating their successful market deployment. A key focus is to deepen the understanding of nutrient recycling potential across the project's target regions, ensuring that both practical and scientific knowledge are effectively leveraged. The project also seeks to foster a high level of awareness among local communities regarding the bioeconomy, its opportunities, and its broader societal and environmental impacts. Additionally, SCALE-UP strengthens collaboration among primary producers, SMEs, industry clusters, social actors, and policymakers, promoting a cohesive approach to innovation. Ultimately, the project contributes to regional, rural, and urban transitions towards a sustainable, regenerative, and inclusive circular economy and bioeconomy, fostering just and resilient development pathways across Europe.

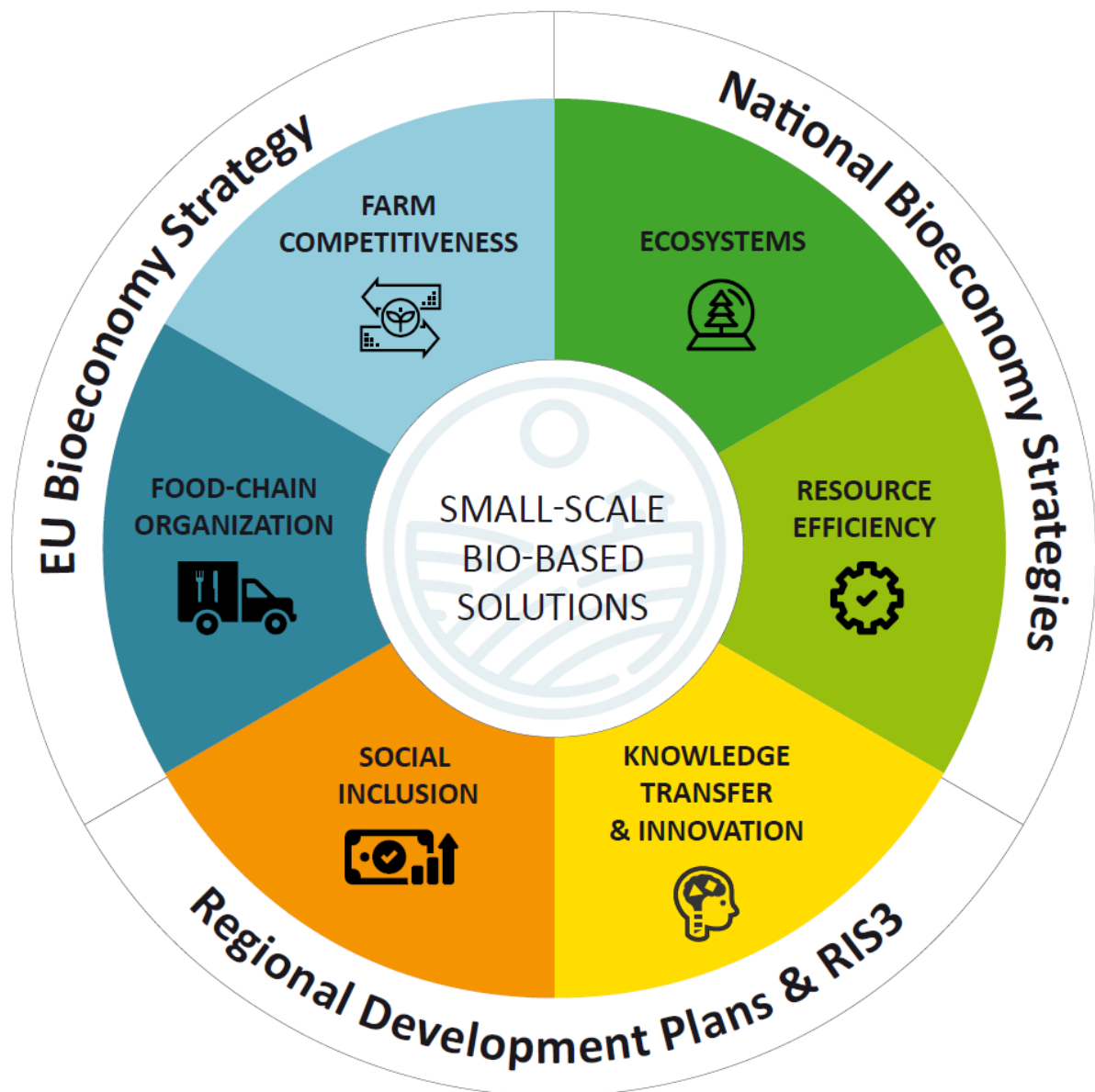


Figure 1. Visual representation of the conceptual framework guiding the work on the SCALE-UP project. Source: Gerdes et al., 2023.

Based on their specific needs and priorities, the selected innovators had a menu of support activities to choose from, put on offer by the business strategy experts and the regional partners from the SCALE-UP consortium. Figure 2 shows the preparatory activities carried out to establish the groundwork for the Innovation Support Programme (ISP) (left end of the figure), and the specialised modules with possible support activities from which the innovators could choose to benefit from, ranging from market assessment to business plan drafting and funding scanning (middle and right end of the figure).



Figure 2. The SCALE-UP Innovation Support Programme modular, flexible approach to innovation support. Source: own elaboration.

Figure 3 shows the outline of tasks integrating SCALE-UP WP4: *Bio-based Business Models, Value Chains & Markets*. This report provides an overview of the lessons collected from Task 4.3 –the implementation of the SCALE-UP ISP– and the practical experience of the regional Task Forces (TFs) that were set up in Task 4.2. The findings and insights presented are grounded in the extensive efforts undertaken by the SCALE-UP project consortium, the 12 selected innovators, and the external members of the TFs through the structured, multi-phase support program.

Work package WP4
Bio-based Business Models, Value Chains & Markets



Figure 3. Task structure of SCALE-UP’s work package on bio-based business models, value chains, and markets. Source: Nieto et al., 2023.

The process began with a comprehensive stocktaking exercise (Task 4.1), in which consortium partners, in collaboration with their regional networks, identified and evaluated promising bio-based solutions involved or seeking opportunities in regionally relevant value chains. Following an open call for Expressions of Interest and a structured selection process, 12 innovators—two per project region—were chosen to receive tailored support services.

Building on this foundation, Task 4.2 established dedicated TFs to provide targeted business development assistance. These TFs brought together a diverse set of stakeholders, including industry experts, investors, and local knowledge holders, ensuring that market realities and community priorities were embedded in the innovation support process. Through their contributions—ranging from scientific and practical expertise to market insights and access to strategic networks—TF members played a key role in shaping the strategic development of the selected innovations.

The core of the project's support activities was then delivered under Task 4.3, where the TFs, led by the SCALE-UP regional partners, worked closely with the selected entrepreneurs to identify their priority needs and work towards resolving them. Over the course of subsequent working sessions, in some cases face-to-face, in others remotely, advisory services were provided to conduct market appraisals, select target groups, assess business feasibility, and identify funding opportunities. Access to regional networks was also provided via direct connections with TF members and other contacts, as part of the ISP sessions, events, and visits. The ISP drew inspiration and tools from the BRIGAD Business Development Programme, yet in SCALE-UP it expanded its previous reach by giving regional partners a more prominent role as leaders of the TFs. This allowed to have a common framework that was implemented by partners with a deep understanding of local market dynamics.

Collectively, these efforts constitute the evidence base for the observations and lessons outlined in this report. The combination of in-depth market assessments, iterative business model development, and close multi-actor collaboration has provided valuable empirical insights into the opportunities and barriers faced by emerging bio-based businesses in the project regions (see Chapter 4).

2 Overview of the bio-based solutions participating in the SCALE-UP Innovation Support Programme

As stated in Deliverable D4.1 –*Overview of regionally suitable bio-based solutions*– SCALE-UP set out to identify regionally-relevant innovations that could benefit deeply from participating in the ISP and that simultaneously are compatible with the overarching goals of the project. This resulted in the engagement of 12 initiatives that strongly depend on, or promote collaboration along the value chain; that have strong interest in- or contribute to the enhancement of regional ecological resilience; that have a clear benefit to offer or gain from resource efficiency; that enable and benefit from knowledge transfer; that positively impact the food sector; and that show a clear potential to increase their region's competitiveness (Nieto et al., 2023).

Figure 4 shows the declared needs and priorities that the selected innovators shared with us at the start of the process.

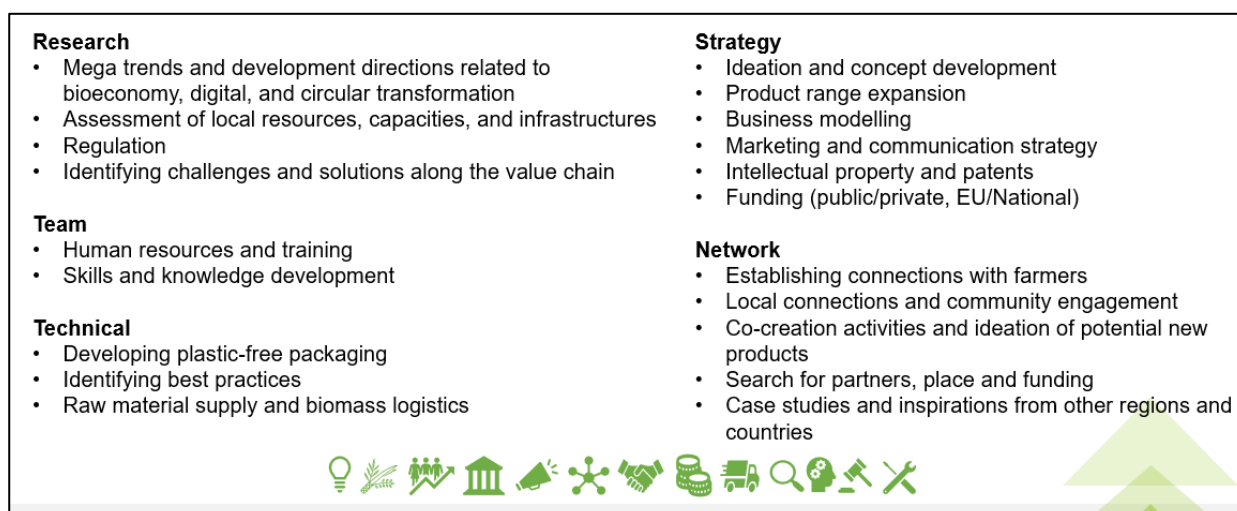


Figure 4. Top needs and priorities of the innovators selected to participate in the ISP. Source: own elaboration.

Based on the type of innovation, its stage of development, the particular needs and priorities of the innovators, customised support activities were selected from the different modules of the ISP (see Figure 2) and coordinated by the SCALE-UP project partners. This included organising the punctual, voluntary contributions from the regional experts and stakeholders that integrated each TF.

Table 1 provides a synthetic overview of the 12 participating entities of the ISP, with short descriptions of their innovations, country of registry, indicative TRL (Technology Readiness Level) before and after the ISP², and the main needs identified for each innovator at the start of the programme.

² The presentation of TRL before and after the ISP is to be understood as indicative, and it is important to note that progress of an innovation along the TRL scale during the period of the programme can hardly ever be exclusively associated to the programme itself. The ISP and the assistance provided to the innovators may certainly play a contributing role in this progress but cannot serve to explain the developments in their entirety.

Table 1: Bio-based innovators participating in the SCALE-UP Innovation Support Programme

Country	Organisation	Product/Service	TRL		Main needs at the start of the ISP
			Oct-2023	Feb-2025	
Austria	Velvety	P – Cosmetics incorporating vegetable proteins from sunflower oil press cake	n/a	6	Expanding customer base, information on funding sources, skill and knowledge development, scaling up from laboratory level.
	HochBROTzzeitig	P – Distilled spirits from waste bakery products	n/a	9	Market analysis, identification of partners
France	COPANO	P – Straw-based insulation panels for construction and renovation	5-6	7-8	Development of pilot project, dissemination of innovation, human resources and training, identification of priority customers
	L'Atelier du Biosourcé / Fabrik du BTP	S – Facility for community building, access to materials and equipment, and exchange of know-how on construction with bio-based materials	n/a	n/a	Business plan support, identification of potential partners and funding streams
North Macedonia	Horti-Eko	P/S – Mulching machine for fine grinding residues from viticulture, gardening and fruit growing	6	6	Concept development and business model support, funding research support, leveraging network for implementation
	Bio-Based Value-Added Grape Products	P/S – Eco-friendly methods for crafting grape-based products that prioritize the preservation of natural qualities and nutritional value at competitive prices	4	4	Business plan development, positioning, market analysis, networking
Poland	Bio-circular Apple Farm	S – Space for developing and testing new technological, social, educational and cultural concepts and solutions in the circular bioeconomy	n/a	n/a	Relevant case studies from other regions/countries, business model generation, testing and validation, branding and marketing
	Gospodarstwo Sadownicze MB Monika Bankiewicz	P – New health-promoting, functional and ecological products from apple pomace	1-2	2-3	Market research, business model generation, branding and marketing, financial monitoring and funding options, assessment of local resources and capacities.
Spain	Bioliza	P – Biochar obtained from olive waste pyrolysis	7	8-9	Clarification of legal framework, market analysis, funding research, business model development
	Compolive	S – Facility to condition, treat and make olive tree prunings compatible for integration as reinforcement in polymer-based composite materials	4	5	Market analysis, intellectual property development, logistics support, business model development, funding research
Sweden	Wood Fuel Network	S – Social innovation to strengthen the value chain for logging residues	n/a	n/a	Identification of challenges/solutions in the logging residue value chain, and screening for areas where best practices can be developed and shared.
	RESELO	P – Suberin extract from birch bark to produce fossil free rubber.	5	6-7	Support and input to a raw material supply analysis (2030-2100) with marginal cost curves around a given location for supply of birch bark.

Expanding on the last column of the synthetic overview given by Table 1, the passages below provide brief descriptions of what the TFs offered to each of the innovators, outlining the work carried out during the ISP and the concrete benefits generated. This information has been extracted from an internal report prepared by SCALE-UP partners CTA at the end of Task 4.2 (see Annex I).

Velvety

In Upper Austria, the TF supported Velvety in a flexible way, due to changing needs of the innovation development process (partially due to the economic situation in Austria). The ISP supported Velvety in further developing its business plan with a particular focus on market development, including both existing customers and new ones. One of Velvety's priorities is to expand into foreign markets; here, the TF supported by disseminating information among the project consortium, leading to exchanges with the Spanish consortium partners about the cosmetics market in their region and an analysis of the competition and the possibility to enter the Spanish market. Furthermore, the TF supported the innovation in providing information on the national funding landscape in Austria, as well as offering support in marketing and product development.

HochBROTzzeitig

The TF and the team from Business Upper Austria supported HochBROTzzeitig by doing research on bakeries in the region that could join their initiative. The group decided to divide the identified bakeries into three target categories: *small bakeries*, *large bakeries* and *bakeries that also run a café, a mini market or a restaurant*. This categorisation was important, as one of the challenges that HochBROTzzeitig faced is the increasingly negative image of alcohol, and the feedback that some bakeries refuse to sell alcohol in general. Since the third target group is already selling or serving alcohol, it carries the most potential. The general goal of HochBROTzzeitig is to scale up the business idea to whole Austria and then to the whole DACH region (Germany, Austria and Switzerland).

COPANO

The TF from the French Atlantic Arc supported COPANO in a variety of ways, including detailed work on its business plan and market development. Furthermore, the TF provided support on issues related to intellectual property rights (patents and innovation protection) as well as human resources and training. As the company currently operates on a volunteer basis, the aim is to train employees to be multi-skilled and be able to access a range of jobs, also while offering adequate salaries.

L'Atelier du Biosourcé / Fabrik du BTP

The initial innovation explored in the SCALE-UP project was the "Atelier du Biosourcé". In June 2024, the responsible innovator met another entrepreneur running a similar initiative called "La Fabrik du BTP". It was then decided by them independently to merge the two projects to take advantage of the synergies and not duplicate the efforts of each initiative. As the innovation is in early stages, ISP support primarily focused on developing concrete ideas for the innovation's business plan, as the exact operation of the initiative is still under development.

Horti-Eko

Involvement in the SCALE-UP ISP offered support to Horti-Eko on a range of topics including its business model development, innovation development and extending not only its network of authorities but also potential implementers. The innovators were supported in understanding regulatory aspects relevant to their business and connected with public authorities. Additionally, they were offered technical expertise to enhance the educational and research dimensions of the project. Finally, the TF offered support in further developing Horti-Eko's networks, especially with regards to regional associations.

Bio-Based Value-Added Grape Products

The TF supported the business owner, Agro-Cooperative Bojane, primarily in developing the business plan for the bio-based products from Bojane's vineyards. The agriculture sector was identified as a strong potential target customer segment, aligning well with the initiative's goals and offering strong possible collaborations. The ISP further supported the innovation in sharpening its value proposition and strategy towards health-conscious consumers who value eco-friendly, high-quality products. Finally, the ISP encouraged the innovation to not only emphasize sustainability but also refine its channels and strengthen existing partnerships.

Bio-circular Apple Farm

The Bio-circular Apple Farm was supported in Mazovia particularly in its business model development. The TF supported the identification of a potential market, particularly for its educational offerings. Additionally, the possibilities for collaboration with the local and regional administration were explored.

Gospodarstwo Sadownicze MB

The SCALE-UP ISP and team from UNIMOS supported Gospodarstwo Sadownicze MB in developing a concept to process the apple farm's pomace into dried apple powder. The TF helped with market research, particularly on trends in the food sector with regards to healthy snacks, where the apple powder could be used. Furthermore, the TF supported the business model development, especially identifying potential synergies with the nearby Bio-circular Apple Farm.

Bioliza

Bioliza was supported by the TF firstly in better understanding the regulations and legal framework surrounding the obtainment of biochar relevant in Andalusia. Further support was offered in terms of the market analysis with regional cooperatives, as well as refining of the already existing business model. Finally, the ISP supported Bioliza in connecting with potential funders such as venture capital firms and investment funds.

Compolive

A key focus for the TF in Andalusia was to support Compolive with their market analysis, especially to identify the potential for long-term biomass availability. Support from two cooperatives in the region was able to help with awareness raising in this regard. The issue of logistics and biomass transport was also an area of focus, with important exchanges taking place on good practices from a case in Catalonia. The TF also supported Compolive on topics of intellectual property in the go-to-market stage as well as consulting on an expert investment report to further develop their financing opportunities.

RESELO

Participating in the SCALE-UP ISP offered this solution's developers the opportunity to assess and map the availability of raw materials across Sweden. The SCALE-UP partner Biofuel Region facilitated access to a wide network of regional actors directly involved in the forestry sector. This gave RESELO new insights into existing by-product streams, helping them to (re)shape their business model and explore possibilities for widening their product portfolio. In the Nordic countries, large quantities of bark are primarily used for heat and electricity production. Extracting valuable compounds like suberin before combustion aligns with the cascading use principle and could serve as a catalyst for retrieving even higher-value chemicals from biomass.

Wood Fuel Network

To mobilise a wide range of actors along the entire value chain of logging residues, this beneficiary of the SCALE-UP ISP worked in close cooperation with buyers and sellers of wood fuels in Northern Sweden. Using a web survey, the Wood Fuel Network was able to determine challenges and solutions relevant to the value chain, as well as identify where best practice cases could be shared or further

developed. This information was fed into the design of workshops and training sessions that are now targeting heating plants, entrepreneurs, and suppliers of wood fuels.

3 Overview of the assessments

This chapter provides an overview of the abridged results of the market assessments carried out by the TFs in each of the six SCALE-UP regions (shown in Figure 5). Synthesis reports providing detailed descriptions of the innovations, their strategic relevance for each region, the nine elements of their business model (Business Model Canvas), and considerations for the future, are available in the annex of this report.

The first step in running these assessments was formulating clear market definitions. Given the focus of our project on previously selected value chains relevant to each of these regions, the screened regional markets were defined accordingly and adjusted as the exercises of the strategic assessment were being completed.

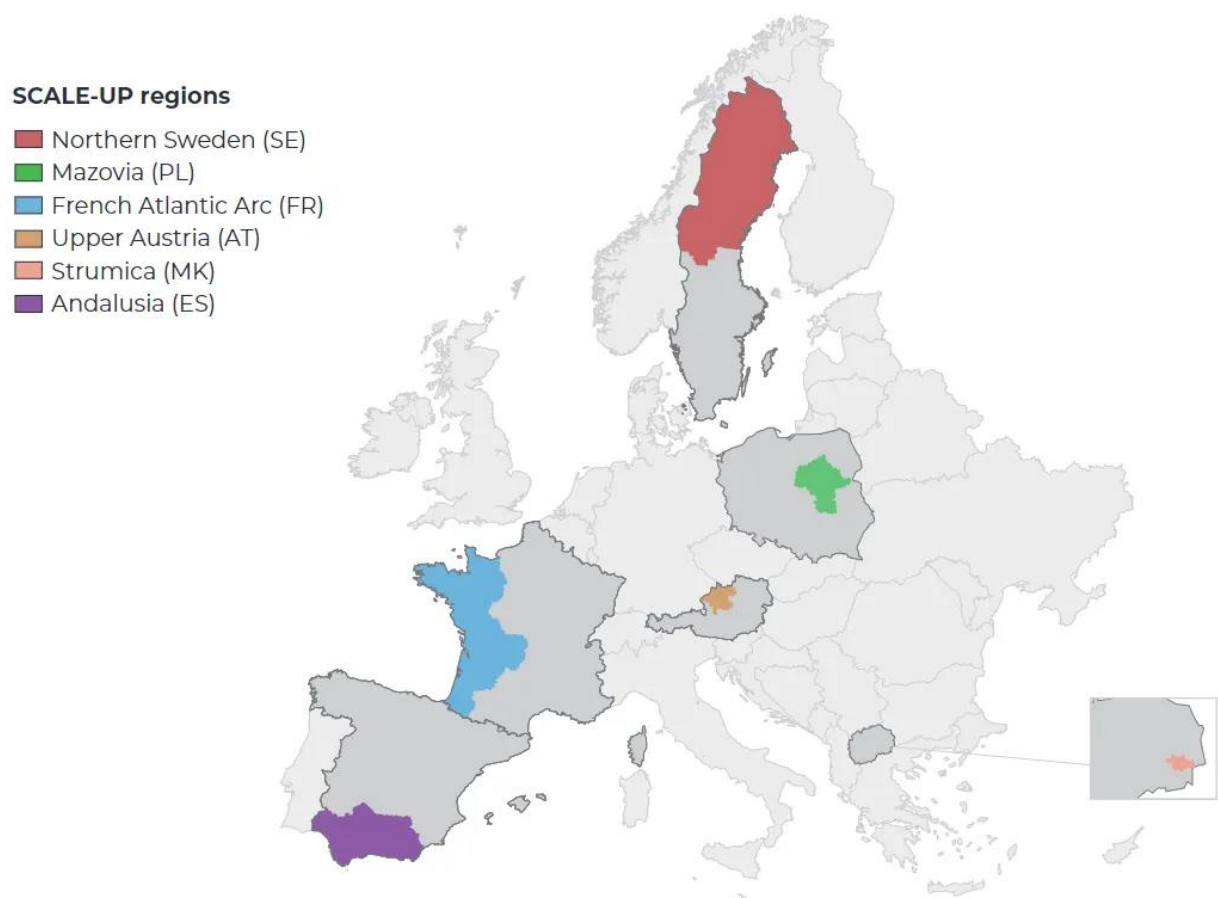


Figure 5. The six SCALE-UP regions: six regional markets assessed as part of the Innovation Support Programme. Source: SCALE-UP project.

3.1 Market needs in six European regions and new bio-based offers to meet them

Upper Austria

Upper Austria has a diverse food processing industry, generating a wide range of food waste and by-products, such as fruit and vegetable residues, as well as bakery and brewery side streams. These by-products can be upcycled to new food products, utilised for feed, biogas or chemicals production, and for the development of other innovative products. The valorisation of such unused resources and by-products is explored and promoted by the Bioeconomy Strategy for Austria: “The Bioeconomy Strategy is aimed to assign a value to previously unused residuals and by-products and make their recovery both climate and environmentally friendly and economically feasible” (BMNT, 2019). The strategy emphasizes reducing food waste and improving resource efficiency as key elements of sustainable development. Specific initiatives include promoting food waste reduction programs, encouraging innovative uses for organic residues, and enhancing consumer awareness to minimize waste.

The business idea of **HochBROTzentig** is driven by the fact that in Austria, every 5th bread is thrown away. As the business idea owner is a baker himself, his motivation is to use these wasted resources. His idea was also to use the bakers’ regional identity and to not just take their leftover bread as a resource for his distilled spirits, but to offer the bakeries a service, so they can sell the spirits made of their own bread in their shops. He created the brand “HochBROTzentig” as his idea was to establish this brand and to add a small label from the bakery where the bread is from. He gave new names to these distilled spirits (BROTKA, BROTGINSKY and BROTUZO) to ensure compliance with the Austrian Codex Alimentarius³, which dictates that sprits like gin and vodka can only be made from agricultural resources. Since baked bread does not classify as an agricultural resource, the products could not be directly labelled as gin or vodka.



Velvety is a cosmetics producer based in Upper Austria that focuses on solid cosmetics like shampoo bars, shower bars, bath bombs, deodorant sticks, and similar products. A vital part of the company’s business model is the development private label products for market leading retailers in the DACH region (Germany, Austria, and Switzerland). Velvety has been a pioneer in the production of predominantly solid cosmetics for many years and continue to set the highest standards in their R&D and operations. The commitment to the environment is an integral part of all corporate activities, and sustainability lies at the center of their production and sales cycles. This has led to their collaboration with the University of Applied Sciences Upper Austria and an oil pressing company to explore applications of proteins extracted from sunflower oil press cake in a new cosmetics line. With SCALE-UP, Velvety has explored the market potential of these new products in the DACH region and in Spain. The company’s value proposition is the reduction or—in most of their products—the complete avoidance of plastic materials. Their products are much smaller, lightweight and easier to transport than bottled shampoo and care products, resulting in reduced resource use, transport costs and carbon emissions.



French Atlantic Arc (FR)

In France, a number of recent regulatory developments are encouraging the use of agricultural bio-mass for industrial purposes: the National Low Carbon Strategy⁴, the Energy Transition Law for Green Growth⁵ and the National Recovery Plan⁶. More specifically, the construction sector, one of the most carbon-intensive sectors of the French economy, is governed by environmental regulations

³ The Austrian Codex Alimentarius is a set of standards and guidelines established to assist stakeholders, authorities, and courts to ensure food quality and safety. Developed over the past century, it serves as a flexible and indispensable instrument in the country’s food regulation framework. For more information see Vojir F. et al., 2012.

⁴ <https://www.ecologie.gouv.fr/strategie-nationale-bas-carbone-snbc>

⁵ <https://www.ecologie.gouv.fr/politiques-publiques/loi-transition-energetique-croissance-verte>

⁶ <https://www.economie.gouv.fr/plan-de-relance>

for buildings, known as RE2020 (Réglementation Environnementale 2020)⁷ and stemming from the ELAN law (Evolution du Logement, de l'Aménagement et du Numérique of November 2018)⁸. The RE2020 plan has set 3 objectives: energy efficiency, reducing the carbon impact of buildings (aiming for neutrality by 2050) and thermal comfort during the summer period. This regulatory framework is encouraging eco-construction projects that use bio-sourced materials, particularly for insulation. In addition, at a more local level, some local authorities are contributing to the development of the bio-based construction sector by choosing, as contracting authorities, to procure bio-based materials for their building projects. Straw construction concerns all types of buildings: from single-family homes to multi-storey buildings, including industrial and commercial buildings. According to the French Network of Straw Construction (RFCP), there are currently around 6,000 straw-built buildings in France, with 500 new constructions every year, representing a steady annual increase of 8% in the number of buildings (RFCP, n.d.). The French straw construction industry is the most dynamic in Europe. In the Pays de la Loire region, 83 out of 27,300 buildings are currently constructed using straw, a very small number. Thus, given the mentioned regulatory push and the resulting demand, the potential for growth is significant. A study by Guillo and Lafargue (2024)⁹ on biomass availability in the French Atlantic Arc region (composed of Normandy, Pays de la Loire, Brittany and New Aquitaine), explores biomass produced in these regions and compares it to the market evolution. This report assesses the biomass available according to several market growth assumptions, as well as the opportunity of development for the farmers. The study showed that the market for bio-based building materials is growing steadily: +10%¹⁰, and some actors even think that it will grow by 25% per year.

COPANO's market can be defined as: *the market for insulation materials for construction and renovation*, and the company is currently focused on gaining a strong position in the French market. The company's main activity is the construction of insulation/construction panels using straw. COPANO has chosen to keep the scope of its sales strategy close to its factory (i.e. Loire-Atlantique and neighbouring departments) to limit the costs and CO₂ emissions associated with transport. The aim is also to source production inputs locally. The expansion model will then be based on setting up COPANO factories in other regions in France.



L'Atelier du Biosourcé / Fabrik du BTP is an organisational innovation whose concept fits squarely into the dynamics of the bioeconomy in the French Atlantic Arc (more concretely, the Rouen area in the Normandy region). It aims to promote the production and use of bio-based materials for construction by creating a physical space to facilitate access to biobased materials, equipment, training and knowledge exchange for craftsmen. The objective is to raise awareness among stakeholders in the construction sector, encouraging their adoption of bio-based materials and creating an ecosystem conducive to their development. It builds community, which in turns will offer concrete benefits like supplies at discounted prices through group purchases, rental of specialised materials/tools/equipment, storage space, trainings and exchanges with experts.

⁷ See <https://www.ecologie.gouv.fr/politiques-publiques/reglementation-environnementale-re2020> for additional information.

⁸ <https://www.ecologie.gouv.fr/loi-portant-evolution-du-logement-lamenagement-et-du-numerique-elan>

⁹ This study is part of the SCALE-UP report on regional biomass availabilities, nutrient balances and ecological boundaries by Groenestege et al. (2024).

¹⁰ See also *Panorama des marchés « fibres végétales techniques matériaux (hors bois) en France »* - Memento 2020 – réalisé par FRD & IAR - financé par l'ADEME et France AgriMer : <https://france-miscanthus.org/wp-content/uploads/2020/03/Memento-March%C3%A9s-fibres-v%C3%A9g%C3%A9tales-techniques-mat%C3%A9riaux-2020-va.pdf>

Strumica (MK)

Driven by climate change and soil health deterioration as well as regulatory changes, the market for bio-based solutions in sustainable agriculture in North Macedonia is currently putting focus on innovative products –such as green fertilisers– to replace traditional agricultural inputs and adjust management practices. This market is becoming increasingly animated in regions where environmental sustainability and resilience to climate change are becoming critical priorities. Technological advances in GPS and mobile applications (e.g. for tracking of biomass and feedstock) are expanding the capabilities of innovators to valorise waste and byproducts and for users to improve their operational efficiencies. From a policy perspective, while the EU promotes bioeconomy initiatives with ambitious goals for reducing the use of synthetic fertilisers, national climate adaptation policies remain underdeveloped. Government support has also diminished recently, posing challenges for innovators. However, local policies, such as the Strumica region's Local Environmental Action Plan (LEAP)¹¹, offer opportunities to promote bio-based practices and drive adoption. In spite of the current global economic downturn, the financial capacity of consumers of agricultural products in North Macedonia appears to remain stable. Nevertheless, the lack of public financial support forces businesses to rely on own funding to acquire new machinery and run adjusted operations, limiting access to new solutions and market growth for the latter. From a social perspective, there is a need for educational efforts to drive behavioral change, particularly in areas like waste management and resource conservation.

Horti Eko is the provider of an innovative mulching machine offering a transformative approach to agricultural and waste management practices. Designed for versatility and efficiency, the mulcher attaches to a tractor and shreds agricultural residues into fine particles, which are subsequently incorporated into the soil to enrich composition, increase fertility, regulate temperature, retain moisture, and prevent erosion. These features collectively improve crop yields while reducing reliance on artificial fertilizers. For farmers, the mulcher addresses critical needs, including improving soil quality and reducing the use of synthetic fertilizers, which can help them attain better market prices for their crops. It also enables farmers to increase their time efficiency. For communal enterprises, the solution can help minimise landfill waste and improve the efficiency of vehicle and labor use, optimising spending while enhancing the environmental and public image of municipal utilities. In both applications, the mulcher demonstrates its potential to replace inefficient and environmentally harmful practices.



The Agro-Cooperative Bojane focuses on enhancing agricultural productivity and fostering collaboration among local farmers in the Saraj region of North Macedonia. Specialising in table grapes and grape products, the cooperative aims to strengthen market competitiveness while creating a sustainable model for agricultural development that can inspire similar initiatives across other regions. The **Bio-Based Value-Added Grape Products** from Bojane's vineyards represent an innovation in sustainable agriculture and food production. This initiative focuses on transforming locally grown grapes into a diverse high-end product line currently not available in the region, including grape juice concentrates, raisins, cold-pressed grape seed oil, and flavoured vinegars. By utilizing advanced processing techniques, these products preserve the natural health-promoting elements of the grapes, such as antioxidants and nutrients, enhancing dietary quality and overall wellness. The innovation is centred around sustainability and local sourcing. Each product is crafted using eco-friendly methods that prioritise the preservation of natural qualities and nutritional value. They are positioned as a superior, yet price-



¹¹ The LEAP is a strategic document designed to protect and improve the environment within the municipality. Its main goal is to ensure a clean and healthy environment for the residents of Strumica by implementing structured measures and activities within a defined timeframe and budget. The plan is valid for six years, after which it is reviewed and updated based on new developments and conditions. See <https://strumica.gov.mk/leap/> for additional information.

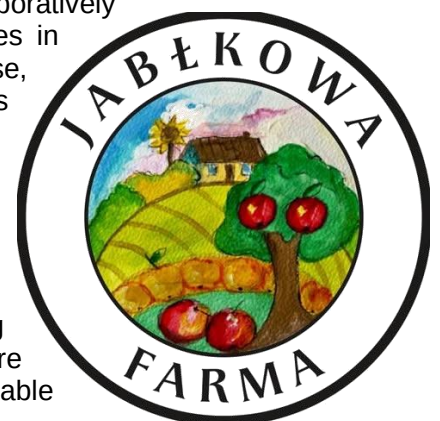
competitive alternative to imported or mass-produced products currently in the market. By offering the same product quality at a lower price and with a reduced environmental impact, this initiative addresses a significant market gap.

Mazovia (PL)

The European Green Deal and the Common Agricultural Policy (CAP) have set a favorable policy environment and driven public support for sustainable agriculture and bioeconomy initiatives in Poland. This is further undergirded by the regional development goals of the Mazowieckie Voivodeship, although intricate procurement processes can place constraints on the set up and operation of projects. There is consumer interest in sustainable, slow living lifestyles and experiences (e.g. hands-on agricultural activities, wellness programs, and culinary workshops), and in community-driven education. These concepts appear to be particularly appealing to younger generations but might also be interesting to institutions engaged in initiatives to raise climate-awareness. EU and national funding for educational and sustainability projects, combined with Poland's growing interest in ecotourism and experiential activities, may open promising perspectives for models that use public funding in their early stages to gain traction and build capacity that then leads to financial independence in the mid- to long term. The economic fluctuations and uncertainty felt at global level are also playing their part in Mazovia, however, some innovators are responding to this by exploring ideas to diversify their businesses and by setting up collaborations with public and private entities –at different jurisdictional levels– to enhance their resilience. From the technological perspective, digitalisation continues to expand and enhance capabilities for co-creation, for using new educational formats and tools, and for sharing good practices across regions and communities more efficiently.

Agricultural residues and food and beverage processing byproducts are often utilised as animal feed, with some of them carrying substantial nutritional value. Political drive for circular economy and circular bioeconomy initiatives, as well as increased awareness on the importance of short and resilient supply chains are increasingly leading to the exploration of byproduct/waste repurposing and upcycling, including for applications as ingredients in human food products. Market trends point toward growing demand for health-preserving foods and ingredients that address specific dietary requirements (e.g. low-calorie, gluten-free, or low-glycemic index options). In Mazovia, consumer demand seems promising, concretely in the HoReCa sector (comprising Hotels, Restaurants, and Cafés), educational institutions (for incorporation into school meals and research activities related to biology and ecology), and specialty health food stores. Specific segments of the HoReCa sector are clearly characterised by high innovation and an eagerness to experiment, driven by a continuous demand to enhance and diversify offerings for consumers. Further factors for these businesses to engage in circular bioeconomy initiatives include Corporate Social Responsibility (CSR) commitments and efforts to combat food waste. In the Mazovia region alone, the HoReCa sector encompasses over 500 entities, indicating significant market potential at the regional level.

The **Bio-circular Apple Farm** is anchored in the heart of European and Polish apple production, in an apple orchard estate with a nearly century-old heritage in Mazovia. The innovator has managed the farm for three decades, effectively leveraging advancements in science and technology while implementing innovative solutions to enhance productivity and support sustainable development. The farm aims to disseminate knowledge, engage communities, and collaboratively develop innovative solutions to enhance circular economy practices in apple production. It will capitalise on its existing resources (expertise, facilities and commitment to development of the region) to operate as a centre for education, entrepreneurship and innovation testing. The initiative will function as a space coordinated by a non-profit organisation, gradually assessing the need to transition into a commercial model. Its primary target market includes NGOs focused on ecology, tourism, and education, with an estimated 7,500 potential partners in the region, as well as educational institutions—particularly kindergartens and primary schools—which seek nature-based learning experiences. Additionally, vocational schools specialising in agriculture and gastronomy, along with providers of training services on sustainable



development, represent an attractive niche market. While its geographic location presents challenges, the Farm's established partnerships, diverse offerings, and ability to integrate bioeconomy education into its services provide a distinct competitive advantage. Offerings from recreational parks and other educational farms represent competition in the region, but the Farm's specialised focus on bioeconomy education is its point of differentiation. Overall, the versatility of the offer, compounded with the innovator's strong network and alignment with current sustainability trends position this innovation well for long-term success in the region's bioeconomy sector.

Gospodarstwo Sadownicze MB is a recognised regional producer of export-quality apples and apple juices in Mazovia that are produced in a 24-hectare apple orchard. The latter is managed according to integrated farming principles, ensuring a consistent supply of high-quality raw materials for producing apple and multi-fruit juices. Apple pomace, a byproduct generated during the juice extraction process, constitutes 20–25% of the weight of the processed raw materials. It is abundant in pectins, fibre, and polyphenols, rendering it a valuable resource for the food and cosmetics industries. Traditionally, pomace has been utilised as animal feed; however, due to its notable nutritional benefits, this new initiative has been developed to repurpose it as a raw material for the culinary and processing sectors. This initiative includes the production of dried pomace, pomace powder, and vacuum-packed fresh pomace. Owing to its established brand presence and reputation, the innovator maintains a robust position and a stable customer base within the HoReCa sector, regional companies, and educational institutions, the primary target audiences for the new product line. Pomace may be utilised to prepare functional beverages and fruit teas in their undried form. At the same time, the powdered variant can serve as an ingredient in baking bread, bars, muesli, and dairy products. Another promising customer segment comprises speciality retailers and wholesalers targeting health-conscious consumers, who can reach individuals seeking natural food products. Additionally, culinary innovators, including culinary schools and restaurants engaged in product experimentation, represent a significant audience facilitated by a strategic partnership with the Bio-circular Apple Farm presented above.



Andalusia (ES)

It is estimated that the amount of biomass resources generated by olive tree pruning in Andalusia amounts to 2,622,280 tons/year (Junta de Andalucía, 2023). Ongoing research and development on biochar, as well as its application as a soil management practice considered in the EU Carbon Removal Certification Framework¹², is leading to the fast development of market interest and demand. Part of the significant quantity of biomass generated by the olive grove and its associated industries can also be converted into biochar. The transformation of this biomass into biochar gives it added value, turning it into a product with multiple applications. The production and use of biochar can create new economic opportunities in rural areas, fostering sustainable development. The production of biochar requires several stages, from the collection and transportation of biomass to its transformation into biochar and its subsequent marketing. Each of these stages involves the creation of jobs, both direct and indirect, in areas such as agriculture, logistics, production and marketing. For an optimal use of olive biomass and its related industries, it is necessary to train new professional profiles capable of generating added value through different strategies for the use of these by-products, both at field and industrial level, helping to generate qualified employment. Simultaneously, demand for biocomposites is expected to increase as industries in sectors such as automotive, construction and consumer goods increasingly adopt sustainable practices. Since 2023, Andalusia has a plan of measures to strengthen the industrial ecosystem of the automotive industry¹³, whose objective is the growth of its value chain through the

¹² For more information, consult European Union (2024) Regulation establishing a Union certification framework for permanent carbon removals, carbon farming and carbon storage in products. European Parliament., 2024. Available at <https://data.consilium.europa.eu/doc/document/PE-92-2024-REV-1/en/pdf>.

¹³ Plan de cadena de valor CRECE Industria de la automoción en Andalucía. See <https://www.juntadeandalucia.es/index.php/organismos/transparencia/planificacion-evaluacion-estadistica/planes/detalle/452236.html> for more information.

consolidation of industrial activities, whether they are suppliers or manufacturers of components, materials, and even service providers for these. One of the objectives of the Plan is environmental sustainability, seeking to reduce the carbon footprint of the value chain and throughout the life cycle of products, the development of integrated solutions in line with the principles of the circular economy, energy optimisation and new forms of production and repair to achieve these objectives.

The innovation proposed by **Andaltec** valorizes olive pruning waste to convert it into a value-added raw material with the potential to be introduced into polymeric matrices and improve their properties, also reducing the environmental impact of the final products (automotive components, urban furniture, home furnishings or packaging). It also avoids the emissions caused by the burning of olive pruning, which generates more than 500 thousand tons of CO₂ each year in the province of Jaen alone (Universidad de Jaén, 2023). These new developments will contribute to the establishment of a suitable ecosystem based on a new business model from which farmers can benefit thanks to the potential added value of olive pruning as a reinforcement of technical materials. On the other hand, the production of new materials requires the development and implementation of new technologies, which can generate opportunities for research and development. Knowledge transfer and the training of qualified personnel are essential for the development of this sector. The innovation presented by Andaltec will position Andalusia as a benchmark in obtaining these materials from olive pruning, helping to strengthen the Andalusian industrial ecosystem.



With the biochar produced by **Bioliza**, Andalusia reinforces its leadership in the olive oil industry, demonstrating how the agricultural sector can be a crucial ally in the transition to a low-carbon economy. According to the Spanish Biomass Association, in 2023 biochar accounted for 94% of long-term carbon removal credits (International Biochar Initiative, 2024), standing out as a fundamental tool to achieve global climate targets. By sequestering carbon, improving soil health, and reducing reliance on synthetic fertilizers, biochar production can contribute to a more sustainable agricultural system in Andalusia. One of the main challenges that Andalusia has to face is drought. The biochar obtained by Bioliza improves the water retention capacity of crops, which means greater resistance to drought. In addition, biochar stores carbon stably in the soil for hundreds of years (Polonio Baeyens et al., 2024), helping to mitigate climate change by reducing the amount of carbon dioxide in the atmosphere.



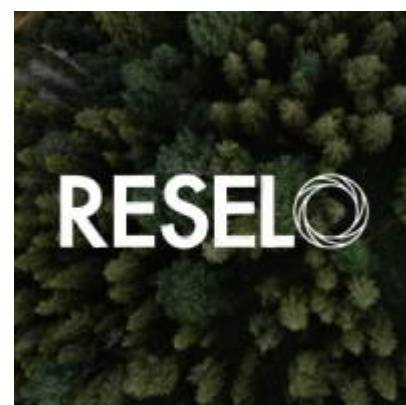
Northern Sweden (SE)

The forestry sector plays a crucial role in the economy of Sweden, where roughly fifty per cent of the forest land is owned and managed by small-scale private proprietors (SFA, n.d.). Driven in part by the EU's increasing ambitions on climate and biodiversity targets, the block's need for energy security/independency, and, more recently, the calls to ensure competitiveness at global level, the forest industry in Northern Sweden is evolving dynamically. Here, the demand for timber has remained steady, underpinned by both domestic construction needs and strong international exports. Simultaneously, several investments are planned to produce biocarbon, biofuels and biochemicals from forest industry byproducts (sawdust and bark), and the region is experiencing a revival in the interest to use the byproducts of harvesting operations in bioenergy production. Forestry operates as a co-production system where multiple products e.g., saw logs, pulpwood, and logging residues, are generated simultaneously, and thus their availability is inherently interconnected. Fluctuations in the demand or production of one product inevitably influence the supply of others (Matisons and Fridman, 2023). This interdependence underscores the importance of integrated forest management strategies to optimise resource use while balancing economic, environmental, and industrial needs. Woodworking industries, such as sawmills, generate substantial volumes of sawdust and bark. These materials are

repurposed into various applications, including mulch production, animal bedding, and biofuel, ensuring that a significant portion of the residual biomass re-enters the market. Similarly, large quantities of logging residues—comprising primarily branches, tops, and needles—are produced during harvesting operations. Currently, in Northern Sweden, these residues serve as a supplementary feedstock for Combined Heat and Power (CHP) plants in the region. However, their widespread utilisation is hindered by logistical challenges related to extraction, transportation, and storage, making their valorisation more expensive than that of sawdust and bark. As a result, a substantial portion of the biomass generated during harvesting remains uncollected and unutilized. On average, approximately 31 million cubic meters of timber are harvested annually in Northern Sweden. The primary factor influencing forest owners' harvesting decisions is the prevailing market price of timber, as it directly impacts profitability. The price of wood and woody biomass used for energy generation is said to have comparatively limited influence on the decision when to harvest. The recent market developments have already sparked initiatives to make the use of logging residues as an energy source more widespread and economically viable. New biorefinery applications are also being explored that extract high added value chemicals and materials from forestry byproducts. These trends are expected to continue as the region seeks to optimise resource efficiency and transit towards a more sustainable, more circular bioeconomy.

The **Wood Fuel Network**, a social innovation with longstanding roots in Northern Sweden, was the first of the 12 selected innovations to receive assistance via the SCALE-UP ISP, and has already put into practice the strategic insight gathered as part of the market analysis carried out in the programme. Its goal is to mobilise and connect multiple regional actors (local and regional authorities, large energy producers, forestry entrepreneurs, logistics operators, equipment developers, forest owners) within the whole value chain and to communicate and exchange best practices for cost-effective deliveries of high-quality logging residues for their valorisation. For operators of CHP plants, membership in the Wood Fuel Network is of interest as it can facilitate the access to- and mobilisation of larger volumes of high-quality logging residues, securing supply and potential decreases in price in the long term. The established contacts and direct communication with suppliers is essential to ensure the biomass meets the operator's specifications (e.g. nutrient and moisture content). For forest entrepreneurs, the network can be an invaluable source of knowledge and insight on past experiences and lessons collected by regional stakeholders over many years. It provides a reliable sounding board to explore new ideas and seek workable ways to expedite the stages of development, implementation and scale up. Lastly, for forest owners, the network can unlock concrete opportunities to generate additional income from the sale of logging residues and endow them with new ideas and validated knowledge on forest management practices to help them deal with the current changing macroenvironmental conditions more effectively.

Reselo is a young startup spinning off from the Wallenberg Wood Science Center of the Royal Institute of Technology (KTH) in Sweden. The team is contributing to the fossil phase-out of large economy sectors, like the footwear and automotive industries, by pursuing an impact-through-scale approach. Concretely, this has led Reselo to develop a scalable process to replace synthetic rubber by converting birch bark into a novel, elastomeric biomaterial: Reselo Rubber. Birch bark is a highly promising feedstock for industrial-scale material production due to its abundance as a residue from the global pulp, paper, and plywood industry. This widespread availability ensures that it remains an easily accessible resource. Furthermore, in Northern Sweden, a significant portion of birch bark is sourced from sustainably managed forests, reinforcing its role in environmentally responsible manufacturing. In addition to its accessibility and sustainability, birch bark contains valuable compounds with diverse applications, such as betulin, which can be used in coatings. These characteristics make birch bark a commercially attractive raw material for various industries. In Northern Sweden, a few large forest companies hold a dominant position in the market, shaping long-established business relationships and trust between buyers and sellers of woody biomass. These deep-rooted connections, developed over decades, can represent significant barriers for new startups and innovators seeking market entry and, importantly, access to biomass. The scalability potential of bio-based rubber will largely depend on the availability of birch bark, which



is primarily obtained from birch logs that are debarked before processing by the forest industry. To ensure a steady and efficient supply of raw material, production facilities should ideally be located near sawmills or pulp mills that process birch and generate large volumes of bark in a single location. A key challenge is that this bark is typically used as biofuel, limiting its availability for new applications. In SCALE-UP, Reselo has gained access to the network of forest companies and stakeholders in Northern Sweden, and through this is exploring the possibilities to enhance the operational and economic viability of their novel solution.

3.2 Key characteristics of the small-scale businesses explored

For confidentiality reasons, particularities of the individual businesses cannot be discussed in this report. Instead, to gain insights that could feed into the design of future innovation policy and support schemes, this sub-chapter offers a cross section of the business models examined with the 12 innovators., a frequency analysis of various elements integrating the 12 innovations' business model canvases was conducted to identify convergence along target groups, key resources, key partners, and communication and sales channels. Other elements of the canvases were also explored in comparative analysis, yet the ones shown below were considered to be the most illustrative.

Target groups

The analysis of the data collected by the TFs during the ISP sessions showed that half of the innovators supported by SCALE-UP (6 innovators from Austria, France, North Macedonia and Poland) consider *distributors and retailers* as a key target group. Within the merged group are included both large, international resellers as well as smaller shops operating at local level. Innovators also often listed *individual consumers* as another relevant customer segment. Here, direct sales to consumers are either already taking place or planned e.g. via their own or third-party online portals. The same number of innovators largely converge on the customer profiles they target for these direct sales, and together they could be described as *health and/or ecologically conscious consumers seeking to acquire premium or specialty products*. Overall, expectations recurrent among the innovators are that a comparatively larger proportion of revenues will come from the former group (retailers and distributors) due to the greater volume of consumers reached through them. Although contingent on the individual terms agreed with each retailer, profit margins should also be comparatively larger here, as economies of scale would allow the innovators to reduce logistics and sales costs per unit. At this point, the unit price for direct sales to consumers cannot range too high, as most of the products and services being offered are early stage and have little or no market traction yet.

Another interesting insight emerging from the data on customer groups was that one-third of the ISP participants (4 innovators from France, Spain and Sweden) are targeting their offer to an array of groups that are members of their own innovation system¹⁴ (e.g. including individual consumers, craftsmen, knowledge workers, and public authorities), even if the latter play very different roles and have distinct needs in the market situation. Some are final users of the product or service, while other play a procurer or intermediary role. In two cases this reflects the versatility of the products offered, and in the two others it is a result of particular characteristics of the innovation, like having a main vision of developing the regional market through concrete objectives of building community, sharing knowledge, and sparking collaboration among local and regional actors.

Another observation is that innovations that could be classified as leveraging more complex technology consistently listed large-scale manufacturers (ranging from the automotive, through the footwear, and to the cement industries) as key target groups. Here, 3 innovators from Spain and Sweden have received direct support during the ISP to explore collaborations that could eventually lead to first- or expanded industrial application of their solutions.

Lastly, a comparatively small proportion of the innovations in SCALE-UP are being targeted to agricultural and energy sector players (often predominant groups in the market for bioeconomy products and

¹⁴ Following the definition proposed by Edquist (1997) „all important economic, social, political, organizational, institutional, and other factors that influence the development, diffusion, and use of innovations.“

services). Here, 2 innovations offer advantages in soil enhancement applications and 1 in the generation of bioenergy.

Key resources

The frequency analysis of the entries in the *key resources* element of the Business Model Canvas template showed that 7 out of 12 innovators identify biomass as a fundamental resource to deliver on their value proposition. Almost the same number of innovators, 6 out of the 12, consider networks and strategic partnerships as essential. Similarly, 6 innovators listed skilled personnel. Here, the analysis distinguished between entry formulations referring explicitly to the team and those referring to expertise, information, knowledge, and intellectual property, as these assets/competences could be held outside the organisation or within its knowledge management system, as opposed to among staff. Taking that consideration, 9 innovators listed the mentioned assets/competences as fundamental resources for the business. Other trailing entries included financial resources, facilities, equipment, marketing and sales, and R&D (including market research and business planning).

Key partners

Perhaps unsurprisingly given the type of organisations that the SCALE-UP innovators are and the type of operations that they run, suppliers and R&D partners were the second and third groups most frequently listed as *key partners* in the assessments (by 7 and 6 innovators, respectively). Innovators often included groups here that they had previously also categorised as clients. This is commonly observed in such exercises and has probably to do with the fact that early-stage enterprises often rely largely on their prospects or first clients to pilot and test their prototypes. Thus, a dual relationship ensues.

Marketing and sales channels

As regards the preferred channels to raise awareness and drive purchase decisions, the majority (10) of the innovators who participated in the ISP are visiting trade/industry fairs and exhibitions, conferences and online events regularly to promote their business. Further, 7 out of the 12 innovators are reaching out to potential clients directly, this includes following up with contacts established in the visited events. The same number of innovators listed online presence via websites and social media as key channels to spread the word about their offer, and 3 innovators included online shops/e-commerce platforms as their sales channels.

4 Discussion and main lessons learned

Some observations on the assessments

The relative prominence of retailers and distributors in the lists of target groups is noteworthy, as it reflects the common dependency of early-stage enterprises on intermediaries that they can lean upon to leverage market presence and sales. This could be seen to indicate that if regionally focused bio-based businesses are to remain small scale, they will need to develop strong bargaining power vis-à-vis larger, international clients they might be dependent upon in their spin-off and start-up phases. This will require a diversified client portfolio and a dependable network of logistics partners. Support seems necessary to successfully navigate these initial periods of market entry and transition into later stages of development, where a strong market pull can be a determinant factor for the enterprise's decision-making.

The current economic downturn and the erosion of purchasing power due to high inflation rates are combining with a shift in global politics towards narratives that pit national competitiveness agendas increasingly sharply against social and environmental policies. In this light, regional bioeconomies will be confronted with the complex task of balancing economic development with social and environmental goals more bluntly than before. Roughly half of the innovations examined in the SCALE-UP programme are high-end consumer products oriented towards health- and/or ecologically conscious consumers. For these young enterprises to enter the market and become financially viable, they will require a customer base that is willing and able to (continue to) pay a premium for their market goods. The rather opposite scenario builds up on the current market, and so this could indicate a need for rolling out policy instruments that increase affordability of healthy, environmentally sustainable products.

The SCALE-UP ISP has drawn a good number of innovations that could be directly classified in the Social and Solidarity Economy category¹⁵ (3 of them from FR, PL and SE are distinctly social innovations) or that strongly incorporate one or more features of entities in that category (3 others from FR, MK, and PL). Some were more focused on ethical research and small-scale operation, prioritising financial sustainability over traditional profit-oriented models. They sought legal guidance on licensing and knowledge transfer while committing to maintain their ethical framework. These innovations appear to carry significant potential to push forward their regional bioeconomy, mainly because of the passion and commitment that drives their leaders—often holders of specialised knowledge and being themselves important nodes of regional networks. If the positive response that the social innovations who participated in SCALE-UP have seen so far is something to be generalised, it would be important to spot these initiatives as they emerge and facilitate their journey. As in these cases a great deal seems to hinge initially on the personal knowledge and dedication of a small group of highly motivated and well-connected individuals, setting up adequate means to ensure knowledge transfer and management may be important to build redundancy and reduce dependencies.

On the aspect of replicability, the core ideas of many of the innovations explored in the ISP are easily replicable and build upon exploitation and business models that already give serious consideration to the question of technology/capacity transfer via both commercial and open mechanisms —e.g. licensing, setting up operations in other markets, sharing, and open sourcing— as market expansion strategy (e.g. HortiEko, Compolive, Bio-based Value-added Grape Products, COPANO). The same can be said of the social innovations explored in France, Poland and Sweden, which place explicit emphasis on knowledge sharing and incorporate notions of open innovation into their core activities.

As regards scalability, while several innovators are optimistic about their prospects and even have already gained good traction (e.g. Gospodarstwo Sadownicze MB, Bioliza, Compolive, Wood Fuel Network), the main limiting factor for some others seems to be the well-known one for the bio-based sector: access to a steady, affordable supply of biomass in the necessary volumes (e.g. to enable semi- or industrial scale operation) and meeting the required specifications (to ensure consistent quality of the end product without disproportionate costs). Here, resistance to change and a lack of clear, strong incentives for biomass holders, competition between current and alternative uses of biomass, and tradeoffs that raise questions of environmental sustainability and affordability of end products, come into play.

Reflections on the implementation of the SCALE-UP ISP

Overall, the experience of planning, setting up, and running the SCALE-UP ISP has been enriching in several ways for both its main beneficiaries (i.e. the 12 selected innovators) as for the consortium members who have been directly involved in the task (Ecologic Institute and all regional partners). For some of the latter, adopting the role of regional leads in the support programme—which entailed taking on community building and entrepreneurial activities—has demanded that they themselves upskill and adopt new stances. The ISP thus represented a challenge in terms of their own skills and capacity. While all regional partners in SCALE-UP possess great knowledge on the technical aspects of bioeconomy in their region, business, marketing and finance strategies were not always their core work. While somewhat disorienting for them and their network at first (e.g. as their peers do not know them as innovation managers), they have overcome this successfully and gathered positive experiences from the engagement. They have built expertise and capacity on these topics and have improved their position as go-to partners in their region. Some partners have directly expressed their conviction that can truly support the bioeconomy innovation ecosystem in their region. In some cases, SCALE-UP has sparked the partners' involvement in new projects and with this they have been able to contribute to concrete strategic developments in the bioeconomy sector of their countries.

On the side of the innovators, they have described their experience participating in the programme as satisfactory, with some of them expressing great gratitude for the concrete opportunities (e.g. participation in international trade fairs, exposure to potential partners and investors) and expanded perspectives that their TFs provided them with. Several innovators primarily struggled with funding,

¹⁵ See https://social-economy-gateway.ec.europa.eu/about-social-economy/social-economy-definitions-and-glossary_en for common principles and definitions of the concept considered by the European Commission.

and aligning business model design with a clear target was crucial to securing and keeping their engagement. Others lacked human resources and marketing support, and so seeking opportunities within the consortium to help them explore possibilities in new geographic markets (e.g. establishing contacts to foreign distributors for gaining supply chain access) and to diversify their products was key. Overall, the ISP was seen as beneficial as it brought time and resources to invest in activating networks around concrete solutions and their value chains, and in pushing different groups in a region to bridge communication gaps.

The experiences with the concept of the TFs and with the engagement of their members has been mixed. The TFs were seen in some regions as instrumental for further developing the bioeconomy network and fostering collaboration within the community. At the same time, in some cases TF members initially invited turned out to not always be the most suitable ones to support with the specific situation the innovators were going through. Flexibility to adapt and rearrange TF membership, and perhaps involving them later, once a better understanding of the innovators' needs was confidently secured, were proposed as ways to improve in the future. Thankfully, some experience with such proposed improvements was already gathered during the programme, as some supporting partners who started later with the more intensive work with the innovators did exactly that. They adopted a flexible approach to setting up and handling the TFs. They met several times with the selected innovators first, and selected TF members once they felt they had a solid grasp of what the innovators needed. They emphasised the importance of confidentiality, as some TF members were too close to the innovators' competitors. This effectively meant that their contributions to the discussions were of high relevance, with sufficient depth and concreteness, but it simultaneously complicated the dynamics of the exchange. Another clear lesson was that pro-bono, recurrent support from the TF members was challenging to secure, which made it crucial to identify incentives and formulate in-kind contributions from SCALE-UP to them. Concretely, one of the regional partners leveraged their social media presence and "marketed" the TF concept as contributing to the broader innovation ecosystem in Andalusia, giving thus the TF members a clear role and spotlight in that frame.

Some partners faced difficulties at the start in identifying innovations and reaching out to potential participants. From the view of some regional partners, the initial effort to standardise general requirements, selection criteria, and scheduling of the call for Expressions of Interest among the six regions at the start of WP4 was perceived as a barrier. For instance, more flexibility in the timing (i.e. accounting for differences in the summer break in different regions of Europe) and earlier communication are expected to have ultimately improved engagement. Steps were indeed taken afterwards to incorporate a certain level of customisation into the open call, but this meant less time was available to keep them open for applications. Once the ISP started, logistical issues (e.g. remoteness, limited accessibility) and the seasonal nature of the innovator's running business (e.g. apple orchards) also complicated their earlier engagement and the coordination of schedules with local stakeholders that would be involved in the TFs. Despite these hurdles, meetings of the regional stakeholder platforms supported by SCALE-UP helped foster collaboration and activate community members, and maintaining a flexible and adaptive approach led to the efforts being fruitful.

One of the advantages of SCALE-UP's structure which innovators could most tangibly benefit from was the geographical spread of the project across Europe. In several cases where innovators were seeking to expand beyond their domestic markets or seek collaborations with international partners, consortium members were able to provide valuable insights and network contacts in their own country/region. Similarly, the distributed conduction of the ISP activities and management of the TFs across the six regions proved to be a good practice. As mentioned earlier, while some regional partners lacked experience with innovation management and support services, they do possess valuable local knowledge and networks, and a nuanced familiarity with the dynamics of the regional bioeconomy. This proved invaluable as it helped potentialise the standard framework and methodology that the project provided the regional partners with, ultimately generating more targeted assistance to the innovators.

Lastly, the shared experiences of several regional partners highlighted the importance of consistency in the planning and diligence in the execution of the working sessions with the TFs. The steady sequence of meetings, scheduled well in advance and involving small groups of 2-6 regular attendees provided a feeling of continuous and incremental progress as a group. Online sessions helped speed

up the process, while face-to-face meetings were beneficial to bring the TFs closer as teams, when this was possible.

5 Conclusions and recommendations

The SCALE-UP project has demonstrated the potential of structured innovation support to enhance the market readiness of bio-based innovations across six European regions. Through their active engagement along the four Tasks in WP4, and particularly in the Innovation Support Programme (ISP), consortium partners and other contributors have provided tailored business development services, activated regional networks, and sparked collaboration between innovators and key local experts along concrete projects with punctual needs. The experience gathered with the ISP highlights key lessons about the challenges and opportunities faced by early-stage bio-based enterprises and initiatives, which we hope can inform future policy and support initiatives.

One of the main findings of the programme is that market access remains a difficult endeavor for bio-based innovators, particularly those operating in niche markets or with sustainability-oriented products whose price is often marked at a premium. The reliance on retailers and distributors as intermediaries underscores the need for young enterprises to develop robust sales strategies and strong negotiating power to ensure long-term viability. On the one hand, the skills and time resources necessary for these are rarely at hand for spin-offs and early-stage start-ups, and future programmes offering innovation support services could give particular focus to addressing this. Conversely, policies that promote sustainable consumption and increase the affordability of bio-based products could play a crucial role in expanding market demand.

The programme coordinators also experienced first-hand the growing role of social innovations and of the influence of the Social and Solidarity Economy (SSE) in the effort to transit to a sustainable bioeconomy. Enterprises operating in the SSE often adopt alternative business models that prioritise social, democratic and environmental objectives over traditional profit maximisation. Several participating innovators exhibited strong commitment to the social and ethical dimensions of their business. Given their potential to drive place-based, mission-driven bioeconomy solutions, targeted support mechanisms should be considered to facilitate their viability. This could include improved access to finance—recurrently listed as a burden by bio-based innovators—legal guidance on business models with a strong ethical or cooperative angle, and capacity-building initiatives tailored to social innovation initiatives.

From an implementation perspective, the experiences collected in setting up and running the regional TFs highlight the importance of preparation, flexibility and adaptability in structuring innovation support. Taking enough time at the start to align the membership of these groups sufficiently well with the identified needs and priorities of the innovators is essential to avoid discouragement at the start. Further, adjustments during the run of the group sessions are to be foreseen, as often necessities change as new information becomes available, and this happened systematically during the SCALE-UP ISP. Future programs should allow for an iterative approach to stakeholder engagement, ensuring that the right expertise and networks are mobilised accordingly. Additionally, sustained voluntary engagement from TF members and contributors will continue to be a challenge. Organising for punctual inputs that require moderate to low effort, and identifying incentives—even if through the provision of in-kind benefits—could help ensure committed participation.

The geographical coverage of the SCALE-UP consortium also proved to be a key asset, allowing some innovators to access international market insights and networking opportunities. This underscores the value of collaboration across regions in bioeconomy innovation, particularly in helping early-stage entrepreneurs explore new markets and identify business opportunities. EU-supported programs should continue to facilitate such linkages and synergies, yet with a clear pursuit of meaningful exchange. The distributed approach that the ISP adopted, which gave regional partners a common framework to follow while allowing flexibility—in the timing and the selected programme activities—and the incorporation of their own understanding of local norms and dynamics proved to be successful in generating value for the innovators.

Finally, ensuring consistency and steady progress during the programme is essential. The structured and regular sequence of TF sessions followed by some regional partners was highly beneficial in maintaining momentum and progress.

Building on these areas, future initiatives can leverage the positive achievements and lessons of SCALE-UP to further support the transition towards a sustainable, circular bioeconomy in Europe.

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Annexes

Annex I – Setting up Task Forces report

Annex II – Synthesis Reports for the six SCALE-UP regions



SCALE^{UP}

community-driven
bioeconomy development

Setting up Task Forces

December 2023

CTA



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EXECUTIVE SUMMARY

The document summarizes the main needs identified during the first meeting with the selected bio-based solution for the Innovation Support Programme. A first introduction of the bio-based solutions followed by the first identified needs and the proposed members for the Task Forces are described in this document.

Table of contents

Setting up Task Forces: overview and linkages with the Innovation Support Programme6

1. Setting up Task Forces for solutions in Northern Sweden6
 - 1.1 Northern Sweden Solution 1: RESELO Biorefinery – Sustainable Production of Rubber from Nordic Forest6
 - 1.2 Northern Sweden Solution 2: Wood Fuel Network – Social innovation to strengthen the value chain for logging residues.8
2. Setting up Task Forces for solutions in Mazovia (Poland)9
 - 2.1 Mazovia Solution 1: BIOCIRCULAR FARM9
 - 2.2 Mazovia Solution 2: APPLE POMACE INNOVATIONS10
3. Setting up Task Forces for solutions in Strumica (North Macedonia)10
 - 3.1 Strumica Solution 1: bio-compost machine developed by Interaktivna idnina DOOEL10
 - 3.2 Strumica Solution 2: Machine for Fine Grinding Residues from Viticulture, Gardening, and Fruit Growing" by ZPGCV Horti Eko Strumica12
 - 3.3 Establishing a Task Force for the solutions in Strumica14
4. Setting up Task Forces in Upper Austria15
 - 4.1 Upper Austria Solution 1: Streuobstwerkstatt - Valorising the biodiversity hotspot meadow orchard15
 - 4.2 Upper Austria Solution 2: SUN Project, Velvety Manufaktur GmbH - Extraction of vegetable proteins from sunflower oil press cake 17
5. Setting up Task Forces in the French Atlantic Arc (France)19
 - 5.1 French Atlantic Arc Solution 1: “Atelier du biosourcé”19
 - 5.2 French Atlantic Arc Solution 2: COPANO21
6. Setting up Task Forces in Andalusia (Spain)23
 - 6.1 Andalusian solution 1: Fundación andaltec i+d+i – COMPOLIVE Biorefinery23
 - 6.2 Andalusian solution 2: BIOLIZA: Biochar Obtained From Olive Waste Pyrolysis24

Setting up Task Forces: overview and linkages with the Innovation Support Programme

During the month of November, regional partners met with the different bio-based solutions selected in the Call of Expression of Interest to design the future Task Force that will work hand by hand by SCALE-UP partners during the Innovation Support Programme (ISP). The twelve selected solutions as well as the potential needs and the accurate stakeholders for solvent them are detailed and explained in D4.1 “Overview of regionally suitable solutions”. For the other hand, in this document, a summary of the first identified solutions as well as the proposed stakeholders are described.

It is relevant to remark that the Task Forces could be modified during the ISP since the situations of entrepreneurs' initiatives are always moving (hopefully) forward. Additionally, the involvement of SCALE-UP advisory board members is expected. A very simple questionnaire has been designed to disseminate them in order to know their priorities.

1 Setting up Task Forces for solutions in Northern Sweden

1.1 Northern Sweden Solution 1: RESELO Biorefinery – Sustainable Production of Rubber from Nordic Forest

With the rise of the industrialization, humanity has increasingly used fossil resources like oil and gas to generate energy and as basis to produce a variety of materials and goods, like plastics and rubbers. However, exploited fossil resources are a mixture of different compounds with a variety of molecular structure and size. To be able to use these divers' molecules the refinery concept was developed, which allowed the separation and isolation of individual molecules from these mixtures. Nowadays, humanity strives towards independence from such fossil resources since they are a finite, non-sustainable feedstock and the incineration or degradation of fossil-derived products generates massive carbon dioxide emissions thus ultimately accelerating climate change.

In contrast, the biorefinery concept aims at using biomass as a renewable feedstock to produce goods and energy. Importantly, biomass is largely build up from carbon dioxide through the process of photosynthesis. However, to transform today's fossil-centered industry into a sustainable bioeconomy new methodologies and industrial processes need to be developed to valorize biomass at commercial scale.

At Reselo, it was developed a process to convert birch bark into a novel, elastomeric biomaterial that we named Reselo Rubber. Birch bark is a great feedstock to produce new materials at industrial scale because:

- ▶ it is an abundant residue of the global pulp, paper and plywood industry, making it an easily accessible resource.
- ▶ birch bark can be obtained to a large extent from sustainably managed forests.
- ▶ it contains several compounds that can be used for different applications, like betulin for coatings, thus making birch bark commercially attractive.

1.1.1 Identified needs.

BioFuel Region has had several meetings and discussions with RESELO to identify their need for support. In general Biofuel Region can support RESELO with:

- ▶ Our knowledge and networks and to be available as a “sounding board” for ideas.
- ▶ Give input into the communication strategy upstream the value chain.
- ▶ Suggest financial support mechanism at EU or at national level.

- Suggest and evaluate solution for raw material supply and biomass logistics.

1.1.1 Mapping of gross potential of birch bark

In northern Sweden, a few big forest companies have a dominating market position. Business relations and trust has developed between sellers and buyers of woody biomass for several decades. Therefore, it is very difficult for new startups and innovators to enter the market and to get access to biomass. Production potential of bio rubber will be determined by the availability of birch bark. Forest industries debark birch logs before processing. Production unit should preferably be located near sawmills or pulp mills that use birch and produce large volumes of bark in on place, but bark is normally used for internal energy generation. – The challenge for RESELO is get access to this bark.

RESELO are interested to receive support and to give input into a raw material supply analysis in 2030-2100 perspective. An overview of the potential amounts of birch bark available in different regions all over Sweden until 2100 has been delivered by Swedish University of Agricultural Sciences

RESELO have asked for further support to develop an advanced raw supply analyses with marginal cost curves around a given location for supply of:

- 50 000-ton wet birch bar (50% moisture)
- 100 000-ton wet birch bark (50% moisture)
- 150 000-ton wet birch bark (50% moisture)

RESELO has also asked for information about:

- Users of birch biomass (pulp mills heating plants)
- Import and Export of birch round wood.
- Potential for thinning of young birch trees and methods for separation of birsh bark
- Regulatory incentives
- Tax exemptions or similar
- EU ETS



1.2 Northern Sweden Solution 2: Wood Fuel Network – Social innovation to strengthen the value chain for logging residues.

Multi-actor partnerships to restart logging residue extraction in northern Sweden

The goal of the social innovation is to mobilize multiple actors within the whole value chain and to communicate and exchange best practices for cost-effective deliveries of logging residues with high quality.

In northern Sweden, several investments are planned to produce biocarbon, biofuels and biochemicals based on forest industry by-products (sawdust and bark). These investments are on higher levels in the biomass value pyramid than energy generation.

Sawdust and bark are today used for combustion in CHP (combined heat and power) plants that must look for alternative wood fuels. Logging residues (branches and tops) represent an underutilized biomass resource. To mobilize this resource several actors must make strategic decisions. A goal of the social innovation is to mobilize all actors within the whole value chain and to communicate and exchange best practices for cost-effective deliveries of logging residues with high quality. A wood fuel network including buyers and sellers of wood fuels in northern Sweden will be mobilized in this task.

In close cooperation with buyers and sellers of wood fuels in northern Sweden, we have started to identify challenges and solutions in the logging residue value chain with a web survey. We also want to identify important areas where best practices can be shared and developed. Based on this input we will design workshops and training sessions together with heating plant, entrepreneurs, and suppliers of wood fuels.



2 Setting up Task Forces for solutions in Mazovia (Poland)

2.1 Mazovia Solution 1: BIOCIRCULAR FARM

2.1.1 Solution Overview

Biocircular Apple Farm – an interdisciplinary and bio-circular apple farm as a space for the development of services and new products in bioeconomy and social innovation. The apple farm will form an innovative space for the development of innovations, testing new concepts and technological, social, educational, and cultural solutions in the field of bioeconomy, digitalization of the agricultural and food industry, and circular economy. It envisages training, educational, entrepreneurial, promotional, and social animation activities.

2.1.1 Identified needs:

- ▶ Mega trends and development directions related to bioeconomy, digital and circular transformation.
- ▶ Case studies and inspirations from other regions and countries related to technologies and applied concepts.
- ▶ Triple impact approach.
- ▶ Support in new business models generation for new services and new products, as well as animation and facilitation of testing and validations
- ▶ Branding and marketing

2.1.2 Stakeholders identified and rationale:

1. Agnieszka Zdanowicz – expert in circular economy, bio-based solutions and cluster manager. Experienced in boosting circular innovations, managing business support programmes financed from European and regional funds. Cluster manager of Waste and Recycling Cluster.
2. Anna Słowiecka – expert in branding and marketing, director of business center club gathering companies and researchers from the Radom region. Coach and initiator of cross-sectoral meetings, conferences and events.
3. Marta Laskowska – expert in circular economy and organizational management. Director of Center of Cooperation and Recycling.
4. Małgorzata Hałkowska – expert in food technology, entrepreneurship and rural development. Vice-President of Slow Beskid foundation specialized in leading and coordinating social, economic and environmental support programmes
5. Anna Bialik – expert in strategic partnerships, agility and cross-industry collaboration. Experienced in managing multiple and multilevel projects and initiatives related to digital and circular transformation, SMEs support and new innovations ecosystems. Vice-President of UNIMOS Foundation
6. Katarzyna Rull Quesada – expert in international cooperation, strategic management and EU programmes related to innovations, internationalization, and dynamic capacities.

2.2 Mazovia Solution 2: APPLE POMACE INNOVATIONS

2.2.1 Solution Overview

Innovative bio-based solution relies on using the pomace generated from the production of natural juices pressed on the farm to design and create new health-promoting, functional, and eco-friendly products, as well as to analyze the possibilities of their utilization in other branches of the economy. Apple pomace is a source of valuable bioactive compounds, as they are mainly accumulated in the fruit peel. The biomass of such residues has a high potential for innovation through certain nutritional values, but also for energy and fertilization purposes.

2.2.2 Identified needs:

- ▶ Market research on healthy snacks, food trends and latest developments
- ▶ Assessment of local resources, capacities, and infrastructures, as well as potential collaborations and strategic partnerships
- ▶ Co-creation activities and ideation of potential new products
- ▶ Support in new business models generation for new products and product development support
- ▶ Branding, marketing, and sales channels development
- ▶ Financing monitoring and architecture of potential funding

2.2.3 Stakeholders identified and rationale:

1. Małgorzata Hałkowska – expert in food technology, entrepreneurship and rural development. Vice-President of Slow Beskid foundation specialized in leading and coordinating social, economic and environmental support programmes.
7. Agnieszka Zdanowicz – expert in circular economy, bio-based solutions, and cluster manager. Experienced in boosting circular innovations, managing business support programmes financed from European and regional funds. Cluster manager of Waste and Recycling Cluster.
8. Anna Słowiecka – expert in branding and marketing, director of business center club gathering companies and researchers from the Radom region. Coach and initiator of cross-sectoral meetings, conferences, and events.
9. Marta Laskowska – expert in circular economy and organizational management. Director of Center of Cooperation and Recycling.
10. Anna Bialik – expert in strategic partnerships, agility, and cross-industry collaboration. Experienced in managing multiple and multilevel projects and initiatives related to digital and circular transformation, SMEs support and new innovations ecosystems.

3 Setting up Task Forces for solutions in Strumica (North Macedonia)

3.1 Strumica Solution 1: bio-compost machine developed by Interaktivna idnina DOOEL

3.1.1 Solution overview

The proposed solution is a bio-compost machine developed by Interaktivna idnina DOOEL, affiliated with DPTU– Kavadarci, in 2016. The objective is to install this machine in the city market of Strumica to address the issue of organic waste, which constitutes 70% of the total waste produced by citizens.

The initiative aims to raise awareness among the community about segregating and depositing organic waste in the bio-compost machine. This innovative machine, developed over a span of five years, is designed to convert garden and food waste into organic fertilizer. Its primary focus is on serving the city market and nearby structures in Strumica. The key financial benefit is estimated at 1000 EUR per month, which can be attributed to several advantages.

Firstly, the bio-compost machine is expected to significantly reduce municipal waste by approximately 70%. This reduction not only eases the burden on waste disposal systems but also aligns with environmental sustainability goals. Moreover, the machine's ability to transform biowaste into organic fertilizer contributes to a more circular and eco-friendly approach to waste management. The initiative also promises a substantial decrease in transportation and waste disposal costs. This cost reduction can have a positive impact on the city's budget and resource allocation. Additionally, the bio-compost machine plays a crucial role in preventing spontaneous combustion in landfills, addressing a potential environmental hazard associated with waste disposal. Furthermore, the project aligns with broader environmental goals by reducing the emission of greenhouse gases. The conversion of organic waste into fertilizer instead of letting it decompose in landfills can help mitigate the environmental impact associated with the decay of biodegradable materials. The implementation of the bio-compost machine is not only a waste management solution but also a step towards achieving the "Zero Waste" goal for the city. By engaging citizens in the process of waste reduction and recycling, the initiative promotes a sustainable lifestyle and contributes to the overall resilience of the city against environmental challenges. Additionally, the project opens opportunities for creating partnerships between various entities, including institutions, associations, and businesses. Collaborations in waste management initiatives can lead to shared responsibilities and more effective solutions. This collaborative approach can foster a sense of community engagement and shared environmental responsibility.

In summary, the introduction of the bio-compost machine in Strumica's city market holds significant promise for waste reduction, cost savings, environmental sustainability, and community engagement. It represents a tangible step towards achieving the "Zero Waste" goal, fostering resilience, and creating opportunities for partnerships that contribute to a more sustainable and environmentally conscious city.

3.1.2 Identified needs.

The identified needs in the context of the bio-compost machine project in Strumica encompass several key areas, with a particular emphasis on local connections, waste quantification, and market advocacy.

1. Local Connections and Community Engagement:

- **Need:** The entrepreneur, not originally from Strumica, should prioritize building strong local connections. This involves engaging with the community, local institutions, and businesses to foster collaboration and garner support for the bio-compost machine initiative.
- **Rationale:** Local connections are essential for successful project implementation. Community buy-in and support from local stakeholders enhance the project's credibility and increase the likelihood of its long-term success.

11. Waste Quantification and Data Management:

- **Need:** There is a requirement for a systematic approach to quantify and manage waste in the suggested area effectively.
- **Rationale:** Proper waste quantification is crucial for understanding the scale of the issue and tailoring the bio-compost machine's capacity to the actual waste generation. Accurate data on the types and volumes of waste will inform better decision-making and resource allocation.

12. Market Advocacy and Public Awareness:

- **Need:** There is a need for a comprehensive advocacy strategy to promote the benefits of the bio-compost machine and encourage widespread adoption of organic waste disposal practices among citizens.
- **Rationale:** Successful waste management relies on active participation from the community. Market advocacy campaigns can educate the public about the environmental

benefits, cost savings, and long-term positive impacts of using the bio-compost machine. This, in turn, increases the likelihood of achieving the project's waste reduction goals.

13. Collaborative Partnerships and Networking:

- **Need:** Establishing partnerships with local institutions, associations, and businesses is crucial for the success of the project.
- **Rationale:** Collaborative efforts can amplify the project's impact by bringing together diverse expertise and resources. Local partnerships contribute to a sense of shared responsibility for waste management and can lead to the creation of a more robust and sustainable system.

In conclusion, addressing the identified needs involves not only the successful implementation of the bio-compost machine but also strategic initiatives focused on community engagement, waste quantification, and effective advocacy. Building strong local connections, understanding the waste landscape through quantification, and advocating for the project in the market are integral components that contribute to the overall success and sustainability of the bio-compost initiative in Strumica.

3.2 Strumica Solution 2: Machine for Fine Grinding Residues from Viticulture, Gardening, and Fruit Growing" by ZPGCV Horti Eko Strumica

3.2.1 Solution overview

The proposed solution, "Machine for Fine Grinding Residues from Viticulture, Gardening, and Fruit Growing" by ZPGCV Horti Eko Strumica (established in 2010), addresses the environmental challenges associated with the disposal of plant material. This innovative machine aims to tackle the significant issue of plant waste ending up in landfills near populated areas, contributing to environmental pollution and air quality degradation. The primary issues being addressed include the improper disposal of plant material in landfills, where it often ends up burned, further exacerbating environmental pollution. Additionally, some of the waste finds its way into river basins, causing water pollution and contributing to flooding, particularly in narrow canal areas. The solution proposes a machine designed for fine grinding of plant residues, transforming them into small particles. The resulting material can then decompose in the soil, effectively becoming a bio-fertilizer. Noteworthy aspects of this technology include its low-cost nature, making it an accessible and sustainable option for addressing environmental challenges associated with plant waste.

The benefits of implementing this solution are multifaceted:

- ▶ **Promoting a Healthy Environment:** The machine aims to significantly reduce the amount of plant material deposited in landfills and burned, contributing to a healthier environment near populated areas.
- ▶ **Environmental Pollution Reduction:** By addressing the improper disposal of plant waste, the solution directly contributes to a reduction in environmental pollution, particularly air pollution resulting from the burning of plant material.
- ▶ **Preservation of Microflora:** The proposed machine helps minimize the destruction of microflora associated with traditional disposal methods, promoting a more balanced and sustainable ecosystem.
- ▶ **Soil Enrichment with Biofertilizer:** The finely ground plant residues, when integrated into the soil, serve as a valuable bio-fertilizer, enhancing soil fertility and promoting healthier plant growth.
- ▶ **Decreased Reliance on Artificial Fertilizers:** As the soil is enriched with biofertilizer, there is a potential reduction in the need for artificial fertilizers, contributing to sustainable and eco-friendly agricultural practices.

In summary, the "Machine for Fine Grinding Residues from Viticulture, Gardening, and Fruit Growing" represents an impactful solution offered by ZPGCV Horti Eko Strumica. By addressing the improper disposal of plant material and providing a low-cost technology for its transformation into bio-fertilizer, the solution not only mitigates environmental challenges but also supports sustainable agricultural practices and a healthier ecosystem.

3.2.2 Identified Needs

The identified needs from the proposed solution, the "Machine for Fine Grinding Residues from Viticulture, Gardening, and Fruit Growing" by ZPGCV Horti Eko Strumica, highlight the developmental nature of the initiative and the challenges associated with its implementation.

1. Concept Development and Business Model:

- **Need:** The solution is currently in the conceptual stage, requiring comprehensive development from scratch. This includes the formulation of a detailed business model that outlines the operational processes, target market, revenue streams, and long-term sustainability strategies.
- **Rationale:** A well-defined business model is crucial for the success of the project. It not only serves as a roadmap for implementation but also provides clarity on how the solution will address the identified environmental challenges and contribute to sustainable agricultural practices.

2. Financial Struggle for Implementation:

- **Need:** The development and implementation of the machine pose financial challenges. Acquiring the necessary funds for purchasing the equipment and covering initial operational costs is a crucial aspect that needs to be addressed.
- **Rationale:** Financial constraints can potentially hinder the progress of the project. Securing funding sources, whether through grants, loans, or partnerships, becomes essential to ensure the successful development and deployment of the grinding machine.

3. Comprehensive Business Plan:

- **Need:** Beyond the conceptualization of the solution, there is a need for a comprehensive business plan. This plan should encompass market analysis, financial projections, risk assessments, and scalability considerations.
- **Rationale:** A robust business plan not only attracts potential investors but also provides a strategic framework for the entrepreneurs to navigate challenges and capitalize on opportunities. It serves as a foundational document for informed decision-making and sustainable growth.

4. Established Connections with Farmers:

- **Strength:** An identified strength lies in the entrepreneur's established connections with farmers in the region. This existing network can serve as an asset in the implementation and adoption of the solution.
- **Rationale:** Leveraging pre-existing connections with local farmers can facilitate the introduction and acceptance of the grinding machine within the target market. Collaborating with farmers ensures a more informed and community-driven approach to the solution's implementation.

In summary, while the idea of the "Machine for Fine Grinding Residues from Viticulture, Gardening, and Fruit Growing" holds significant promise, the identified needs underscore the essential steps required for successful execution. These include developing a robust business model and plan, securing financial resources, and leveraging established connections with local farmers. Overcoming these challenges will be pivotal in transforming the conceptual solution into a tangible and impactful initiative that addresses environmental concerns and promotes sustainable agricultural practices in the region.

3.2.3 Establishing a Task Force for the solutions in Strumica

The proposed Task Force for the bio-based solutions in Strumica is a diverse and well-rounded team, consisting of individuals from various sectors with complementary expertise. The composition of the Task Force reflects a strategic approach to address different aspects of the project, ensuring comprehensive coverage from regulatory compliance to technical implementation and community engagement. Here is a summary of the key members and their roles:

1. SDEWES-Skopje Representatives (Emilija Mihajloska and Pavlina Zdrevava):
 - **Roles:** Coordination of the entire process and assistance in utilizing the MAF platform.
 - **Contribution:** Their involvement brings organizational and platform management expertise, ensuring smooth collaboration among team members and effective utilization of the MAF platform for project implementation.
2. Municipality of Strumica Representatives (Pance Bedzovski and Tomislav Andreev):
 - **Roles:** Covering regulatory aspects and establishing connections with public authorities.
 - **Contribution:** Their roles are pivotal in navigating regulatory frameworks, securing necessary approvals, and fostering collaboration with local government bodies. They act as a bridge between the project and the municipality.
3. Entrepreneurs (Dimitrija Angelkov and Tome Timov):
 - **Roles:** Providing technical expertise and innovation for the bio-based solution.
 - **Contribution:** As innovators of the bio-compost machine, they bring crucial technical know-how. Additionally, Tome Timov's role as a teacher in an agricultural high school adds an academic perspective, enhancing the project's educational and research dimensions.
4. Regional Platform Representative (Mitko Shopov):
 - **Roles:** Assisting in networking, connections, and providing technical knowledge.
 - **Contribution:** Coming from the NGO sector, Mitko Shopov brings valuable networking skills, contributing to the establishment of associations and connections in the region. His technical knowledge further enriches the Task Force's capabilities.

While the Task Force is robust, there is a recognized gap in representation from the business sector and a lack of expertise in financial mechanisms. This is acknowledged as a potential weak link that requires external assistance. To address this, the team may consider seeking guidance or collaboration with a business representative or financial expert to ensure a more comprehensive approach.

In summary, the proposed Task Force is well-equipped to tackle the multifaceted challenges of implementing the bio-based solutions in Strumica. Each member brings unique skills and perspectives, and the acknowledgment of the weak link in the business sector highlights a proactive approach to addressing potential gaps in expertise. This collaborative and interdisciplinary effort positions the Task Force for success in achieving the project's goals and contributing to sustainable waste management in the region.

The composition of the Task Force in Strumica is designed to be flexible, with the potential for adjustments based on member availability and evolving opportunities. The members of the Task Force should cover the two selected bio-based solutions. The initial meeting is scheduled to take place online in December 2023, serving as a foundational session for collaborative planning and strategy development. Subsequent frequent meetings are planned for the following months to ensure continuous progress and adaptation.

4 Setting up Task Forces in Upper Austria

4.1 Upper Austria Solution 1: Streuobstwerkstatt - Valorising the biodiversity hotspot meadow orchard.

4.1.1 Solution Overview

The company Streuobstwerkstatt e.U. has set itself the task of generating as much added value as possible for farmers who cultivate orchards. Only if farmers receive sufficient economic incentive, it is guaranteed that orchards are maintained and preserved.

The company Streuobstwerkstatt e.U. buys scattered fruit from farmers who no longer cultivate their orchards due to the high labour input and low economic output. They develop high-quality food products from it and then create various distribution channels for these products. Together with the partner farmers, solutions are developed regarding product development, distribution channels and especially regarding awareness raising on the topic of biodiversity, species and variety diversity. In cooperation with institutions such as the Nature and Biodiversity Conservation Union, ARGE Streuobst, Bio Austria and the food retail trade, a high added value is created for agriculture as well as for the consumer.

In addition to the company's own knowledge of biodiversity, agriculture and the circular economy, scientific expertise will also be increasingly used in the future to generate even more solutions. Thus, a cooperation with different research institutions is aimed at.

The business model of Streuobstwerkstatt e.U. is based on the cooperation of farmers, food manufacturers, food industry and food trade. A regional economic cycle is established, expanded, and increased through greater efficiency, thereby increasing regional added value, and promoting a sustainable economy. In addition to the reduction of food waste, an important part of the Upper Austrian cultural landscape is protected with the meadow orchards. Scattered fruit is often no longer collected. The stock of meadow orchards is decreasing dramatically in Austria. Strong and practical models are needed to curb this development.

This business model is novel. Mostly the industry buys scattered fruit, but only from large farms. The goal of Streuobstwerkstatt e.U. is to involve as many small-structured agricultural enterprises as possible. Furthermore, the degree of innovation regarding product development, logistics, fulfilment, marketing, sales and supply chain is continuously developed.

All developed products are sold under the brand name STREUOBSTWERKSTATT, with a uniform corporate design. The products developed are mainly food products and are correspondingly high in the biomass value pyramid. The customers' primary motive for buying the product is to actively contribute to the topic of biodiversity. Raising awareness for the topic is the main focus and is carried out intensively via social media and inbound marketing. Furthermore, sales measures are very focused on digitalization. For example, the products are specifically positioned on digital marketplaces and distributed internationally.

In general, the sale of Streuobstwerkstatt products is the focus of business activities. However, in the future, the focus will increasingly be on other measures that create value for biodiversity areas. For example, companies can contribute sponsorships and biodiversity contributions for orchards.

4.1.2 Identified needs.

With the help of a questionnaire created by CTA in several discussions with the streuobstwerkstatt, 3 core needs were identified:

1. **Plastic-free packaging for dried fruit:** The Streuobstwerkstatt produces various dried fruits, including apple crisps, which are currently offered for sale in plastic packaging. Plastic packaging is common, has many practical uses and is cheap too. However, they do not fit in with the sustainable concept that Streuobstwerkstatt embodies. That is why the company wants to switch to packaging that is sustainable and meets the requirements of food. It is

important to note that each alternative has its own advantages and disadvantages. Therefore, the company should carefully consider which option best suits its products and goals. A comprehensive analysis of the environmental impact, costs and customer preferences will help in the decision-making process.

2. **Marketing:** By selling products from Streuobstwerkstatt, customers can help to preserve the biodiversity hotspot of orchards in Upper Austria and make an important contribution in terms of food waste. These facts should be communicated simply and clearly to the customer. This requires good marketing and a good knowledge of the end customers. Awareness of the important cultural asset of orchards should be raised among customers and linked to the products. The challenge in marketing is therefore to develop and implement simple and clear wording (at the product, POS or online).
3. In the medium term, the **product range** should be expanded. To do this, it is important to analyse the market thoroughly to understand the needs and preferences of customers and to develop products in line with the expectations of the target group. In addition to market research, resources, competition, sales, and marketing also play a role.

In individual meetings between the Streuobstwerkstatt company and the members of the Task Force, these needs, and future challenges of the Streuobstwerkstatt company will be addressed in order to develop proposals for solutions. In a Lego Serious Play workshop, a specific question will be addressed, and specific work will be carried out on this topic at a creative level.

4.1.3 Identified Task Force members and rationale.

1. **Florian Winner** - Head of department Research & Innovation, Business Upper Austria – OÖ Wirtschaftsagentur GmbH - The Research & Innovation Promotion Consulting department offers innovation promotion for domestic companies and passes on information on national and international research to companies. Innovative strength and innovation strategies are promoted with a wide range of customized services. Innovation promotion includes individual funding advice, innovation advice for SMEs and advice on protecting intellectual property, as well as support for specific innovation projects and start-ups in the high-tech sector. Florian Winner is Head of the Research & Innovation Promotion Consulting department, specialist for national funding. Advice in the following areas:
 - Funding advice
 - Funding programs
 - Advice on intellectual property rights
 - Support for innovation projects
 - Support for technology start-ups
2. **Heimo Strebl** - Farmer and consultant for fruit growing, viticulture, compost, Plant Production Department, Upper Austrian Chamber of Agriculture. Heimo Strebel is an expert in fruit plant pockets and owns several orchards on his own farm. Through his advisory work at the Chamber of Agriculture, he has good contacts with farmers with orchards and can provide the Streuobstwiese eU company with an overview of the current availability of old fruit varieties and plantations. He can establish contacts with other farmers with orchards, which can increase the number of suppliers. This provides the basis for expanding the product range.
3. **Markus Käferböck** - Head of department Corporate Communication, Business Upper Austria – OÖ Wirtschaftsagentur GmbH. Markus Käferböck heads the marketing department at Business Upper Austria and coordinates all areas of communication for the company, from press relations to social media appearances and podcasts.
4. **Alexandra Puchner** - Head of department Investor and Location Management, Business Upper Austria – OÖ Wirtschaftsagentur GmbH. Alexandra Puchner joins the Investor and Location Management department of the Upper Austrian business location agency Business Upper Austria. Together with her team, this department is the first point of contact for investors from Austria and abroad.

5. **Christoph Reiss-Schmidt** - Project manager and Certified Facilitator of LEGO® SERIOUS PLAY® at Business Upper Austria – OÖ Wirtschaftsagentur GmbH. Christoph Reiss-Schmidt's core competencies are customized workshops that help to overcome challenges in the areas of strategy and organizational development, team, individual and product development, creative mining and training. organizational development, team, individual and product development, creative mining or training and further education. He uses the LEGO® SERIOUS PLAY® method and agile management approaches to facilitate a collective understanding and dynamic approach to problems in order to bring about faster and better decisions.
6. **Willy Lehmann** - Owner of the company Willy Lehmann, Markenagentur. Expertise in:
 - Market research
 - Product development
 - Brand positioning
 - Sales marketing concept
 - Communication consulting
 - Public relations
 - Social media & influencer marketing
 - Corporate wording, text & editing
 - Network coordination

4.2 Upper Austria Solution 2: SUN Project, Velvety Manufaktur GmbH - Extraction of vegetable proteins from sunflower oil press cake

4.2.1 Solution Overview

Sunflower oil press cake has a high protein content. Further processing and reintroduction into the raw material cycle can lead to the development of new high-quality food, pharmaceutical or (natural) cosmetic products. The aim is to use solid state fermentation including membrane separation technology to dissolve and concentrate the proteins and then develop natural cosmetic products.

Together with the University of Applied Sciences Upper Austria, work is being done on a process for extracting proteins from the oil press cake. This knowledge will also be applied practically. After the proteins are extracted and can be processed, the company Velvety Manufaktur GmbH would also like to develop innovative products together with their essential customers. The focus of customers is more and more on resource conservation and sustainability. Regional raw material waste can be recycled (in the long term) with little resource input. The aim is to obtain even more raw materials from waste in the future and thus to promote circular economy.

Sunflower oil press cake is currently only used as animal feed or is disposed of. By extracting these proteins, Velvety Manufaktur GmbH's existing products can be further refined, and new products can be created. Products that do not yet exist in this form on the market. The goal is to create product lines from purely 'recovered' resources which is in the second phase of the biomass value pyramid "Materials".

Velvety relies on long-standing customer relationships in its market strategy and the constant expansion of existing markets by developing business relationships and offering new products. These are developed specifically for customers. Product innovations are regularly presented and selected by the customer. This current innovation project is to be presented to the company's largest customers as a first step.

Customer loyalty in this area is very high and is constantly being expanded. The focus is clearly on innovation leadership and the product selection is increasingly focused on sustainability and innovation. Targeted efforts will be put into building up the company's own brand and online sales via

several channels (omnichannel strategy - Cross-channel business model for companies to improve customer experience management).

4.2.2 Identified needs

- 1) **Technical Needs:** Based on the R&D carried out, the input materials were extracted on a laboratory scale and successfully processed into glycerine. Stability of the natural green color is given in contrast to the original use of synthetic substances (higher color input in production, the intensity of which decreases during production - control via higher intensity at the start of the process). The processes that were carried out on a laboratory scale are now to be tested on a machine level. For this purpose, it must be analyzed which processes are necessary, whether they can be carried out in-house or which partners are required. The results will show whether commercialization of the product is possible. Other topics would also be interesting: use of peeling particles from the food industry, use of whole bursts (camomile)
- 2) **Market Development Needs:** The current focus is on expanding existing customers. The sales cycle for new customers is > 6 months. Customers are large retail chains that already have confidence in velvety; the aim is also to increase confidence and gain new customers who list velvety as a supplier. The market currently relates to the DACH region (Austria-Germany), the next step would be the international market. Scandinavia, France and the UK are desired markets for velvety.
- 3) **Financial Needs:** The company is currently family-run. However, if a financially strong investor who has little influence on the daily business shows interest in the company, this could be considered. In this area, information on AWS Gründerfonds or high-tech funds for velvety would be of particular interest. When implementing the SUN project, investments would have to be made primarily in the upstream companies and areas:
 - Who can do the extracting?
 - Who is interested in building a larger plant?
 - What price must be paid for the extracted ingredients?
 - Testing with a larger quantity of products
- 4) **Skill & Knowledge Needs:** Advice and support in the following areas is desired.
 - Support in research
 - team management
 - Sales expansion
 - Updates from the cosmetics industry
 - Promotions, sales expansion
 - Rapid growth of the organization
 - Fluctuation and loss of knowledge

4.2.3 Identified Task Force members

- 1) Bettina Zieher. Professor of Food Technology and Engineering at the University of Applied Science in Upper Austria
- 2) Dr. Zieher has over 15 years of experience in the management of research and industrial projects, particularly in the following areas:
 - Management of research projects in the food industry: development of innovative food products and processes in an international environment for markets worldwide
 - Management of industrial projects: technical innovation, optimization and modernization projects in a GMP-regulated environment
 - Coaching and guidance of project managers in the function of production management
 - Project portfolio management of infrastructure and qualification projects in the role of technical manager
- 3) Oil mills. Contact with various oil mills. Greater cooperation between Velvety and an oil mill is necessary to drive the project forward. Here it is important to find a financially strong oil mill that is prepared to make the necessary investment for the larger plant for extracting the components from the oil press cake. Contacts are being established with various oil mills.

- 4) Florian Winner. Head of department Research & Innovation, Business Upper Austria – OÖ Wirtschaftsagentur GmbH. The Research & Innovation Promotion Consulting department offers innovation promotion for domestic companies and passes on information on national and international research to companies. Innovative strength and innovation strategies are promoted with a wide range of customized services. Innovation promotion includes individual funding advice, innovation advice for SMEs and advice on protecting intellectual property, as well as support for specific innovation projects and start-ups in the high-tech sector. Florian Winner is Head of the Research & Innovation Promotion Consulting department, specialist for national funding.

Advice in the following areas:

- i. Funding advice
 - ii. Funding programs
 - iii. Advice on intellectual property rights
 - iv. Support for innovation projects
 - v. Support for technology start-ups
- 5) Markus Käferböck. Head of department Corporate Communication, Business Upper Austria – OÖ Wirtschaftsagentur GmbH. Markus Keferböck heads the marketing department at Business Upper Austria and coordinates all areas of communication for the company, from press relations to social media appearances and podcasts.
- 6) Alexandra Puchner. Head of department Investor and Location Management, Business Upper Austria – OÖ Wirtschaftsagentur GmbH. Alexandra Puchner joins the Investor and Location Management department of the Upper Austrian business location agency Business Upper Austria. Together with her team, this department is the first point of contact for investors from Austria and abroad.
- 7) Christoph Reiss-Schmidt. Project manager and Certified Facilitator of LEGO® SERIOUS PLAY® at Business Upper Austria – OÖ Wirtschaftsagentur GmbH. Christoph Reiss-Schmidt's core competencies are customized workshops that help to overcome challenges in the areas of strategy and organizational development, team, individual and product development, creative mining and training. organizational development, team, individual and product development, creative mining or training and further education. He uses the LEGO® SERIOUS PLAY® method and agile management approaches to facilitate a collective understanding and dynamic approach to problems in order to bring about faster and better decisions.
- 8) Willy Lehmann. Owner of the company Willy Lehmann, Markenagentur. Expertise in:
- vi. Market research
 - vii. Product development
 - viii. Brand positioning
 - ix. Sales marketing concept
 - x. Communication consulting
 - xi. Public relations
 - xii. Social media & influencer marketing
 - xiii. Corporate wording, text & editing

5 Setting up Task Forces in the French Atlantic Arc (France)

5.1 French Atlantic Arc solution 1: “Atelier du biosourcé”

5.1.1 Solution summary

The « atelier du biosourcé » is on organisational innovation. The idea is to place in the same location an important part of biobased construction solutions and to involve several craftsmen. This should help

the development of the use of biobased solutions for building construction. This solution will be set up with the notion of "to several we go further". The following tools were considered to take place inside the "Atelier du biosourcé": Straw tools:

5) Straw:

- a. Chopped straw tool
- b. In the future, synergies with COPANO project (see other selected solution) will be considered to use the tool they develop.

6) Prefabrication tools:

- a. hangar with mounting table, suction, pit, etc.

7) Hemp:

- a. hemp with lime or earth
- b. hemp tool with a strong link with the Normand hemp transformation site

8) Wood reuse

The main problems are the storage, the place, and the investments. However, before developing all these tools, we will have to define all the steps to create this place "Atelier du biosourcé". We will use a step-by-step method.

5.1.2 Identified needs

The main needs are to define all the steps we will have to pass to create this place. Then, the first steps will be to swarm the IEOL chopped straw tool. To implant it in Normandy, we will need to the way to do it, search for partners, find the place and the funding. On the road, we will probably face new problems and we will look for adequate experts to help us solve them.

5.1.3 Identified Task Force members and rationale.

We have identified several stakeholders who can integrate the Task Force to support the "Atelier du biosourcé" in its development:

- 9) **Carole Leman**, ARPE Normandie (Association Régionale pour la Promotion de l'Écoconstruction en Normandie – Regional Association for the Promotion of Ecoconstruction in Normandy), will give help on the marketing part and on the technical part because she is an architect and used to work in building construction field.
- 10) **Stephane Lagrève**, Regional natural parc (PNR) of the Boucles de la Seine, will give help on the technical part. He used to work at the CODEM (Construction Durable et Écomaterial Innovants - Sustainable Construction and Innovative Ecomaterial) which does research and develops new biobased materials.
- 11) **Céline Vincent**, Village by CA, will give some help on the creation of the business plan and can give good advice on start-up development.
- 12) **Amélie Giger**, Gi-Nov, will help us to search finality for by-product.
- 13) **ADEME Normandy or AD Normandy** for the funding part of the project. Both have been asked. However, it has not been received an answer yet.

During the development of the project, we may call additional external resources for specific subjects: they will not be involved throughout the company's support, but rather on an ad hoc basis. We may need some help on the legal part to swarm the technology of IELO.

The composition of this group may change according to the availability of each member and the opportunities offered by the meetings.

The first meeting on the technical part was held on the 13/11/2023.

Two other meetings are planned on the 19/12/2023 with IELO structure to discuss how to swarm their technology.

5.2 French Atlantic Arc solution 2: COPANO

5.2.1 Solution summary

COPANO was founded in February 2022 by the architect Raphaël DECLE. Oriane PICHOT, architect as well, helps him for his development.

The company manufactures straw insulating panels for construction and renovation. The company is determined to make a long-term commitment to protecting the environment. It also promotes the values of respect and social responsibility, with a view to sustainable development.

The founder converted a large sewing machine originally used to make rice straw tatami, for manufacturing rigid insulating straw panels. This is an innovative way of making the panels, as they are sewn together, dry, cold and without glue or additives.

Straw is currently used in construction in the form of 36 cm and 22 cm wide bales, combined with soil.

This format limits the possibilities in terms of use, particularly for thermic renovation of buildings, which is a major energy-saving issue.

The straw panel is an innovation that offers several advantages: in terms of use, it is practical to lay, easy to transport and easy to handle. The panel can be cut to fit small areas: its size is adaptable. It is also environmentally friendly throughout its life cycle: use of locally produced straw, biogenic carbon storage (7 to 8 kgCO₂/m²), thermal performance ($R = 2.3 \text{ m}^2\text{K/W}$ in 11 cm), summer comfort (density > 110kg/m³), acoustic performance and this panel is totally biodegradable.

The company won two awards in 2023:

- It is the winner of the call for proposals "Circular Economy 2023" organised by the Regional Council of the Pays de la Loire. COPANO will be funded under this call to work on research and development phase of the straw panel, and of the process in the straw value chain, by continuing to improve the initial machine to move towards a more efficient, safer, and more ergonomic production tool: a turnkey tool that can be replicated.

- At national level, COPANO has been classified as priority N°1 in the "Support for innovation in wood, bio-sourced and geo-sourced construction materials" call for projects. This award means that the company is supporting the identification of straw panels to guarantee their recognition and level of quality.



5.2.2 Identified needs.

Following the selection of the bio-based solutions last June, we met the company twice to explain the support offered by the SCALE-UP project and to determine the needs of COPANO. Together, we set an order of priorities for 2024.

- Straw panels Market: the panels are already on the market, but the company needs to increase its sales and boost the market penetration of the solution. The aim is to identify priority customers and find ways of convincing them.

- A pilot project with a local authority. COPANO wants to work with a local authority to build a building that can be used as a showcase project, that can be visited and that is close to the company. The aim is to show that the authorities have put their trust in them and to demonstrate the benefits of this material in concrete terms.

- The model for disseminating innovation: COPANO wants to disseminate its innovation over time. It has not decided to expand beyond its local area, preferring instead to spread its know-how and spread its innovation. It is looking for ways in which it can spread without losing its values while protecting its know-how.

- Human Resources and training: the company currently operates on a voluntary basis. The company manager is not paid yet. He gradually wants to employ more staff, while respecting the company's development and without jeopardizing its survival. The company wishes to respect conditions of salary packages and staff training. The manager wants to train his employees to control the production and be multi-skilled, to hold several different jobs. The aim is also to make the work less arduous and more interesting.

COPANO is continuing to improve its machinery to enhance panel production and design new panels using other materials and innovative, sustainable techniques. But he also wants to improve workstations and is keen to make work less painful so that all employees - men and women - can use the machine.

5.2.3 Identified Task Force members and rationale.

We have identified 4 stakeholders who can support COPANO in its development:

1. **Jean-Marie LANDRE**, who oversees the environment project at the CAPEB. This is a regional union for the building trades. He has extensive knowledge of the construction market, particularly construction by small, local craft firms. He is an engineer (POLYTECH).
2. **Céline LEMASSON** from CEREMA (public body for climate and territories): CEREMA provides local and regional players with engineering support and technical expertise in a number of fields, including construction, with a view to promoting the transition to a low-resource, low-carbon economy that respects the environment and is fair. Céline LEMASSON works in particular with bio-sourced materials and has a very good knowledge of the construction market.
3. **Céline BOHERS** from Collectif Paille Armoricaïn: this is an association of farmers and craftsmen whose aim is to develop the use of straw in construction. It is active in Brittany and Pays de la Loire regions.
4. **Christelle BUREL** is an agronomy and organic farming advisor at the Brittany Chamber of Agriculture. She helps farmers to set up a network to develop the use of straw in construction.

COPANO accepted them to take part in the Task Force. Some of them have not responded to our request yet.

We called on additional external resources for specific subjects: they will not be involved throughout the company's support, but rather on an ad hoc basis.

14) Intellectual property rights: we met a consultancy specialized in patent and innovation protection.

15) Human Resources: we are going to contact the Chamber of Trades and Crafts, and in particular a human resources adviser who supports companies in their development.

The composition of this group may change according to the availability of each member and the opportunities offered by the meetings.

We have to set the date for the first meeting with the members of the Task Force, before the end of the year or the beginning of 2024, to establish the schedule for the 2024 support.

6 Setting up Task Forces in Andalusia (Spain)

6.1 Andalusian Solution 1: Fundación andaltec i+d+i – COMPOLIVE Biorefinery

The bio-based solution proposes a facility to condition, treat and make olive tree prunings compatible for integration as a reinforcement in polymer-based composite materials, getting a biomaterial tested in several sectors applications such automotive or furniture industry. This application would consist of a biorefinery for the integral use of olive pruning in the framework of the polymer sector.

To do this, pruning waste is transformed into short fibres that are incorporated as reinforcement in biocomposites with conventional thermoplastic matrices, from fossil resources, or even bio-based. Therefore, compounds can be obtained from pruning to produce bioplastics or nanocomposites based on cellulose or lignin.

Within the biomass value pyramid, the bio-based solution proposed by Andaltec is located in the category of Functional Materials and in the subcategory of Performance Materials: "Treat and make compatible olive pruning to integrate it as reinforcement in polymer-based composite materials". The bio-based solution is aligned with the objectives of the SCALE-UP project (criterion 1 within the evaluation criteria), as it involves and benefits various actors along the olive value chain, as these innovative materials are starting to be known in the agricultural sector in the province of Jaen and have aroused great interest in large multinationals in the automotive and furniture sector. Furthermore, the use of this renewable biomass resource, olive pruning, requires the collaboration and support of local producers. The valorisation of this waste can promote collaboration between local producers, agricultural cooperatives, local industries, and large industries (as the end user of the biocomposite product).

To this end, the project promotes collaboration between all these actors, in addition to the support of policymakers and public administration officials - therefore, this solution can encourage regional actors to identify and develop innovative business models based on the bioeconomy. In addition, it enables the efficient use of resources, as these materials obtained through the revalorisation of agricultural waste, are a way to access the traditional agricultural sector to subsequently implement more solutions based on the circular economy, energy efficiency, and renewable energies in this sector. Olive pruning waste (essential to maximise olive oil production) is valorised and processed to function as reinforcement fibres in polymeric composite materials, allowing the creation and transfer of new knowledge and improvement of competitiveness, as the materials developed with olive fibres constitute a product of technical and commercial value extensible to all olive oil producing regions in the Mediterranean area.

6.1.1 Identified needs and identified stakeholders for the Task Force

In meeting we have had with Andaltec team, several needs have been identified and correlatively, we provide the stakeholders identified for the Task Force, in accordance with D4.1:

1. **Market analysis.** The main issue of this solution is to get long-term biomass availability in order to ensure the supply chain. Appropriate volumes of biomass, spatial distribution, seasonality factors should be addressed. For that, the actors who coordinate and optimize the supply chain, including activities such as harvesting, storage, handling, and transportation of biomass are the cooperatives. At the same time, cooperatives are able to raise awareness on farmers since they do not know about the biomass potential and the possibility of make money with a waste that usually they use as cover soil.

The following cooperatives from the Andalusian Bioeconomy Platform are able to be part of the ANDALTEC Task Force:

- a. Cooperativas Agro-alimentarias de Andalucía.

- b. Cooperativa San Isidro de Loja – which is member of the Andalusian SCALE-UP platform.

Both of them cover the entire Andalusian region, Cooperativas Agro-alimentarias de Andalucía on the occidental side and Cooperativa San Isidro de Loja in the occidental side.

2. Regarding **logistics**, it is clear that biomass transport is one of the most relevant barriers for new green solutions and innovative solutions are needed to get a more profitable and sustainable process. For this need, the members of the Task force will be:
 - c. OGA, an artificial intelligence consultancy with a specific line of work in logistics.
 - d. BioHub CAT – Through one of the trainings breakout sessions, we have been in contact with a representative from the Lerida Province Department (Diputación de Lérida) who presented the Catalan Bio-economy Strategy 2030 and the BioHub Cat as a case study. We believe that Andaltec can benefit from the exchange of good practices and lessons learned from the Catalan case.
3. **Intellectual property:** the core research from this bio-based solution has been raised from an EU project with different partners. Although they are the main actors and they have the patent, different problems could drive up during the "go-to-market" process. To assist Andaltec with intellectual property development, it has been identified the following members for the Task Force:
 - e. Clarke Modet & Co. is the largest international Industrial and Intellectual Property group in Latin America and the gateway to Europe.
 - f. Pons IP, a Global Consulting Firm specialized in Intellectual Property

Business modelling and sales channeling: Andaltec is a technological center based on the plastic industry with several relevant research groups. However, they are not able to design an attractive business model for investors. They totally cover the technical part of the bio-based solution but the financial one remains unclear. For that, the Task Force member will be:

- g. The Inter-American Institute for Cooperation on Agriculture (IICA), SCALE-UP advisory board member, is the specialized agency for agriculture of the Inter-American System with strong expertise in the development of business and regions models.

Funding is a crucial need for the sustainability and scalability of the solution. They carried out the pilot plant testing and they are ready to jump into the market but biorefinery involves a big investment. They need an expert investment report for presenting relevant financing institutions. The Task Force members to provide advice for this will be:

- h. ENISA, the Spanish Agency for Innovation Investment and, in particular, its programme Agroimpulso to support the R+D+I projects.

6.2 Andalusian Solution 2: BIOLIZA: Biochar Obtained From Olive Waste Pyrolysis

"Design and development of a business model for the commercialization of the biochar obtained from the pyrolysis of by-products of the olive tree and the industry olive oil for use as a soil improver, water absorber and CO₂ sink in the olive grove".

The olive grove and its associated industries, mills and extractors of pomace oil mainly, generate a significant volume of residues and by-products such as pruning remains, olive stone, oily and wet pomace or 'alperujo', remains of leaves and branches, wastewater, etc., likely to be recovered through emerging technologies (TRL > 8) to obtain bioenergy and bio-products of high added value, as is the case of biochar, which can help to increase farmers' income and it is an action that is in line with the good practices of the circular economy.

One of the most emerging technologies in this field is pyrolysis, which consists of a thermal decomposition of the biomass or residue, in the total absence of oxygen, and at a temperature that can oscillate between 250 and 450 °C. As a result of the process, they obtain 3 fractions, one solid or

biochar, the main one; another liquid called pyrolysis oil which is a bio-oil, and another soda or syngas that is used to maintain the process temperature so that it is auto thermal. The biochar obtained depends on certain parameters, but above all the content in Carbon, has innumerable applications in very diverse fields: agriculture, industry, pharmacy, chemistry, construction, packaging, etc., due to its excellent physicochemical properties. In addition, it presents other advantages such as reducing the volume of waste or by-products treated and their current capacity as a CO₂ sink, of the order of 2.5-3 tons of CO₂ per ton of biochar. However, it is an unknown product for the market, especially the agricultural one, in which it can play a fundamental role as a soil improver, water absorber and CO₂ sink, among other advantages. But for this, it is necessary to obtain a standardized product that meets a series of technical requirements, and to develop a strategy suitable commercially, in which all the advantages it presents can be integrated D4.1 – Overview of regionally suitable solutions 31 so that they are known and validated by farmers, in order to increase their progressive penetration in the market.

Within the biomass value pyramid, the bio-based solution proposed by Bioliza is located within the category of Functional Materials and in the subcategory of fertilisers/biofertilisers: “Commercialization of biochar for use as a soil improver, water absorber and CO₂ sink in the olive grove”. The bio-based solution is considered to be in line with the objectives of the SCALE-UP project (criterion 1 within the evaluation criteria) as it allows the increase of knowledge of local actors within the value chain to accelerate market penetration: such as biochar and bio-oil, with direct applications in agriculture and in the olive sector. On the other hand, it allows an efficient use of resources, as it D4.1 – Overview of regionally suitable solutions 32 enables the improvement of knowledge on bio-products that improve the quality of the soils where olive trees are grown. It allows the transfer of practical application of the knowledge acquired, in this case through a spin-off such as BIOLIZA. This bio-based solution is a bioeconomy project based on the conversion of waste and by-products into raw materials for new processes based on emerging technologies, with a high degree of cooperation with local agents (farmers, cooperatives, research centres, universities, companies, etc.). It thus enables the acquisition of new skills and capacities among stakeholders, allows the efficient use of natural resources and is in line with the objectives of the European Green Pact, the EU Bioeconomy Strategy and relevant national and regional bioeconomy strategies because this project promotes key points such as:

- 16) New business opportunities for Andalusia.
- 17) The use and valorization of waste and specific by-products from the olive grove and olive oil industry in a sustainable and competitive manner.
- 18) Introduction of emerging technologies such as pyrolysis in the primary sector.

6.2.1 Identified needs and identified stakeholders for the Task Force

The identified needs and stakeholders for the Task Force to support BIOLIZA are the following:

1. **Regulations.** The legal framework related with the obtention of biochar from pyrolysis process changes depends on the region and it is subject to specific policies and regulations. In the European Union, there are analyses of different policies and regulations from a legal perspective, addressing the constraints and opportunities. They need to clarify the legal framework in Andalusia, especially the legislation for the CO₂ capture commercialization. The Andalusia Regional Platform feature with relevant policy makers advisors and the own Regional Government representatives.
 - a. Tragsatec, a consultancy company member of the Andalusian Bioeconomy Commission, in charge of the Andalusian Bioeconomy Strategy.
 - b. Upper International Regulation, a consultancy company expert in the field of crop protection to cover different areas of services to companies and users.
 - c. Technical Secretariat Department, from the Andalusian Regional Government. The main actor of the Andalusian Bioeconomy Platform within SCALE-UP project. The are the technical department of the Agriculture Regional Minister.

2. Market analysis. Bioliza has the same market analysis needs than Andaltec solution since the use biomass from olive as main feedstock for their process. Here, we would like to carry out a joint session with both bio-based solutions in order to have higher feedback, not only from the Task Force member but also from the another solution.
 - d. Cooperativas agro-alimentarias de Andalucía.
 - e. Cooperativa San Isidro de Loja.
3. Financial needs. Bioliza, a spin-off from the University of Jaen, presents a different situation than Andaltec. These kinds of companies are more attractive for private investors like venture capital companies or impact investment funds. One of the main objective of the regionals platforms developed through SCALE-UP project is to link members from the quadruple helix model of innovation with funding companies. Especially, the Andalusian Platform feature with four different venture capital companies. We request them to participate in the innovation support programme and we are waiting the final answer:
 - f. Alter Capital
 - g. Axon Capital
 - h. Mar Océana
 - i. Austral found.
4. Business Model. Although they have an existing business model, it must be refined and improved by experts. The legal framework has changed from the initial years of the companies and there are many potential business opportunities for reaching by the innovators with the new legislation. Here, the feedback of a company with a business model based on crops management is essential.
 - j. Tepro, an international consultancy company with strong experience in the technical, financial and environmental management of crops.



SCALE^{UP}
community-driven
bioeconomy development

SCALE-UP Innovation Support Programme | Synthesis Report for ANDALUSIA

February 2025

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EXECUTIVE SUMMARY

This report outlines the outcomes of the Innovation Support Programme (ISP), focusing on the development and market readiness of the two Andalusian bio-based innovations: COMPOLIVE BIOREFINERY (ANDALTEC) and Bioliza. The ISP aimed to refine their business models, assess market potential, and facilitate strategic partnerships, accelerating their market entry and scalability.

COMPOLIVE has developed an innovative ‘cradle-to-gate’ approach, converting abundant olive tree prunings (OTP) into eco-friendly, lightweight, and customizable polymeric biocomposites. These materials offer superior technical properties, and a reduced environmental footprint compared to traditional plastics, aligning with the Sustainable Development Goals (SDGs) and the European Green Deal. Key attributes include competitive pricing, seamless integration into existing manufacturing and prototyping processes, and versatile applications across automotive, furniture, and future sectors like additive manufacturing and packaging. The biorefinery model not only minimizes agricultural waste but also creates new revenue streams for farmers and supports rural economies. Market analysis indicates a significant total addressable market (TAM) for biocomposites, with the automotive sector being a primary target.

Bioliza provides innovative solutions for sustainable energy production by converting olive oil biomass into biogas and biochar through advanced pyrolysis technology. This approach promotes energy self-sufficiency, reduces CO₂ emissions, and valorizes agricultural waste, aligning with the European Green Deal. Bioliza's innovative solution addresses the need for decarbonization and offers biochar as a valuable byproduct for soil improvement or biofuel. The electricity industry is identified as the most attractive target market, with significant potential in the building and agriculture sectors. Despite facing international competition, Bioliza's unique position in the Spanish market and its expertise in biomass valorization provide a competitive edge.

The ISP provided tailored support to both innovators, including market assessments, business model refinement, and stakeholder engagement. For COMPOLIVE, the ISP facilitated strategic partnerships and identified key customer segments. Regarding Bioliza, the ISP focused on enhancing market visibility, establishing strategic partnerships, and addressing intellectual property concerns. Both COMPOLIVE and Bioliza have demonstrated significant potential for growth and impact within the bioeconomy.

Key recommendations from the ISP sessions include prioritizing strategic partnerships, scaling production to meet growing demand, and leveraging platforms like the Andalusian Bioeconomy Platform for continued collaboration. Actionable insights highlight the importance of aligning with regulatory trends, capitalizing on the increasing demand for sustainable materials and energy solutions, and continuously innovating to expand into new markets.

Table of contents

1	Relevance of the selected innovations for the bioeconomy in Andalusia	9
2	Small-scale business models explored.	10
2.1	COMPOLIVE BIOREFINERY	10
2.1.1	General description and value proposition of the innovation	11
2.1.2	Stakeholders involved in the ISP	12
2.1.3	Results of the market assessment and business model design process	13
2.1.4	Relevant considerations for the future.....	21
2.2	BIOLIZA: Biochar obtained from olive waste pyrolysis.	21
2.2.1	General description and value proposition of the innovation	21
2.2.2	Stakeholders involved in the ISP.	22
2.2.3	Results of the market assessment and business model design process	23
2.2.4	Relevant considerations for the future.....	35
3	Reflections on the SCALE-UP Innovation Support Programme	36
3.1	Barrier Analysis during ISP Implementation	36
3.2	ISP Conclusions and Bioeconomy Applications	37
3.3	Innovators and ISP Future Directions	37
	References	39
	Appendix I: Activities for ANDALTEC.....	40
	Appendix II: Activities for Bioliza	44

Figures

Figure 1: COMPOLIVE BIOREFINERY business approach.	11
Figure 2: CAMPOLIVE BIOREFINERY's logo	12
Figure 3: COMPOLIVE PESTEL analysis from MAF+ platform (exercise 1).	14
Figure 4: COMPOLIVE Biorefinery Target Group Selection (Attractiveness Scorecard). Exercise 4.	16
Figure 5: Final COMPOLIVE BIOREFINERY business model canvas.	20
Figure 6: Bioliza's Logo	22
Figure 7: Target Group Selection (Attractiveness Scorecard). Exercise 4.	28
Figure 8: Heat Map. MAF+. Exercise 9.	30
Figure 9: Final Bioliza business model canvas.	34

Tables

Table 1: Bioliza's PESTEL Analysis.....	24
Table 2: Porter's Five Forces. Exercise 8.	29

Abbreviations

CAGR	Compound Annual Growth Rate
CAPEX	Capital Expenditures
CDTI	Centro para el Desarrollo Tecnológico y la Innovación - Centre for Technological Development and Innovation
EUCAR	European Council for Automotive R&D
ISP	Innovation Support Programme
kg	Kilogram
M€	Million Euros
Mt	Metric Tonne
OPEX	Operating Expenses
OTP	Olive Tree Pruning
R&D	Research and Development
SAM	Serviceable Available Market
SOM	Serviceable Obtainable Market
TAM	Total Addressable Market

1 Relevance of the selected innovations for the bioeconomy in Andalusia

1.1. ANDALTEC: COMP0LIVE biorefinery.

It is estimated that the amount of biomass resources generated by olive tree pruning in Andalusia amounts to 2,622,280 tons/year. The innovation proposed by Andaltec valorizes olive pruning waste to convert it into a value-added raw material with the potential to be introduced into polymeric matrices and improve their properties, also reducing the environmental impact of the final products (e.g. automotive components, urban furniture, home furnishings or packaging). It also avoids the emissions caused by the burning of olive pruning, which generate more than 500 thousand tons of CO₂ each year in the province of Jaen alone.

These new developments will contribute to the establishment of a suitable ecosystem based on a new business model from which farmers can benefit thanks to the potential added value of olive pruning as a reinforcement of technical materials. On the other hand, the production of new materials requires the development and implementation of new technologies, which can generate opportunities for research and development. Knowledge transfer and the training of qualified personnel are essential for the development of this sector.

Demand for biocomposites is expected to increase as industries in sectors such as automotive, construction and consumer goods increasingly adopt sustainable practices.

Andalusia has a Plan of measures to strengthen the industrial ecosystem of the automotive industry (Plan de Cadena de Valor Crece. Industria de la automoción en Andalucía¹), whose objective is the growth of its value chain through the consolidation of industrial activities. This involves suppliers or manufacturers of components, materials, and even service providers for these. Another objective of the Plan is environmental sustainability, seeking to reduce the carbon footprint of the value chain and throughout the life cycle of products, the development of integrated solutions in line with the principles of the circular economy, energy optimisation and new forms of production and repair to achieve these objectives.

COMP0LIVE, the innovation presented by ANDALTEC will position Andalusia as a benchmark in obtaining these materials from olive pruning, helping to strengthen the Andalusian industrial ecosystem.

1.2. BIOLIZA: Biochar Obtained from Olive Waste Pyrolysis.

The olive grove and its associated industries produce a significant quantity of biomass that can be converted into biochar. The transformation of this biomass into biochar gives it added value, turning it into a product with multiple applications.

The production and use of biochar can create new economic opportunities in rural areas, fostering sustainable development. The production of biochar requires several stages, from the collection and transportation of biomass to its transformation into biochar and its subsequent commercialisation. Each of these stages involves the creation of jobs, both direct and indirect, in areas such as agriculture, logistics, production and marketing. For an optimal use of olive biomass and its related industries, it is necessary to train new professional profiles capable of generating added value through different strategies for the use of these by-products, both at field and industrial level, helping to generate qualified employment.

With the biochar produced by Bioliza, Andalusia reinforces its leadership in the olive oil industry, demonstrating how the agricultural sector can be a crucial ally in the transition to a low-carbon economy. According to the Spanish Biomass Association, in 2023 biochar accounted for 94% of long-term carbon removal credits, standing out as a fundamental tool to achieve global climate targets (International Biochar Initiative, 2024). By sequestering carbon, improving soil health, and reducing

¹ Plan de cadena de valor. Industria de la automoción en Andalucía

reliance on synthetic fertilizers, biochar production can contribute to a more sustainable agricultural system in Andalusia. One of the main challenges that Andalusia has to face is drought. The biochar obtained by Bioliza improves the water retention capacity of crops, which means greater resistance to drought (Polonio Baeyens, Gómez-Limón, La Cal, & Villanueva, 2024).

In addition, biochar stores carbon stably in the soil for hundreds of years, helping to mitigate climate change by reducing the amount of carbon dioxide in the atmosphere.

2 Small-scale business models explored.

2.1 COMPOLIVE BIOREFINERY

COMPOLIVE is an innovative business with a high potential to become scalable within a short period. The business model focuses on sustainable innovation by developing ecofriendly, lightweight, and highly scalable polymeric biocomposites for mass production. The products outperform traditional materials with better technical properties and lower environmental impact, aligning with the UN's Sustainable Development Goals. Green technology drives the core value proposition, leveraging proven production processes and scalable facilities. Strategic positioning highlights market differentiation with resource efficiency and customisation. The company collaborates with sustainable suppliers and research institutes for raw materials and development. Financial projections show profitability especially after 2 years, following the Discounted Cash Flow (DCF) model for COMPOLIVE (data provided from the LIFE-Comp0live project), supported by partnerships and public funding options for growth. Existing pilot sales and industry collaborations further strengthen market entry and expansion.

COMPOLIVE has developed an innovative 'cradle-to-gate' approach for producing biocomposite material ready to be processed with conventional polymer technologies (injection molding, extrusion, etc.). COMPOLIVE's process represents an innovative approach to sustainable material development by transforming olive tree prunings (OTP) into high-performance biocomposites. Starting with the collection, transport, and storage of prunings, the company ensures a sustainable supply chain that utilises a previously untapped resource. In the next stage, prunings undergo fiber treatment and compounding, where advanced characterisation and validation processes optimise the material's properties for industrial applications.

What sets COMPOLIVE apart is the seamless integration of these bio-based materials into prototyping and manufacturing workflows, supported by collaborations with industry leaders such as Ford², Caliplast³, and Matricería Peña⁴. This ensures the biocomposites meet rigorous quality standards for use in diverse markets. The final products are tailored for high-demand sectors like automotive, home furniture, and urban furniture, addressing the growing need for sustainable alternatives. By coupling innovation with a commitment to circular economy principles, COMPOLIVE transforms agricultural residues into scalable, eco-friendly solutions. This forward-thinking strategy does not only minimise waste but also creates a versatile material platform that benefits multiple industries. The entire value chain—from OTP to market-ready biocomposites—is designed to minimise environmental impact while maintaining superior performance standards.

² <https://www.ford.com/>

³ <https://www.caliplast.fr/>

⁴ <https://matriceriagranada.com>

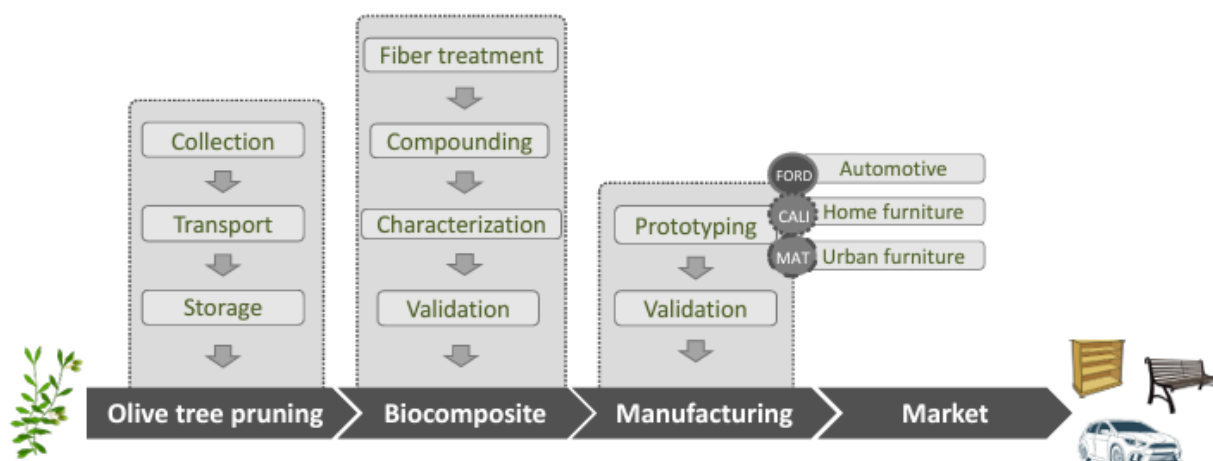


Figure 1: COMPOLIVE BIOREFINERY business approach.

The COMPOLIVE biocomposites offer a sustainable alternative to conventional plastics without compromising on performance or cost-effectiveness. These materials can be processed using standard equipment, allowing manufacturers to adopt them without significant retooling costs. This compatibility with existing infrastructure facilitates a smoother transition to more sustainable practices across industries. Despite their eco-friendly nature, COMPOLIVE biocomposites are priced competitively with commercial materials, making them an economically viable alternative for businesses looking to improve their sustainability profile and positioning COMPOLIVE as a strong contender in the biobased materials market. The biorefinery concept employed by COMPOLIVE adds significant value to olive grove waste, transforming low-value agricultural byproducts into high-value engineering materials.

This process does not only create new revenue streams for olive farmers but also addresses the environmental concerns associated with traditional disposal methods such as burning, which contributes to increased carbon emissions.

The COMPOLIVE business model, rooted in circular economy principles, creates new opportunities for farmers and supports population retention in agricultural regions threatened by depopulation. As the EU's leading olive oil producer, Spain generates 7 million tons of olive pruning waste annually, most of which is burned, releasing harmful emissions. COMPOLIVE aims to revalorise this waste by converting it into biocomposites for automotive and furniture manufacturing industries.

2.1.1 General description and value proposition of the innovation

COMPOLIVE Biorefinery offers a groundbreaking solution for sustainable materials by transforming OTP waste into high-value biocomposites. This innovative approach aligns perfectly with circular economy principles and addresses the growing demand for eco-friendly alternatives in various industries:

- **Sustainability:** COMPOLIVE utilizes OTP waste, which is abundant in olive-growing regions, reducing agricultural waste and promoting resource efficiency.
- **Versatile applications:** The biocomposites can be tailored for use in automotive interiors, outdoor furniture, and home furnishings, with potential expansion into additive manufacturing and packaging.
- **Environmental benefits:** The production process significantly reduces carbon footprint and fossil resource consumption compared to conventional material production processes.
- **Competitive pricing:** Despite its eco-friendly nature, COMPOLIVE biocomposites are priced competitively against traditional polymers.
- **Customizable properties:** The materials can be engineered to meet specific industry requirements, offering a wide range of applications.

- Regulatory compliance: COMPOLIVE helps clients meet increasingly stringent environmental regulations.
- Unique aesthetics: The OTP-based materials offer a distinctive appearance, setting products apart in the market.
- Strong partnerships: Collaboration with leading automotive manufacturers, furniture producers, and research institutions ensures ongoing innovation and market relevance.
- Circular Economy Champion: COMPOLIVE exemplifies the principles of the bioeconomy, turning agricultural waste into valuable products.
- Rural development: The biorefinery concept supports rural economies by creating new value chains for agricultural by-products.

COMPOLIVE Biorefinery represents a significant step forward in sustainable material production, offering a win-win solution for industries seeking to reduce their environmental impact while maintaining high-performance standards.

2.1.2 Stakeholders involved in the ISP

Task force: The MAF+ exercises and other support services for this innovation were carried out by the task force composed by a total of 15 persons, which included team members of the business idea owner Andaltec Biorefinery and CTA, as well as the European Council for Automotive R&D (EUCAR), ClarkeModet (IPR expert), Santander Bank, Austral Venture Gestión (venture capital), Center for Technological Development and Innovation (CDTI) which is Business Public Entity under the Spanish Ministry of Science, Innovation and Universities, Mozaik Business Consultancy (SCALE-UP advisory board member) and VITO (Flemish research organization in the area of cleantech and sustainable development). Ecologic Institute supported and followed the overall process as task lead. CTA, on behalf of the SCALE-UP project, have conducted **eleven distinct support sessions**.

Business idea owner:

The University of Jaen and Andaltec make up the company's founding team. They will contribute their know-how and part of their staff who was previously dedicated to the LIFE COMPOLIVE project to the creation and proper functioning of the new company. The people who are involved in the process of creating and launching the spin-off have participated in the inception phase and present a very suitable curriculum to cover all the needs that meeting an objective like this has in the different areas: engineering, R&D, finance, marketing, processes, production, quality, etc. Estimates indicate that COMPOLIVE will create 28 jobs in five years.



Figure 2: CAMPOLIVE BIOREFINERY's logo

Core Team Setup: Begin with a small core team, focusing on engineers, technicians, and a limited commercial and administrative staff. This group drives the product development and market testing. Regarding process design, the establishment of processes for production, quality control, and project management is carried out by engineers and technicians focused on optimising production and ensuring product quality. At this stage, the R&D activity is basic research on product improvement, led by a small R&D team to ensure innovation is part of the long-term strategy.

In addition, a Board of Advisors will be set up. The Board of Advisors will play a crucial role in guiding and supporting the company's strategic direction. They will provide expert advice on critical decisions, leveraging their experience and industry knowledge to help the business navigate challenges and seize

opportunities. The board will also serve as a sounding board for new ideas, offering insights into market trends, innovation, and competitive dynamics.

Team:

The current founding team is comprised of the following:

- **Francisco Javier Navas Martos, Co-founder.** PhD in Engineering with extensive experience in the management of R&D teams and projects. His main research work is related to the following areas of knowledge: development and characterisation of polymer-based composite materials, revalorisation of plastic and agricultural waste, design and manufacture of new products made with polymer-based materials, scaling of chemical processes, synthesis of polymer-based materials, plastic-plastic and plastic-metal joining based on laser technology, efficient air conditioning systems based on polymers, and life cycle analysis. BSc & MSc in Chemistry from the University of Jaen (Spain) since 2004.

BEng & MEng in Chemical Engineering from the University of Granada (Spain) in 2008. PhD from the University of Jaen in 2018 in the field of polymeric materials and laser welding technology. As additional complementary training, he also has a master's degree in business management and a master's degree in marketing. He is co-author of 50 contributions to national and international conferences and 28 scientific articles. He coordinated the LIFE COMPOLIVE project (€1.8M) from which this business idea emerged.

- **Sofía Jurado Contreras, Co-founder.** Degree in Mechanical Engineering from the University of Jaen since 2019 and Master's Degree in Industrial Engineering from the University of Jaen since 2021. PhD, with an industrial mention, from the University of Jaen since 2024, she carried out her Doctoral Thesis in the field of the development of polymer-based composite materials reinforced with agro-industrial waste. The work developed in her research career has focused on the field of polymer science and technology, their sustainability and waste recovery. Since March 2023, she has been part of the team of the R&D Projects Department of the Andaltéc Technology Center, working as R&D Project Manager. She is co-author of 30 contributions to national and international conferences and 10 scientific articles published in high-impact journals related to sustainable materials and waste recovery. Currently, her work focuses on the development of industrial-scale solutions of more environmentally friendly polymeric biocomposite materials, with a special focus on the reuse of waste from the olive sector as a source of final polymer-based end products with high added value. She has been working on the validation of these materials up to a semi-industrial scale and on demonstrating their potential for industrial application.

2.1.3 Results of the market assessment and business model design process

Market overview

The first step in the market definition is to examine the external conditions that surround the biorefineries in the region. A PESTEL analysis has shown a first overview of the political, economic, social, technological, environmental and legal environment in which COMPOLIVE is embedded (Figure 2).

Exercise 1 PESTEL	
P	• Solution aligned with olive grove strategy, which promotes the revaluation of olive pruning for material recovery. Material revalorisation. • Support from council and regional government of Andalusia (European funds) for R&D
E	• Existence of demand for bio composites. The product is in line with future European directives. • Sustainable production. • Renewable resource that does not imply use of land (wastes). • The quantity of waste generated covers the product demand (e.g. automobile industry). • The solution is aligned with the sector needs. • Access to subsidies (R&D), future (infrastructure). Advice (Green Assist, SCALE UP Project). • Possible to find investors. • External support from the buyer (FORD) for the purchase of materials.
S	• Wastes from agricultural area. Bring technology to the primary sector. • Raising awareness of circular economy in the primary sector. • Promotion of new business lines in economically disadvantaged areas. • Ambient protection to the burning of pruning. • Industrialize rural areas. • There is a consumer preference for a more environmentally sustainable industry.
T	• The solution implies a technological development. • Customised production adapted to the needs of the customer. • High technological level. Knowledge-based. Not easy to copy by competitors. • Traditional manufacturing machinery can be used to produce. • New method for chopping. • Advantage: Availability of raw materials and products. Improvement needs: Optimize and reduce costs of the processing technology. • No competitors were identified for this fibre and these volumes
E	• For manufacturers, the solution means a reduction in the environmental impact. • Reduction of carbon footprint by up to 55%. • The solution is in line with ODS and circular economy policies.
L	No legal conditions beyond those related to the sector are detected.

Figure 3: COMPOLIVE PESTEL analysis from MAF+ platform (exercise 1).

The PESTEL analysis for COMPOLIVE Biorefinery reveals a favorable environment for its implementation and growth:

- **Political:** The project aligns with the recently launched olive grove strategy for promoting the revalorisation of olive pruning waste. It receives support from local and regional governments in Andalusia, with access to European funds for R&D.
- **Economic:** There's a growing demand for biocomposites, aligning with the European strategic objectives. The solution offers sustainable production using renewable resources without land use competition. The available waste quantity meets current product demand, particularly in the automotive industry. The project can access R&D subsidies and potential future infrastructure funding.
- **Social:** COMPOLIVE brings technology to the primary sector, raising circular economy awareness in economically disadvantaged rural areas. It promotes new business lines and protects the environment by preventing pruning waste burning and it will promote the creation of new jobs.
- **Technological:** The solution represents a significant technological development, offering customised production adapted to customer needs. It is knowledge-based and not easily replicable by competitors (a patent application is underway). Importantly, traditional manufacturing machinery can be used for production, with a new method for chopping developed. As part of the ISP, Andaltec contacted an expert firm on IP to assess the current situation of Andaltec and their needs to secure their research and projects, see Appendix I: Activities for ANDALTEC).
- **Environmental:** For manufacturers, the solution reduces environmental impact, potentially lowering carbon footprint by up to 55% (data from LIFE-CompOlive project). It aligns with Sustainable Development Goals and circular economy policies.
- **Legal:** No specific legal conditions were mentioned in the provided analysis.

This PESTEL analysis indicates that COMPOLIVE Biorefinery is well-positioned to capitalise on current trends and policies, with strong potential for success in the biocomposites market.

Considering the company priorities, the current goal is to directly address applicable sectors such as automotive, street furniture, and home furnishings. The potential COMPOLIVE company is currently in

its initial development phase. The R&D function for the initial offering has been completed based on biocomposites. Pilot testing has been conducted and validated. Following this line, the objective is to reach the exponential growth phase within 2-3 years, addressing new sectors such as additive manufacturing and packaging and establishing new growth engines based on increased recurrence, helpful life, and average tickets for each client. The market and the sectors in which we are going to compete are attractive because:

- The size of the potential market for sustainable plastic materials is significantly large.
- The market's potential growth is also very large, given the forecasts for manufacturing vehicles and furniture with these materials.
- The expected profitability is good, similar to that of conventional polymeric materials. High profitability is expected because:
 - There is a wide range of clients from various sectors, which means that clients have limited bargaining power over the potential company COMPOLIVE;
 - The threat or risk of there being substitute products in the short or medium term is moderate, given the novelty of the use of OTP as reinforcement
 - Entry barriers can be established based on the know-how of the COMPOLIVE company promoters, which protects the spin-off from potential new competitors.
 - Good alliances can be established with OTP providers and there is a wide range of them, which also limits their bargaining power against the COMPOLIVE company.
 - It is a *blue ocean* since there are materials reinforced with fibers from olive pruning on the market.

As a consequence of the activities developed in the LIFE-COMPOLIVE project, there is currently an actual demand of COMPOLIVE material for 60,000 Ford vehicles per year, with a total of 5 kg of composite material per vehicle.

When choosing target groups for the COMPOLIVE Biorefinery (Figure 4), a strategic approach is crucial to pinpoint the most promising sectors that stand to gain from its innovative polymeric biocomposites:

Automotive Industry. The automotive industry presents the most promising target group for COMPOLIVE Biorefinery's biocomposites. With a large market size and existing demand, exemplified by Ford's order for 60,000 vehicles, this sector offers significant growth potential. Stringent regulatory pressures for sustainable materials in automotive manufacturing align perfectly with COMPOLIVE's eco-friendly solution. The industry's high potential for customisation and technical requirements matches well with COMPOLIVE's ability to tailor biocomposite properties. However, challenges include meeting strict safety and performance standards and competing with established material suppliers. Despite these hurdles, the automotive sector remains highly attractive due to its size, regulatory alignment, and COMPOLIVE's existing relationships with key players like Ford.

Outdoor Furniture. The outdoor furniture market shows strong potential for COMPOLIVE's biocomposites. There's a growing demand for sustainable urban solutions and eco-friendly outdoor furniture. The durability requirements of this sector align well with the properties of COMPOLIVE's biocomposites. Additionally, there is potential for public sector contracts, such as furnishing city parks and public spaces⁵. Challenges include seasonal demand fluctuations and varying weather resistance requirements across regions⁶. However, the increasing consumer preference for sustainable furniture and the material's ability to withstand outdoor elements make this an attractive market.

Home Furniture. The home furniture sector offers moderate potential for COMPOLIVE. There's increasing consumer interest in eco-friendly products, and the growing online furniture market provides

⁵ https://insights.made-in-china.com/Outdoor-Furniture-What-Awaits-in-the-Future-of-Sustainable-Designs-and-User-Centric-Innovations_HATrGjXImiV.html.

⁶ <https://amerlifelifehome.com/blogs/news/go-green-with-eco-friendly-patio-furniture>

new opportunities⁷. COMPOLIVE's ability to customise appearance and properties of the biocomposites could be a significant advantage in this design-focused market⁸. However, this is a competitive market with established players, requiring extensive marketing to educate consumers about the benefits of biocomposite furniture. The potential for 3D printing applications in home furniture design could be an interesting avenue for future exploration, given the material's properties.

Additive Manufacturing. The additive manufacturing sector, while currently scored as medium attractiveness, holds significant future potential for COMPOLIVE. This rapidly growing sector has increasing demand for sustainable materials and aligns well with Industry 4.0 trends⁹. COMPOLIVE's ability to customise material properties could be a major advantage in this field. However, entering this market would require significant R&D investment and facing competition from established filament manufacturers¹⁰. Despite these challenges, the potential for growth and innovation in this sector makes it worth considering for future expansion.

Packaging. The packaging industry presents a large market with increasing demand for sustainable solutions¹¹. COMPOLIVE's biocomposites could potentially offer biodegradable packaging options, aligning with growing environmental concerns. However, this sector faces high competition from other sustainable materials like bioplastics¹². Additionally, stringent food safety regulations and the need for significant material property adaptations pose considerable challenges. While the market size is attractive, the barriers to entry and required modifications to the biocomposite make this sector less immediately appealing than others.

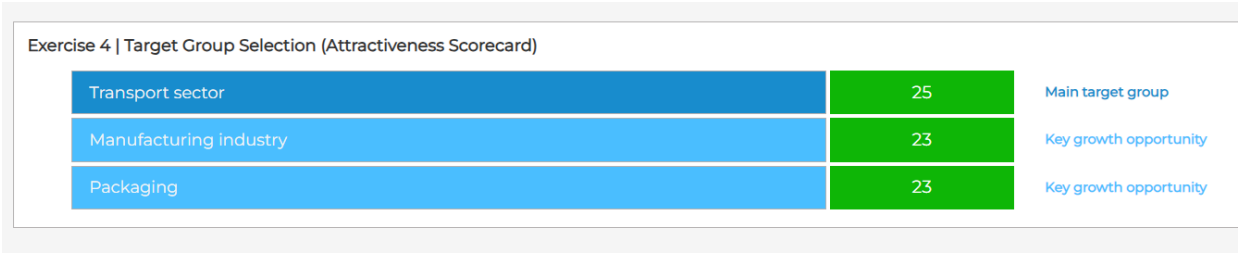


Figure 4: COMPOLIVE Biorefinery Target Group Selection (Attractiveness Scorecard). Exercise 4.

The relevance of **market size estimation**, carried out in exercise 5 from the MAF+ platform, lies in its critical role in guiding strategic business decisions, enabling companies to assess potential revenue, allocate resources effectively, and tailor product development and marketing strategies to meet market demands. The COMPOLIVE Biorefinery is poised to tap into a significant opportunity within the biocomposites market, which is estimated to reach a total addressable market (TAM) of €46.4 billion annually (data provided from the LIFE-CompOlive project). This figure reflects the global potential for biocomposite materials across various industries, encompassing both current usage and the anticipated replacement of traditional materials with more sustainable alternatives. The growing emphasis on eco-friendly solutions in multiple sectors underscores the relevance of COMPOLIVE's offerings. Focusing on the automotive and furniture sectors, the serviceable available market (SAM) for COMPOLIVE's biocomposites is estimated at €4.6 billion. Within this SAM, the automotive sector accounts for €2.8 billion, representing 60% of the total. Key opportunities exist in interior components, non-structural parts, and potential exterior applications. Meanwhile, the furniture sector contributes €1.8 billion, with outdoor and home furniture as primary areas of focus. This segmentation highlights the increasing demand for sustainable materials in both industries. The serviceable obtainable market (SOM) for COMPOLIVE is projected at €30 million per year, which represents approximately 0.65% of

⁷ https://insights.made-in-china.com/Outdoor-Furniture-What-Awaits-in-the-Future-of-Sustainable-Designs-and-User-Centric-Innovations_HATrGjXlmiV.html
⁸ <https://www.belamo.com/trends/european-trends-in-outdoor-living/>
⁹ <https://www.karsan.com/en/blog/sustainability-blog/the-role-of-sustainable-materials-in-automotive-manufacturing>
¹⁰ <https://www.karsan.com/en/blog/sustainability-blog/the-role-of-sustainable-materials-in-automotive-manufacturing>
¹¹ https://insights.made-in-china.com/Outdoor-Furniture-What-Awaits-in-the-Future-of-Sustainable-Designs-and-User-Centric-Innovations_HATrGjXlmiV.html
¹² https://insights.made-in-china.com/Outdoor-Furniture-What-Awaits-in-the-Future-of-Sustainable-Designs-and-User-Centric-Innovations_HATrGjXlmiV.html

the SAM. This initial market share reflects a realistic entry point for COMPOLIVE as it establishes itself in the biocomposites landscape. The breakdown indicates that the automotive sector will contribute €18 million (60% of SOM), while the furniture sector will account for €12 million (40% of SOM), showcasing the diverse applications of COMPOLIVE's biocomposites. COMPOLIVE has set ambitious production targets to align with its market potential. The initial production target is set at 600 tons per year, with a significant portion allocated to automotive applications (300 tons) and other uses (300 tons). Looking ahead to a five-year horizon, COMPOLIVE aims to ramp up production to 24,000 tons per year, with an estimated distribution of 14,400 tons for automotive applications and 7,200 tons for furniture. This growth trajectory positions COMPOLIVE to capture a substantial share of the rapidly expanding biocomposites market, which is projected to grow significantly in the coming years.

Projections indicate a compound annual growth rate (CAGR) of 12.5% to reach €46.3 billion by 2025, positioning the biocomposites market for significant growth; increasing demand for sustainable materials across various industries, particularly in the automotive and furniture sectors, drives this growth. The automotive sector is expected to lead with a 10-12% CAGR due to stringent regulations and consumer demand for eco-friendly vehicles, while the furniture sector is projected to grow at a steady 6-8% CAGR as awareness of sustainable living increases.

COMPOLIVE's specific growth trajectory is ambitious, with initial-phase growth rates of 100–150% year-over-year in the first two years as the company transitions from pilot production to commercial scale. This is followed by an exponential growth phase in years 3-5, with projected year-over-year growth of 200-300%, aiming to reach the target of 24,000 tons annual production. This rapid expansion is supported by increasing legislative pressure for sustainable materials, growing consumer demand for eco-friendly products, and the potential to expand into new sectors, such as additive manufacturing and packaging.

Several factors contribute to this positive growth outlook, such as ongoing R&D to enhance the material's properties and broaden its uses, the possibility of expanding to other olive-growing regions outside of southern Spain and rising awareness across all industries of the need for environmentally friendly materials. The expectation of reaching the exponential growth phase within 2–3 years suggests a highly optimistic outlook, which will require aggressive marketing strategies and rapid scaling of production capabilities.

It is important to note that while these projections are based on industry trends and COMPOLIVE's goals, achieving such rapid growth will require overcoming significant challenges in scaling production, market penetration, and maintaining quality standards. The company's success will depend on its ability to capitalise on the growing demand for sustainable materials while effectively managing its expansion and maintaining a competitive edge in the biocomposite market.

The **heat map analysis** for COMPOLIVE reveals critical areas of focus for the company's success and growth. In the high-impact and high-probability categories, automotive industry adoption stands out as a crucial factor, with existing demand exemplified by large firms' interests. This aligns with the broader trend in the automotive sector, which is increasingly adopting biocomposites to reduce vehicle weight and enhance fuel efficiency while meeting stringent emissions regulations. Environmental regulations favouring sustainable materials are also likely to intensify, directly benefiting COMPOLIVE's products. This is because of the growing need for eco-friendly materials and the move towards a circular economy. The biocomposites market is expected to grow at a compound annual growth rate (CAGR) of 15.5% to 16.92% through 2033 and 2034¹³. Production scaling capabilities are identified as critical to meet this growing demand and achieve cost efficiencies, which is essential given the ambitious growth targets for COMPOLIVE.

In the medium impact and medium probability category, furniture industry adoption presents significant opportunities but may require more time and marketing efforts. This aligns with the market trends showing steady growth in the use of biocomposites in the furniture sector. R&D for new applications can open up new markets, particularly in emerging fields such as additive manufacturing and packaging, though outcomes are less certain. Raw material supply consistency, while important, is generally considered reliable given the abundance of olive groves. The low impact and low probability factors, such as potential competition from other OTP-based materials and changes in olive production

¹³ <https://www.thebrainyinsights.com/report/biocomposites-market-14122?srsId=AfmBOoqBSjulA5tqVVITA6gAJ8AI9JLy6z00QLs0nUdkel6-GfX6JFs>

affecting supply, are currently less pressing concerns but should be monitored as the market evolves. Overall, the heat map analysis underscores the importance of focusing on automotive sector partnerships, regulatory compliance, and production scaling to capitalise on the rapidly growing biocomposites market.

Business model canvas

After eleven different sessions involving 15 experts in different fields, CTA on behalf of SCALE UP ISP have designed an innovative business model canvas for COMPOLIVE biorefinery (Figure 5):

- 1- Customer segments: as already commented in the market overview carried out in section 2.1.3, the main customer segments are: automotive industry, outdoor and home furniture manufacturers as well as additive manufacturing and packaging players. All of them have already been identified by the innovators, but the ISP, mainly through the European Council for Automotive R&D (EUCAR), has supported them in the identification of key intermediaries, as well as clusters of reference that can contribute to build new direct relationships.
- 2- Value propositions: it is already commented in section 2.1 as well. The SCALE UP ISP, by the involvement of Mozaik Business Consultancy (business experts) have supported the innovators in the final design of the main company goals and values, highlighting the sustainability of the business and its high local and regional impact.
- 3- Channels: The strategy mentioned for reaching customers aligns perfectly with the biocomposites market's growth trajectory, leveraging personal interactions, industry networking, and digital platforms to capitalise on the increasing demand for sustainable, eco-friendly materials across various sectors.
- 4- Customer relationships: COMPOLIVE aims to emphasise the importance of strategic collaborations, co-development, and technical expertise in driving innovation and market penetration, aligning with industry trends towards sustainable materials and joint R&D efforts. Mozaik Business Consultancy has added value in the design of new customer relationships and channels.
- 5- Key resource: These key resources combine unique raw materials, specialised equipment, research capabilities, expert human capital, and proprietary technology to create innovative and sustainable products. The task force member VITO, through the use of their innovative tools MooV¹⁴, have supported the innovators to really define the key resource as well as to tackle logistics challenges and boost sustainable development.
- 6- Key activities: COMPOLIVE biorefinery's key activities encompass the entire value chain of biocomposite production, from raw material sourcing to product development, manufacturing, quality assurance, and commercialisation. The company also highlights the strategic focus on innovation, scaling up operations, and securing financial resources, which are crucial for establishing a competitive edge and sustaining growth in the evolving biocomposites market.
- 7- Key partners: COMPOLIVE aims to build a robust ecosystem that supports the entire value chain of biocomposite production, leveraging partnerships with suppliers, industrial manufacturers, research institutes, and EU initiatives. The main contribution of the task force arises from Mozaik Business Consultancy and CTA as business partners with strong knowledge in innovation and very well consolidated EU networks.
- 8- Cost structure: many competitive advantages of this innovative business model were revealed given the abundance of OTP, its low cost, its high and very localized availability, the lack of need for special machinery for the transformation of the new polymeric biocomposite materials into a final part, as well as the low cost and custom design of the resulting material. They detailed the CAPEX and OPEX costs. Here, the taskforce has played a very relevant role in the entire cost structure definition, especially CDTI and its financial department.
- 9- Revenue streams: The revenue streams encompass direct product sales, specialised R&D services, and potential technology licensing; they are bolstered by positive financial projections and potential public funding, indicating a diverse and promising financial foundation for the

¹⁴ <https://moov.vito.be/en>

biocomposite business. Both financial partners from the task force, Santander Bank and Austral Venture Gestion, supported to innovators not only in the revenue streams definition, but also in the design of innovative financial mechanism for the market deployment.

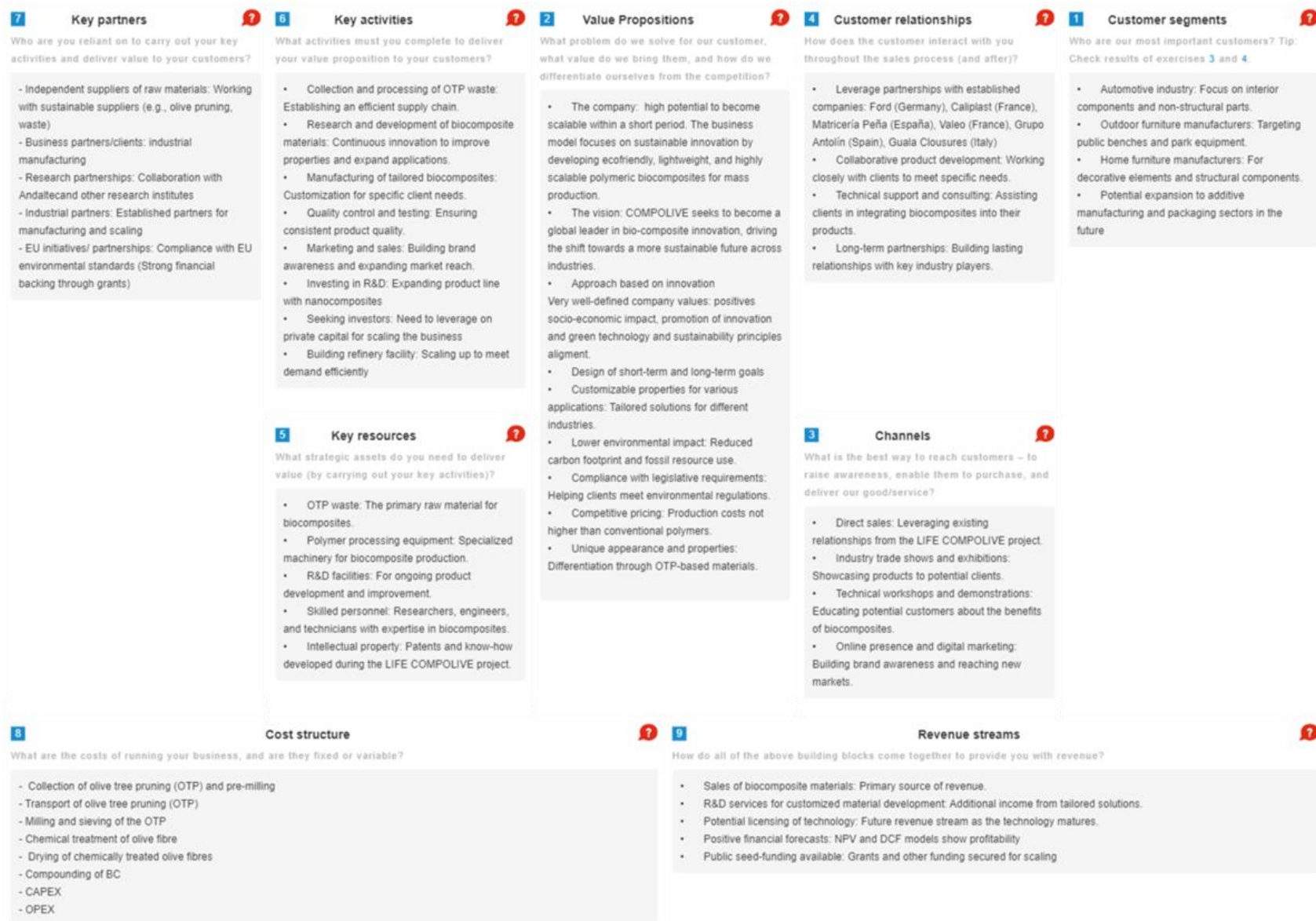


Figure 5: Final COMPOLIVE BIOREFINERY business model canvas.

2.1.4 Relevant considerations for the future

After the support, innovators and CTA carried out and exercise for defining next steps and the strategy for the full solution deployment. All the meetings and their outcomes are in Appendix I: Activities for ANDALTEC. The main conclusions can be summarised such as:

- Growing sustainability demand: As governments worldwide push for greener regulations and industries look to reduce their environmental impact, the demand for biocomposites is expected to surge. COMPOLIVE is well-positioned to capitalise on this trend by offering a sustainable alternative to traditional plastics.
- Scalability into new markets: Beyond automotive and furniture, COMPOLIVE has the potential to expand into industries such as construction, textiles, and consumer goods, increasing its customer base and revenue streams.
- Technological advancements: Continued R&D can lead to the development of new, innovative biocomposites and optimisation of production processes, enhancing product quality and reducing costs. Advances such as nanocellulose and continuous fiber technologies could open new market opportunities.
- Market leadership in biocomposites: COMPOLIVE could establish itself as a global leader in biocomposites, especially in Europe, where it benefits from abundant local resources (e.g., OTP) and supportive regulations. As a pioneer in this field, the company can set industry standards.
- Eco-conscious partnerships: Many large corporations, particularly in the automotive, packaging, and consumer goods sectors, are seeking partnerships with companies that offer sustainable solutions. This creates opportunities for COMPOLIVE to form strategic alliances and boost market presence.

2.2 BIOLIZA: Biochar obtained from olive waste pyrolysis.

2.2.1 General description and value proposition of the innovation

Bioliza's value proposition is based on providing innovative solutions for sustainable energy production through the conversion of olive oil biomass into biogas and biochar. Leveraging advanced gasification technology, Bioliza enables the transformation of biomass into valuable energy resources, thus promoting energy self-sufficiency and helping the customer to develop their own biogas project. Adopting this approach has two key benefits: firstly, it avoids any potential waste management issues, and secondly, it leads to a substantial reduction in CO₂ emissions. These benefits are especially significant when viewed in the context of current global decarbonisation efforts.

Bioliza enhances the competitiveness of its clients by creating economic value from materials which would otherwise be discarded, while aligning with the principles of the bioeconomy to foster sustainable regional development.

The most significant advantage of Bioliza's solution is its capacity to decarbonise and minimise environmental impact. The technology serves to reduce CO₂ emissions and contribute to the process of energy decarbonisation, due to the utilisation of olive biomass residues. This innovation is therefore aligned with the European Green Deal and its stated objectives.

Bioliza's solution is based on an innovative model approach that is unique in the national context and ensures energy self-sufficiency of companies. Its gasification technology allows agro-industries to generate their own electrical and thermal energy, thereby promoting energy independence. As a by-product of the process, biochar is produced, which can be used as a fertilizer or as a source of biofuel.

The Bioliza innovative solution addresses some of the customer needs identified by Bioliza during its 25-year experience in the sector. These include:

- The solution ensures energy self-sufficiency for companies.
- Expertise and Innovation. Bioliza facilitates the transition of academic research and expertise into practical applications.

- Open innovation and demonstration projects.
- Securing funding for customers on the basis of Bioliza in-depth knowledge of the sector and the personalised attention afforded to each customer.

Some of the customers' difficulties, as identified by Bioliza, pertain to the necessity of financial resources to invest in technology for biomass solutions. To this end, Bioliza offers an alternative for unused stored biomass. Bioliza's technology is pioneering in Spain and particularly so in Andalusia. As the company itself has stated, there are no comparable alternatives in Spain. However, one of the main risks identified by Bioliza is the existence of international alternatives, particularly in India and China, which are more advanced in technology and cheaper.

2.2.2 Stakeholders involved in the ISP.

Task force: The MAF+ exercises and other support services for this innovation were carried out by the task force composed of a total of **13 persons**, which included:

- Team members of the business idea owner Bioliza: **José Antonio La Cal Herrera with the support of Isabel Cano-Caballero** in some exercises.
- The SCALE-UP regional partner in Andalusia (CTA): **Rafael Castillo Barrero, Carmen Ronchel Barreno, Antonio Carlos Ruiz Soria and Marina Barquero León**
- Advisory Board Member of the SCALE-UP Project: **Tatjana Batas**. Support in Funding (public / private) and Business modelling.
- Public and private financing opportunities. Direct communication with members of:
 - Public Fund: **Andrés Ubierna**, Head of the Department of Capitalisation and Technological Companies of the Center for Technological Development and Innovation (CDTI).
 - Venture capital: **Manuel Ibáñez**, Partner of Austral Venture.
 - Private Banking: **Roberto Fernández**, Territorial Head of Start-up & Scale-up of Santander Bank.
- IPR Support. Meeting with **María José** from the PONS consulting firm on the issue of intellectual protection of the Bioliza solution.
- San Isidro de Loxa Cooperative. Market Support. Meeting with **Antonio Rodríguez** (Technical Director of San Isidro de Loxa Cooperative).
- Ecologic Institute (**Gerardo Anzaldúa**) supported and followed the overall process as task lead.

Business idea owner:



Figure 6: Bioliza's Logo

Bioliza is a knowledge-based company of the University of Jaen, established in April 2014, with a primary focus on research and the provision of solutions in the field of energy recovery from agricultural and forestry by-products and their processing industries.

The company's area of expertise is biomass in general. Therefore, it is essential to analyze the type of by-products generated by its clients, as well as to have an in-depth knowledge of the main energy recovery technologies to propose the most appropriate solutions from a technical, energy, environmental and economic standpoint.

Team:

José Antonio La Cal Herrera.

The R&D&I manager of this business project is José Antonio La Cal Herrera. Industrial Engineer by the Universidad Politécnica de Madrid (1994), Master MBA in Business Administration and Management by the Escuela Superior de Gestión Commercial y Marketing ESIC (2011) and PhD by the University of Jaen (2013).

He is Associate Professor in the Department of Business Organization, Marketing and Sociology at the University of Jaen. He has been Manager of the Energy Management Agency of the Province of Jaen and teaches courses and Masters in Renewable Energies in different Universities (Jaen, Castilla-La Mancha and Cordoba). He is an approved professor by the Escuela de Organización Industrial, EOI for the areas of energy and renewable energies.

He has written numerous articles in specialised journals and participates in national and international forums related to energy and the environment, as well as in research projects linked to the use of energy resources, especially biomass.

Isabel Cano-Caballero.

The strategic direction and business management of Bioliza is developed by Isabel Cano-Caballero Ramírez. She holds a degree in Law from the University of Granada (1994/1999). Master in 'Social Economy and Territorial Development' by the Universities of Jaen and Bordeaux IV (Montesquieu-France) 2006/2007 edition.

She collaborated as an advisor to the vice-presidency of the Andalusian Association of Technology-Based Companies, being manager of the Technology-Based Company (EBT) Energygem (Biot Group) of the University of Granada. She was also the manager of ItVirtual Consultancy (Marwen Calsan Group) providing business advisory services, innovation and Corporate Social Responsibility.

She has been responsible for BIÓPTIMA, International Biomass and Energy Services Fair during her professional career and for the organisation of the II Ibero-American Congress on Biorefineries.

2.2.3 Results of the market assessment and business model design process

Market overview

The Bioliza's solution is an unknown product for the market, especially the agricultural Spanish market. The solution can play a fundamental role as a soil improver, water absorber and CO₂ sink, among other advantages. To achieve this objective, it is essential to consider the following key points:

- It is necessary to obtain a standardised product that meets a series of technical requirements.
- Develop an adequate commercial strategy in which all the advantages it presents can be integrated.
- Validate the technology by farmers in the market.

Bioliza's PESTEL analysis has revealed information relevant to the market as indicated as follows (Table 1: Bioliza's PESTEL Analysis Table 1).

- Political Factors: Bioliza operates in a highly favorable political environment, particularly in Andalusia. The presence of several government subsidies, such as those provided by the Andalusian Energy Agency and CDTI, significantly reduces the capital investment and risks associated with acquiring Bioliza's solutions. The overall political context is supportive, with

policies that promote and benefit decarbonisation technologies and a favourable bioeconomy policy framework.

- **Economic Factors:** Economically, Bioliza benefits from collaborations with experts, primarily through SMEs and consortia agreements with universities. The recruitment of industrial PhDs also plays a vital role in providing innovative solutions and expertise.
- **Social Conditions:** From a social perspective, Bioliza leverages open innovation, which fosters a collaborative environment that encourages the sharing of ideas and solutions. Additionally, there is a strong client willingness to reduce natural gas consumption, aligning with the broader societal trend towards sustainability and reduced energy consumption.
- **Technological Conditions:** Technologically, Bioliza faces competition from more developed and low-cost technologies, particularly from Asian countries such as China and India. These competitors pose a significant challenge due to their advanced technological standing and cost advantages.
- **Environmental Conditions:** Environmentally, the availability of biomass is not a concern for Bioliza. The company has the capacity to connect clients with biomass suppliers if they do not have their own resources. This ensures a stable supply chain and reduces the risk associated with biomass availability, making Bioliza's solutions more reliable and attractive to clients.
- **Legal Factors:** Legally, the administration has a positive view of gasification technology, considering it a green and emission-free solution. This positive legal context means that clients only need to make minor changes to their environmental permits, which are easy to obtain and do not face administrative controversy or rejection. The absence of significant legal barriers further supports the smooth operation and adoption of Bioliza's technology.

Table 1: Bioliza's PESTEL Analysis

PESTEL Analysis		
Element	Description	Issues identified by the innovator
P	Political conditions refer to all existing or potential government policies and strategies (local, regional, national or supra-national level) that could impact your organization.	• There are several government subsidies available to fund this type of project. This helps clients to reduce their capital investment and risks when acquiring the solution. • In Andalusia, the Andalusian Energy Agency provides financial support for this type of projects. CDTI also provides financial support. • In general, there is a good political context with policies that promote and benefit decarbonisation technologies. • A favourable bioeconomy policies framework.
E	Economic conditions include any issues related to the economy (local, national, and global) in your organization's home or target markets that could affect your organization and its success.	• Help from experts. • Mainly SMEs • Consortia agreements and with universities. • Recruitment of industrial PhDs.
S	Social conditions are those that arise from the side of consumers and can influence the demand for your organization's products and services.	• Open innovation. • Clients' willingness to reduce consumption in natural gas.

T	Technological conditions cover all technological developments that could affect your organization, including both industry/market-specific developments and general trends.	Asian technologies have been identified as main competitors. Chinese and Indian technologies, which are more developed technologies and low cost.
E	Environmental conditions include all ecological or environmental issues that could affect your business.	The availability of biomass in the industry is not seen as an obstacle. If the client does not have their own, Bioliza has the capacity to connect them with biomass supplies.
L	Legal conditions include all potential changes to the legal environment in which your organization operates.	• The administration has a positive view of gasification because it is a green and emission-free technology. • Clients only need to make a minor change to their environmental permits. The permit is easy to obtain. • It does not cause controversy or rejection by the administration. • No legal barriers have been identified.

To guarantee the success of Bioliza's expansion and scale-up strategy, it is essential to identify and evaluate the most promising sectors for the implementation of its biomass valorisation technology. One of the principal objectives of this ISP was the identification of the most appropriate target group for optimising the impact, efficiency and profitability of investments. The target group selection exercise (Figure 7) and the evaluation of the attractiveness of each sector provide a detailed overview of the opportunities and challenges present in various industries, including the electricity industry, the building sector, agriculture, the manufacturing industry, and the research community. These were identified as potential market sectors for Bioliza's technology.

This analysis is based on a series of key criteria, such as the existence of a pressing need, the ability to satisfy that need, the ease of communication or access to the target group, the presence of competitors addressing the same need, and the sector's potential profitability. The following sections present the results and conclusions of this evaluation, enabling Bioliza to make informed and strategic decisions for its growth and expansion.

After a thorough analysis of the potential target group for Bioliza's solution, the subsequent step is to assess the market potential that can be generated by addressing its identified needs.

Bioliza already had this information due to an analysis they had previously conducted. The data provided are the property of Bioliza and, according to them, are based on their own market analysis. The results are shown for each group.

1. Electricity Industry (Main Target Group):

The electricity industry stands out as the most attractive target group for Bioliza.

- **Pressing Need and Willingness to Act:** This sector scores a perfect 5 out of 5. The electricity industry has a significant need for alternative energy sources, and companies in this sector are highly motivated to adopt technologies that can generate electrical and thermal energy from biomass.
- **Satisfaction of Need:** Bioliza's technology aligns perfectly with this need. The biogas obtained from biomass is a crucial source of energy generation for this sector.

- Ease of Communication/Access: With extensive experience and an established network of contacts within the sector, Bioliza scores 5 out of 5 in terms of ease of communication and access.
- Absence of Competitors: While there is no significant competition at the national level, international competitors from India and China offer lower prices and more advanced technology, resulting in a score of 4 out of 5.
- Substantial and Profitable Customer Group: The electricity industry is both broad and highly profitable, with Bioliza having already received offers from several companies, earning a score of 5 out of 5.

To estimate the market size for Bioliza in the Spanish electricity industry, the following information was provided by Bioliza:

- Target Market: Spanish electricity industry
- Number of Target Customers: 3
- Market Penetration: 40%
- Price per Service: €1.5 million
- Total Potential Revenue: With a target of 3 customers and a price per service of €1.5 million, the total potential revenue would be €4.5 million. However, considering the market penetration rate of 40%, the actual revenue would be **€1.8 million**.

In order to comprehend the market potential of the Spanish market in relation to this industry, it is necessary to consider the following key elements.

- The Spanish electricity market is significant, with a projected growth from 303 terawatt-hours in 2023 to around 347 terawatt-hours by 2028¹⁵. This indicates a growing demand for energy solutions.
- The market is moderately consolidated, with key players such as Endesa SA, Iberdrola SA, and Naturgy Energy Group SA dominating the market.
- The competition in the electricity market includes other energy solutions that target the same customer group, although they may not be based on the same technology. This competition reduces the market penetration rate to 40%.

2. Building Sector (Key Growth Opportunity):

The building sector is identified as a key growth opportunity. This sector likely benefits from energy-efficient solutions and sustainable practices, which align well with Bioliza's technology.

- Customer Need and Willingness to Act: The incorporation of Bioliza technology in the construction industry helps to achieve energy efficiency standards, enhance the sustainability profile of buildings, and facilitate the transition towards more environmentally friendly urban development. This is an area in which customers are demonstrating a growing interest. Score: 4 out of 5
- Ability to Satisfy the Need: Bioliza's technology, which has been adapted for use in buildings, offers a sustainable solution for heating and power needs. The technology has the potential to reduce energy costs and carbon emissions. Score: 5 out of 5
- Ease of Communication and Access: His extensive experience in the sector has enabled him to establish a network of contacts with an interest in the technology. Score: 5 out of 5
- Absence of Competitors: At the national level, there is no competition. However, on the international stage, there is significant competition from India and China, which offer lower prices and more advanced technology. Score: 2 out of 5
- Substantial and Profitable Customer Group: The sector knowledge and established contacts indicate that the customer group is substantial and potentially profitable. Score: 5 out of 5

Currently, Bioliza has not yet established a market presence in this sector. However, there is significant potential for growth and innovation in this sector, and the company is well-positioned to leverage its technology as it scales up operations in the future.

¹⁵ <https://www.reportlinker.com/clp/country/7352/726363>

3. Agriculture Sector

The agriculture sector presents a moderate level of attractiveness for Bioliza.

- Pressing Need and Willingness to Act: Existence of stored biomass that can be valorised and can generate revenue for farmers. This waste would otherwise simply be burnt. However, this need is not as acute as in the electricity sector for Bioliza, scoring 3 out of 5.
- Satisfaction of Need: Bioliza's offering can satisfy this need by providing the possibility of valorising biomass. Bioliza offers customers the option of accompanying them in their search for financing, which provides added value. Scoring 3 out of 5.
- Ease of Communication/Access: Consultancy services provide access to these customers, but this is not as straightforward as in the electricity sector, scoring 3 out of 5.
- Absence of Competitors: Biomass is currently an untapped resource in Andalusia, but this does not mean there are no competitors, scoring 2 out of 5.
- Substantial and Profitable Customer Group: While the sector is substantial, it is not the main source of profitability for Bioliza's technology, scoring 2 out of 5.

Given the calculations and contextual information of Bioliza:

- Potential Market Size: The actual potential market size for Bioliza in the Spanish agricultural sector is €3 million, based on the target of 3 customers and a price per service of €1 million.
- Monetary Value: The monetary value of this market is also €3 million, aligning with the expected return mentioned.
- Market Viability: The strong market penetration rate of 80% and the growing demand for biomass-based energy solutions in Spain suggest that Bioliza is well-positioned to capture a significant share of this market.

In summary, the market size estimation for Bioliza in the Spanish agricultural sector is more accurately reflected as €2.4 million, considering the target number of customers and the price per service.

4. Manufacturing Industry

The manufacturing industry is comparable to the agricultural sector in terms of attractiveness for Bioliza.

- Pressing Need and Willingness to Act: This sector has a moderate need for energy solutions but is not as motivated as the electricity sector, scoring 3 out of 5.
- Satisfaction of Need: Bioliza's offering can partially satisfy this need, but it is not the primary focus, scoring 3 out of 5.
- Ease of Communication/Access: Similar to agriculture, communication and access are manageable but not as easy as in the electricity sector, scoring 3 out of 5.
- Absence of Competitors: There are known competitors addressing this need, scoring 2 out of 5.
- Substantial and Profitable Customer Group: The sector is not as substantial or profitable for Bioliza's technology as the electricity sector, scoring 2 out of 5.

To estimate the market size for Bioliza in the Spanish manufacturing industry, the following information was provided by Bioliza:

- Target Market: Spanish manufacturing industry
- Number of Target Customers: 2
- Market Penetration: 30%. The market penetration rate of 30% is influenced by competition from other alternative technologies. The Spanish manufacturing sector is highly competitive, with various players and a fragmented business fabric compared to other European benchmarks like Germany¹⁶.
- Price per Service: €1.2 million
- Total Potential Revenue: With a target of 2 customers and a price per service of €1.2 million, the total potential revenue would be €2.4 million.

¹⁶ <https://www.caixabankresearch.com/en/sector-analysis/industry/overview-spains-manufacturing-industry>

However, considering the market penetration rate of 30%, the actual revenue would be **€0.72 million**.

The Spanish manufacturing industry is diverse and export-oriented, with a projected output of approximately €759 billion by 2028, up from €682 billion in 2023, indicating a compound annual growth rate (CAGR) of 1.7%¹⁷

5. Researchers (Universities or Research Institutions).

- Need and Willingness to Act: This is an innovative and cutting-edge research topic. However, it is not Bioliza's main customer. Score: 2 out of 5
- Ability to Satisfy the Need: As a spin-off from the University of Jaen, Bioliza continues to maintain close links with the academic world, but this is not its primary focus. Score: 2 out of 5
- Ease of Communication and Access: As a spin-off from the University of Jaen, Bioliza continues to maintain close links with the academic world, facilitating communication and access. Score: 4 out of 5
- Absence of Competitors: It is a cutting-edge topic in the field of research. There is no competition like Bioliza's at the national level, but this does not guarantee a significant market advantage. Score: 2 out of 5
- Substantial and Profitable Customer Group: Not applicable, as this customer group is not substantial or potentially profitable for Bioliza's main business objectives. Score: 1 out of 5

The evaluation of potential target groups for Bioliza's solution has clearly identified the electricity industry and the building sector as the most promising markets. The electricity industry stands out as the main target group, scoring perfectly in terms of pressing need, satisfaction of need, ease of communication, and profitability. This sector's high motivation to adopt alternative energy sources and the alignment of Bioliza's technology with these needs make it an ideal target. The building sector also presents a key growth opportunity due to its growing interest in energy-efficient and sustainable solutions, which Bioliza's technology can effectively address

Exercise 4 | Target Group Selection (Attractiveness Scorecard)

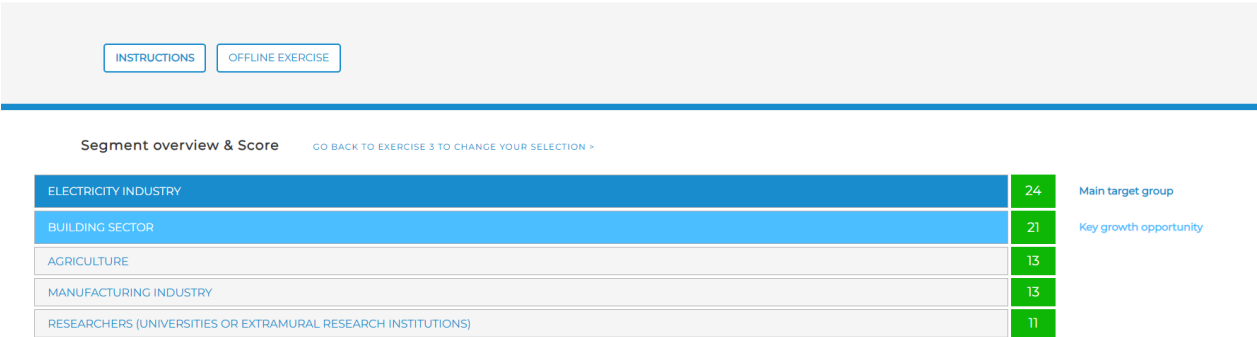


Figure 7:Target Group Selection (Attractiveness Scorecard). Exercise 4.

Following the analysis of the target group for Bioliza’s solution and the estimation of the most promising market sizes, the next step involves identifying other key stakeholders who will influence Bioliza’s business success. These include competitors, buyers, and suppliers. To assess the level of competition and the balance of power in these critical business situations, the Porter’s Five Forces framework is a very useful tool.

Porter’s Five Forces analysis is a method for evaluating the competitive environment of a business. It considers five distinct forces: the threat of new entrants, the threat of substitute products or services, the bargaining power of suppliers, the bargaining power of buyers, and the competitive rivalry among existing firms. This framework helps in determining the competitive intensity and attractiveness of an industry in terms of its profitability. The analysis for the Bioliza solution is shown in Table 2.

¹⁷ <https://www.reportlinker.com/clp/country/6277726363>

Table 2: Porter's Five Forces. Exercise 8.

Force	Your assessment
Supplier Power	- Bioliza works with only 2-3 suppliers annually, with a target of 1.5 M€ per project. - This relatively small number of suppliers could potentially give them moderate bargaining power. - Suppliers are primarily national (likely Spanish), with possible expansion to Moroccan and Portuguese suppliers. - Focus on the olive industry. The abundance of by-products from the olive industry (pruning waste, pomace...) in the region where Bioliza operates provides a significant source of biomass.
Buyer Power	- Bioliza has used biomass obtained from bioproducts obtained from the olive oil industry for the development of its technology. This industry has a biomass potential in Andalusia that can be estimated at 2.6 Mt per year in agriculture.
New Market Entrants	- Bioliza is taking initial actions to protect its technology and business model. This will create a significant barrier to entry for potential new competitors. - Bioliza's collaborative approach strengthens customer relationships and encourages partnerships with its clients. This approach makes it challenging for new market entrants to gain a foothold.
Substitutes	- International Competition: - o Cheaper Indian technology poses a significant threat as a substitute. The presence of international competitors demonstrated the existence of a global market for comparable solutions. - The regulatory environment is increasingly oriented towards sustainable solutions, which presents both opportunities and challenges for Bioliza because it may also stimulate the development of substitutes technologies.
Competitive Rivalry	- Bioliza employs a differentiation strategy through its innovative open innovation model and strong scientific-technical support. This helps set it apart from competitors who may offer more generic solutions in the biomass and renewable energy sectors. - The company is facing significant pressure to succeed, given the lack of accurate market estimates and the critical importance of gaining a foothold in the sector. - Bioliza faces competition from international players, particularly those offering cheaper technologies, such as Indian firms.

The regional abundance of by-products from the olive oil industry in Andalusia, estimated at 2.6 Mt per year, highlights an important source of biomass that Bioliza can exploit. However, the company's dependence on a limited number of national suppliers, with moderate bargaining power, requires careful management of the supply chain. Protective measures around Bioliza's technology and business model, combined with its collaborative approach with the customer, create significant barriers to entry for new competitors, but also underscore the importance of maintaining strong customer relationships.

The growing regulatory interest in sustainable solutions presents a dual scenario; while increasing demand for Bioliza's innovative solution, it also stimulates the development of substitute and/or competing technologies. The presence of cheaper international technologies, especially from Indian

companies, poses a significant threat, although Bioliza's differentiation strategy through its open innovation model and strong scientific-technical support helps it stand out in a competitive market.

In order to thrive in the face of a shifting market, Bioliza must navigate the intricate interplay of these forces to capitalise on the growing demand for sustainable energy solutions. In addition, the company must mitigate threats posed by substitutes and international competition and establish a foothold in the industry despite the lack of accurate market estimates. By comprehending and addressing these macro-environmental conditions and competitive forces, Bioliza can develop effective strategies to address the growing demand for sustainable energy solutions.

The final step in this market segment for the ISP Innovators is to demonstrate and highlight the advantages of their technology in comparison to their competitors. This is a competitive strength analysis. A heat map is used to visualize this information.

Figure 8: Heat Map. MAF+. Exercise 9.

Heat Map: Biochar obtained from olive waste pyrolysis		Indian technology	Chinese technology	Bioliza
Key for success	Expert knowledge	3	3	3
	Open Innovation	1	1	3
	Creation of the customer's own biogas from its own bi- omass or external biomass.	3	3	3
	Lack of national competi- tion	1	1	3
	Waste Valorisation: It trans- forms agricultural waste, especially from the olive oil industry, into valuable en- ergy resources	2	2	3
	Energy Self-Sufficiency: The system enables agri- businesses to generate their own electrical and thermal energy, promoting energy	3	3	3
Secondary Importance	Environmental Impact: By utilizing biomass waste, it reduces CO ₂ emissions and helps in decarbonisa- tion efforts	3	3	3
	Achieving biomass-based green technologies in Eu- rope, contributing to the European Green Deal and the SDGs.	1	1	3

Key (3 point scale):

	3 = Above Average
	2 = Average
	1 = Below Average

In conclusion, Bioliza is an innovative and disruptive solution in the Spanish market. Pyrolysis is a technology with limited penetration in the Spanish market, even in other areas such as waste or biomass. It is innovative in the sense that there are very limited biochar production initiatives in Andalusia, especially from by-products of the olive grove and its industries. As defined by the Technical Manager, José Antonio La Cal, Bioliza has no direct competitor in Spain.

Internationally, there are competitors within the Indian and Chinese industry, however, as the heat map clearly indicates, Bioliza has a number of important strengths, including its role in achieving biomass-based green technologies in Europe, contributing to the European Green Deal and the SDGs. Within Europe, we have strong regulation to ensure that technology development meets a number of minimum standards. While more affordable technologies can be an advantage, the quality and certifications of these technologies can vary. European companies, such as Bioliza, have the advantage of complying with strict European regulations and certifications, which ensures higher quality and sustainability (for example, The European Biochar Certificate (EBC)).

In terms of olive oil residues valorisation, biomass from Spain, particularly Andalusia, is highly valuable. Spain produces 70% of the EU's olive oil, and 45% of the world's¹⁸, making it a significant player in the global market.

Business model canvas

After a series of meetings with various experts from different fields of expertise, CTA on behalf of SCALE UP ISP have designed an innovative business model canvas for Bioliza's solution (Figure 9):

- 1- Customer segments: As outlined in the market overview (section 2.2.3), the primary customer segments are as follows: agriculture, electricity, manufacturing, building and research. These segments have been identified by the innovator, with some indicators from the CTA Team. The SCALE-UP ISP, in conjunction with SCALE-UP onsite events, promotes the importance of the biosolutions supported in the project and presents to the innovator one type of new customer segment related to EU initiatives and some international (and national) entities focused on sustainable practices, waste reduction, and renewable energies. SCALE-UP Project and their partners have supported them in the identification of key intermediaries, as well as clusters of reference that can contribute to the establishment of new direct relationships.
- 2- Value propositions: This subject has already been addressed in Section 2.2.1. SCALE UP ISP, with the participation of Mozaik Business Consultancy (business experts), has supported the innovator in the final design of the main objectives and values of the company. Tatjana Batas, a Business Consultant specialized in SMEs, start-ups, regional and sectoral development, and Advisory Board member of the SCALE UP project, commented on the importance of Bioliza focusing more specifically on the developmental aspects of its solutions. In addition, the section dedicated to technology conditions requires further analysis of Bioliza's capabilities. Consequently, the final Bioliza business model places greater emphasis on its value proposition, identifying new key elements and refining the development of those that were already incorporated.

¹⁸ <https://www.mapa.gob.es/es/agricultura/temas/producciones-agricolas/aceite-oliva-y-aceituna-mesa/aceite.aspx>

- 3- Channels: Following a series of meetings between Bioliza and the various experts involved in its ISP, the necessity to facilitate the comprehension of the solution and to engender confidence among customers was identified. Bioliza, with its extensive experience of 25 years in the sector, benefits from a substantial network of contacts, which is further strengthened by its presence on social networks (LinkedIn) and its professional connections derived from its consultancy and mentoring services. The collaboration with SCALE-UP and several experts and partners has resulted in the establishment of new business channels, including those pertaining to the dissemination of knowledge and the receipt of invitations to relevant events and industrial exhibitions within the sector. For instance, Bioliza was invited to present its solution at Expo Agri Tech. Furthermore, the establishment of new partnerships between biosolutions is facilitated (for example, the establishment of a relationship of trust between the Andalusian solutions of SCALE UP and the partners of the SCALE-UP project), thereby opening up new possibilities, such as the recent proposal by the regional partner of Poland, UNIMOS, with the presentation of D2XCEL (a European project) and its possible participation in Bioliza. .
- 4- Customer relationships: In the same line as indicated in 'channels' and with a view to fostering strong customer relationships, it is vital that Bioliza focuses on a business model based on building trust through personalised interactions and consistent communication with the customer. One of the company's weaknesses (identified during this ISP) is the failure to close business. One of its main strengths in customer relations lies in offering personalised support and dedicated consultancy services, especially for high-value customers. This helps to integrate pyrolysis technology and ensure that customers understand its features and benefits. Furthermore, the establishment of partnerships with well-established companies serves to enhance credibility and facilitate access to resources. Collaborative development involves close collaboration with customers to address their specific needs, fostering trust, and ensuring a consistent stream of satisfied customers. Technical assistance and consultancy services play a pivotal role in assisting customers in integrating technology, offering training and ongoing support to maximise the utilisation of Bioliza technology.
- 5- Key resource: Bioliza's key resources include highly skilled employees with extensive sector knowledge, knowledge about national financial resources, and strategic access to raw materials. During their ISP, the company established a connection with the San Isidro de Loxa Cooperative through its technical director, Antonio Rodríguez, who provided valuable market insights. He emphasised the crucial importance of establishing strong connections with the primary sector, developing a comprehensive understanding of available biomass, and navigating the complex challenges of obtaining financial support. A possible collaboration emerged in the framework of this meeting.
- 6- Key activities: Bioliza's key activities are vital to establishing a strong presence in the renewable energy sector. These include a business model in which marketing, engineering, and project development are key activities. The company's strategic initiative is to implement a robust marketing plan with the objective of establishing itself as a disruptive technology within the national market. With the support of the ISP and various strategic collaborations, the company is planning to adopt an increasingly international approach. Engineering efforts are directed towards the development and optimisation of pyrolysis technologies, ensuring high-quality results. To enhance credibility and facilitate market acceptance, as well as to adapt to trends in European regulations, Bioliza should aim to obtain and be aware of European certifications such as the European Biochar Certificate (EBC).
- 7- Key partners: The key partnership strategy employed by Bioliza focuses on the establishment of a robust network comprising industrial partners and strategic investors. The focus is on cultivating robust relationships with industrial partners. Derived from the ISP, it is proposed in this Final Business Model Canvas to add, as Key Partners, European investors specifically interested in bio-based technologies and other European initiatives. These strategic partnerships are designed to provide technological validation, financial support, and market credibility, enabling the company to overcome initial barriers to entry and position itself as a disruptive solution in renewable energy and waste valorisation. The carefully selected network of partners not only supports Bioliza's current operational needs, but also creates a foundation for long-term growth, knowledge sharing and technological advancement.

- 8- Cost structure: Bioliza's cost structure is divided into two key categories: personnel costs and administrative costs. Personnel costs represent a significant investment in highly skilled professionals, including engineers and technical experts specialised in pyrolysis and biomass valorisation technologies, which are essential to maintain the company's technological advantage and innovative capacity. Administrative costs cover essential operational expenses such as office infrastructure, software licenses, management systems and overheads necessary for the smooth running of the company. In this regard, the working group has played a pivotal role in formulating the cost structure, particularly the CDTI and its financial department.
- 9- Revenue streams: Bioliza has strategically designed its revenue streams to capitalise on its technological expertise and market positioning in the biomass valorisation sector, focusing primarily on project closures and complementary service offerings. The company generates revenues through the implementation of renewable gas generation plants, and earning fees for the design, installation and commissioning of pyrolysis technology projects. In addition to these project-based revenues, Bioliza provides specialised training and consultancy services, leveraging its in-depth technical expertise to offer clients comprehensive support. This support ranges from feasibility studies and technical guidance to strategic advice on integrating biomass technologies. The innovators were supported in defining revenue streams and designing innovative financial mechanisms for market implementation by two financial partners, Banco Santander and Austral Venture Gestion.

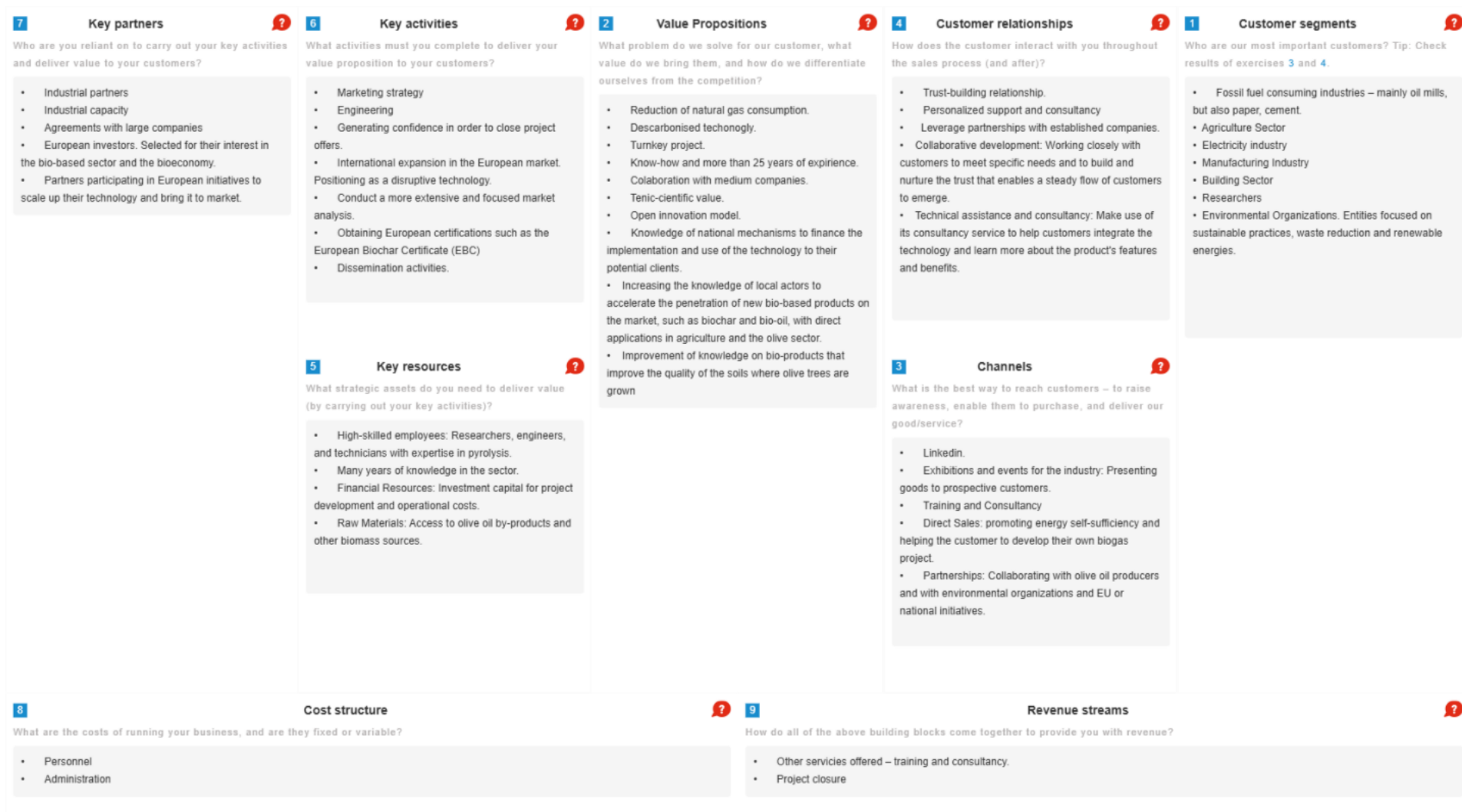


Figure 9: Final Bioliza business model canvas.

2.2.4 Relevant considerations for the future

During the implementation of the Innovation Support Programme (ISP), various activities were undertaken to promote the innovative solution of Bioliza, extending beyond the analysis of provided exercises. CTA conducted follow-up meetings to identify specific needs, such as the requirement for Intellectual Property Rights (IPR) consulting services for Bioliza. CTA detected several barriers hindering the promotion of Bioliza's technology, including a lack of dissemination activities, the need to create trust in their technology, and a knowledge gap regarding its real-world implementation. To address these needs, multiple meetings were organised to promote dissemination activities, participate in knowledge-sharing events or create market opportunities. These efforts included presentations, workshops, and networking events to raise awareness and build credibility for Bioliza's innovative solution. All meetings and their outcomes are in Appendix II: Activities for Bioliza. The main conclusions can be summarized such as:

- **Expansion Strategies:** In order to expand and increase market opportunities, Bioliza must focus on leveraging and generating new strategic partnerships with new partners and building confidence in the technology and its development. For this purpose, contacts and interactions created during the project are of essential importance, as is the identification of potential market share in emerging economies with a growing demand for energy. Collaboration with established companies in different geographical regions can help to access new customer bases.
- **Market positioning:** It is crucial to position Bioliza as a leader in the field of biomass valorisation, emphasising its unique approach to the sector. A robust marketing strategy is essential to highlight the environmental and economic benefits of Bioliza's technology. By showcasing its innovative pyrolysis technology and its applications from olive residues, Bioliza can differentiate itself in the competitive renewable energy market. This includes seeking European certifications such as the European Biochar Certificate (EBC) to increase credibility and market acceptance, thus differentiating itself from its competitors.
- **Investors and funding:** In order to secure adequate funding to expand its operations and enter new markets, Bioliza must proactively seek out European investors with a focus on the bio-based sector and the bioeconomy. These investors can provide not only financial support, but also valuable industry connections and expertise. In addition, exploring opportunities for government incentives and grants available for renewable energy projects can provide additional financial support to potential clients. Participation in European initiatives focused on scaling up innovative technologies can also open doors to potential funding sources and strategic partnerships.

3 Reflections on the SCALE-UP Innovation Support Programme

The ISP has been instrumental in advancing the bioeconomy in Andalusia, particularly through the collaborative efforts of the task force and the Andalusian Bioeconomy Platform. These entities have played a crucial role in implementing the ISP and enhancing the bioeconomy ecosystem, aligning closely with the Andalusian Circular Bioeconomy Strategy set forth by the regional government. This alignment not only strengthens existing initiatives but also solidifies a future-proof path for the development of the sector in the region.

3.1 Barrier Analysis during ISP Implementation

The implementation of the ISP faced several key obstacles, primarily due to the diverse contexts and varying stages of readiness among the selected innovations. For instance, COMPOLIVE and Bioliza exemplify this diversity; COMPOLIVE entered the programme with a well-developed business model and support from other initiatives, while Bioliza was still refining its market strategy.

Key Obstacles Identified:

1. **Diverse Development Stages:** The differences in maturity levels among innovations made it challenging to provide uniform support. Some projects required intensive mentoring, while others were ready for scaling.
2. **Resource Allocation:** Balancing resources effectively across the different innovators was essential to ensure that all innovations received adequate attention without stretching the programme's capabilities.
3. **Need for Tailored Support:** Each innovation required customised assistance to address specific challenges related to market entry, technology development, and stakeholder and investors engagement.

Strategies to Overcome Barriers:

1. **Task Force Coordination:** The task force facilitated communication among stakeholders, ensuring that each project received tailored support based on its unique needs. This coordination was vital for fostering collaboration and sharing best practices.
2. **Utilisation of the Andalusian Bioeconomy Platform:** The platform served as a hub for knowledge exchange, bringing together innovators, researchers, and industry leaders to collaborate on solutions that enhance bioeconomic activities in Andalusia.
3. **Enhancing Complementarity with External Support Programmes.** The ISP strengthened its complementarity with other support programs, such as Green Assist, to optimise support for innovators and avoid duplicating efforts. By leveraging these external partnerships, the programme provided targeted resources that effectively addressed specific barriers, particularly for more mature projects like COMPOLIVE. This strategic collaboration ensured comprehensive and tailored support, maximising the programme's impact while minimising redundant efforts. This approach optimised resource allocation and fostered a cohesive and efficient support ecosystem for the innovators

Lessons Learned:

The experience underscored the importance of initial assessments to categorise innovations based on their development stages. Future iterations of the ISP should maintain this flexibility while ensuring that support mechanisms are adaptable to meet diverse needs across various projects and geographical European regions.

3.2 ISP Conclusions and Bioeconomy Applications

The ISP has yielded significant outcomes that contribute to both individual innovations and the broader bioeconomy in Andalusia. The collaborative framework established by the task force and the Andalusian Bioeconomy Platform has been pivotal in achieving these results.

Key Outcomes:

1. **Enhanced Business Models:** Innovations like COMPOLIVE have refined their business models to focus on sustainable practices, transforming olive tree prunings into high-performance biocomposites. This aligns with both regional sustainability goals and global climate initiatives.
2. **Market Readiness Achievements:** Bioliza has made strides toward commercialising its bio-char production from olive waste, demonstrating how agricultural by-products can be valorised into valuable resources that support sustainable agriculture and enhance soil health.

Bioeconomy Applications:

The ISP has highlighted several promising applications for bio-based innovations:

1. **Agricultural Waste Valorization:** COMPOLIVE's approach to converting olive pruning waste into biocomposites exemplifies how agricultural residues can be transformed into valuable materials, reducing environmental impact while creating economic opportunities.
2. **Sustainable Agricultural Practices:** Bioliza's production of biochar not only sequesters carbon but also improves soil water retention, addressing critical challenges such as drought resilience in Andalusia.
3. **Alignment with Circular Economy Principles:** Both innovations reflect key elements of the Andalusian Circular Bioeconomy Strategy by promoting resource efficiency and sustainable practices across various sectors.

3.3 Innovators and ISP Future Directions

The contributions of the ISP have significantly impacted both COMPOLIVE and Bioliza, positioning them as leaders in their respective fields within Andalusia's bioeconomy landscape.

Contributions and Impact:

1. **Strengthening Regional Ecosystem:** The task force's efforts have enhanced collaboration among local stakeholders, fostering an ecosystem where innovations can thrive. This collaborative spirit is essential for driving economic growth and job creation within rural communities.
2. **Supporting Policy Alignment:** The initiatives under the ISP align closely with the Andalusian government's Circular Bioeconomy Strategy, reinforcing regional policies aimed at sustainability and innovation.

Proposed Next Steps for ISP Development:

Short-term Vision:

- **Refine Programme Structure:** Implement a more structured approach that categorises projects based on their maturity levels while ensuring that tailored support is available for each stage of development.
- **Enhance Collaborative Networks:** Strengthen ties between innovators and other stakeholders through workshops and networking events facilitated by the Andalusian Bioeconomy Platform.

Medium-term Aspirations:

- **Expand Regional Impact:** Leverage successful case studies from COMPOLIVE and Bioliza to attract additional bio-based projects to Andalusia, showcasing the region as a hub for sustainable innovation.

- **Develop Sector-Specific Tracks:** Create specialised tracks within the ISP focused on key areas such as agricultural waste valorisation and sustainable materials development to deepen expertise in these sectors.

Long-term Vision:

- **Position Andalusia as a Bioeconomy Leader:** Build on existing successes to establish Andalusia as a benchmark region for bio-based innovation within Europe, driving investment and research into sustainable practices.
- **Foster Cross-Sector Integration:** Encourage integration of bioeconomy principles across various industries to create a holistic approach that promotes sustainability throughout all economic activities in the region.

In conclusion, the SCALE-UP Innovation Support Programme has laid a robust foundation for advancing bioeconomic initiatives in Andalusia. By emphasising collaboration through task forces and platforms like the Andalusian Bioeconomy Platform, this programme not only addresses immediate challenges faced by innovators but also aligns with long-term strategic goals set forth by regional authorities. This synergy ensures a resilient path forward for developing a thriving circular bioeconomy in Andalusia.

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Appendix I: Activities for ANDALTEC

Activities for Andaltec				
Date	Activities	Format	Company	Comments
04/14/2023	Visit of Andaltec: Scale-up & LIFE-COMPOLIVE	On-site visit	ANDALTEC	Presentation of the LIFE-COMPOLIVE project. Presentation of the SCALE UP project. Presentation of the EoI call. Search for synergies between the initiatives.
07/20/2023	SCALE-UP: Innovation Support Programme ISP ES	Online	ANDALTEC	First meeting to inform in detail about the ISP and the activities that will be carried out. Tentative start date. Presentation of the document to sign the commitment of participation and work during the support programme.
11/29/2023	SCALE-UP: Task Force	Online	CTA	A brief document was proposed with a short description of the solutions, the needs identified, and the stakeholders identified explaining why they have been chosen, structured in a similar manner to the following: - Summary of the solution. - Identified needs. - Each stakeholder identified.
January 2024	SCALE-UP: Advisory Board in ISP	Online	CTA	Involve the Advisory Board in the ISP: Preparation of Google Forms explaining the different solutions and the needs identified. AB members will select those where they can add value.

02/27/2024	Possibility of collaboration: EUCAR and ANDALTEC	Online	ANDALTEC /EUCAR	EUCAR was interested in positioning a topic on the use of biomass to obtain polymers for the automotive industry, and to establish a roadmap to define the scaling up of these technologies. They were looking for contacts such as ANDALTEC that could help them in the definition of the proposal.
03/18/2024	SCALE-UP: Innovation Support Programme ISP ES	Online	ANDALTEC	ISP meeting in the framework of the SCALE-UP project. Gerardo Anzaldua, Ecologic, presentation of the MAF+ platform and its application to ISP. Presentation of Andaltec.
06/06/2024	“Bioeconomía en el sector olivarero como palanca de transformación económica y social”	On-site visit	ANDALTEC	Presentation of the innovative bio-based solution in an area of the event reserved exclusively for them. Networking areas with representatives of the quadruple helix to promote investment and development of bio-based solutions. Interaction with investment funds and other innovators. Presentation of the ISP of the SCALE UP project.
06/12/2024	Logistics tool: MooV	Online	CTA	ANDALTEC was invited to participate in a study of its revalorization route, which CTA will be carrying out. This analysis is a multi-criteria evaluation of 10 selected routes, and the production of biocomposites from pruning waste is one of the most favourable options. The tool used is MooV, developed by VITO, which is designed to help companies optimize the design of their supply chains and rethink their logistics strategies independently. The objective is to address the logistical challenges associated with olive biomass in Andalusia.
06/26/2024	Patent protection - Andaltec & ClarkeModet.	Online	ANDALTEC	Consultation with expert firm on IP to assess the current situation of Andaltec and their needs to secure their research and projects as IP. Future signing of an NDA with the company.

08/13/2024	SCALE UP_ISP_ANDAL- TEC	Online	ANDALTEC	The meeting focused on the need to complete the CANVAS and PESTEL analyses, considering the information provided in the Deliverable B.5.5 and E.1.1.v2 documents, and to incorporate improvements to both the business plan and the after-life plan of the project.
09/24/2024	ANDALTEC (ISP) Business Plan Im- provement Follow-up Meeting	Online	ANDALTEC	Kick-off meeting to contextualize Andaltec's current situa- tion: Analysis of barriers, solutions proposed until now by Andaltec and short- and medium-term objectives. Possibilities of support from the ISP of SCALE UP. MAF+ Platform exercises: 0,1,2,3 and 4.
11/07/2024	SCALE UP. Innova- tion Support Pro- gramme_ exercises	Online	ANDALTEC/CTA	Review of previous exercises: Exercises 0,1,2,3 and 4. Completion of exercises 8,9,10 and 11. Preparation for a meeting with the expert Tatjana Batas.
11/28/2024	Expo Agri Tech	Trade Fair in Má- laga	Bioliza, Andaltec	Innovando en agroeconomía circular - Expo AgriTech The panel "Innovating in Circular Agro-Economy" at Expo AgriTech 2024 provides Bioliza and Andaltec with a valua- ble platform to showcase their innovative solutions to over 8,000 agricultural professionals, positioning their brands as leaders in the circular bioeconomy. This exposure enables them to connect with industry leaders, potential partners, and investors, while also offering insights into market needs and trends. Participation in this high-profile event enhances their visibility and credibility. Additionally, the panel addresses key needs identified in the Innovation Support Programme (ISP) by facilitating market access, exploring funding opportunities, promoting knowledge transfer, and highlighting their contributions to sustainabil- ity. Ultimately, this engagement can accelerate the growth and impact of both organizations within the agricultural in- novation ecosystem
12/02/2024	SCALE UP. Innova- tion Support	Online	ANDALTEC/CTA	Task Force Expert: Tatjana Batas

Programme Task Force Collaboration				
12/02/2024	Final Meeting ISP	Online	ANDALTEC/CTA	Final review of the exercises. Balance of the ISP. Comments and future steps.

Appendix II: Activities for Bioliza

Activities for Bioliza				
Date	Activities	Format	Company	Comments
05/03/2023	SCALE-UP project & Bioliza	Online	Bioliza	Kick-off meeting. Presentation of the innovative bio-based solution by the entity. Bioliza participation in the Eol call is considered.
11/29/2023	SCALE-UP: Task Force	Online	CTA	A brief document was proposed with a short description of the solutions, the needs identified and the stakeholders identified explaining why they have been chosen, structured in a similar manner to the following: - Summary of the solution. - Identified needs. - Each stakeholder identified.
January 2024	SCALE-UP: Advisory Board in ISP	Online	CTA	Involve the Advisory Board in the ISP: Preparation of Microsoft Forms explaining the different solutions and the needs identified. AB members will select those where they can add value.
03/18/2024	SCALE-UP: Innovation Support Programme ISP ES	Online	Bioliza	ISP meeting in the framework of the SCALE-UP project. Gerardo Anzaldúa, Ecologic, presentation of the MAF+ platform and its application to ISP. Presentation of Bioliza.
06/06/2024	"Bioeconomía en el sector olivarero como palanca de transformación económica y social"	On-site visit	Bioliza	Presentation of the innovative bio-based solution in an area of the event reserved exclusively for them. Networking areas with representatives of the quadruple helix to promote investment and development of bio-based solutions. Interaction with investment funds and other innovators. Presentation of the ISP of the SCALE UP project. Facilitation of the exchange with investors, one of the key identified needs of Bioliza.

08/21/2024	SCALE UP. Innovation Support Programme_ exercises 0,1,2	Online (email)	Bioliza	The first three exercises of the MAF+ platform have been sent to Bioliza: Business Model Canvas, PESTEL and value proposition. Establishment of the Deadline for the delivery of the exercises. Assignment of the expert who will help correct the exercises and support this work.
09/20/2024	SCALE UP. Innovation Support Programme_ exercises 0,1,2,3 and 4	Online	Bioliza/CTA	Kick-off meeting to contextualize Bioliza's current situation: Analysis of barriers, solutions proposed until now by Bioliza and short- and medium-term objectives. Possibilities of support from the ISP of SCALE UP. MAF+ Platform exercises: 0,1,2,3 and 4.
10/15/2024	SCALE UP. Innovation Support Programme_ exercises	Online	Bioliza	Review of previous exercises: Exercises 0,1,2,3 and 4. Completion of exercises 8,9,10 and 11. Preparation for a meeting with the expert Tatjana Batas.
10/15/2024	SCALE UP. Innovation Support Programme Task Force Collaboration	Online	Bioliza/CTA	Task Force Expert: Tatjana Batas. The meeting was based on the exercises previously developed by Bioliza with the help of CTA. These related to the Business Model Canvas, PESTLE analysis and value proposition of Bioliza's innovative solution. The meeting was very focused on mechanisms to support Bioliza in securing investment, enhancing its business model to attract investors and potential customers and closing projects. This was based on the expertise of the expert in relation to business models and investment knowledge.
10/28/2024	IPR Support. PONS	Online	Bioliza	Meeting with María José from the PONS consulting firm on the issue of intellectual protection of the Bioliza solution. Summary of the meeting: Sign an NDA and fill in a document so that they can assess in a first phase whether it is not susceptible to protection. Once they have determined

				whether it is, the next step will be under which figure: patent, utility model, industrial secret, etc.
				Preliminary Agenda: - Market Analysis of Bioliza: Market Size Estimation, Market Growth Rate, CVP analysis. Time: 30 minutes - Final Review and Feedback of MAF+ Platform exercises. 30 minutes Next steps: 15 minutes.
11/15/2024	Final Meeting ISP	Online	CTA/Bioliza	
11/15/2024	San Isidro de Loxa Cooperative. Market Support	Online	LOXA/CTA/Bioliza	Opportunities for collaboration between the two entities. The problem of the lack of trust in this technology and possible ways to solve it is discussed.
11/28/2024	Expo Agri Tech	Trade Fair in Málaga	Bioliza, Andaltec	Innovando en agroeconomía circular - Expo AgriTech The panel "Innovating in Circular Agro-Economy" at Expo AgriTech 2024 provides Bioliza and Andaltec with a valuable platform to showcase their innovative solutions to over 8,000 agricultural professionals, positioning their brands as leaders in the circular bioeconomy. This exposure enables them to connect with industry leaders, potential partners, and investors, while also offering insights into market needs and trends. Participation in this high-profile event enhances their visibility and credibility. Additionally, the panel addresses key needs identified in the Innovation Support Programme (ISP) by facilitating market access, exploring funding opportunities, promoting knowledge transfer, and highlighting their contributions to sustainability. Ultimately, this engagement can accelerate the growth and impact of both organizations within the agricultural innovation ecosystem
12/16/2024	D2XCEL (European Project)	Email invitation	UNIMOS	A beneficial opportunity for Bioliza has been identified through the D2XCEL project, a European initiative funded by the European Innovation Council (EIC). This project is particularly relevant as Bioliza is seeking investors and financing. The D2XCEL Call, which is currently open for

applications until December 20, 2024, aims to scale innovative solutions in various market opportunities, including Renewable Energy Production. The D2XCEL program offers a unique scaling approach, providing selected ventures with access to an international network of over 150 potential buyers and investors. Participating companies will engage in a comprehensive mentorship program that includes individual mentoring sessions with two dedicated mentors, collective workshops on topics such as internationalization strategies, go-to-market approaches, intellectual property rights (IPR), team building, and access to financing. Additionally, the program features ecosystem-specific activities, contact exchange sessions, roadshows, and visibility and promotion through the project's media channels.



SCALE^{UP}

community-driven
bioeconomy development

SCALE-UP Innovation Support Programme | Synthesis Report for Upper Austria

February 2025

Susanne Mader & Gabriele Wolkerstorfer, Business Upper Austria



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PU	Public	
PP	Restricted to other programme participants (including the Commission Services)	
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EXECUTIVE SUMMARY

Upper Austria has a diverse food processing industry, generating a wide range of food waste, by-products, such as fruit and vegetable residues, as well as side streams, for instance from bakery and brewery production processes. These products can be upcycled to new food products, utilized for feed or biogas production, chemicals and the development of other innovative products.

During the Innovation Support Programme (ISP) of SCALE-UP, two very different innovations were supported in Austria, but both business models have potential to or are based on the use of leftover food waste. In one case, a research project studied the possibilities of using proteins from sunflower oil press cake for cosmetics production. In the other, old bread is used to produce high quality spirits like gin, vodka and ouzo.

During the ISP, the innovators were supported by the conduction of a LEGO® SERIOUS PLAY® (LSP) workshop to tackle current challenges, get inputs from stakeholders, employees and outside experts on their business model.

Table of contents

1	Relevance of the selected innovations for the bioeconomy in Upper Austria.....	7
2	Small-scale business models explored	9
2.1	Velvety Manufaktur GmbH	9
2.1.1	General description and value proposition of the innovation	9
2.1.2	Stakeholders involved in the ISP	11
2.1.3	Results of the market assessment and business model design process	13
2.1.4	Relevant considerations for the future.....	21
2.2	HochBROTzeitig.....	22
2.2.1	General description and value proposition of the innovation.....	22
2.2.2	Stakeholders involved in the ISP	22
2.2.3	Results of the market assessment and business model design process	23
2.2.4	Relevant considerations for the future.....	28
3	Reflections on the SCALE-UP Innovation Support Programme	29
3.1	Barrier Analysis during ISP Implementation	29
3.2	ISP Conclusions and Bioeconomy Applications	29
3.3	Innovators and ISP Future Directions	30
	References	31

Figures

Figure 1. Bread and beer nutrient cycle Upper Austria. Source: SCALE-UP Factsheet – Biomass and Nutrients AT (Austria - www.scaleup-bioeconomy.eu).....	9
Figure 2. Business Model Canvas for Velvety. Source: own elaboration in the MAF+ portal.....	13
Figure 3. Results of the target group selection exercise for Velvety on the MAF+ portal. Source: own elaboration.....	15
Figure 4. Competition heat map for Velvety's solid perfume idea. Source: own elaboration on the MAF+ portal.....	18
Figure 5. Impressions of the LSP WS Velvety Manufaktur GmbH.	20
Figure 6. Business Model Canvas for HochBROTzzeitig. Source: own elaboration in the MAF+ portal.	25
Figure 7. Results of the target group selection exercise for Velvety on the MAF+ portal. Source: own elaboration.....	27
Figure 8. Impressions of the LSP WS hochBROTzzeitig	28

Tables

Table 1. SWOT Analysis for Velvety. Source: Own elaboration.....	14
Table 2. SWOT analysis for solid perfume. Source: own elaboration.	15
Table 3. SWOT Analysis for HochBROTzzeitig. Source: Own elaboration.	24

Glossary

by-products	secondary products that derive from a production or manufacturing process; it is not the primary product or service being produced.
side streams	by-products that are in relation to the production amount: unavoidable products like spent grain, all kind of shells, bones, etc.
residual streams	by-products that are not in relation to the production amount: avoidable products like overproduction, spoilt food, leftovers, rejects, etc.

Abbreviations

ISP	Innovation Support Programme
LSP	LEGO® SERIOUS PLAY®
WP	Work Package

1 Relevance of the selected innovations for the bioeconomy in Upper Austria

Upper Austria has a diverse food processing industry, generating a wide range of food waste and by-products such as fruit and vegetable residues, as well as bakery and brewery side streams. These by-products can be upcycled to new food products, utilized for feed, biogas or chemicals production, and for the development of other innovative products. Within the food processing industry, food waste is an important topic and it is important to differentiate between waste and by-products or side streams.¹ Halim et al. (2025) add a differentiation between food waste, by-products and side streams by saying that by-products are part of resource that is not used for the main product, e.g. fish parts that are not used for fillet production, while side streams are products that are created during the production process like waste water or, in this case, oil press cake. Food waste, as used in the case of HochBROTzzeitig, is food that would be edible for people, but is discarded due to several reasons like overproduction, etc. The use of unused resources and by-products is also included in the Bioeconomy Strategy for Austria: *“Biogenic waste, wastewater and sewage sludge are important raw material sources of the bioeconomy and are to be used as a resource as efficiently as possible. ... The Bioeconomy Strategy is aimed to assign a value to previously unused residuals and by-products and make their recovery both climate and environmentally friendly and economically feasible.”* (BMNT 2019).

The focus of the supported innovations in Upper Austria was the valorisation of side and waste streams to use them as a resource for other (high value added) products. Two innovations were chosen that are working on doing this. It is an area where creativity, new technologies and pioneer spirits are needed.

Velvety Manufaktur GmbH

Velvety, a cosmetics company based in Upper Austria whose specialty are solid cosmetic products, was part of a research project in which the goal was to gain proteins from sunflower oil press cake. Oil press cake is an unavoidable side stream from the production of sunflower oil and is commonly used as animal feed. It has little market value. The aim is to dissolve and concentrate the proteins using solid state fermentation and membrane separation technology, so they can then be used in solid cosmetic products that the company produces. By extracting the proteins, existing products can be refined, and new products can be created or made even more sustainable and regional. The aim for the future is to find distribution channels and customers to create product lines from purely ‘recovered’ raw materials.

According to the AMA area analysis, a tool that visualises the use of cultivated agricultural land in Austria on a map (Agrarmarkt Austria, 2024), 26,258 ha of oil seeds (oilseed rape, oil sunflowers and soya beans) were cultivated in Upper Austria in 2024. Reintroducing the oil press cake as productive input for other value chains would increase values for local producers and decrease transportation and logistics needs and costs. Another big advantage would be the increase in the availability and use of regional resources for a rising cosmetics company. The aim for Velvety is to extract even more raw materials from waste and thus promote the circular economy. This way, dependency on imported ingredients from other regions and countries could be reduced, generating new sources of wealth for the region and increasing its resilience while improving the environmental footprint of the end-product. The use of regionally sourced inputs for cosmetic products would add value to the local economy. Other important challenges that are addressed with the solid cosmetic products by Velvety are plastic pollution and transport. Their products do

¹ The EU Waste Framework Directive defines exactly what waste, by-product and biowaste is, which criteria have to be met and the order of the cascades that lead from redistribution to people to feeding to animals, anaerobic digestion, composting, incineration, and landfill as the last option (European Commission, 2018).

not need plastic packaging, the bars are just wrapped in cardboard. In this solid shape, the active ingredients are much more compressed, they are much smaller and weigh less than usual bottles of shampoo. That way, much more products can fit on a truck or a logistic unit.

HochBROTzentig GmbH

About 210.000 tons of bread are thrown away each year in Austria, 52,000 tonnes of which are thrown away in processing only (BMK 2021). Upper Austria has a very strong baking industry, covering small scale artisan bakeries as well as big industrial bakeries. As shown in the bread and beer nutrient cycle in the SCALE-UP *Deliverable 2.1 Regional Biomass and Nutrient Availabilities Upper Austria*, there are various by-products produced in the bakery and brewery sector. The business model of HochBROTzentig is aiming at this problem and uses old bread as a resource to make high quality spirits. It is one way for the bakeries to valorise their old bread. The company's founder created HochBROTzentig from his personal experience as a baker who had to throw away parts of his work every day. This solution is not the one solution to food waste, as a variety of innovative ideas and solutions is needed to tackle the problem. However, examples like this bring awareness to the topic of upcycling products like old bread, display possibilities and serve as best practice examples to motivate others.

At HochBROTzentig, stale bread and old baked goods are mashed to form the basis for spirits. This idea is not fundamentally new, as there are several distilleries in Austria and Germany that produce bread schnapps. However, these usually have a very intense bread flavour and, as niche products, are only a small contribution against the waste of precious bread. HochBROTzentig wanted to break out of this niche and developed spirits without a flavour of their own using special processes. By adding herbs, spices and fruit, spirits such as gin, vodka and ouzo were created.

In September 2020, the Aschauer bakery started selling BROTKA, BROTUZO and BROTGINSKY. The company recently received the European Green Award² and the Pegasus in Gold³.

² Visit <https://europeangreenaward.com/portfolio-items/en-unddeutsch-media-eu/> for additional information.

³ Visit <https://www.tips.at/nachrichten/ooe/wirtschaft-politik/569387-gestandene-unternehmen-als-pegasus-sieger> for additional information.

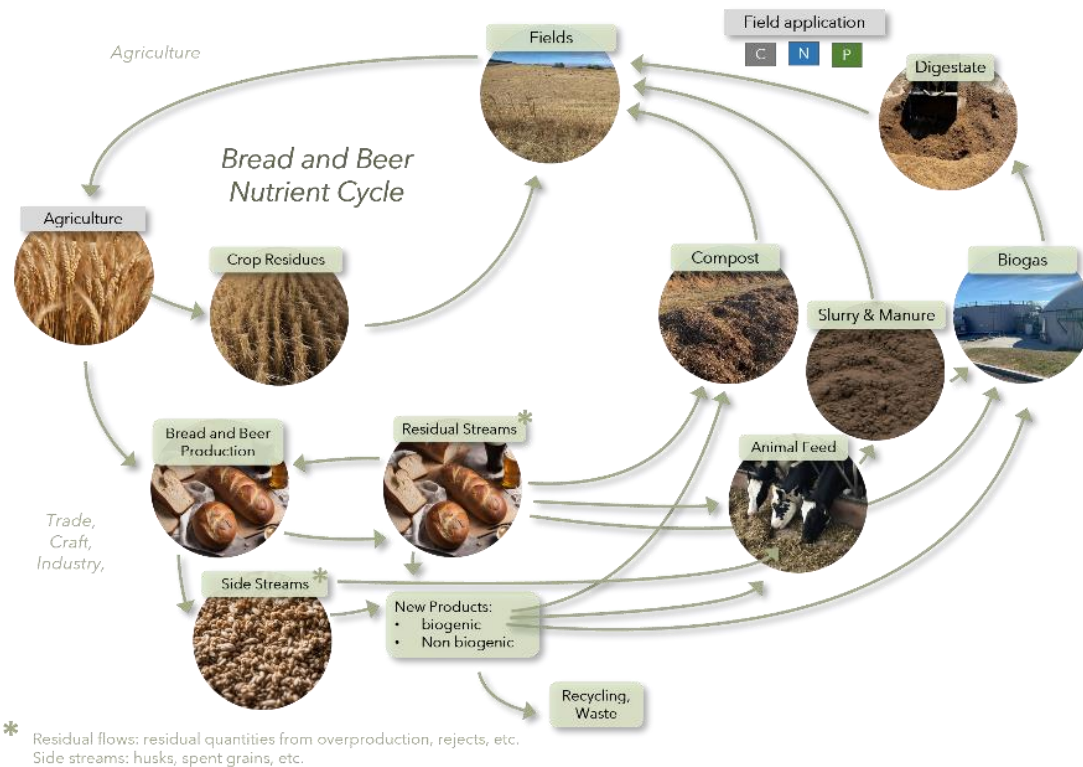


Figure 1. Bread and beer nutrient cycle Upper Austria. Source: SCALE-UP Factsheet – Biomass and Nutrients AT (Austria - www.scaleup-bioeconomy.eu)

2 Small-scale business models explored

2.1 Velvety Manufaktur GmbH

2.1.1 General description and value proposition of the innovation

The innovation that Velvety applied with for the SCALE-UP Innovation Support Programme (ISP) was a project called „SUN“ - *Sustainable innovation in natural cosmetics: upcycling food waste*. In this project, Velvety was collaborating with the University of Applied Sciences Upper Austria. The aim of this collaboration was to explore new ways of using food waste to develop natural soap solutions.

In natural cosmetics, active ingredients have so far been obtained from various natural sources, with proteins playing an important role. Nevertheless, plant-based food waste such as the residue from sunflower oil pressing remains unused. For this reason, Velvety has been in intensive discussions with the University of Applied Sciences (specializing in food technology) about a methodology that makes it possible to valorise the previously unused waste. This resulted in the “SUN” project. The main objective was to test the usability of proteins from food waste for the development of a vegetable soap solution. During the project, factors like positive skin appearance and UV stability, no synthetic dyes and preservation of the natural colour were checked. However, there were uncertainties regarding compliance with hygiene standards in research and development with organic waste and regarding the effectiveness and concentration of the proteins from the oil press cakes. In addition, the low water content (<1%) in soap production poses a challenge compared to the significantly higher water content of the press cake. Various methods were used to achieve these goals. The first step was to analyse the sunflower oil press cake at different quality levels and then mix it with standard soap blends at different concentrations. During the research, some difficulties were encountered, such as high

bacterial loads during long-term incubation and limitations in solubility in glycerol. Various experimental approaches were undertaken and adjustments made, with initial feasibility established. Nevertheless, additional investigations were necessary to further develop the process, especially due to specific challenges such as the high water content. The water content of the press cake had to be reduced using various methods (e.g. drying) to make it possible to produce soap.

The innovation of this research lies in the fact that food waste such as sunflower oil press cake, which was previously mainly used in the animal feed industry (downcycling), can now also be used in the cosmetics industry. This research thus opens up new possibilities for the utilization of food waste and helps to establish more sustainable production methods. The results were extremely promising. However, due to the currently still high production costs, commercial use of the plant protein is not yet feasible. The collaboration with the University of Applied Sciences continues and Velvety is confident that there will be a product with a plant-based protein from sunflower oil press cake on the market soon. Nevertheless, Velvety was still supported in the ISP to help them with new product development and reaching out to new markets to find the right product or market for cosmetic products with proteins from oil press cake.

2.1.2 Stakeholders involved in the ISP

Task force: The MAF+ exercises and other support services for this innovation were carried out by the task force composed by a total of nine people, which included team members of the business idea owner Velvety GmbH and the SCALE-UP regional partners from Business Upper Austria (TMG). Ecologic Institute supported and followed the overall process as task lead.

At the beginning of the ISP programme, the existing needs of the innovator, Velvety Manufaktur GmbH, were defined on the basis of a detailed interview. Based on this, a task force of seven people from the Business Upper Austria partner network and experts within the business agency was set up. However, the need to adopt a flexible approach for the innovation development process quickly became apparent. In addition, Austria was in a difficult economic situation (recession) when the ISP programme was launched. These aspects were also included in the programme, and a flexible response was offered to meet Velvety's changing needs. As a result, the task force members were constantly adapted and the people who could support the company in the respective situation or issue were contacted on an ongoing basis, in line with newly identified needs.

On the one hand, the task force consists of internal experts from the large Business Upper Austria network. Seven experts from Business Upper Austria supported velvety in the ISP programme with their expertise in the application of

- The LEGO® SERIOUS PLAY® (LSP) method to promote creative problem solving and strategic development.
- Extensive experience in project management, marketing and international sales.
- Specialisation in the development and implementation of sustainable solutions.
- Expertise in the implementation of strategic projects with an international focus.
- Training in the field of sustainability
- Scientific background for product development
- National funding landscape and project submission

Velvety would also like to gain a foothold in foreign markets with its products. Information about the products was therefore disseminated among the entire SCALE-UP project consortium. Intensive discussions were held with two experts from the CTA team, who provided an initial overview of the Spanish cosmetics market to Velvety. A competitive analysis was carried out and possible ways in which Velvety could gain a foothold in the Spanish market were considered.

External research is necessary to push products in the field of bioeconomy more strongly. Contacts have been established with the University of Applied Science, Research Centre Wels, Centre of Excellence Food Technology and Nutrition⁴.

Business idea owner:

Velvety is a cosmetics company based in Upper Austria that focuses on solid cosmetics like shampoo bars, shower bars, bath bombs, deodorant sticks, and similar products. The company develops private label products. This means Velvety produces for business customers and supports them from the initial idea, through development, to market launch. They have been pioneers in the production of predominantly solid cosmetics for many years and continue to set the highest standards. In addition, the commitment to the environment is an integral part of all corporate activities. Sustainability is at the centre of their entire production, sales cycle and beyond. In addition to focussing on solid cosmetics, through their collaboration with the University of Applied Science and an oil pressing company, Velvety is working on using proteins extracted from sunflower oil press cake in a future cosmetics line. This collaboration is to be strengthened and expanded in the future. The use of other by-products from the food industry is also being considered and is currently being evaluated. New formulas are constantly being developed - always with a focus on the environment. Velvety develop products or have ideas for products such as hair care, body care, facial care, pencils, soap, perfume, merchandising, bath additives, gift sets, children's care or animal care products.

⁴ Visit CoE Lebensmitteltechnologie und Ernährung | FH OÖ for additional information.

VELVETY

Team:

PATRICK SCHATZER, managing partner and CEO

Patrick Schatzer is an import/export wholesaler with extensive international experience. Together with his wife Michaela, he founded Velvety Manufaktur GmbH, which has been on the road to success ever since thanks to their expertise and his commercial and logistical knowledge.

CARINA BINDREITER, financial executive officer

Carina Bindreiter is financial executive officer at Velvety and also responsible for Marketing and some new products. She was involved most in the innovation support programme and the support activities.

MICHAELA SCHATZER, product development and management

As a qualified chemist, Michaela Schatzer has the specialist knowledge and has been familiar with cosmetics for many years. She and her product development team put their heart and soul into creating innovative formulations, always orientated towards the latest trends in the cosmetics industry.

2.1.3 Results of the market assessment and business model design process

Business model canvas

As part of the work carried out during SCALE-UP, the task force has examined and elaborated upon the different aspects of Velvety's business plan using a Business Model Canvas. The main results of the work are shown in Figure 2 and briefly described below.

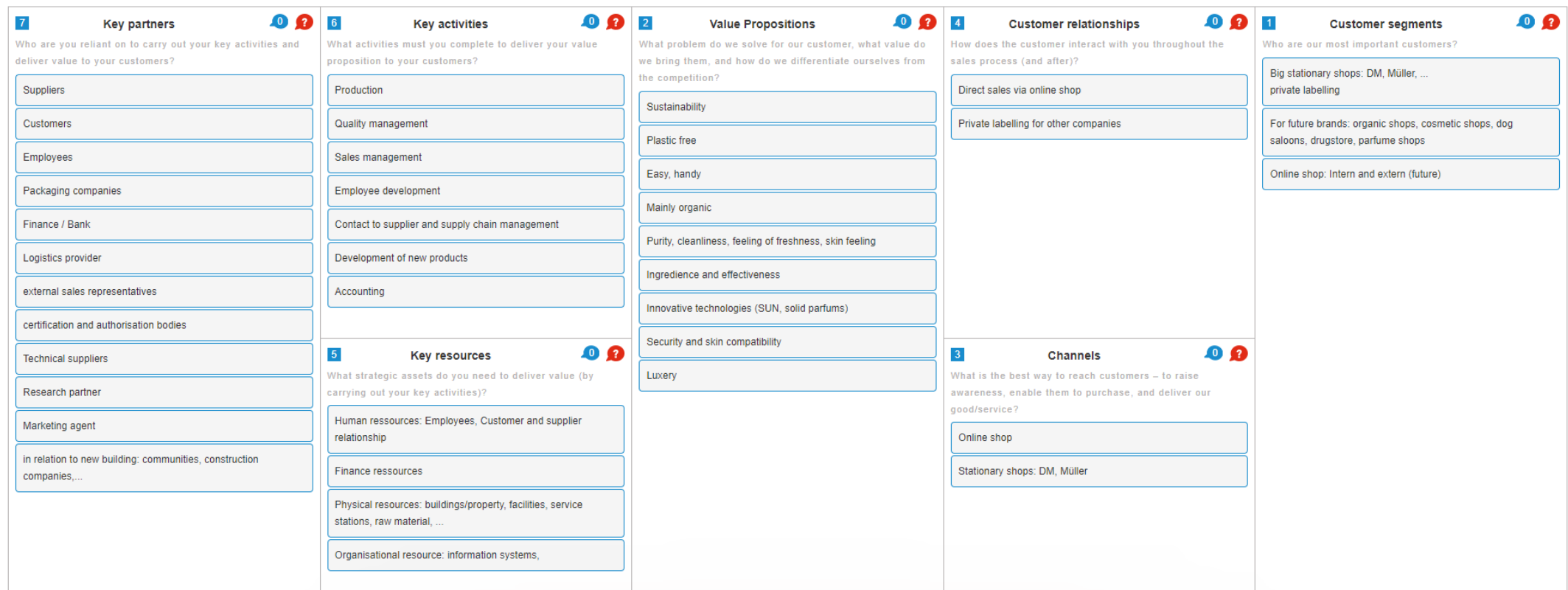


Figure 2. Business Model Canvas for Velvety. Source: own elaboration in the MAF+ portal.

The analysis showed that key partners are the usual partners in business like suppliers, employees, packaging and logistics, banks and technical suppliers. For Velvety, certification bodies, research partners, external sales representatives and marketing agents are also very important. Finally, the customer is also considered a very important partner, as product development takes place in close coordination and according to the wishes of the b2b customer.

Key activities of Velvety are the production of solid cosmetics, quality management, product development, sales and accounting.

Key resources include human relations (e.g. employee, customer and supplier relationships), finance resources, physical resources (e.g. building property, facilities, service station) and raw materials.

Velvety's value proposition is the reduction of, or in most of their products, complete renunciation of plastic materials. Their products are much smaller, lightweight and easier to transport than bottled shampoo and care products. Therefore, they save a large amount of resources associated to transport costs and emissions. They can produce certified nature cosmetics and innovative products.

The most important customer relationships are b2b customers that order individual products in large volumes (commonly associated to higher margins). Velvety also sells to individual customers via their online shop, but the sales volumes there are comparatively very small.

SWOT analysis

Table 1. SWOT Analysis for Velvety. Source: Own elaboration.

Strength • Good connections and relationships to relevant customers (=distribution channels) • In-house experience and expertise • Definitive product range (solid soaps are the core product, not just a by-product of a larger beauty brand) • Strong, cohesive communication	Weaknesses • Weak Sales department (workforce too small) • Overall internal structural issues (for example lack of defined project management process) • Weak brand-name (due to private labelling) in comparison to other competitors • Due to private labelling, Velvety is not known as a brand. Consumers buy Velvety products under various private labels of the major drugstore chains. Recognition is therefore difficult. • Dependence on a small number of suppliers: A strong dependence on certain raw material suppliers could lead to problems in the supply chain if they fail.
Opportunities • Societal development (towards natural, "better", sustainable options) • Price sensitivity for cosmetics is rather low, cosmetic is generally accepted to be pricy • Expansion into international markets: Velvety could achieve new growth by expanding into international markets. • Cooperations and partnerships: Collaborations with influencers, beauty experts or well-known personalities could increase the brand awareness of the own brand Velvety. • Development of new product lines: By introducing new product lines, such as dog shampoo or solid perfume, Velvety can appeal to new target groups.	Threats • Changing political climate in Europe and Austria might impact the overall perception and importance of green/sustainable products • High inflation makes customers more price sensitive/sensitive to "luxury expenses" • Small/niche market, difficult to reach target group • Brand needs to be defined rather specifically – focused and pointed rather than going wide and broad • Fierce competition: The cosmetics market is highly competitive, with many established brands and new competitors offering similar solid cosmetic products.

Target group selection

Velvety's biggest and most important customers are several market leading drugstores in Austria, Germany and Switzerland, especially "DM" and "Müller". They play an important role for most of their product range. Because of plans for a new product line for medical or sensitive body care products, pharmacies or pharmacy retailers were selected as the most promising growth opportunity. If solid perfumes are produced, a new target group would be beauty shops and perfumeries.

RETAILER: DRUGSTORES	20	Main target group
RETAILER: PHARMACYS	17	Key growth opportunity
RETAILER: BEAUTY SHOPS AND PARFUMERIES	15	
ONLINE MARKETPLACES	15	
WHOLE SALERS	13	
RETAILER: SUPERMARKETS	10	

Figure 3. Results of the target group selection exercise for Velvety on the MAF+ portal.
Source: own elaboration.

The soap products from the SUN project turned out to be very expensive for the current market and can therefore most likely only be produced as a niche product (pharmacies or natural cosmetics shops, for example, are currently being considered as sales outlets). Therefore, Velvety requested the task force's help with new product ideas that incorporated the proteins from the oil press cake. Research was done about solid perfume and therefore the MAF+ exercises were used for this product idea. The hope/expectation was that the higher retail price of a new high-end product like perfume could make the use of oil press cake protein financially viable.

Solid Perfumes

Perfume is a very sensual, often luxurious product, and even applying it can be a ritual.

- How can this feeling be realised in solid form without having to resort to plastic packaging? (see DIPTYQUE - visually very beautiful and luxurious, but plastic, but also refillable)
- How can the difference to deodorant be clearly emphasised?
- For which target group would this product be interesting?
- Could it also be used to enter the luxury perfume segment?
- What speaks against the luxury segment?

Table 2. SWOT analysis for solid perfume. Source: own elaboration.

Strength Ideal for on the go, when travelling or in everyday life - small, light, no liquid	Weaknesses Less flexible: not on clothing
Opportunities Not yet available in stationary retail	Threats Some prejudices: Does it melt in your bag? What if I sweat? Does it produce stains?

Value proposition:

Ideal for on the go, when travelling or in everyday life - small, light, no liquid.

Target groups for solid perfumes

a) Practical sustainability fans (environmentally aware public transport users)

Advantages:

- Convenience: easier to transport compared to conventional perfume, small and light, travel-friendly (both in everyday life and on holiday/air travel)
- Sustainability; no plastic necessary
- Discreet application possible in public

Experience:

- Simple, discreet, quick application
- 'no brainer' - no time wasted thinking about it

Features:

- quick, simple, convenient, designed for easy application in private and public areas
- pleasant/good fragrance
- perfect for on the go, public transport, travelling...

Desire:

- good/pleasant fragrance
- Longevity/long-lasting fragrance

Needs:

- Natural ingredients
- Reasonable price
- Availability in stores

Fears:

- Loss of flexibility compared to a sprayable product
- (application on clothing)
- Stains on clothing?
- Sticky feeling on the skin?
- Product only available online: testing not possible
- Not shareable with other people

Substitute:

- Use conventional, liquid perfume
- Do not use perfume
- Use of other scented products (deodorant, body lotion, shower gel, shampoo and hair products...)

Value proposition

Our product simplifies the lives of our customers by enabling easier, faster and more subtle application and reapplication of perfume at home, in public, on the go and on holiday, while providing a sustainable and enjoyable alternative to commonly used perfumes.

b) It-girls / luxury customers (also environmentally conscious)

Advantages:

- 'something new', something that not everyone has -> fragrance is recognisable and not 'worn by everyone'
- Unique design and packaging
- Sustainability; no plastic necessary

Experience:

- Haptic/perceptible application
- Precise application to desired areas possible, sensual experience

Features:

- Unique design and packaging
- eye-catching fragrance that stands out from the crowd
- perfect for on the go, public transport, travelling...

Desire:

- unique product
- unique product application experience
- unique fragrance

Needed:

- Availability in brick-and-mortar shops to enable purchase and trial of product

Fears:

- Loss of flexibility compared to a sprayable product (application on clothing for different fragrance release)
- Product only available online: testing not possible
- Sticky/greasy skin feel
- Not luxurious enough
- Sweat in summer may make the product disappear
- Cannot compete with major perfume brands
- Stains on clothes?

Substitute:

- Use of conventional liquid perfume

Value proposition

Our product allows for a unique perfume application experience that allows one to engage with the application of the fragrance in a physical way, giving the user full control over where they want to place their fragrance on their skin whilst interacting with a unique product that stands out from its conventionally used liquid counterparts.

Heat map for solid perfume products

As Velvety does not yet have a solid perfume, Velvety was only given ones in the heat map.



Figure 4. Competition heat map for Velvety's solid perfume idea. Source: own elaboration on the MAF+ portal.

There are solid perfume products on the market. The price range of products found in online shops is between 790 €/kg up to 1663 €/liter. No solid perfume could be found that was available in stationary retail, all of the products found could only be bought from online shops, at least in Austria. The products varied a lot in shape and packaging.

Sector analysis for new product lines and new markets

During the ISP, extensive research on new products and new markets was carried out by the TMG team. While Velvety asked for some market research on new products like solid perfume and dog shampoo bars as well as information about expanding to markets outside of the German-speaking countries, further research was done to identify new markets and sectors within the German-speaking market.

There are two possible strategies:

- Expansion from the DACH region into new cosmetics markets, i.e. other (EU) countries.
- Further penetration of existing markets in the DACH region and expansion into other sectors.

The research focused on the second strategy, as advantages are:

- No cultural and language barriers
- No need for a dedicated contact person for the country (native speaker)
- No long transport routes
- No hassle with customs/logistics, etc.

There is potential in the following business sectors:

- Tourism and hotels
- Merchandising and promotional gifts (wholesalers)
- ECO- online retailers
- Tour operator and outdoor outfitter
- Travel luggage producers

A very interesting sector could be the outdoor outfitters/operators. There are many advantages of solid cosmetic products for outdoor activities: small, light, no liquid, economical, etc. On the one hand, these outdoor companies would make great corporate clients for possible promotional gifts, Christmas presents, etc., as the product fits well with their values/beliefs. It could also be considered to work with travel agencies, travel agents, airlines, luggage manufacturers, outdoor outfitters, etc. On the other

hand, outdoor outfitters could include the products in their programme, either as a private label (e.g. SevenSummits) or a new own brand.

The big benefit here is a similar ideology. Outdoor outfitters/enthusiasts want light, small luggage, biodegradable products, no waste (especially plastic) and a practical product. The ideal solution here, however, would be an optimized packaging solution. This could also be a point of co-operation with various outfitters (bag manufacturers etc.). Ideas emerged to create a small set (e.g. shampoo, laundry wash, soap and dishwashing soap) or a great little storage bag. An additional product idea was a solid outdoor shampoo that is particularly fast and completely biodegradable so that it can also be used in rivers. Many of these retailers have shampoos in their range, but mostly shampoo concentrates in small bottles.

Efforts to expand into the Spanish market

Velvety also sees great potential in several other European markets, as they believe that the market for solid cosmetics has not yet been penetrated there. An enquiry to the SCALE-UP project partners revealed that the project partner in Spain has good relations with the Spanish cosmetics industry. Several meetings were held with Velvety to understand the Spanish market structure and to analyse Velvety's opportunities to penetrate the Spanish market. Velvety received good basic data on the structure of the Spanish market. Here, similar to the Austrian market, private labels and large drugstore chains play a major role in the distribution of cosmetics. There are a few solid cosmetics on the market, but not yet in large quantities; there is great potential for Velvety here.

Internal structure of Velvety - LEGO® Serious Play® Workshop

Additional to the the MAF+ Analysis, Business Upper Austria also supported Velvety with a LEGO® Serious Play® (LSP) workshop. Christoph Reiss-Schmidt is a certified instructor and hosted the event. The team from Velvety invited a selected number of employees to the LSP workshop that they thought are relevant for this topic. The aim was to find out how the collaboration within the company can be put on a higher level.

Building the problem: Where do you see problems in the internal collaboration within Velvety?

Each participant built their own view of the problem using LEGO pieces. This resulted in 4-5 individual constructions per table. These were explained to the other participants at the table.

The next step was to build one joint structure per table from the individual structures. The most important aspects were combined into one structure, resulting in a larger and more complex problem structure. This was then presented to the other group/table. The other group could then ask questions about the structure.

Building the solution: How would the optimal state of collaboration within Velvety look like?

Same procedure as in point 1, first the individual proposed solutions were built, presented to the group and then put together to form a structure. It was then presented to the whole group again and discussed.

Wow - how - now - ciao matrix

For each group, the most important aspects of the jointly developed solutions were written on sticky notes and then categorised in a matrix, divided according to cost and benefit. These were then presented to the whole group, which led to a joint discussion about possible solutions and the next steps.



Figure 5. Impressions of the LSP WS Velvety Manufaktur GmbH.

2.1.4 Relevant considerations for the future

Velvety is a company with a very innovative product range that has a lot of potential to make the cosmetics market more sustainable. A broad-based analysis of Velvety's future sustainable orientation revealed various sectors and markets in which solid cosmeceuticals could gain a foothold.

During the research several connections to NGOs and consumer information on the topic of microplastics were found. There are quite a few NGOs that campaign against microplastics and the health effects of microplastics. There are also initiatives of companies that tackle these problems. One consideration for Velvety could be to join these initiatives to promote their products and to find partners with the same ideas.

Above all the new product developments and project ideas, the focus is on utilising the high-quality proteins from the sunflower press cake and undertaking further research efforts to obtain new ingredients from food waste. Collaboration with the University of Applied Science is therefore very important and will continue to be intensified.

2.2 HochBROTzentig

2.2.1 General description and value proposition of the innovation

How HochBROTzentig came to life:

HochBROTzentig is the idea of Moritz Aschauer, a young baker who took over the family's bakery. He was faced with the fact that there is leftover bread every day and his baker's heart ached at the thought of delicious bread having to go to waste, he came up with an idea: the bread is dried, ground and mashed with clearest water and thus forms the basis for spirits. This idea is not fundamentally new, as there are already a number of bread schnapps on the market. However, these usually have a very intense bread flavour and, as niche products, are probably only a small contribution against the waste of precious bread. Inspired by the first attempts at distilling, the foundation stone for the innovation was laid: Could premium spirits such as gin be made from high-quality leftover bread? The baker then went looking for a distiller and found Farthofer distillery, just 25 kilometres from the bakery. This distillery was awarded the IWSC Trophy for the world's best vodka in London in 2012. Sustainable and resource-conserving management is also a top priority for Doris and Josef Farthofer. This is why they were recently honoured as 'Sustainable Designers' throughout Austria⁵. From the very first conversation, Josef is enthusiastic about the idea of producing premium spirits from leftover bread. The distillation trials began and, together with the master distiller, a process was developed that made it possible to produce spirits from the crushed stale bread. The production method and recipes are reminiscent of vodka, gin and ouzo.

Cooperation is a crucial element in this kind of ideas, and a friend of Moritz worked out the recipe for BROTGINSKY in his master's thesis for the 'Food Product Development & Resource Management' programme at the Wieselburg campus of the Wiener Neustadt University of Applied Sciences. For BROTGINSKY, for example, in addition to the main ingredient, juniper, 15 selected botanicals such as herbs, spices and fruit are perfectly balanced to achieve a unique flavour. Josef Farthofer's many years of experience and attention to detail have enabled him to develop three perfect bread distillates: BROTKA, BROTGINSKY and BROTUZO, which are now the product range that is made from leftover bread. The project has already won several awards for the project, including the European Green Award and the Pegasus in Gold⁶. Moritz and his business partner Bernhard are now trying to find other bakeries who also want to use their brand and produce these spirits from their old bread.

How the business model works:

HochBROTzentig offers a one-stop-shop solution for left over bread from bakeries. They provide packaging, labels, a brand, and product names that are in line with the legal requirements and therefore offer a solution for the limitations that arise from the latter. Partner bakeries simply dry, store, and grind the old bread. HochBROTzentig organises the logistics, commissions the distillery, the labelling, packaging and the delivery of the bottles back to the bakeries. The bakeries then can sell the spirits with their own label as well, made from their bread.

2.2.2 Stakeholders involved in the ISP

Task force: The MAF+ exercises and other support services for this innovation were carried out by the task force composed by a total of 12 persons, which included team members of the business idea owner Moritz Aschauer and Bernhard Mayer and the SCALE-UP regional partners Gabriele Wolkerstorfer, Christoph Reiss-Schmidt and Susanne Mader as well as seven participants of the LEGO SERIOUS PLAY workshop, e.g. Josef Farthofer from Farthofer Distillery and other friends and

⁵ Visit Farthofer-Urkunde-Nachhaltige-GestalterInnen-2019-Foto-Draper (28) - Destillerie Farthofer for more information.

⁶ Visit Media eU (EN) – European Green Award or Europäische Auszeichnung - Gold für „Schnapsidee“ aus Mostviertel - NÖN.at and Hochbrotzentig: Ideen mit Zukunftspotenzial | Nachrichten.at for more information.

colleagues from the business idea owners. Ecologic Institute supported and followed the overall process as task lead.

These people have the following expertise:

- Founder and entrepreneur competences: Entrepreneurial skills, master baker expertise, financial management, strategic business management
- Production and technology: master baker, miller, sales of bakery machines
- Consumer perspective: sales and networks
- Sales and marketing competencies

Business idea owner:

HochBROTzartig is the idea of Moritz Aschauer, a young baker who took over the family's bakery. Moritz owns the bakery Aschauer, which is his main business. He founded the label HochBROTzartig.

Team:

The team behind HochBROTzartig is rather small: it is just business idea owner Moritz Aschauer and his friend Bernhard Mayer who are involved in the current business activities. During the development of the idea, a good friend - Alexander Höftberger - was consulted. As part of his master's thesis for the 'Food Product Development & Resource Management' programme at the Wieselburg campus of the Wiener Neustadt University of Applied Sciences, he worked on the recipe for BROTGINSKY and tested it several times. Moritz and Bernhard are both involved in sales, distribution, logistics and brand development of HochBROTzartig. As it is a side project for both of them, the amount of time they are able to put into the project is rather limited. Josef Farthofer from Farthofer distillery could also be mentioned as part of the team, as he produces the spirits and is always open to try new ideas. His organic vodka was awarded the world's best vodka at the IWSC (International Wine and Spirits Competition) in 2012 or second place 2014⁷.

2.2.3 Results of the market assessment and business model design process

Market overview

The business idea of HochBROTzartig is driven by the fact that in Austria, every 5th bread is thrown away. As the business idea owner is a baker himself, his motivation is to use these wasted resources. His idea was also to use the bakers' regional identity and to not just take their leftover bread as a resource for his spirits, but to offer the bakeries a service, so they can sell the spirits made out of their own bread in their shops. He created the brand "HochBROTzartig" as his idea was to establish this brand and to add a small label from the bakery where the bread is from. He created also names for spirits, because there is a problem with spirits made from old bread: according to the Austrian Codex Alimentarius, spirits like gin and vodka can only be made from agricultural resources. Already baked bread is not an agricultural resource anymore, so the products cannot be named gin or vodka. This is why he came up with the names BROTKA, BROTGINSKY and BROTOUZO.

The upcycling of old left-over bread to high quality spirits is a bioeconomic and circular economy business model for bakeries. The problem is that associated requirements for compliance with food law, labelling, etc. represent an additional expense and therefore an obstacle for bakeries. The Codex Alimentarius (Food Code) says, that spirits like vodka and gin are always made from agricultural resources (e.g. grain). Bread is not considered an agricultural resource; hence it is not possible to make these spirits out of it. At least it cannot be called like that. For this reason, HochBROTzartig invented the names BROTKA, BROTGINSKY and BROTOUZO.

⁷ Visit O•Vodka, Organic Premium Vodka, weltbester Wodka | Destillerie Farthofer or Auszeichnungen - Destillerie Farthofer or Edeldestillerie Josef V Farthofer | Farthofer Organic Premium Vodka Bottle N°14 | IWSC for more information

The team from Business Upper Austria supported HochBROTzartig by doing research on potential bakeries that could join the brand. It was decided to divide them into three categories: small bakeries, large bakeries and bakeries that also run a café, a mini market or a restaurant. This was important, as one of the challenges that HochBROTzartig faced is the increasing negative image of alcohol and the feedback that some bakeries refuse to sell alcohol in general. The third target group is already selling or serving alcohol, so this target group seems the most promising. The general goal of HochBROTzartig is to scale up the business idea to whole Austria and then to the whole DACH region (Germany, Austria and Switzerland).

SWOT HochBROTzartig

Table 3. SWOT Analysis for HochBROTzartig. Source: Own elaboration.

Strength	Weaknesses
- Utilising old bread - Inexpensive raw material - Can be stored well and for a long time (bread and spirits!) - Does not require refrigeration etc. - Legally compliant declaration: branding = solution for Codex restriction (gin, vodka, ouzo from agriculture) - Good scalability - Use of the bakeries' brand awareness - Existing brand rights - High product quality - Low fixed costs	- Negative image of alcohol - Expensive product - Investment of at least €7,000 - Selective solution for the waste bread problem - Low personnel resources - 3 parties involved (baker, HochBROTzartig, distillery) - Dependent on distillery
Opportunities	Threats
- Expansion of partners to the entire DACH region possible - Less LM waste - Upcycling of the raw material - New products possible - Increasing sustainability awareness - Possible changes to the legal framework (sustainability)	- Can't find partner bakeries - Product too expensive - Going it alone without brand HochBROTzartig - Possible changes in the legal framework (alcohol) - Economic fluctuations - Additional competition

Business model canvas

As part of the work carried out during SCALE-UP, the task force has examined and elaborated upon the different aspects of HochBROTzentig’s business plan using a Business Model Canvas. The main results of the work are shown in Figure 6 and briefly described below.

7 Key partners Who are you reliant on to carry out your key activities and deliver value to your customers? Bakery Aschauer Distillery Farthofer Partner Bakeries Label-Designer Webdesigner	6 Key activities What activities must you complete to deliver your value proposition to your customers? akquise logistics marketing sales and distribution 5 Key resources What strategic assets do you need to deliver value (by carrying out your key activities)? old bread partner bakeries	2 Value Propositions What problem do we solve for our customer, what value do we bring them, and how do we differentiate ourselves from the competition? less food waste high quality and local product new income product range expansion little effort image enhancement thoughts about sustainability	4 Customer relationships How does the customer interact with you throughout the sales process (and after)? direct product sale: online and in bakeries sale to bakeries: only via direct contact 3 Channels What is the best way to reach customers – to raise awareness, enable them to purchase, and deliver our good/service? direct contact with bakeries	1 Customer segments Who are our most important customers? small bakeries big bakeries direct customers
8 Cost structure What are the costs of running your business, and are they fixed or variable? logistics production akquise marketing		9 Revenue streams How do all of the above building blocks come together to provide you with revenue? sale of batches to bakeries selling bottles to direct customers		

Figure 6. Business Model Canvas for HochBROTzentig. Source: own elaboration in the MAF+ portal.

HochBROTzzeitig is a small enterprise and it has a simple business model with two main parts. The first one are the direct sales of the spirits to end consumers. This happens at the Aschauer bakery and via the online shop. The second part is the sale of a service to partner bakeries, so they can also sell the spirits made out of their own leftover bread. Key partners are the bakery of the business owner, the distillery and the partner bakeries as well as label and the web designer. Their key activities are sales, logistics and marketing. Key resource is the old bread from the partner bakeries. The value proposition of their products is the reduction of food waste, the high quality (produced by a distillery that was world vodka champion in 2012), the image enhancement for sustainability, local production, new income because of product range expansion and use of unused resources, all with very little additional effort for the partner bakeries.

Customer relationships are direct sales to end-customers in the Aschauer bakery and via the online shop, and sale of the service (pick up the old bread, produce the spirits, label them and bring them back to the bakery) to the partner bakeries.

Sales and communication channels are the online shop and the bakeries for end-consumers and direct contacts for the bakeries as partners of HochBROTzzeitig.

In this business model canvas, the customer segments focused on the partner bakeries, so there are small artisan bakeries, large industrial bakeries and bakeries that also have a side business like a grocery store, a café or a restaurant. The last segment seems very promising, as they already sell alcohol (and so have no reserves associated to negative perception of alcoholic beverages) and can sell the spirits in restaurants, etc.

The biggest cost position is the production of the spirits at the distillery, then there are also costs for logistics, marketing, sales and labelling.

Revenue streams are from direct sales and from sales to the partner bakeries.

The business model canvas was first done by the team from Business Upper Austria and then merged with the business model canvas that HochBROTzzeitig already had to see the different views from outside and inside the company. HochBROTzzeitig is still exploring possibilities with new partners and a new strategy to attract new bakeries and strengthen their business model might be formulated in the future.

Value Proposition

The production of spirits from stale bread helps to reduce food waste and is a new business model for bakeries. The associated requirements for compliance with food law regulations, labelling, etc. represent an additional expense and therefore an obstacle. HochBROTzzeitig offers a complete solution for the utilisation of stale bread into distillates. It provides packaging, labels, a brand and product names that offer a solution to the restrictions imposed by the Food Codex. The bakeries only need to collect and pre-process the stale bread and have no other effort.

Competition

Research for the heat map showed that there is only one competitor in Austria who produces spirits (gin, but also a variety of liquors like egg nogg and so on) from old bread. It is a company that started off as a bakery, but now owns a large number of supermarkets in the western part of Austria. They only use their own bread and do not offer the service for other bakeries. According to the distiller Farthofer, they cannot meet the same quality levels of HochBROTzzeitig with their spirits. So, at the moment, competition is very low on the Austrian market.

Target group selection

BAKERIES WITH OTHER BUSINESSES	20	Main target group
BIG BAKERIES	18	Key growth opportunity
SMALL BAKERIES	14	

Figure 7. Results of the target group selection exercise for Velvety on the MAF+ portal.
Source: own elaboration.

As HochBROTzzeitig wants to focus on bakeries and not the individual customer, the target groups above were selected. As previously mentioned, bakeries who also run another business like a grocery store, a restaurant or a café seem to be the most promising group, as they already sell alcohol, have space and use for a new product in their shelves or on their bar.

LEGO® Serious Play® Workshop

Additionally to the MAF+ Analysis, Business Upper Austria also supported HochBROTzzeitig with a LEGO® Serious Play® (LSP) workshop. Christoph Reiss-Schmidt is a certified instructor and hosted the event. The team from HochBROTzzeitig invited seven participants to the LSP workshop, including Josef Farthofer from Farthofer Distillery and other friends and colleagues. The aim was to find out why so few bakeries want to join HochBROTzzeitig and sell spirits made from their old bread and what is needed, so more bakeries want to join in.

Building the problem: Why don't want the bakeries to join in?

Each participant built their own view of the problem using LEGO pieces. This resulted in 4-5 individual constructions per table. These were explained to the other participants at the table.

The next step was to build one joint structure per table from the individual structures. The most important aspects were combined into one structure, resulting in a larger and more complex problem structure. This was then presented to the other group/table. The other group could then ask questions about the structure.

Building the solution: What is needed to convince more bakeries of the business idea?

Same procedure as in point 1, first the individual proposed solutions were built, presented to the group and then put together to form a structure. It was then presented to the whole group again and discussed.

Key aspects of the workshop

- Several influences on bakeries are needed
- 2 paths: HochBROTzzeitig to bakeries or customer to bakery
- Bakeries as multipliers
- clear messages: lucrative, easy, innovative
- Bakery must be willing, then possible 'problems' will be solved
- Marketing events e.g. bus
- Focus on the customer (=bakeries)
- Focus on the baker's brand
- More individuality for bakeries (only on the label)
- USP = service
- Added value for bakeries:
 - o Utilise old bread
 - o Image gain
 - o Turnover from residual materials
 - o New product
- BRAND or SERVICE?
- Modular system
- Brand or private label
- USP of the labels

One key message from the workshop was that the team from HochBROTzzeitig should consider to change their labels so that the labels from the bakeries can be used and HochBROTzzeitig is just a small part of it, similar to private labelling. Basically, they have to decide what is more important to them, the brand or the service. Workshop participants argued that if they want to go with the brand, they must buy the bread from the bakeries and just sell it as HochBROTzzeitig. If they want to offer the service for bakeries, then they must come up with a new idea, maybe some kind of modular system for the labels, so the spirits really are a product of the bakeries.

2.2.4 Relevant considerations for the future

The LEGO® Serious Play® (LSP) workshop revealed that the two aspects of the business model are competing or are influencing each other, not always positively. It seems that there needs to be a decision if the focus should be on the brand HochBROTzzeitig with the products Brotka, Brotginsky and Brotouzo or the service for the bakeries and they can decide to use their own label.

In the first case, the team from HochBROTzzeitig would have to buy the old bread from the bakeries and sell the products directly to the end consumer. In the second case, they would sell a service to the bakeries. Nevertheless, the goal of saving old bread from waste would still be reached. It is a decision of personal preference. The owners of hochBROTzzeitig would like to stick with their existing concept and deliver the brand they have developed to the partner bakeries with only minimal branding of the respective bakeries. The risk of the sale lies with the partner bakeries. During the workshop, it became clear that if partner bakeries are to bear the high risk of the sale, they would also like to see their own branding in a corresponding size on the product. It is not yet clear what conclusions hochBROTzzeitig will draw from the workshop results and whether or how they will adapt their business model.



Figure 8. Impressions of the LSP WS hochBROTzzeitig

3 Reflections on the SCALE-UP Innovation Support Programme

3.1 Barrier Analysis during ISP Implementation

One key factor for successful innovation support is choosing the right innovation, or better, having the right innovation join the support programme. This is important as everything depends on the motivation of the innovators, their personalities and the time they are willing to invest. Of course, this also depends upon if the needs of the innovation fit with the to dos of the project. If the benefits are clear for them, they will be more willing to take part in the project activities. The stage of the innovation is also important as different stages need different types of support, and it depends on the capacities of the supporter if every stage can be covered.

The ISP should be as flexible as possible and tailored to the needs of the innovations. Therefore, the programme and task force should be outlined, but fully developed only after the innovations, their stages and needs are known. Due to changes in the economic situation or internal company processes or people, an ISP programme must be designed flexibly and always be able to adapt quickly to the new situation.

The innovations are in different stage, have different challenges and therefore, they need different support. In Upper Austria, the ISP started with Velvety and another innovation called Streuobstwerkstatt⁸. Streuobstwerkstatt was quite difficult to reach, and it was a challenge to get a hold of the business idea owner. Finally, after having done one LEGO SERIOUS PLAY workshop with the innovator, the support programme stopped because of personal reasons. Fortunately, HochBROTzzeitig was already well known within the project, as the innovator was invited to present his products during the study trip in Upper Austria. Because of this connection, there was no doubt, that HochBROTzzeitig was a perfect new innovation for the SCALE-UP project.

3.2 ISP Conclusions and Bioeconomy Applications

From our point of view, the ISP delivered helpful output for both innovations. However, we think that the most important aspects for them were not the market analyses in the MAF+ tool, but the individual research and LSP workshops that really helped them with their current challenges. We have also received this as feedback from the innovations. In general, the feedback was very positive, and we very much hope that the results will have a positive impact on their day-to-day business. Considering the effectiveness, it can be said that the ISP should be very flexible and designed according to the innovation, the country, the stage of the idea and so on. As in the case of Velvety, their research project showed, that it is feasible to use by-products as a new resource for cosmetics, but at the same time the idea failed to meet all market needs as it is still too expensive, or consumers are not willing to pay certain prices. In the case of HochBROTzzeitig it was also shown that resources that are usually are thrown away can, with the right idea and the right team, become something very valuable again.

Depending on the stage of innovation, the MAF+ exercises were not necessarily important for the innovations. Either, because they were not trying to put a new product on the market (HochBROTzzeitig) or they are already a company with a size that's not sharing these numbers any more (Velvety). Because of this, additional research and workshops were designed for their current needs and challenges. Here, especially creative tools like LEGO® Serious Play® were helpful and appreciated by the innovators.

⁸ The company Streuobstwerkstatt e.U. has set itself the task of preserving orchard meadows with old fruit varieties. It aims to generate as much added value as possible for farmers who manage orchard meadows, thus ensuring that orchard meadows are cared for and preserved. It buys the fruit from farmers who manage meadow orchards, uses it to develop high-quality food products and creates various distribution channels for these products. Visit Bioprodukte aus der Streuobstwerkstatt - 100% aus Österreich for more information.

3.3 Innovators and ISP Future Directions

According to the innovators, the ISP helped them in the medium and probably even long term. In our view, it is important to organise a meeting where different people with different backgrounds come together to work on the predefined problem of the innovation. The different experiences and perspectives can create new solutions for the innovators. Working together on the problems further strengthens the output. Carrying out the LSP workshops as the used type of creative workshop method is very helpful if you want people to participate in such activities as they are also interested in the method not only in the innovation. Therefore, one of our recommendations is, that creative methods should be implemented in ISP and that there should be more flexibility and methods used according to the need of the innovations.

Another recommendation is to use the international knowledge within the consortium. An idea could be to have regular meetings where the whole consortium (or one person from each project partner) works on one innovation. For instance, every meeting, one innovation is in the spotlight and current challenges and questions are presented either by the innovation itself or by the responsible partner. In our case, we saw how useful it was if people from other countries and with different languages and backgrounds helped with research on a specific topic.

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SCALEUP
community-driven
bioeconomy development

SCALE-UP Innovation Support Programme | Synthesis Report for Northern Sweden

March 2025

Gerardo Anzaldúa and Magnus Matisons



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EXECUTIVE SUMMARY

This report compiles the work carried out as part of the SCALE-UP Innovation Support Programme (ISP) in the Northern Sweden region.

The forestry sector plays a crucial role in the economy of Sweden, where roughly fifty per cent of the forest land is owned and managed by small-scale private proprietors. Driven in part by the EU's increasing ambitions on climate and biodiversity targets, the block's need for energy security/independency, and, more recently, the calls to ensure competitiveness at global level, the forest industry in Northern Sweden is evolving dynamically. Here, the demand for timber has remained steady, underpinned by both domestic construction needs and strong international exports. Simultaneously, several investments are planned to produce biocarbon, biofuels and biochemicals from forest industry byproducts (sawdust and bark), and the region is experiencing a revival in the interest to use the byproducts of harvesting operations in bioenergy production.

Currently, in Northern Sweden, logging residues serve as a supplementary feedstock for Combined Heat and Power (CHP) plants in the region. However, their widespread utilisation is hindered by logistical challenges related to extraction, transportation, and storage, making their valorisation more expensive than that of sawdust and bark. As a result, a substantial portion of the biomass generated during harvesting remains uncollected and unutilized. The recent market developments have already sparked initiatives to make the use of logging residues as an energy source more widespread and economically viable. New biorefinery applications are also being explored that extract high added value chemicals and materials from forestry byproducts. These trends are expected to continue as the region seeks to optimise resource efficiency and transit towards a more sustainable, more circular bioeconomy.

The Wood Fuel Network, a social innovation with longstanding roots in Northern Sweden, was the first of the 12 selected innovations to receive assistance via the SCALE-UP ISP, and has already put into practice the strategic insight gathered as part of the market analysis carried out in the programme. Its goal is to mobilise and connect multiple regional actors (local and regional authorities, large energy producers, forestry entrepreneurs, logistics operators, equipment developers, forest owners) within the whole value chain and to communicate and exchange best practices for cost-effective deliveries of high-quality logging residues for their valorisation.

Reselo is a young startup spinning off from the Wallenberg Wood Science Center of the Royal Institute of Technology (KTH) in Sweden. The team is contributing to the fossil phase-out of large economy sectors, like the footwear and automotive industries, by pursuing an impact-through-scale approach. Concretely, this has led Reselo to develop a scalable process to replace synthetic rubber by converting birch bark into a novel, elastomeric biomaterial: Reselo Rubber. Birch bark is a highly promising feedstock for industrial-scale material production due to its abundance as a residue from the global pulp, paper, and plywood industry. Furthermore, in Northern Sweden, a significant portion of birch bark is sourced from sustainably managed forests, reinforcing its role in environmentally responsible manufacturing. The scalability potential of bio-based rubber will largely depend on the availability of birch bark. To ensure a steady and efficient supply of raw material, production facilities should ideally be located near sawmills or pulp mills that process birch and generate large volumes of bark in a single location. A key challenge is that this bark is typically used as biofuel, limiting its availability for new applications. In SCALE-UP, Reselo has gained access to the network of forest companies and stakeholders in Northern Sweden, and through this is exploring the possibilities to enhance the operational and economic viability of their novel solution.

Chapter 1 of the report introduces the selected innovations against the backdrop of the regional context and market requirements. Chapter 2 dives into the specific work carried out with each of the two innovations on market research, business model development, and other support activities that were offered by the SCALE-UP task forces. Chapter 3 closes with brief reflections and conclusions building from the experiences of the task force leader and feedback points from the innovators.

Table of contents

1	Relevance of the selected innovations for the bioeconomy in Northern Sweden.....	7
2	Small-scale business models explored	8
2.1	Wood Fuel Network	8
2.1.1	General description and value proposition of the innovation	8
2.1.2	Stakeholders involved in the ISP	8
2.1.3	Results of the market assessment and business model design process	9
2.1.4	Network actions completed and relevant considerations for the future	16
2.2	RESELO	19
2.2.1	General description and value proposition of the innovation	19
2.2.2	Stakeholders involved in the ISP	19
2.2.3	Results of the market assessment and business model design process	20
2.2.4	Relevant considerations for the future.....	26
3	Reflections on the SCALE-UP Innovation Support Programme	26
3.1	Barrier Analysis during ISP Implementation	26
3.2	ISP Conclusions and Bioeconomy Applications	27
3.3	Innovators and ISP Future Directions	27
	References	28

Figures

Figure 1 SWOT analysis for the Wood Fuel Network. Source: own elaboration..... 12

Figure 2. Business Model Canvas for the Wood Fuel Network. Source: own elaboration in the MAF+ portal..... 13

Figure 3. Results of the target group selection exercise for the Wood Fuel Network on the MAF+ portal. Source: own elaboration. 14

Figure 4 Participants at the training session and study visit to Jämtkraft CHP plant terminal in Östersund, Sweden on 7 November 2025. Source: Magnus Matisons. 18

Figure 5 Results of the QuickScan carried out for RESELO. Source: own elaboration. 22

Figure 6 SWOT Analysis for RESELO. Source: Own elaboration on the MAF+..... 23

Tables

Table 1 Notes from the screening of potentially influential EU policy and regulation..... 24

Abbreviations

BMC	Business Model Canvas
CAGR	Compound Annual Growth Rate
CHP	Combined Heat and Power
ETS	Emissions Trading System
GIS	Geographic Information System
HVO	Hydrotreated Vegetable Oil
IP	Intellectual Property
ISP	Innovation Support Programme
MAF+	BRIGAD Market Analysis Framework
RED	Renewable Energy Directive
SFA	Swedish Forest Agency
WP	Work Package

1 Relevance of the selected innovations for the bioeconomy in Northern Sweden

The **Wood Fuel Network**, a social innovation with longstanding roots in Northern Sweden, was the first of the 12 selected innovations to receive assistance via the SCALE-UP Innovation Support Programme (ISP), and has already put into practice the strategic insight gathered as part of the market analysis carried out in the programme. Its goal is to mobilise and connect multiple regional actors (local and regional authorities, large energy producers, forestry entrepreneurs, logistics operators, equipment developers, forest owners) within the whole value chain and to communicate and exchange best practices for cost-effective deliveries of high-quality logging residues for their valorisation. For operators of Combined Heat and Power (CHP) plants located in the Northern Sweden region, membership in the Wood Fuel Network is of interest as it can facilitate the access to- and mobilisation of larger volumes of high-quality logging residues, securing supply and potential decreases in the price of feedstocks in the long term. The established contacts and direct communication with suppliers is essential to ensure the biomass meets the operator's specifications (e.g. nutrient and moisture content). For forest entrepreneurs both located in the region and interested in doing business in it, the network can be an invaluable source of knowledge and insight on past experiences and lessons collected by regional stakeholders over many years. It provides a reliable sounding board to explore new ideas and seek workable ways to expedite the stages of development, implementation and scale up. Lastly, for forest owners from Northern Sweden, the network can unlock concrete opportunities to generate additional income from the sale of logging residues and endow them with new ideas and validated knowledge on forest management practices to help them deal with the current changing macroenvironmental conditions more effectively.

Reselo is a young startup spinning off from the Wallenberg Wood Science Center of the Royal Institute of Technology (KTH) in Sweden. The team is contributing to the fossil phase-out of large economy sectors, like the footwear and automotive industries, by pursuing an impact-through-scale approach. Concretely, this has led Reselo to develop a scalable process to replace synthetic rubber by converting birch bark into a novel, elastomeric biomaterial: Reselo Rubber. Birch bark is a highly promising feedstock for industrial-scale material production due to its abundance as a residue from the global pulp, paper, and plywood industry. This widespread availability ensures that it remains an easily accessible resource. Furthermore, in Northern Sweden, a significant portion of birch bark is sourced from sustainably managed forests, reinforcing its role in environmentally responsible manufacturing. In addition to its accessibility and sustainability, birch bark contains valuable compounds with diverse applications, such as betulin, which can be used in coatings. These characteristics make birch bark a commercially attractive raw material for various industries. In Northern Sweden, a few large forest companies hold a dominant position in the market, shaping long-established business relationships and trust between buyers and sellers of woody biomass. These deep-rooted connections, developed over decades, can represent significant barriers for new startups and innovators seeking market entry and, importantly, access to biomass. The scalability potential of bio-based rubber will largely depend on the availability of birch bark, which is primarily obtained from birch logs that are debarked before processing by the forest industry. To ensure a steady and efficient supply of raw material, production facilities should ideally be located near sawmills or pulp mills that process birch and generate large volumes of bark in a single location. A key challenge is that this bark is typically used as biofuel, limiting its availability for new applications. In SCALE-UP, Reselo has gained access to the network of forest companies and stakeholders in Northern Sweden, and through this is exploring the possibilities to enhance the operational and economic viability of their novel solution. For Northern Sweden, the case of Reselo presents a promising opportunity to turn an under-valorised residue into high value-added products with substantial research and innovation input. Its success can open a pathway for other entrepreneurs to find opportunities and drive economic development in the region.

2 Small-scale business models explored

2.1 Wood Fuel Network

2.1.1 General description and value proposition of the innovation

The Wood Fuel Network – Northern Sweden (Trädbränslenätverk – norra Sverige) is a collaborative initiative addressing the evolving dynamics of the wood fuel market in Sweden's four northernmost counties. This network responds to significant industry shifts, including substantial investments in the paper and pulp sectors, structural changes in sawmills, and the emergence of new biofuel products aligned with the green transition and the need for enhancing energy security in Europe. These developments necessitate a platform for stakeholders to navigate and adapt to the changing landscape effectively.

The network offers a structured forum for stakeholders involved in wood fuels and forest industry by-products to exchange experiences, acquire new knowledge, and establish valuable contacts to spark and continue collaborative efforts in the region. By facilitating regular meetings and discussions, the network enhances participants' strategic planning capabilities, identifies bottlenecks and knowledge gaps, and fosters initiatives to increase the value of forest industry by-products. This collaborative approach aims to create a more cohesive and efficient wood fuel market in Northern Sweden.

The primary target groups that are being sought to participate in the Wood Fuel Network's activities include:

- **Buyers and Sellers of Wood Fuels:** companies engaged in the procurement and sale of wood fuels within the northern counties of Sweden, seeking to optimise operations and adapt to market changes.
- **Stakeholders interested in valorising Forestry by-products:** entities focused on adding value to by-products from the forest industry, aiming to innovate and improve sustainability practices and thereby drive the economic development of Northern Sweden.
- **Logistics Service Providers:** Contractors offering transportation and logistics services for wood fuels and related products, essential for maintaining an efficient supply chain.

The network is managed by Magnus Matisons from BioFuel Region, supported by North Sweden Cleantech and Piteå Science Park, organisations dedicated to promoting sustainable practices and innovation within the region. Already during the lifetime of SCALE-UP, the network has become reactivated and is serving as a vital platform for stakeholders to recognise their current challenges, establish new contacts, and share knowledge with the concrete aim of contributing to the region's sustainable development and economic resilience.

2.1.2 Stakeholders involved in the ISP

Task force: The MAF+ exercises and strategic scoping of macroenvironmental factors for this innovation were carried out by the task force composed of Gerardo Anzaldúa from Ecologic Institute (coordinator of the ISP in SCALE-UP) and Magnus Matisons from the BioFuel Region.

Business idea owner:

Established in 2003 and based in Umeå, BioFuel Region is a member-owned, non-profit organisation dedicated to advancing a well-developed bioeconomy in Sweden's four northernmost counties. By initiating, coordinating, and collaborating on projects, BioFuel Region pulls together the strengths of the public sector, industry, and research institutions to drive sustainable development. The organisation focuses on networking, project coordination, knowledge exchange, advocacy, and youth involvement to promote the strategic use of the region's raw materials, expertise, and industrial capabilities. BioFuel Region is financed through membership fees, regional funding, and project grants. Its members include municipalities and companies committed to fostering a bioeconomy and achieving a fossil-free vehicle fleet.

Team:

Magnus Matisons, Network Manager

Magnus Matisons is a senior project manager specialising in the bioeconomy, with two decades of experience in forestry and the forest energy supply chain, both in academia and industry. His background includes managing a wood pellet mill and overseeing raw material logistics in Latvia, as well as engaging in international pellet trade. He has led EU-funded projects such as Forest Power and Forest Refine (Interreg Botnia-Atlantica), which focused on optimising forest biomass supply chains for combined heat and power (CHP) plants and biorefineries in Sweden and Finland.

Currently, Magnus is actively involved in shaping policy discussions on the role of forests in climate and energy strategies. He contributes to the development of regional forest strategies, national bioeconomy policies, and advocacy efforts aimed at influencing EU legislation on sustainable forestry and bioenergy. Magnus Matisons was one of 29 members of the EU Bioeconomy Stakeholders Panel.

2.1.3 Results of the market assessment and business model design process

Market Overview

The forestry sector plays a crucial role in the economy of Sweden, where roughly fifty per cent of the productive forest land is owned and managed by small-scale private proprietors (SFA, n.d.). Driven in part by the EU's increasing ambitions on climate and biodiversity targets, the block's need for energy security/independency, and, more recently, the calls to ensure competitiveness at global level, the forest industry in Northern Sweden is evolving dynamically. Here, the demand for timber has remained steady, underpinned by both domestic construction needs and strong international exports. Simultaneously, several investments are planned to produce biocarbon, biofuels and biochemicals from forest industry byproducts (sawdust and bark), and the region is experiencing a revival in the interest to use the byproducts of harvesting operations in bioenergy production.

Forestry operates as a co-production system where multiple products e.g., saw logs, pulpwood, and logging residues, are generated simultaneously, and thus their availability is inherently interconnected. Fluctuations in the demand or production of one product inevitably influence the supply of others (Matisons and Fridman, 2023). This interdependence underscores the importance of integrated forest management strategies to optimise resource use while balancing economic, environmental, and industrial needs. Woodworking industries, such as sawmills, generate substantial volumes of sawdust and bark. These materials are repurposed into various applications, including mulch production, animal bedding, and biofuel, ensuring that a significant portion of the residual biomass re-enters the market. Similarly, large quantities of logging residues—comprising primarily branches, tops, and needles—are produced during harvesting operations.

Currently, in Northern Sweden, logging residues serve as a supplementary feedstock for CHP plants in the region. However, their widespread utilisation is hindered by logistical challenges related to extraction, transportation, and storage, making their valorisation more expensive than that of sawdust and bark. As a result, a substantial portion of the biomass generated during harvesting remains uncollected and unutilized. On average, approximately 31 million cubic meters of timber are harvested annually in Northern Sweden. The primary factor influencing forest owners' harvesting decisions is the prevailing market price of timber, as it directly impacts profitability. The price of wood and woody biomass used for energy generation is said to have comparatively limited influence on the decision when to harvest (Matisons and Fridman, 2023). The recent market developments have already sparked initiatives to make the use of logging residues as an energy source more widespread and economically viable. New biorefinery applications are also being explored that extract high added value chemicals and materials from forestry byproducts. These trends are expected to continue as the region seeks to optimise resource efficiency and transit towards a more sustainable, more circular bioeconomy.

PESTEL Analysis

The wood fuel market in Northern Sweden is shaped by the interplay of political, economic, social, technological, environmental, and legal factors. The following sections are based on the PESTEL analysis carried out over several task force sessions in the spring of 2024¹ and compiled in the preparation of this report. It provides a structured overview of the macro-environmental conditions affecting the market and aims to highlight opportunities and challenges that the innovator could engage.

Political Conditions

The EU's Fit for 55 package presents both drivers and challenges for the bioenergy sector, not the least in Northern Sweden. The Emissions Trading System (ETS) and the rising cost of carbon emissions make bio-based energy sources increasingly competitive, while EU blending mandates for transport fuels (already in place for road transport and set to be implemented for aviation by 2025) drive investments in biofuels and increase demand for biomass. However, sustainability criteria within the Renewable Energy Directive (RED) could limit the availability of biomass from forestry, potentially constraining market growth.

At the national level, Sweden has actively promoted renewable energy for over 40 years through CO₂ taxes (introduced in the 1980s) and green electricity certificates, resulting in the country exhibiting the highest share of renewable energy in the EU. Bioenergy—primarily sourced from forest biomass—is Sweden's most important energy carrier. Although some recent policy shifts may affect the availability of biomass, geopolitical uncertainties and global energy demand have reinforced its role in ensuring Sweden's energy security.

Economic Conditions

A well-functioning value chain is crucial for the economic viability of logging residue procurement. Proper education, best-practice exchanges, and efficient material handling minimise contamination, which is essential for the marketability and cost-effectiveness of biomass combustion. Trust and stable, long-term delivery contracts are also necessary for entrepreneurs to justify investments in specialised machinery, such as chipper trucks.

Several major infrastructure investments—including hydrogen production for energy, steel manufacturing, and electro-methanol production—are expected to impact biomass markets, likely driving up demand. Additionally, the development of biocoal as a replacement for fossil coal as a reduction agent further reinforces the role of forest biomass in Sweden's industrial transition.

Municipalities across Northern Sweden have ambitious carbon neutrality plans, with CHP plants playing a pivotal role. The rise of industrial ecoparks around CHPs is opening opportunities to implement circular economy principles in practice by integrating bio-based industries and fostering synergies between energy, forestry, and manufacturing sectors.

Social Conditions

The inland regions of Northern Sweden are sparsely populated, with a long-term trend of rural-to-urban migration since the 1970s. However, new economic opportunities—particularly in bioeconomy-related industries—may help reverse this trend. A growing workforce in forestry and bio-based industries will be essential for sector expansion.

One critical challenge is the aging workforce of forest machine operators, most of whom are men aged 60–70 years. The demanding work conditions, long hours, and physical strain make it difficult to attract new talent, raising concerns about workforce renewal and succession planning. Improving working conditions and enhancing gender diversity in the profession will be necessary to ensure a sustainable labour supply.

¹ Given the fast-paced changes in geopolitics in the second half of 2024, part of the information and assumptions may be obsolete.

Perceptions of forestry and biomass use vary geographically. In Northern Sweden, attitudes are generally positive, whereas urban centres in Sweden and parts of Central Europe tend to be more critical, particularly regarding concerns over biodiversity and carbon neutrality claims. Maintaining public trust and ensuring that bioenergy is seen as a climate-friendly solution will be important for market stability.

Technological Conditions

To optimise the efficiency and sustainability of logging residue utilisation, investments in technology for forwarding, chipping, and transport are essential. New innovations should be systematically tested and evaluated, particularly in areas such as GIS-based resource mapping, quality control, and automation.

Despite Northern Sweden's forest technology cluster of 15–20 companies, the market for specialised machinery remains small and concentrated in Sweden and Finland. The challenges of handling bulky biomass assortments—which require large payloads and compaction to reduce transport and processing costs—limit the incentive for large machinery manufacturers to invest in the sector.

Nevertheless, digitalisation and GIS technologies already play a significant role in improving planning efficiency. These tools are also essential for implementing environmental protection measures to ensure sustainable biomass extraction.

Environmental Conditions

The extraction of logging residues must adhere to best-practice recommendations from the Swedish Forest Agency (SFA) to minimise environmental impact. Proper education of entrepreneurs and logistics operators is crucial in preventing soil damage—one of the most critical environmental risks associated with residue harvesting. Sensitive areas should be avoided to preserve biodiversity.

From a climate policy perspective, substituting fossil fuels with woody biomass significantly contributes to Sweden's and the EU's carbon reduction targets. However, the 10-year pause on logging residue extraction that was driven by a lack of market demand for wood fuel in the region has led to a partial loss of knowledge, necessitating efforts to rebuild expertise and ensure best practices are followed. Additionally, improving working conditions in the sector will help maintain high operational standards while making the profession more attractive.

Legal Conditions

Logging residue extraction is regulated and requires approval from regional Forest Agencies. CHP plants and heating facilities that combust biomass must hold an environmental permit, which mandates the installation of flue gas cleaning systems and continuous monitoring of emissions. These stringent environmental standards in place in Sweden ensure that biomass combustion remains within acceptable sustainability thresholds.

Despite strict regulatory oversight, combustion of woody biomass is exempt from CO₂ taxation and carbon credit requirements. This policy provides economic incentives for biomass-based energy production, reinforcing its role in Sweden's energy transition.

Overall, the wood fuel market in Northern Sweden operates within a highly regulated but, currently, opportunity-rich environment. The political and economic landscape, while until recently being uncertain from the RED and other EU policy developments, now supports continued bioenergy expansion. At the same time and driven by new market demand for energy security and other competing uses, long-term biomass availability remains a key concern. Social and workforce challenges must be addressed to ensure future labour supply, while technological advancements and best-practice adoption will be critical for driving and then maintaining the region's competitiveness. Environmental challenges will continue to be a concern, although within the region, and supported by longstanding regulation and governance of the Forestry sector, there is a strong perception that high sustainability standards are in place which reinforce Sweden's global leadership in forestry and renewable energy. Continued involvement in policy discussions at all governance levels will help the

region adapt to policy shifts and evolving market dynamics. This will be essential for securing that forest-based bioenergy can be a lever for regional development in Northern Sweden.

SWOT analysis

Another strategy exercise carried out by the task force during the ISP sessions was an extended SWOT Analysis. Here, a small set of items was collected in brainstorming about the key features, assets and competences that make the Wood Fuel Network stand out (strengths), and which ones are missing or not developed fully (weaknesses). Building on the preliminary results of the PESTEL analysis, external factors that could open opportunities for the innovator as well as adverse developments were identified and listed (see Figure 1).

Category	Item	Rank
STRENGTHS	Triple helix approach	1
	Identifying market needs and responding	0
	Compiling information from a wide range of sources	2
		0
WEAKNESSES	We do not have the hands on practical experience	1
	We are using tax money - No real business	0
	Include more experience from entrepreneurs	0
		0
OPPORTUNITIES	Demand for wood fuels is growing quickly	0
	Entrepreneurs with little or no experience of logging residues	0
	Expanding our network and perspective from interaction from multi actors	1
		0
THREATS	Weak or slow response from forest owners	1
	Business as usual unwillingness for change	0
	A level of uncertainty remains regarding the REDD+ classifications and policies around the sustainability of forest biomass for fuel	0
		0

Figure 1 SWOT analysis for the Wood Fuel Network. Source: own elaboration.

To give the SWOT analysis further depth and actionability, the 12 listed items were then ranked in a subsequent exercise according to the importance of each strength and weakness for the initiative's success, and the relative position against potential competitors or substitutes along these aspects. Similarly, the opportunities and threats were evaluated and compared according to the probability and magnitude of impact of each item in the respective lists.

The main take-away message of the extended exercise was that the Wood Fuel Network's strongest point is the breadth of information and knowledge its manager has collected over his many years of professional work, and the regional network that has been reactivated and is now contributed new and updated knowledge to the core. The second important lesson from the exercise was the simultaneous weakness and opportunity that the engagement and deeper collaboration with bioeconomy entrepreneurs represents in terms of potential for future enhancement of the Wood Fuel Network's position and offer. The reason is that the experiences, interests and capacities from entrepreneurs has rarely been incorporated into such knowledge exchange initiatives, while at the same time, the same actors require specialised knowledge and contacts that the Wood Fuel Network currently possesses, thus making it an attractive partner for entrepreneurs to engage with. Two concrete actions stemmed from these realisations, both already underway at the time of writing this report (see section 2.1.4). They included requesting forest owners in the network to spread the word and invite entrepreneurs they know to upcoming workshops and training sessions of the Wood Fuel Network. The second action, also underway, is the engagement of entrepreneurs in the field and study trips that the innovator is organising.

Business model canvas

As part of the work carried out during SCALE-UP, the task force has examined and elaborated upon the different aspects of the strategic plan for the Wood Fuel Network using a Business Model Canvas. The main results of the work are shown in Figure 2 and briefly described below.

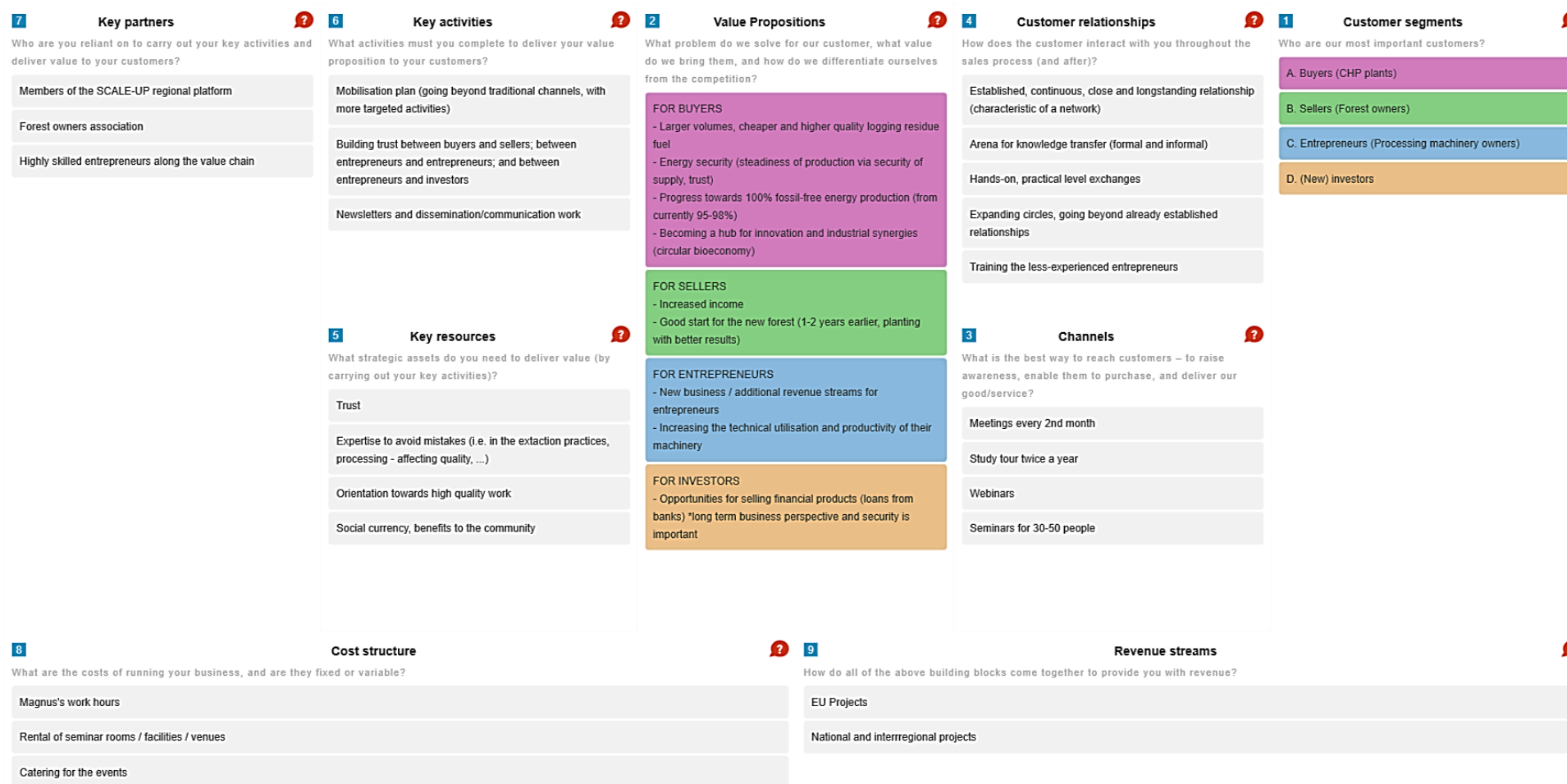


Figure 2. Business Model Canvas for the Wood Fuel Network. Source: own elaboration in the MAF+ portal.

The analysis of the Business Model Canvas (BMC) for the innovation showed the importance of individuals like Magnus Matisons for the success of the initiative, as they act as key knowledge holders and network nodes with the necessary recognition and trust in the region. Given that there is no strong commercial drive for this initiative, the main orientation of the BMC and the overall analysis was towards identifying the costs of running the network and spotting sources of funding and revenue to ensure the financial sustainability of the social innovation (rather than building a strong profit-making case). Key partners include the Forest Owners Association and entrepreneurs that are engaged along the wood fuel value chain, as well as the North Sweden Cleantech cluster and the Piteå Science Park, who have previously helped to co-manage the network.

The main activities of the innovator are organising workshops, trainings and a yearly study tour, building on a carefully thought-out mobilisation plan and knowledge accumulated over a couple of decades of work. Given that currently the team is mainly run by a single innovator with strong collaborative ties with a running set of partners, the cost structure is quite simple and so far well covered through project grants at from EU, national and regional sources.

An initial rough set of potential “customer groups”, in this case more adequately named as target audience groups, were identified and included in the business model canvas. In subsequent sessions of the ISP, the task force then characterised the different groups further and selected a larger set for exploration.

Target audience group selection

As part of the market segmentation exercise carried out by the task force, potentially relevant stakeholder groups were identified and later evaluated against a set of standard attractiveness criteria to generate a ranking (see Figure 3).

Segment overview & Score GO BACK TO EXERCISE 3 TO CHANGE YOUR SELECTION >		
ELECTRICITY INDUSTRY	24	Main target group
FORESTRY SECTOR	23	Key growth opportunity
LOCAL AUTHORITIES	20	
REGIONAL AUTHORITIES	20	
TRANSPORT SECTOR	17	
RESEARCHERS (UNIVERSITIES OR EXTRAMURAL RESEARCH INSTITUTIONS)	17	
ENVIRONMENTAL ORGANISATIONS	15	

Figure 3. Results of the target group selection exercise for the Wood Fuel Network on the MAF+ portal. Source: own elaboration.

The Wood Fuel Network aims to bring together a diverse set of stakeholders in Northern Sweden who can play crucial roles in the development and optimisation of the regional bioenergy market. As the initiative’s main aim is to foster collaboration and knowledge exchange among actors involved in the supply, processing, and valorisation of logging residues, the following key groups stand out as particularly relevant for the network’s activities:

- **Local Authorities:** municipalities are central actors in the wood fuel market, as they often own and manage district heating networks and heating plants. The revenues generated from these facilities contribute directly to financing essential public services, including schools and other municipal buildings that rely on district heating. Additionally, many municipalities in Northern Sweden are forest owners, making them both consumers and suppliers of biomass. With ambitious climate neutrality goals, local governments are increasingly prioritising the security of biomass supply, recognising its role in reducing fossil fuel dependency and ensuring long-term energy resilience.
- **Regional Authorities:** regional governing bodies play a strategic role in shaping the policy framework for bioenergy and forestry. They develop regional development plans, climate action policies, and bioeconomy strategies, often placing strong emphasis on fostering sustainable

growth within the bioeconomy sector. The regional county boards are responsible for overseeing forest strategies, environmental monitoring, and regulatory compliance, ensuring that biomass extraction and utilisation adhere to best practices. Through their policymaking and oversight functions, regional authorities help create a supportive environment for investment and innovation in forest-based bioenergy.

- **Electricity and Energy Industry (ranked highest):** CHP plant operators in the region are key players in the bioenergy sector, as they produce both green electricity and district heating, benefiting from Sweden's green electricity certificate system and their classification as carbon-neutral energy providers under the EU ETS. Many local energy companies have set targets to become 100% climate neutral by 2030, further driving demand for sustainable and locally sourced biomass. Ensuring a secure and stable biomass supply is increasingly important, particularly as companies seek to reduce dependence on imported fuels and shift towards more regionally sourced logging residues to enhance energy security and market resilience.
- **Transport Sector:** the growing demand for logging residues as an energy source translates into higher transport needs, necessitating efficient and sustainable logistics solutions. Transport operators are paid based on the energy content (MWh) of delivered biomass, making payload optimisation and streamlined loading/unloading processes critical for profitability. Given the remote and challenging geography of Northern Sweden, a well-maintained forest road network that remains accessible year-round is essential. Additionally, the increasing focus on fossil-free transport solutions means that many transport providers are transitioning to Hydrotreated Vegetable Oil (HVO) biodiesel and other sustainable fuel alternatives to align with market and regulatory demands for lower-emission logistics.
- **Forestry Sector (ranked second-highest):** the broader forestry industry is responsible for supplying wood chips and logging residues, necessitating the efficient coordination of supply chains to minimise environmental impact and maximise operational efficiency. Planning year-round transportation of biomass is a key challenge, particularly given the logistical constraints imposed by harsh winter conditions, including snow-covered terrain. Moreover, land management responsibilities require forest operators to ensure that logging sites and forest roads remain undamaged and in good condition post-harvest. Contractual agreements and fair payment structures for forest owners and entrepreneurs are essential to maintaining a robust and reliable biomass supply chain.
- **Researchers:** Academic and research institutions contribute valuable expertise to the wood fuel value chain, particularly in (novel) biorefining and biomass processing techniques. Strong ties through SCALE-UP and other research projects where BFR is a member facilitate access and collaboration with this group. While some members of this target group already possess relevant knowledge in their field or discipline, joining the network offers them a holistic perspective integrating technical, policy, and environmental dimensions. Although academic findings may take years to influence practice, structured engagement with the network can help bridge this gap, fostering innovation and evidence-based decision-making in Northern Sweden's bioenergy sector.
- **Environmental organisations:** engaging with environmental organisations presents both challenges and opportunities due to often polarised positions on biomass use. Local and regional branches of larger NGOs tend to be less accessible and engaged, yet there is interest from the innovator to establish a better communication with such actors. These organisations are highly active in the media, using public discourse as their primary means of influence. To foster dialogue, the network must tailor its communication approach, focusing on policy and environmental dimensions rather than overly technical aspects. Strengthening ties with these groups could improve mutual understanding and contribute to a more balanced and informed discussion on sustainable bioenergy.

As shown in Figure 3, the Electricity and Energy industry, particularly Combined Heat and Power (CHP) plants, stands out as the most attractive target audience group for the Wood Fuel Network. These plants and their operators require a secure and steady supply of feedstock, a demand that is intensifying due to geopolitical factors, new bioenergy users, and evolving EU policies. Unlike other

stakeholder groups, CHP operators and other energy producers already share the same technical language as the network's manager and close partners, facilitating direct and effective communication without the need for extensive adaptation.

Additionally, strong existing connections within this group create a solid foundation for engagement and act as a pull for other important target audiences like entrepreneurs. The unique value proposition of the network—providing a specialised, multi-actor platform with high-quality expertise—aligns closely with their strategic needs. While the network is not designed with mass participation as its top aim, its focus on expert-driven collaboration makes it particularly well-suited for the electricity and energy sector, ensuring meaningful engagement that can support supply chain optimisation, market stability, and long-term energy security.

Value proposition statement

Considering the top-ranking target audiences for the Wood Fuel Network, and combining several statements formulated in a set of three Value Proposition Canvas exercises completed during the ISP MAF+ sessions, the following integrated value proposition statement has been elaborated:

The Wood Fuel Network serves as an open platform for diverse stakeholders from the Electricity and Energy Industry, the Forestry sector and public administration in Northern Sweden to share knowledge, address common challenges, and collaborate on solutions that enhance the efficiency, sustainability, and resilience of the regional bioenergy sector. By fostering cross-sectoral dialogue and innovation, the network contributes to the long-term competitiveness and sustainability of the forest-based bioeconomy in Northern Sweden.

This formulation is put at the disposal of the innovator for further adaptation, update and perusal as part of their strategic communications in the future. As stated, it builds on the wants, needs and fears of the main target audiences, including:

- the need for long-term and stable deliveries of wood fuels of good enough quality at an affordable price (for energy plant operators, the price almost doubled in the past years, after 10 years of stagnancy)
- the need for new knowledge and network contacts (e.g. in the case of forest owners and entrepreneurs)
- concerns of increasing prices of wood fuels and shortages in peak season. Past problems with storing, feeding and combustion (e.g. in some cases causing spontaneous combustion) related to deliveries of logging residues of poor quality, including issues with phosphorus from needles and moisture content being beyond the required parameter range
- uncertainties and lack of knowledge around the impact of logging residue extraction on long-term soil productivity (e.g. generally associated to soil damage, messy landings and road damage from larger numbers and frequencies of heavy machinery coming into the forest)
- the wish for expanded networks in the region of Northern Sweden, and of establishing new and more resilient supply chains
- the wish of forest owners to generate extra income from their stand, to improve their forest management practices, and to be a more active part of the forest owners community in the region

2.1.4 Network actions completed and relevant considerations for the future

In northern Sweden, several investments are planned for the production of biocarbon, biofuels and biochemicals based on forest industry by-products (sawdust and bark). These investments are on higher levels in the biomass value pyramid than energy generation. Sawdust and bark are today used for combustion in CHP plants that must look for alternative wood fuels. Logging residues (branches and tops) represent a substantial and under-utilised biomass resource. To mobilise this resource, several actors must make strategic decisions. A goal of the social innovation—the Wood Fuel Network—is to mobilise all actors within the whole value chain and to communicate and exchange best practices for cost-effective deliveries of logging residues with high quality.

In close cooperation with buyers and sellers of wood fuels in Northern Sweden a survey to identify challenges, bottlenecks, knowledge and solutions in the logging residue value chain has been prepared and answered by 30 regional stakeholders. The purpose was also to identify important areas where best practices can be shared and developed. Based on the input collected and previous experiences, a training session was developed and a proposal was sent out to buyers and sellers of wood fuels in Northern Sweden. Out of that initial offer, the following events have been organised and carried out:

- **13 May 2024 - Domsjö Fiber Örnsköldsvik.** Domsjö Fiber is a prime example of a successful co-operation between biofuel consumers and pulpwood consumers. Domsjö Fiber is responsible for raw material supply to Domjö Fabriker pulp mill and CHP plant. Öviks Energi. Domsjö Fabriker consumes about 1.3 million scbm of pulpwood and wood chips annually and Övik Energi consumes about 800 MWh of wood fuels annually. Domsjö Fiber has experienced increasing difficulties to purchase forest industry by products on the local market and has developed a strategy to purchase increasing amounts of logging residues the coming years. To support this strategy, a 3-hour training session together with local forest owners association and local sawmills was organized.
8 participants engaged
- **22 May 2024 RISE Processum Örnsköldsvik. Wood fuel network northern Sweden training session and study visit.** To support strategic planning and knowledge sharing, a network of buyers and sellers of wood fuels in northern Sweden been established. During the past 4 years, regular meetings and study visits have been organised. During this day, a 2-hour training session together with representatives from forest owners association, entrepreneurs, CHP plant, pulp and paper industry, biorefinery operators and several research organisations and clusters.
20 participants engaged
- **3 June 2024 Umeå Energi Dåva CHP plant.** The Dåva plant converts waste and biofuel into energy and electricity. The plant operator has experienced increasing difficulties to purchase forest industry by products on the local market and has developed a strategy to purchase increasing amounts of logging residues the coming years. To support this strategy, a 3-hour training session together with Umeå Energi staff and entrepreneurs. Representatives from a neighboring CHP plant Skellefteå Kraft also participated. Both CHP plants are competitors on the wood fuel market.
15 participants engaged
- **7 November 2024 Östersund** in cooperation with fuel purchasers representing CHP plants, Vattenfall and Jämtkraft. Both has experienced increasing difficulties to purchase forest industry by products on the local markets and has developed a strategy to purchase increasing amounts of logging residues the coming years. To support this strategy, a full day training session including a study visit was organized.
25 participants engaged
- **12 November 2024 Piteå in cooperation with SCALE-UP platform member representing Piteå Science park.** Increased competition from Finland and decreased output from local forest industries has created difficulties for heating plants to source wood fuels. Several stakeholders have declared interest to purchase increasing amounts of logging residues the coming years. To support this, a full day training session including a study visit was organised.
30 participants engaged



Figure 4 Participants at the training session and study visit to Jämtkraft CHP plant terminal in Östersund, Sweden on 7 November 2025. Source: Magnus Matisons.

Towards the end of the SCALE-UP project in June 2025, further training sessions are being planned. A new proposal for a new series of training sessions is being prepared for buyers and sellers of wood fuels, similar to the one mentioned above that sparked the series of events listed. In March, the Wood Fuel Network met to showcase tools and devices that can be used to facilitate the monitoring of characteristics of logging residues (e.g. moisture content). Lastly, a study trip is being planned for late May / early June, following the project's final conference.

2.2 RESELO

2.2.1 General description and value proposition of the innovation

Reselo Rubber is a pioneering, fossil-free elastomer derived entirely from birch bark—a byproduct of the global pulp, paper, and plywood industries. This innovation serves as an attractive alternative to conventionally produced rubber polymers, as it can significantly reduce the carbon footprint associated with rubber production and it is a clear example of a high value-added circular bioeconomy product at its core. Its areas of application include its incorporation in footwear and fashion accessories, tyres and automotive components, sports equipment, and industrial machinery and components.

The key features of Reselo Rubber include:

- It has excellent flexibility, strength, and water repellency, making it durable and suitable for a wide range of applications and operating conditions.
- It integrates seamlessly with commonly used rubber polymers, fillers, and additives, making it compatible and versatile
- It maintains compound hardness with less filler content, improving environmental impact and material efficiency.
- Its carbon content is 100% biogenic, i.e. it contains no fossil-based components and is produced exclusively from renewable resources.
- Its carbon emissions from cradle to grave are shown to be up to 90% lower than those associated to conventional rubbers.

Reselo's primary value proposition lies in its commitment to sustainability and innovation. By using birch bark—a residue from the forestry industry often used as biofuel—to provide a renewable alternative to fossil-based rubbers, the startup generates value added from a commonly under-valued resource. This approach aligns with principles of circular bioeconomy and promotes resource efficiency and waste reduction. Reselo's proprietary biorefinery process incorporates efficient green chemistry principles, using environmentally benign solvents and operating under relatively low temperatures to isolate bulk suberin. The process is designed for scalability. The company is continuously seeking collaborations with industrial infrastructure suppliers and piloting service partners to expedite validation and commercial viability.

Reselo Rubber offers their target industries a sustainable, high-performance material that meets the functional requirements of traditional rubber applications while significantly reducing environmental impact, supporting the global transition towards a circular bioeconomy.

2.2.2 Stakeholders involved in the ISP

Task force: The activities carried out with RESELO included providing specialised knowledge on raw material supply and biomass logistics in Northern Sweden, granting the innovators access to pertinent network actors in the region, giving input on strategic communication upstream the value chain, and a strategic policy scoping. This was carried out by the task force composed of SCALE-UP regional partner Biofuel Region, the Swedish University of Agricultural Sciences, Ecologic Institute, and Josefin Larsson from RESELO.

Business idea owner:

Reselo is a biomaterials science company committed to enabling sustainable living by replacing fossil-derived materials with renewable alternatives. Founded with the mission to reshape the raw material landscape, Reselo has developed a novel, fossil-free elastomer known as Reselo Rubber, produced entirely from birch bark—a side stream of the global pulp, paper, and plywood industry. This innovative material offers up to a 90% reduction in carbon footprint compared to traditional rubber, aligning with several United Nations Sustainable Development Goals, including driving innovation, promoting responsible production and consumption, reducing greenhouse gas emissions, and preserving biodiversity.

**Team:**

Reselo was founded in December 2020 by a small core team: Thomas Baumgarten, Co-founder and Chief Technology Officer, whose research led to the development of Reselo Rubber from birch bark; Henrik Otendal, Co-founder and Chief Executive Officer, who leads the company's strategic direction and operations; and Josefin Larsson, Co-founder and Chief Product Officer, who combines technical solutions with commercial products, drawing parallels between molecules and business strategies. The Reselo team has grown over the last year and comprises professionals with diverse expertise in process engineering, materials science, R&D and project management.

2.2.3 Results of the market assessment and business model design process

Given that at the time of joining the SCALE-UP ISP RESELO had a strong team dedicated to strategic market research and business development work, and that the maturity level of the start-up is past the initial stages, the task force decided that the exercises from the MAF+ framework would not be optimally suitable and would only be carried out to a limited extent (see market overview below, SWOT analysis in Figure 6, and screening of potentially influential EU policy and regulation in Table 1). In its stead, the support programme would focus on offering RESELO the opportunity to assess and map the availability of raw materials across Sweden and giving them access to relevant contacts that could eventually become biomass suppliers or partners, both fundamental aspects of the start-up's business plan to be solved at their current stage of development. This would supplement the start-up's ongoing efforts to assess the long-term feasibility of sourcing birch bark for its bio-based rubber production at scale.

Market overview

The global rubber market encompasses both natural and synthetic rubber produced and utilised across various industries, including automotive, construction, manufacturing, and consumer goods. The market is experiencing dynamic shifts in the last years, with certain regions and countries emerging as high-potential areas for growth. In Asia-Pacific, particularly countries like China and India stand out due to rapid industrialisation and increasing demand from the automotive and construction sectors. In North America, Mexico stands out as both regional and growth leader, underpinned also by a growing automotive sector and manufacturing as well as its increasing domestic production capacities. In Europe, Turkey and France are regional and growth leaders, respectively. While Turkey's position is supported by its manufacturing industry, and particularly the tire industry, in France the growth potential seems to be driven by new labelling for natural rubber products and an increased demand for sustainable materials (MI, 2025). Here Europe's stringent environmental regulations, e.g. on carbon emissions, are fostering innovation and leading to the development of advanced rubber products and alternative production processes that enhance resource efficiency.

In 2025, the global natural rubber market was valued at approximately USD 18.99 billion and is projected to reach USD 23.90 billion by 2030, growing at a Compound Annual Growth Rate (CAGR) of 4.7% during the forecast period (MI, 2025). Assuming Reselo Rubber will operate mainly within the natural rubber market—a critical sector underpinning various industries due to its unique properties

such as high tensile strength, elasticity, and durability—some potentially relevant target groups include manufacturers of tyres, industrial equipment, footwear, and medical supplies.

Reselo Rubber's sustainable and innovative characteristics position it favorably within the current rubber market both in the global and European dimensions. By targeting industries such as automotive, fashion, industrial equipment, sports equipment manufacturing, and medical, Reselo could capitalise on the growing demand for renewable and sustainable materials. Even with recent shifts towards competitiveness and defense, the current political, economic, and legal trends appear to be favorable for the adoption of such alternatives (assuming economic viability is secured).

The European Union's commitment to sustainability is evident through initiatives like the Green Deal and the Circular Economy Action Plan. The review of the EU Bioeconomy Strategy is due by the end of 2025, and it will aim at “reinforcing the bioeconomy's industrial dimension, and its links to biotechnology and biomanufacturing to contribute to a stronger EU economy” (EC, 2024). Additionally, the proposed 2025 EU Biotech Act aims to streamline regulatory pathways, reducing fragmentation and shortening time-to-market for biotech innovations. These policy directions create a favorable environment for companies like RESELO that offer sustainable, bio-based materials driven by science, technology and innovation.

The natural rubber market has experienced supply constraints due to factors like adverse weather conditions and reduced production in major producing countries. For instance, in 2024, global natural rubber production declined by up to 4.5%, leading to a 13-year high in prices. This scarcity and price volatility create opportunities for alternative materials like Reselo Rubber to gain market share.

European consumers are increasingly concerned about environmental issues. A special Eurobarometer survey on the environment showed that 78% of respondents agree that such issues directly affect their daily lives and health. Similarly, 84% of the respondents worry about the environmental impact of harmful chemicals found in everyday products (EU, 2024). This growing environmental consciousness drives demand for sustainable products, aligning with Reselo's value proposition.

Advancements in biotechnology and materials science are facilitating the development of bio-based alternatives to conventional materials. RESELO operates in a dynamic landscape where sustainable rubber alternatives and recycling technologies are rapidly evolving. Companies in various sectors like Vibracoustic, Kumho Petrochemical, and TômTex are looking into biotechnical recycling methods like enzyme treatments; recycled styrene monomers from plastic waste; and plastic-free alternatives to leather; respectively. While most of these initiatives are not yet commercial, advances in biotechnology are already influencing material choices across industries. Reselo's innovative approach leverages these technological advancements to create a sustainable rubber alternative without compromising performance.

The environmental impact of traditional rubber production, including deforestation and biodiversity loss, has raised concerns among consumers, both corporates and private individuals. Reselo's bio-based rubber offers a sustainable solution by utilising renewable resources that are a side stream of the forestry sector, thereby having the potential to reduce the ecological footprint associated with rubber production. At the same time, and driven by scandals around carbon offsets and compliance with regulation in the automotive sector, greenwashing has become a growing and widespread concern over the recent years. These trends underscore the need for RESELO to stay ahead by continuously refining their innovation and carefully developing their market positioning.

Lastly, stricter environmental regulations and sustainability reporting requirements are being driven, especially in the EU. On one hand, developments like the Corporate Sustainability Reporting Directive (CSRD) and similar directives and guidelines have been recently rolled out to drive sustainable finance and corporate compliance with environmental regulation. Simultaneously, the EU's plan to simplify biotech regulation and speed up approvals aims to reduce regulatory complexity, benefiting companies like Reselo. Additionally, the EU Biotech Hub will serve as a tool for biotech companies to navigate this regulatory framework and identify support to scale up (Bergeson and Hutton, 2024). These developments create a favorable environment for RESELO's sustainable rubber solutions.

Support on raw material supply analysis and regional network access

RESELO has received support from the task force to supplement its research on biomass availability in Sweden. A raw material supply analysis was conducted by the Swedish University of Agricultural Sciences, providing an overview of the potential quantities of birch bark available across different regions of Sweden from 2030 to 2100.

Building on these findings, RESELO has received further assistance in developing an advanced raw material supply analysis, including marginal cost curves for sourcing specific volumes of wet birch bark (50% moisture content) near several designated locations across Sweden. The initially targeted supply scenarios included 50,000 tons, 100,000 tons, and 150,000 tons, allowing for a detailed assessment of cost structures and logistical feasibility.

In addition, the task force has sought further data on key factors influencing birch biomass supply and demand. These include existing users of birch biomass, such as pulp mills and heating plants, as well as information on the import and export of birch roundwood. The company has also received expert input from BFR on the potential for thinning young birch trees and the methods available for separating birch bark, alongside an analysis of relevant regulatory incentives that could impact future supply chains.

Additionally, BFR facilitated access to a wide network of regional actors directly involved in the forestry sector, with particular focus on pulp mills and other forestry sector infrastructure operators that could eventually become their partners or suppliers. This gave RESELO new insights into existing by-product streams, helping them to (re)shape their business model and explore possibilities for widening their product portfolio. RESELO is now a member of the Wood Fuel Network in Northern Sweden, which will continue to give them access to emerging knowledge, market trends, and relevant contacts in the region.

QuickScan

To inform the focus of the (abridged) market research business model design activities that would be supported by the task force, an initial diagnosis of the current state of RESELO was carried out using the BRIGAD QuickScan methodology. This builds on a structured interview with the innovator where a standard set of questions is addressed, yielding a scan of the enterprise along four dimensions: Strategy, Technology, Financing, and Social. Figure 5 shows a summary graph of the scan results.

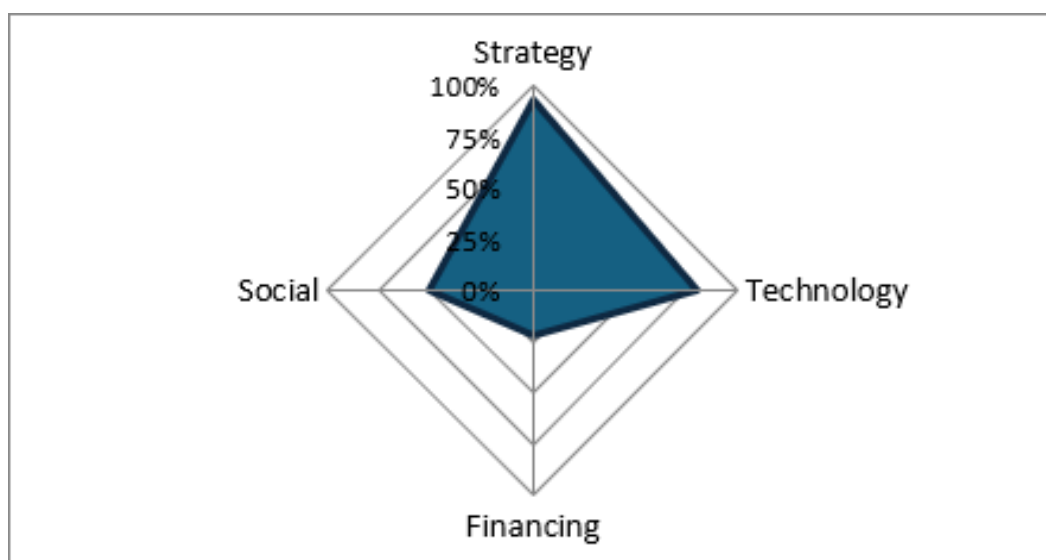


Figure 5 Results of the QuickScan carried out for RESELO. Source: own elaboration.

The scan reflects the fact that—at their current phase—RESELO is well covered on what concerns the building blocks of a business strategy and organisational structure, as well as having a novel, yet tested product and protected Intellectual Property (IP).

Some potential for further development appears to exist in social dimension aspects (e.g. estimation of a social ROI, consideration of public acceptance issues) and financial planning items (e.g. estimations of revenue and profit forecasts, and of the NPV and ROI of specific projects).

As a result of the scan results and the discussion with the innovator, it was agreed that further support from the task force would focus on assisting RESELO with attaining a better understanding of the current EU policy landscape (and, particularly, the possible implications of recent developments in this realm); spotting adequate subsidy/funding programmes and getting a better grasp on how to best position RESELO to respond to EU R&I funding calls.

SWOT Analysis

A conventional SWOT Analysis was conducted by Ecologic Institute on the basis of the initial work carried out by the task force, as well as the exchanges had during the QuickScan session and a face-to-face workshop at RESELO's premises that took place on 16 September 2024.

The items collected point to clear strengths of the start-up being the technological development, strong scientific partnerships, and good alignment to environmental policy trends and market demand for sustainable materials. On the other side, current weaknesses reside in the lack of clarity on the organisation's financials as well as deep consideration of social acceptability aspects (beyond the solid results of the available environmental impact assessment, there would be a need to gauge what potential perceptions of consumers of the end products are). The external aspects influencing the company's future are strong both on the opportunities as on the threats sides, somewhat balancing each other out. While policy, social perception and technological developments appear to be driving demand for sustainable materials and production processes, market volatility and uncertainty as regards long-term policy could hinder, or at least slow down uptake and investment at the scale necessary to drive substantial impact.



Figure 6 SWOT Analysis for RESELO. Source: Own elaboration on the MAF+.

Zoom-in on the Policy and Legal dimensions of the PESTEL analysis

Also as part of the work carried out in the run up to the face-to-face workshop in September 2024, Ecologic Institute conducted an integrated mapping of current policy and regulatory developments at EU level that could eventually have a meaningful impact on RESELO. These were matched with latest developments at RESELO to show where past and future convergence may exist. The overview is shown in Table 1 below.

Table 1 Notes from the screening of potentially influential EU policy and regulation

Developments on the EU Policy landscape	• The Commission will review the EU Bioeconomy Strategy by the end of 2025. The review will take into account the current societal, demographic and environmental challenges, reinforcing the bioeconomy's industrial dimension and its links to biotechnology and biomanufacturing to contribute to a stronger EU economy. • Mario Draghi's recent report is a masterplan for a new European Industrial Strategy. It stresses that ambitious climate policy can and should unleash substantial industrial opportunities for the continent. His <i>joint plan for decarbonisation and competitiveness</i> that matches a new flagship initiative proposed by von der Leyen for 2024-2029 – the 'Clean Industrial Deal'. It proposes measures to coordinate industrial, competition and trade policy; mobilise investment; and coordinate EU-level industrial policy. Open policy for aspects where EU competitiveness is relatively low, and extra-support where Europe has developed competitive advantages. • The EU biotechnology and biomanufacturing sector is facing several challenges: research and technology transfer to the market [<i>RESELO is working on accelerating commercialisation and strategic partnerships in 2024</i>], regulatory complexity, access to finance (Innovation Fund running in regular intervals, threshold for small-large-scale projects 7.5 M€) (Green Deal Industrial Plan - proposal for a Temporary Crisis and Transition Framework aims to boost investments for a faster roll-out of renewable energies as well as to support the decarbonisation of the industry and the production of equipment necessary for the net-zero transition) [<i>RESELO received an EIC Accelerator grant of €2.5M in 2023 - to expand the team and make the first prototypes together with their earliest pioneering partners</i>], skills, value chain obstacles, intellectual property, public acceptance and economic security. • To succeed on the market, bio-based products need to prove their lower environmental impact when compared, for instance, to petrochemical products. [<i>In collaboration with the Swedish Environmental Research Institute IVL, RESELO proved Reselo Rubber has a much lower carbon footprint than commonly used fossil-based rubbers, thus allowing to quantify the positive impact of the technology</i>] • Since March 2024, the EC is taking action seeking to: ○ Leverage research and innovation ○ Stimulate market demand ○ Streamlining regulation ○ Fostering public and private investment ○ Strengthening skills ○ Elaborating and updating standards ○ Supporting collaboration and synergies ○ Fostering international collaboration ○ Using AI and generative AI • Industrial Biotechnology Innovation and Synthetic Biology Accelerator (IBISBA) - integrated services for end-to-end bioprocess development. The only European Research Infrastructure dedicated to Industrial Biotechnology and Biomanufacturing • bio-based content requirements in specific product categories and in public procurement. • Better positioning through labelling of bio-based products • The Strategic Technologies for Europe Platform (STEP) raises and steers funding across 11 EU programmes to three target investment areas:
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	• Digital technologies and deep-tech innovation • Clean and resource-efficient technologies • Biotechnologies with the objectives of developing and manufacturing critical tech, securing its value chains, and addressing labour and skill shortages. It aims at high economic potential developments that reduce or prevent strategic dependencies • Possible EU Biotech Act. Streamlining regulatory pathways: The Commission will assess how EU legislation and its implementation could be further streamlined to reduce any fragmentation, explore potential simplification, and shorten the time to market <i>[We are targeting a high production capacity, making our operations commercially viable, significantly reducing the time-to-scale and the associated time-to-market.]</i> for biotech innovations; regulatory sandboxes that allow to test novel solutions in a controlled environment for a limited amount of time under the supervision of regulators, as a way of bringing more of them quickly to the market. • EU Biotech Hub end of 2024, an operational tool for biotech companies to navigate through the regulatory framework and identify support to scale up • Funding and financing instruments like Horizon Europe, including the Circular Bio-based Europe Joint Undertaking (CBE JU), the Innovation Fund, • Incorporating challenges on biotech and biomanufacturing in the European Innovation Council (EIC) accelerator Work Programme 2025. • Study end of 2024 on the consolidation of investment funds, stock exchanges and post-trading infrastructure • The Green Deal Industrial Plan. The Plan aims to provide a more supportive environment for the scaling up of the EU's manufacturing capacity for the net-zero technologies and products required to meet Europe's ambitious climate targets. It is based on four pillars: a predictable and simplified regulatory environment, speeding up access to finance, enhancing skills, and open trade for resilient supply chains. • The Commission will propose a Net-Zero Industry Act to identify goals for net-zero industrial capacity and provide a regulatory framework suited for its quick deployment, ensuring simplified and fast-track permitting, promoting European strategic projects, and developing standards to support the scale-up of technologies across the Single Market. It should create better conditions to set up net-zero projects in Europe and attract investments, with the aim that the Union's overall strategic net-zero technologies manufacturing capacity approaches or reaches at least 40% of the Union's deployment needs by 2030. The framework will be complemented by the Critical Raw Materials Act • Results of the Strategic Dialogue on the Future of EU Agriculture will guide the work of the European Commission when shaping its Vision for Agriculture and Food, to be delivered in the first 100 days of President von der Leyen's second mandate.
Matching elements from RESELO's profile, value proposition, and recent developments	• Reselo is a biomaterial science company specializing in bio-based rubber that matches the properties of conventional rubber. It can be cured and vulcanized using existing manufacturing equipment, allowing seamless integration into current production processes. Reselo Rubber can be used alone or blended with traditional rubber alternatives, enabling smooth adoption in existing products. • Birch bark is abundantly available, with millions of tons produced annually as a residual byproduct of the global pulp, paper, and plywood industry. • Suberin, a natural polymer, serves as the foundation for Reselo Rubber. Using proprietary technology, Reselo extracts and reconstructs suberin's polymeric network, creating a unique rubber material with well-documented structural properties. • Efficient green chemistry drives Reselo's process. Unlike traditional approaches that focus on extracting individual suberin compounds—yielding less than 1% product efficiency—Reselo isolates bulk suberin, significantly increasing yields and making large-scale production commercially viable. • Scaling is key to maximizing environmental impact. Instead of building a pilot plant, Reselo collaborates with industrial infrastructure suppliers and piloting service partners, allowing for faster validation and cost efficiency. Early engagement with equipment manufacturers ensures the process is designed for scalability and industrial feasibility. • Reselo has partnered with Nokian Tyres, a leading tire manufacturer, to further develop Reselo Rubber for commercial tire production. This collaboration aims to refine the material for mass-market applications. • Tyres represent the largest segment of the rubber industry, making them a critical opportunity for scaling up. • Nokian Tyres has set a sustainability goal to ensure that 50% of its raw materials are renewable or recycled by 2030 and has recently achieved several milestones toward this target.

2.2.4 Relevant considerations for the future

Over its initial years RESELO has managed to build a strong profile on innovation and scientific research with direct industrial application and an interesting model for achieving impact through scale. It also is building an attractive brand that speaks to potential partners, clients, and the wider public (although our collaboration has shown deeper consideration of social acceptability would be advisable). The current stage sees the company facing a challenge that is not uncommon for bio-based innovators: accessing a steady and sufficient supply of biomass that allows for competitive pricing and process optimisation that can reduce risk and uncertainty associated to scale-up investments.

The company is hard at work on multiple fronts simultaneously, including process optimisation, widening the product palette, and continuing to seek partnerships to secure access to the necessary feedstock. The biomass availability estimations generated as part of the SCALE-UP ISP will hopefully provide useful insight not only for RESELO's efforts on getting a strong foothold in the Swedish market, but also on other potentially interesting geographies where their integrated plant concept could be set up close to pulp mills, power plants, and other users of forest biomass.

In terms of financing, towards the end of summer 2024 RESELO was planning to extend their EIC Grant and go into a fundraising round. Beyond this, the work carried out by the task force during the ISP shows clearly that RESELO's profile and offer is very well aligned with the recent and ongoing policy developments at EU level, which place the start-up in a good position to benefit from additional grant funding and from red tape reductions being sought for biotech companies. Revenues could come from securing market traction via the recently established partnership with Nokian Tyres. On the footwear sector, the lifestyle segment can represent an interesting market entry pathway, as it is associated with high-end, innovative products at a premium price level. Further R&D being carried out shows potential for extending the product palette into additional markets that could give additional thrust and stability to the company.

3 Reflections on the SCALE-UP Innovation Support Programme

3.1 Barrier Analysis during ISP Implementation

The implementation of the SCALE-UP ISP in Northern Sweden has entailed the need to flexibilise the offer to meet the wide ranging needs of two very different innovators. On one hand, a social innovation seeking to drive collaboration and knowledge exchange, building on a previously existing network and local knowledge that had been dormant for some time and is now being uncovered once more. On the commercial end, this innovation does not foresee ambitious commercial goals, but rather securing financial stability. On the other hand, a young–yet well mature from a business strategy perspective–biotechnology start-up, having a clear pathway and ambition to scale and seeking partnerships with large actors of important economic sectors. This wide range of beneficiaries put the ISP, and more concretely, the MAF+ to a tough test. While the MAF+ provides a good framework for early-stage, primarily commercially oriented spin-offs, start-ups and sole entrepreneurs that are not necessarily versed on business development and market analysis concepts, its current offer shows limitations when it comes to matching the needs of a wider spectrum of innovators. According to the feedback received, the framework served the purpose as it was used flexibly and with a strong orientation towards the needs of the beneficiaries, but not all of the work originally conceived would have been valuable. The regional partner, as leader of the task force, took thus a direct and practical approach to identify the priority needs at the start of the programme period and swiftly proceeded to take action to address them. This meant going beyond business model design and market research, and into more technical studies, expert advice (sounding board), and access to the regional network of forestry and bioeconomy actors in Northern Sweden. As seen in other SCALE-UP regions, the adaptability, flexibility and regional customisation of the ISP offer were important actions to take during the run of the project task to secure success.

Further, BFR faced difficulties at the start in identifying innovations and reaching out to potential participants. The formal nature of the application process was perceived as a barrier, and better timing (i.e. accounting for differences in the summer break in different regions of Europe) and earlier communication would have improved engagement. Despite these hurdles, the Northern Swedish platform meetings helped foster collaboration and community activation.

3.2 ISP Conclusions and Bioeconomy Applications

BFR noted that the ISP represented a challenge in terms of their own skills and capacity. While they possess great knowledge on the technical aspects of bioeconomy in their region, business, marketing and finance strategies are not their core work. This point was raised as a positive one though, as they have gained experience and built capacity on these topics and have improved their position as a go-to partner in the region, one that can really support the regional innovation ecosystem. SCALE-UP has sparked BFR's involvement in new projects and with this they have been able to contribute to the national bioeconomy strategy of Sweden.

Both innovations in Northern Sweden showcase clearly the difficulties, but also the great potential and capacity for making bioeconomy initiatives a reality and for driving rural and regional economies while maintaining strong standards and ambitions towards environmental sustainability and innovation. Concrete applications are already underway as shown by the multiple actions undertaken by the Wood Fuel Network in 2024 already and with great success. This will hopefully serve as an example and source of learning for other social innovation initiatives across Europe.

3.3 Innovators and ISP Future Directions

Training sessions (on technical aspects) and network access both within and across regions in Europe were seen as incentives that could boost engagement of innovators and other regional actors in the bioeconomy. More targeted support to increase regional collaboration would be beneficial in future iterations of the ISP. Being ambitious will continue to be important, while the teams must stay realistic as to what the reach of such innovation support schemes can be within the framework of a project.

New opportunities for collaboration building on the ISP and the experiences collected in SCALE-UP are already being sought and explored in ongoing projects and in emerging consortia. Yet, before the project's end, the partners from Northern Sweden suggest the SCALE-UP consortium to organise a workshop where all innovators who participated in the ISP are given a space to present their solution and their experience as a final chance to exchange lessons learned during the project's lifetime and plant opportunities for future collaboration.

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SCALE^{UP}
community-driven
bioeconomy development

SCALE-UP Innovation Support Programme | Synthesis Report for Poland

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Executive Summary

Within the framework of the SCALE-UP project and particularly the Innovation Support Programme (ISP), Task Forces have been set up in Mazovia to assist two innovative solutions from the region: the *Biocircular Apple Farm* and *Apple Pomace Innovations*.

I. Biocircular Apple Farm

Biocircular Apple Farm is an interactive and interdisciplinary space that allows experiencing and co-creating bioeconomy development first-hand in a century-old apple orchard located in the heart of the Mazovia region.

The primary mission of the farm is to foster educational, social, environmental and technological innovations by providing a platform for co-creating and testing solutions within the realms of bioeconomy and sustainable development. The main activities of the initiative include: organising workshops, business meetings, and social integration initiatives to create impactful community relationships and jointly support bioeconomy development.

Inspired by several past and ongoing EU-projects and powered by cross-fertilisation with European initiatives, this innovative approach targets the connection of diverse sectors and industries to stimulate the bioeconomy in rural areas, positioning the farm as a transformative force within the local and regional communities. By increasing awareness of bioeconomy principles and sustainable lifestyles, the Biocircular Apple Farm seeks to deliver enduring social, educational, and economic benefits. The farm collaborates with local authorities, educational institutions, and non-governmental organisations (NGOs) throughout the year to attract a wide-ranging audience, including families, school groups, seniors, and professionals seeking distinctive recreational and educational experiences. Thanks to the SCALE-UP Task Force, this collaboration has been organised and facilitated towards commonly established goals. This multifaceted impact enhances the region's visibility and promotes active engagement across diverse demographics, thereby supporting community-driven bioeconomy initiatives through hands-on experiences and collaborative spaces.

The farm's business model combines awareness-raising and educational offerings, social integration and entrepreneurship initiatives presenting a comprehensive value proposition tailored to varied audiences. While initially functioning as a non-profit organisation, the farm anticipates a gradual transition to a commercial enterprise.

Educational programmes encompass engaging thematic apple trails¹, a digital bioeconomy library, and laboratory spaces designed to test innovative solutions through co-creation and peer-to-peer learning. In the recreational domain, the farm offers unique experiences such as self-harvesting (short food supply chain model), culinary workshops, and outdoor yoga, which cater to individuals seeking slow-life experiences.

By leveraging its educational resources and innovative capabilities, the farm emphasizes community engagement through collaboration with local stakeholders and the provision of programmes designed to meet the needs of various social groups. Key customer segments include NGOs, educational institutions (preschools, primary schools, and vocational schools), local government administrations, and organised recreational groups. The farm seeks to establish partnerships with selected organisations within the Radom subregion, reflecting its commitment to environmental education and social integration. Key partners include local producers of regional products and tourism operators.

The farm's value proposition is to serve as a space where apples inspire innovations and enable visitors to immerse to discover, engage, and co-create an apple-powered bioeconomy in the region. It is also supplemented by an offer of healthy, natural products alongside recreational spaces, thereby merging education with practical experiences in the bioeconomy. Customer relationships are cultivated through active engagement based on social media, participation in local events, and loyalty programmes, supplemented by regular feedback collection. The farm employs various outreach channels, including partnerships, local events, social media, direct sales and e-commerce. Its offerings are specifically designed to target educational institutions, NGOs, organised groups of visitors (school groups, elderly people, companies' employees within CSR/teambuilding activities, etc.) and individual consumers interested in

¹ Which consist of dedicating part of the apple farm to organise thematic activities related to apples and bioeconomy.

healthy lifestyles and sustainable development.

Compared to competitors such as educational farms, Biocircular Apple Farm's holistic approach to foster bioeconomy distinguishes it by combining interdisciplinary approaches with practical experience, social and innovative technological solutions. By providing educational programs, environmental activities, and support for the local community, the farm has the potential to emerge as a leader in local initiatives related to sustainable agriculture and bioeconomy.

Biocircular Apple Farm aligns closely with the objectives outlined in the European Green Deal and the Common Agricultural Policy in terms of supporting family farming, investing in sustainable farming, and building a more sustainable and equitable food system, thus creating opportunities for establishing partnerships with public administration in education and ecotourism. Moreover, its alignment with the regional development strategies of the Mazovia province facilitates access to both European Union and national funding opportunities.

II. Apple Pomace Innovations - Functional products derived from apple pomace

Gospodarstwo Sadownicze MB is a recognised regional producer of export-quality apples and apple juices that are produced in a 24-hectare apple orchard managed according to integrated farming principles, ensuring a consistent supply of high-quality raw materials for producing apple and multi-fruit juices. Apple pomace, a byproduct generated during the juice extraction process, constitutes 20–25% of the weight of the processed raw materials. It is abundant in pectins, fibre, and polyphenols, rendering it a valuable resource for the food and cosmetics industries. Traditionally, pomace has been utilised as animal feed; however, due to its notable nutritional benefits, a new initiative has been developed to repurpose it as a raw material for the culinary and food processing sectors. This initiative includes the production of dried pomace, pomace powder, and vacuum-packed fresh pomace.

Owing to its established brand presence and reputation, the innovator maintains a robust position and a stable customer base within the HoReCa (Hotel-Restaurant-Cafe) sector, regional companies, and educational institutions, the primary target groups for the new product line. Pomace may be utilised to prepare functional beverages and fruit teas in their undried form. At the same time, the powdered variant can serve as an ingredient for baking bread, bars, muesli, and dairy products. Another promising customer segment comprises speciality retailers and wholesalers targeting health-conscious consumers, who can reach individuals seeking natural food products. Additionally, culinary innovators, including culinary schools and restaurants engaged in product experimentation, represent a significant audience facilitated by a strategic partnership with the Biocircular Apple Farm, a centre for innovation and co-creation of bioeconomy solutions.

This initiative Apple Pomace Innovations addresses the increasing demand for healthier dietary alternatives while upholding the principles of a circular economy. It focuses on reducing food waste and promoting sustainable practices. These efforts increase the value of byproducts and align with the growing trends among consumers and businesses toward more environmentally conscious and eco-friendly food production. This project responds to the escalating demand for innovative solutions within the bioeconomy sector by integrating eco-friendly production methods (including precision agriculture, Community Supported Agriculture (CSA), the incorporation of waste reduction measures, and the protection of natural pollinator habitats) with the utilisation of fruit waste.

The business model focuses on selling products to the HoReCa industry and institutions with canteens, specifically targeting entities with existing business relationships with the farm during the initial market launch phase. Retail sales are anticipated through speciality stores that provide organic and regional products. The farm intends to expand its operations by establishing additional partnerships and actively participating in trade fairs and festivals as alternative marketing channels.

The main operational expenses will include investments in equipment for drying, grinding, and vacuum-packing pomace, as well as logistics and marketing costs. In the initial phase, these expenses will be mitigated by leveraging the farm's existing customer base (kindergartens, schools, HoReCa sector customers).

This initiative aims to deliver innovative ecological products while fostering environmental awareness and sustainable development within the region, thus supporting the local bioeconomy. A key strategic partner for the company MB and its initiative Apple Pomace Innovations is the Apple Farm Association², which operates as an educational and testing centre and organises culinary workshops to develop new solutions

² See <https://www.facebook.com/profile.php?id=61569217891985> for additional information.

and recipes based on apple pomace. Furthermore, collaboration with a local culinary school³ will generate new recipes and diversify the product range.

³ See <http://zsz.przysucha.pl/index> for additional information.

Table of contents

1	Relevance of the selected innovations for the bioeconomy in Poland	9
2	Small-scale business models explored	10
2.1	Biocircular Apple Farm	10
2.1.1	General description and value proposition of the innovation	10
	Stakeholders involved in the ISP	12
2.1.2	Results of the market assessment and business model design process	13
2.1.3	Relevant considerations for the future	20
2.2	Apple Pomace Innovations – Functional products derived from apple pomace	20
2.2.1	General description and value proposition of the innovation	20
2.2.2	Stakeholders involved in the ISP	22
2.2.3	Results of the market assessment and business model design process	22
2.2.4	Relevant considerations for the future	28
3	Reflections on the SCALE-UP Innovation Support Programme	28

Figures

Figure 1 Old house for apple harvesters to be repurposed. Source: UNIMOS.....11

Figure 2 Apple Farm infrastructure to be used for experimentation activities. Source: UNIMOS.....12

Figure 3 Business Model Canvas for the Biocircular Apple Farm. Source: Own elaboration on the MAF+. 16

Figure 4 Landscape at the Biocircular Apple Farm. Source: UNIMOS. 20

Figure 5 Apple pomace generation 21

Figure 6 Business Model Canvas for Apple Pomace Innovations. Source: Own elaboration on the MAF+. 25

1 Relevance of the selected innovations for the bioeconomy in Poland

The rural areas within the Mazovian region, including Radom, encounter several substantial challenges, most notably the limited access to knowledge and modern technologies essential for developing a robust bioeconomy. Despite the region's significant agricultural potential, there is a notable absence of systemic support for implementing sustainable development solutions that could enhance production efficiency, mitigate environmental impact, and improve the quality of life for residents. Although there is an increasing awareness of environmental issues, rural areas frequently lack the requisite resources and expertise to adopt innovative solutions based on circular bioeconomy principles. Furthermore, structural changes exacerbate these challenges, such as migration to urban centres and decreasing employment levels in the agricultural sector. Effective collaboration among key sectors like agriculture and industry, and public administration, non-governmental organisations (NGOs), and research and development centres, remains underdeveloped.

There is a critical need for spaces that facilitate co-ideation, cross-sectoral collaboration and knowledge exchange, promoting the development of new business models grounded in sustainable practices, innovative technological solutions, and the strategic utilisation of local resources. While the Radom region boasts rich agricultural traditions, it continues to face difficulties activating local communities, particularly among older adults and younger generations relocating to urban areas. Initiatives designed to engage residents in activities related to the bioeconomy, environmental education, and sustainable development are pivotal in fostering community engagement through collaborative projects, community events, and educational programmes.

In this context, initiatives that generate new employment and entrepreneurship opportunities, particularly in bio-based environmental education, innovation, agricultural goods processing, tourism, and recreation, possess considerable potential and align with the Mazovia Regional Innovation Strategy for 2030⁴. Despite the growing interest in bioeconomy and eco-friendly solutions, a significant local environmental education gap remains. The lack of access to specialised training, workshops, and other educational resources regarding sustainable development and innovation restricts local communities from fully capitalising on available opportunities. Several studies and research performed within EU and regional funded projects (Digi&Circular Hub, Orkiestra 22, Orkiestra 23, Impacto) showcased that high levels of environmental illiteracy hinder active participation in critical issues such as environmental protection, efficient resource utilisation, byproduct management, and engagement in the circular economy.

The initiatives developed within the SCALE-UP project are designed to address the aforementioned key challenges in the region. The Biocircular Apple Farm integrates innovative approaches to sustainable bioeconomy with local social and economic needs, mainly focusing on education and cross-sectoral collaboration. The second initiative, Apple Pomace Innovations, concentrates on the efficient use of byproducts from juice production, specifically apple pomace, and aims to transform them into high-quality functional products. During the juice production, apple pomace constitutes approximately 20-25% of the raw material. While typically regarded as a byproduct, it is a source for valuable protein, pectin, vitamins, and minerals. Its predominant utilisation occurs within the feed industry; however, its rich nutritional profile and the rising consumer trend toward healthy foods and conscious consumption offer substantial potential for its application as a raw material in further food production.

Both initiatives are complementary and poised to serve as exemplary models for implementing innovative solutions within the bioeconomy using available resources and potential, adhering to circular economy principles, maximising resource utilisation, and minimising waste—critical factors in addressing escalating environmental challenges.

⁴ See <https://mazovia.pl/pl/bip/dokumenty-strategiczne/strategia-rozwoju-województwa-mazowieckiego-2030-innowacyjne-mazowsze.html> for additional information.

2 Small-scale business models explored

2.1 Biocircular Apple Farm

2.1.1 General description and value proposition of the innovation

Biocircular Apple Farm represents an initiative to foster educational, social, technological and environmental innovation. The innovator - Apple Farm Association ([FB](#)) is a non-governmental organisation (NGO) with headquarters in the village Wieniawa. It is anchored in the heart of European and Polish apple production, in Mazovia region and in an apple orchard estate with a nearly century-old heritage. The team of innovator has experience in managing the apple farm for three decades, effectively leveraging advancements in science and technology (for instance, high-tech apple sorting lines equipped with a strain gauge weighing system and an innovative vision system for classifying products according to various parameters, such as size, color and quality) while implementing innovative solutions that enhance productivity and support sustainable development.

As a central hub for business meetings and integration events among diverse stakeholder groups, the farm provides an exemplary environment for establishing a contemporary educational centre focused on bioeconomy and sustainability. The owners' extensive expertise, experience, and strategic partnerships cultivated over many years have informed this vision.

The innovative solution will initially function as a space coordinated by a non-profit organisation, gradually assessing the possibility to transition into a commercial entity. Capitalising on its resources, it will operate as a centre for education, entrepreneurship and innovation testing. Serving as a lighthouse project within the broader mission of the Association, the farm aims to disseminate knowledge, engage communities, and collaboratively develop innovative solutions to enhance circular economy practices in apple production.

The methodology of launching and running the Biocircular Apple Farm has been inspired by the Task Force experiences in implementing projects, programmes and initiatives developed at local, regional and international level. It integrates advanced peer-to-peer learning techniques with practical "*learning by doing*" approaches, thereby promoting the development of sustainable, bio-based value chains. The centre, equipped with thematic zones, multimedia training rooms, recreational areas, and extensive orchards, is designed for workshops, training sessions, and demonstrations centred on circular agricultural models, sustainable practices, and bioeconomy principles.

The initiative strongly emphasises community engagement. By collaborating with local governments, NGOs, and educational institutions, the farm offers tailored programs that address the needs of diverse social groups. Its inclusive framework fosters community cohesion while equipping stakeholders with the essential knowledge and tools to embrace bio-based solutions. Furthermore, by partnering with local producers, the farm promotes traditional agricultural methods and bolsters the regional economy.

The business model adopted is holistic, integrating elements of education, entrepreneurship, the slow-life/healthy living movement, and social integration to present a comprehensive value proposition for various target groups. The key pillars of this proposition encompass experiencing apple-based circular economy in form of education, slow-life recreation, and the integration of diverse social groups. The farm serves as a venue for active leisure, relaxation, and skill development through educational activities and workshops catering to various ages and social demographics.

A primary target audience comprises educational institutions ranging from preschools and primary schools to vocational schools specialising in agriculture and gastronomy. The farm offers engaging educational pathways for younger participants where children learn through direct, practical interaction with nature. Activities such as self-harvesting, cooking workshops, and eco-art sessions around the apple potential and its life cycle introduce concepts of sustainability, healthy living, and bioeconomy in an engaging and age-appropriate manner. Immersion-based activities, including orchard tours and seasonal events, provide memorable experiences that reinforce theoretical knowledge through enjoyable practice related to bioeconomy.

For older students and vocational schools, a dedicated farm would be transitioning in the future towards a lighthouse site where good practices are tested or in place and can be showed to inspire other practitioners and further analyze the possibility to become a living lab where apple-related and bioeconomy related experimentations happen in real-life conditions, operating with end-users. At the beginning, the apple farm would be growing organically, testing new solutions, facilitating the experimentation and refinement of

innovative practices in sustainable agriculture and the circular bioeconomy. The farm actively engages local communities, researchers, and industry professionals in addressing real-world challenges through a collaborative co-creation approach. Peer-to-peer learning forms a core component of the farm's methodology, fostering a platform for knowledge exchange and best practices among farmers, educators, NGOs, and other partners. Workshops, training sessions, and joint projects create a dynamic learning environment that benefits all stakeholders.

Operating in the spirit of bio-based sustainability and local collaboration, the farm is an ideal partner for local governments and non-governmental organisations that promote environmental and social initiatives. Its programmes⁵ support community building, circular bioeconomy awareness, and waste reduction. The farm also offers an inclusive environment for underserved or marginalised groups, providing tailored workshops and events catering to their needs and constraints. For instance, mentoring sessions, integration workshops, circular food events are some of the examples planned to be organised.

With its vast orchard and thoughtfully designed infrastructure, including pavilions, a fishpond, and recreational facilities, the farm offers a setting and an ideal venue for self-development activities, such as therapeutic sessions, art workshops, and yoga. By organising collaborative projects, the farm enhances civic engagement and exemplifies the region's commitment to sustainable practices.



Figure 1 Old house for apple harvesters to be repurposed. Source: UNIMOS.

⁵ See <https://www.agrobridges.eu> for more information.



Figure 2 Apple Farm infrastructure to be used for experimentation activities. Source: UNIMOS.

For institutional partners—including pop-up co-working workplaces, event companies, and administrative units—the farm's infrastructure and resources foster an environment conducive to engagement with sustainability and community-oriented initiatives.

Stakeholders involved in the ISP

Task Force: The MAF+ exercises and other support services for this innovation were carried out by the Task Force composed of a total of 8 persons, which included team members of the business idea owner Stowarzyszenie Jabłkowa Farma (Apple Farm Association) and the SCALE-UP regional partners: Unimos, and Business Upper Austria. Ecologic Institute supported and followed the overall process as task lead.



The Apple Farm Association is committed to advancing a comprehensive social, ecological, and educational mission that prioritises environmental protection, ecological advocacy, the preservation of natural heritage, and regional development. The organisation's primary activities encompass supporting the development of nature and culture trails related to bioeconomy, engaging and activating the local community, and assisting socially excluded individuals.

The association focuses heavily on education related to horticulture, ecology, and nature-based culture and promotes local products and organic food. It collaborates with governmental authorities, educational institutions, and social organisations to implement training, academic programs, and publishing initiatives. Furthermore, it is dedicated to nurturing national traditions, promoting intergenerational integration, and cultivating an inclusive environment for children, youth, adults, and seniors.

Team:

Ms. Monika Bankiewicz is the association's president. For 30 years, she and her husband successfully managed an orchard farm and a fruit juice pressing plant operating under the Smaczek z Doliny Radomki brand. In 2013, in recognition of her contributions to the agricultural sector, she was awarded the National Agroleague Champion title in the farmer category.⁶

Ms. Bankiewicz holds a degree from the Robert Schuman European University of Social and Technical Sciences in Radom, where she specialised in Public Health, Management, Dietetics and Catering. She exemplifies the qualities of an enterprising, communicative, and open-minded professional, actively engaging in various social and charitable initiatives.

Her commitment to personal development and brand promotion is evident through her participation in numerous events throughout the Radom region—such as the Business Gala 'Granite Tulip', Business Evenings 'Brand Elite - Meetings with Brand', and the 'Echo Dnia Radom' plebiscites—as well as in many events across Poland⁷. Ms. Bankiewicz has garnered a range of accolades, including the 'Granite Tulip'⁸, 'Leader of Vocation', 'Charismatic Woman', 'Entrepreneurial Woman', and 'Golden Ten of Women of Success in Mazovia', among others.

2.1.2 Results of the market assessment and business model design process

Market Overview

Per the objectives outlined in the European Green Deal and the Common Agricultural Policy (CAP), initiatives targeting sustainable agriculture and the bioeconomy receive considerable support from public administration at both national and local levels. This environment creates substantial opportunities for the Biocircular Apple Farm to forge enduring and stable partnerships, facilitating the implementation of educational programs and the promotion of ecotourism, thereby aligning with the strategic development goals of the Mazowieckie Voivodeship. The alignment of the Farm's mission with the regional strategy and objectives significantly enhances its prospects for securing financial support to fulfil its goals.

The project's economic foundation is predicated upon access to the European Union and national funding allocated for educational projects and the advancement of sustainable agricultural practices. As learned during the EU-project called agroBRIDGES, the rising interest in ecotourism within Poland, particularly in activities such as solution-testing laboratories and self-picking experiences, presents an opportunity to attract additional visitors and contribute to the local economy. While economic fluctuations—including inflation or recession—may influence consumer spending behaviours regarding these initiatives, the non-profit status of the Farm provides a mitigating factor through collaborative partnerships with governmental entities and NGOs.

⁶ See <https://echodnia.eu/radomskie/monika-i-tomasz-bankiewiczowie-spod-przysuchy-zostali-mistrzami-agroligi/ar/8038541> for further information,

⁷ See <https://echodnia.eu/radomskie/brand-elite-spotkania-z-marka-w-hotelu-rubin-w-starym-kielbowie-wiele-znanych-osob-z-radomia-i-regionu-gosciem-był-szymon/ar/c3-18899361> for further information.

⁸ See <https://www.radom24.pl/wiadomosci-radom/granitowe-tulipany-rozdane-11685> for further information.

The farm's conceptual framework is versatile and based on the increasing societal emphasis on sustainable, circular and health-conscious lifestyles and ecological sustainability, which is especially prevalent among younger generations. Consumers demonstrate a growing preference for slow-life experiences, elevating the attractiveness of open-air yoga sessions and culinary workshops. The Farm's dedication to community education and its collaborations with NGOs, educational institutions, and various social groups position it as an integral participant in local endeavours to enhance climate awareness and foster innovative solutions.

From a technological standpoint, innovative initiatives such as the Farm's digital knowledge library and co-creation spaces for closed-loop solution testing augment its appeal while establishing it as a leader in progressive educational methodologies. It is foreseen that the old house located in the middle of the farm will be repurposed to become a training and knowledge centre where visitors will have the opportunity to get access to different learning and awareness-raising materials on bioeconomy. The Farm showcases alignment with global trends promoting sustainable agricultural practices, biodiversity conservation, and circular economy principles. Its initiatives cater to environmentally aware consumers and serve as a model of best practices within the bioeconomy. While climate change introduces particular challenges, it simultaneously generates educational opportunities, such as illustrating strategies for managing climate-related agricultural variability. The Farm is well-positioned to promote initiatives focused on waste reduction, composting, and recycling, engaging the local community through workshops and educational programs.

From a legal perspective, as a non-profit organisation, the Farm must comply with Polish regulations concerning financial transparency, organisational governance, and partnerships with public and private entities. Furthermore, to conduct educational and recreational activities, the Farm must adhere to stringent safety and hygiene standards, including sanitary regulations and protocols for visitor safety.

The Biocircular Apple Farm presents a multifaceted proposition, making its potential clients diverse, including individual consumers, educational institutions, organisations, and businesses. To facilitate the launch of its services and sustainable growth without incurring excessive initial investment, the Farm intends to concentrate on business entities—such as organisations, institutions, and entrepreneurs—whose objectives are congruent with its mission.

The most promising market segment for potential collaboration comprises NGOs focused on ecology, environmental protection, social integration, tourism, and education. Official databases (including National Statistic Office-GUS) indicate that approximately 7,500 organisations are registered within the Mazowieckie Voivodeship. The Farm aims to establish partnerships with roughly 1% of these entities, particularly those located in the Radom subregion, that align with the Farm's strategic goals. By merging its educational mission with initiatives that promote ecological sustainability and social integration, the Biocircular Apple Farm stands to become a valuable strategic collaborator for these organisations, facilitating the design and execution of joint initiatives. The Farm's holistic offerings, encompassing diverse age and social demographics, integrate educational content, personal development, and the promotion of healthy lifestyles. The innovators' experience in collaboration with similar organisations and the Farm's established reputation provide a robust foundation for creating enduring business relationships.

Another market segment with substantial potential includes educational institutions, particularly kindergartens and primary schools, which often seek avenues to enhance their academic programs. The strong trends surrounding ecology and environmental conservation, combined with a relatively low expertise in these areas found in the region, render the Farm's offerings particularly appealing. Outdoor lessons that facilitate engagement with nature, paired with healthy apple-based products and tailored educational pathways and practical activities, effectively address the needs of these institutions. Nevertheless, financial constraints—minimal budgets for such programming—may pose challenges.

Vocational schools focused on training students in agriculture and gastronomy in the education sector present a potential customer demographic. While this group is relatively small, comprising approximately five entities within the subregion, the Farm's offerings of co-creating and testing innovative solutions, combined with its robust infrastructure, effectively address a specific market niche. This alignment could facilitate an appealing developmental direction for these educational programs. Additionally, organisations providing courses and training in gastronomy, ecology, and sustainable development stand to enhance this segment's value substantially.

Significant opportunities for collaboration are also evident within the local and regional administration sector. The objectives of these institutions, which arise from the Regional Strategy of Mazovia region and local needs, are closely aligned with the Farm's mission. The Innovators' substantial involvement in regional activities and participation in local governmental initiatives reinforce the Farm's status as a reliable and stable partner. Although collaboration may be constrained by formal requirements such as public procurement processes, the Farm's extensive experience, competencies, and offerings ensure its competitiveness in the marketplace. Identified opportunities also are present in open calls managed by the Regional Government annually and oriented on NGOs to implement activities related to agriculture, local development, rural animation and integration, among others.

Furthermore, another identified customer segment comprises organised recreational groups interested in outdoor activities. The farm's infrastructure provides diverse opportunities, including agricultural activities such as plant care and self-picking, culinary experiments, personal development sessions, and recreational activities such as yoga and painting workshops.

Upon analysing market potential in conjunction with the offerings of existing entities, it becomes evident that the Farm's propositions are already competitive. Its most substantial assets include well-established partnerships and a diversified range of offerings catering to various target groups. Opportunities for future development lie in enhancing infrastructure and educational-didactic offerings—crucial domains for establishing a competitive advantage in the long term. The Farm's geographical location is its primary competitive disadvantage, because of the geographical location and instable internet connectivity; however, this challenge may be mitigated through focused service offerings to organised groups.

When considering the Farm's established position and partnerships within the local market, Supplier Power may be deemed low in a Porter's Five Forces analysis, while Buyer Power is moderate. The distinctive nature of the Farm's offerings, particularly in the educational sector, is apparent; nevertheless, the constrained budgets of institutional clients, such as schools or NGOs, exert considerable pressure for competitive pricing. The threat posed by substitute solutions is high, as alternative entities such as recreational parks and educational farms (Zielonka Spirit Farm, Dobrowianka⁹) provide similar attractions, often with enhanced accessibility due to their locations. Nonetheless, the Farm's unique integration of bioeconomy education—a specialised niche in the region—with hands-on experiences and recreational opportunities differentiates its offerings.

Consequently, the threat from new market entrants can be classified as moderate; while entry barriers are low, challenges remain in forming partnerships and delivering specialised bioeconomy education. The competitive intensity within the industry varies from mild to high, encompassing traditional farms, Educational Farms, and urban educational institutions. The Farm's comprehensive offerings and flexibility in adapting to diverse needs and current market trends empower it to cultivate a competitive advantage rooted in user requirements and market dynamics.

⁹ See <https://www.dobronianka.pl> for more information.

Business model canvas

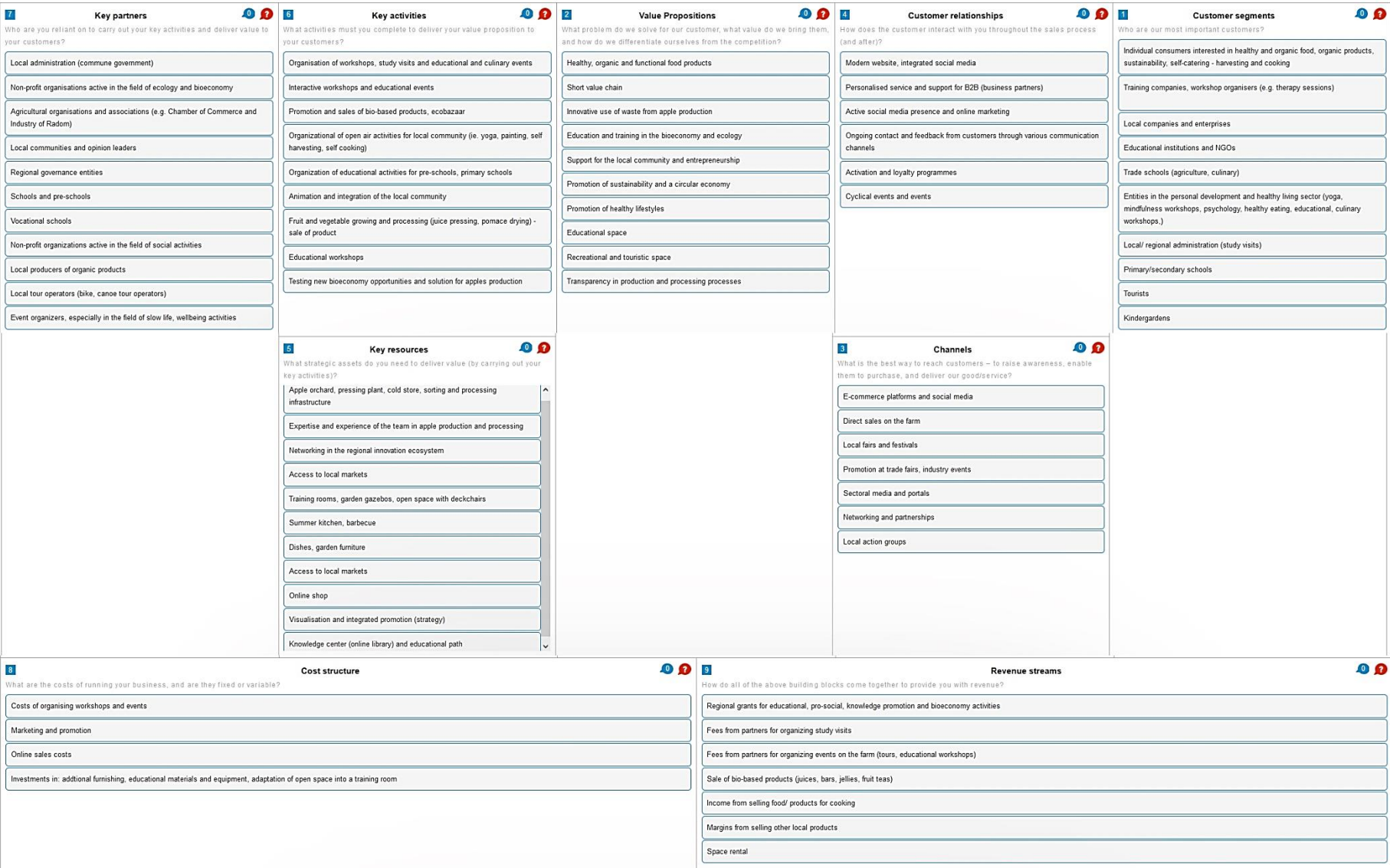


Figure 3 Business Model Canvas for the Biocircular Apple Farm. Source: Own elaboration on the MAF+.

Key partners

Establishing enduring and stable partnerships is the foundation of the farm's business model. Capitalising on established relationships and a robust regional presence, the innovators aspire to enhance collaboration, explicitly targeting local administrative entities, NGOs, and educational institutions.

The regional and local administrations are key partners for the farm. The Farm's operational concept aligns seamlessly with local governments' goals outlined in the Regional Innovation Strategy. These goals include augmenting innovative activities through knowledge transfer, fostering open innovation initiatives, and actively promoting pro-innovation attitudes among diverse social groups, notably school-aged children and youth. The Farm functions as a knowledge hub in the bioeconomy and a platform for developing and testing new solutions; it offers these entities valuable instruments to accomplish their objectives.

Equally significant are the relationships the Farm cultivates with educational institutions. These partnerships aim to facilitate environments for mutual learning, dynamic idea exchange, co-creation, and the scaling of innovative solutions.

Furthermore, the concept underscores the importance of establishing strong connections with local non-profit organisations, particularly those dedicated to ecology, tourism, and overall well-being. Social integration is a fundamental aspect of the Farm's mission, which endeavours to promote principles of sustainable development while enhancing the quality of life.

In addition, the Farm intends to collaborate with local tourism operators and event organisers, assuming that such partnerships will result in meaningful benefits, including increased recognition, improved competitive positioning, and the organic development of educational and recreational offerings adapted to the target audience's needs.

As part of its brand-building strategy, the Farm plans to engage with local organisations and associations, producers of regional products, and key opinion leaders and influencers.

Key activities

The Biocircular Apple Farm adopts a comprehensive approach that links education, community engagement, and sustainable practices. Its activities include interactive workshops, study visits, and circular culinary events promoting hands-on learning in areas such as bioeconomy and sustainable agriculture. Many of these events are designed for local communities, encouraging participation in outdoor activities like yoga, painting, pick-your-own harvesting, and self-cooking, which foster well-being and environmental awareness.

Educational programs tailored for preschools and primary schools are essential to the Farm's mission, as they instil knowledge about bioeconomy and environmental sustainability from an early age. The Farm also plays a vital role in fostering and integrating the local community by providing a space for social interactions and knowledge exchange.

In addition to educational activities, the Farm cultivates and processes fruits and vegetables, such as pressing juice and creating products from local raw materials, closing the loop in one single territorial area. Selling regional organic products in an eco-market format is sustainable and directly connects farmers and consumers.

Above all, the Farm serves as a testing ground for innovative bioeconomy solutions, designing and exploring new methods and practices to enhance ecological awareness, facilitate knowledge exchange among diverse stakeholders, and create scalable solutions within the circular economy. This holistic blend of activities establishes the Farm as a dynamic hub for education, sustainable agriculture, and community development.

Key resources

The resources of the Biocircular Apple Farm are essential for achieving its educational, social, and sustainable outcomes. At the centre of its operations is the apple orchard, which provides raw materials for producing various products and solutions alongside a fully equipped, modern juice-pressing facility.

The farm also includes training rooms, educational trails, a knowledge library, garden pavilions, and open spaces with lounge chairs. These areas enable visitors to participate in workshops, team-building events, and social gatherings. Additionally, a fishpond, summer kitchen, and barbecue area enhance the farm's role as a venue for community interaction, relaxation, and social integration.

The farm's physical resources are complemented by the expertise of its staff, which is crucial for organising events and workshops and designing and testing innovative solutions. The experience of the farm's owners and team contributes to the high quality and substance of its activities. Furthermore, the farm benefits from an extensive network within the regional innovation ecosystem, fostering collaboration with local partners, institutions, and experts to develop new bioeconomy solutions.

The farm's strong brand and established reputation in the local market, supported by an integrated promotional strategy, ensure consistent communication of its mission and activities.

A key success factor for the farm is its knowledge centre, which includes a digital knowledge library and an educational trail. These resources provide opportunities for learning and co-creation, reinforcing the farm's role as a hub for education and innovation in the bioeconomy.

These resources support the farm's mission to integrate sustainable practices with the community and advance bioeconomic solutions.

Value Proposition

The value proposition of the farm addresses the growing customer expectations related to tangible offerings in the field of circular economy and apple-based potential for a healthy lifestyle and social responsibility. The farm offers a welcoming and adaptable space for various social and age groups, providing access to healthy, natural food products while adhering to sustainability principles and a short supply chain. Transparent production processes, the opportunity to create dishes in the spirit of apple-driven circular economy from local products, and the valorisation of by-products from apple juice production respond to the challenges of living healthily and sustainably, which has become increasingly significant in recent years.

The core value of the farm lies in its educational and laboratory space, enabling the implementation of diverse educational and social projects. Practical experiments and knowledge exchange between different sectors (science, administration, business) serve as a foundation for development of new bioeconomic solutions.

Customer relationship

The Farm builds strong customer relationships through modern digital communication and in-person activities. The company maintains an active presence on social media, conducting promotional, educational, and sales activities to engage a broad audience. The Farm also offers activation and loyalty programs to its customers that will be regularly visiting the farm. Additionally, the innovator participates in local events, fairs, and festivals, which are crucial in connecting with the community. To continuously enhance the quality of its services, the company plans to implement regular feedback initiatives. These efforts ensure a dynamic and adaptable relationship with individual and business customers. In addition, SCALE-UP activities, such as the Student Competition, have been used to gather first-hand feedback on customers' needs and preferences, as well as to connect directly with potential visitors of the farm.

Channels

The primary outreach channels will include networking, established partnerships, and Local Action Groups like Razem dla Radomki¹⁰. The Farm's offerings will also be promoted at regional events, fairs, and festivals. Additionally, Farm plans to actively engage with customers through social media platforms such as Facebook and Instagram and media and industry portals.

Regional products, like Smaczek z Doliny Radomki¹¹, will be sold directly at the Farm, at events where the Farm is a partner, and through e-commerce channels like online marketplaces.

Customer segments

The Farm offers a holistic and sector-agnostic experience, targeting individuals and organisations, including business entities. Its primary audience includes organised groups with educational institutions, entities focused on academic and pro-social activities, and NGOs aligned with its mission.

Potential clients may include schools, kindergartens, vocational schools and training centres. These institutions host educational and developmental events (like therapy centres and social integration centres) and tourist agencies that organise trips to promote the region. These agencies can enhance their offerings by incorporating outdoor activities and the educational programs available at the Farm.

Local government units also represent a vital group of clients. The Farm can provide a venue for study visits, strategy sessions, and various educational and social activities. Additionally, the Farm offers space for workshops, outdoor sessions, and company team-building events. Individual tourists seeking inspirational weekend trips that combine relaxation with active pursuits are also welcomed.

Costs and revenue streams

The Bio Circular Farm is managed by the Apple Farm Association, a NGO dedicated to achieving its statutory goals rather than making a profit. These goals include educational activities in orchard farming, ecology, and natural heritage and fostering and activating the local community. With these priorities in mind, the innovators have decided that the farm will operate as a non-profit organisation during its initial phase.

Event fees (such as workshops and study visits) will be the primary source of income, supplemented by available grants for educational activities, social initiatives, and efforts to promote regional development and transition to sustainable practices. Additional funding sources may include selling materials for educational and culinary workshops, local products (including a margin on regional partner products), and revenue from renting the facility and infrastructure to organisations that host their events on-site.

On the cost side, a significant expense will be adapting the facility to ensure year-round usability and equip it for training, recreational, and laboratory purposes. The farm plans to partially fund these upgrades through grants allocated explicitly for this purpose within the funding offered by the Regional Government of Mazovia. They include financing for regional activation, local products, cultural activities, educational programmes, among others. Operational costs will primarily consist of organising events and marketing and promotion efforts.

As the farm expands, plans are underway to launch an online store for regional products. This will introduce additional expenses related to promotion and logistics.

Evolution of the Business Model Canvas of the Biocircular Apple Farm

The business model's original assumptions were based on a purely commercial approach, aiming to attract a broad audience, including individual customers such as tourists and recreational groups. However, an alternative model was developed considering factors related to the company's profitability and operational risks—such as distance from transport routes, seasonality, and the significant

¹⁰ See <https://razemdlaradomki.pl> for additional information.

¹¹ See https://www.facebook.com/smaczekzdolinyradomki/?locale=pl_PL for additional information.

investment needed to establish and promote the facility. This new model focuses on the organic growth of the offering, transitioning from a non-profit to a commercial model.

The target customer group list was refined, narrowing it down to entities and institutions that align with the Farm's mission, such as local administrations, educational institutions, foundations, and associations. These groups represent a stable and cohesive audience whose needs align with the Farm's offerings. Consequently, the value proposition was appropriately modified and adapted to meet these new target customers.

2.1.3 Relevant considerations for the future

In the near future, the farm's development activities will address the weaknesses identified in the SWOT analysis. These weaknesses include the seasonal nature of the facility, the underutilisation of the farm's potential (as group activities are currently sporadic and ad hoc, with no established programs that allow for quick scaling), and a strong dependence on local partnerships. During the winter, the team plans to adapt and equip the mezzanine and pavilion spaces to enable year-round activities, regardless of weather conditions.



Figure 4 Landscape at the Biocircular Apple Farm. Source: UNIMOS.

At the same time, the team aims to formalise established partnerships by signing letters of intent and collaboratively developing a permanent offering of educational and integrative activities. As part of the farm's operational concept, they also plan to engage additional stakeholders from the targeted interest groups. This strategy is designed to mitigate the threat posed by competitive entities with larger and more established operations while leveraging partners' networks to attract new clients.

The farm's strengths and competitive advantage lie in its unique combination of education, recreation, and social integration. The growing interest in bioeconomy and ecological practices presents new opportunities for the farm to conduct educational initiatives and awareness campaigns in the region, helping bridge knowledge gaps within local communities.

2.2 Apple Pomace Innovations – Functional products derived from apple pomace

2.2.1 General description and value proposition of the innovation

Apple pomace, a byproduct of juice pressing, constitutes 20–25% of the raw material's weight and has a high moisture content, which can be up to one-third of its volume. This high moisture and sugar content create an ideal environment for the growth of spoilage bacteria, posing a significant risk of

biological contamination when large quantities of pomace are stored for extended periods. Despite these challenges, apple pomace is a rich source of pectin, dietary fibre, polyphenols, and other valuable nutrients, making it a highly desirable raw material for the food and cosmetics industries.



Figure 5 Apple pomace generation

The ISP Task Force developed a concept to process the farm's pomace into dried apple powder for use in the food industry to address this issue. The plan includes two primary applications: vacuum-packed pomace for sale to businesses in the HORECA sector (such as those that purchase the farm's juices for dessert production), and dried pomace. The dried pomace can serve as a base for functional beverages and fruit teas in its unground form. When ground, it can be used to fortify flours for baking, as well as in products like crispbread, bars, cookies, muesli, desserts, dietary supplements, and dairy products (including yoghurts, cottage cheese, and processed cheeses).

The primary target group, or early adopters, will be the farm's existing clients and partners, including businesses in the HORECA sector and educational or business institutions with in-house cafeterias. The increasing demand for healthy, minimally processed, and natural products, alongside the growing trend of food waste reduction, makes these groups ideal consumers for the new offerings. The established collaboration with the farm reassures these clients about the high quality and consistency of sustainably produced raw materials. Additionally, trends in corporate social responsibility, particularly those that focus on circular economy principles and reducing food waste, can further motivate these entities to explore apple pomace-based products.

The second target group includes individual consumers and retail establishments (such as shops and wholesalers) that cater to health-conscious individuals or those with specific dietary needs. Though general awareness of the nutritional value of juice production by-products is low, health and nutrition enthusiasts—typical clients of such stores—are more informed and open to trying innovative plant-based products. This demographic is usually more environmentally conscious and values resource valorisation and waste reduction, making these products particularly appealing.

The third target group consists of culinary innovators, including culinary schools and organisers of courses and workshops focused on natural food, sustainable practices, healthy lifestyles, and restaurants experimenting with innovative solutions. The farm has strong ties with the Biocircular Apple Farm, located on the same premises, which serves as a hub for bioeconomy experiments, testing, co-creation of innovative solutions, and culinary classes. This partnership will facilitate the development of new applications for valorised pomace, the creation of new recipes, and the introduction of new pomace-based products (such as gummies and functional bars). For this audience, the quality and transparency of raw material production are crucial for ensuring top-quality final products. The farm is a reliable business partner with complete control over apple cultivation and juice pressing processes and a strong brand and established reputation.

2.2.2 Stakeholders involved in the ISP

Task Force: The MAF+ exercises and other support services for this innovation were carried out by the Task Force composed by a total of 7 persons, which included team members of the business idea owner and the SCALE-UP regional partners. Ecologic Institute supported and followed the overall process as task lead.

Business idea owner: Gospodarstwo Sadownicze MB



The MB Orchard Farm is located in Komorowo. Over the years, the farm has expanded its operations to include nursery production and juice pressing, among other activities. The farm spans 36 hectares, with approximately 24 hectares dedicated to fruiting apple trees. The remaining land consists of nurseries, woodlands, and areas designated for orchard reclamation.

The orchards are fertilised and protected according to the Integrated Production (IP) Program. The farm is certified in IP and GLOBALGAP and has an HACCP system. Additionally, it is part of the SKOWRONKI Producers' Group, which brings together fruit farms from the Grójec region and the Przysucha area.

The farm specialises in producing dessert apples, with 90% of the harvest sold for export. Furthermore, the farm operates its juice press, selling Smaczek z Doliny Radomki products. Only full-flavored dessert apple varieties are used in their juice production.

Team:

Ms. Monika Bankiewicz is the owner of the company with more than 30 years of experience in managing an orchard farm and more than 10 years a fruit juice pressing plant operating under the Smaczek z Doliny Radomki brand. In 2013, in recognition of her contributions to the agricultural sector, she was awarded the National Agroleague Champion title in the farmer category.

Ms. Bankiewicz holds a degree from the Robert Schuman European University of Social and Technical Sciences in Radom, where she specialises in Public Health, Management, Dietetics and Catering. She exemplifies the qualities of an enterprising, communicative, and open-minded professional, actively engaging in various social and charitable initiatives.

Her commitment to personal development and brand promotion is evident through her participation in numerous events throughout the Radom region—such as the Business Gala 'Granite Tulip', Business Evenings 'Brand Elite - Meetings with Brand', and the 'Echo Dnia Radom' plebiscites—as well as in many events across Poland. Ms. Bankiewicz has garnered a range of accolades, including the 'Granite Tulip', 'Leader of Vocation', 'Charismatic Woman', 'Entrepreneurial Woman', and 'Golden Ten of Women of Success in Mazovia', among others.

2.2.3 Results of the market assessment and business model design process

Market overview

The current primary application of apple pomace is its utilisation as animal feed, attributed to its substantial nutritional value. The proposed initiative seeks to repurpose apple pomace as an ingredient applicable in human food products, encompassing both unprocessed forms (such as bases for

desserts or fruit teas) and as raw materials for various food items (e.g., flour for baking or thickeners for soups and sauces).

Market segmentation has revealed three significant customer segments for these novel products: the HORECA sector (comprising Hotels, Restaurants, and Cafés), educational institutions (for incorporation in meals provided to students and academic activities related to biology, ecology, or home economics), and speciality health food stores.

The HORECA segment is identified as the most promising and critical target group, driven by robust trends towards health-conscious food and ingredients that address specific dietary requirements (such as low-calorie, gluten-free, or low-glycemic index options). The company possesses access to orchard and solid business relationships within this sector regarding the supply of fruits and juices, facilitating customer outreach and reducing acquisition and service costs at the inception of operations. Furthermore, this sector is characterised by high innovation and an eagerness to experiment, driven by a continuous demand to enhance and diversify offerings for end consumers. Essential factors for these businesses include corporate social responsibility initiatives, efforts to combat food waste, and promoting circular economy practices. Adopting apple pomace-based products as a by-product may be a cost-effective alternative to currently utilised ingredients. In the Mazovia region alone, the HORECA sector encompasses over 500 entities, indicating significant market potential at the regional level.

Additional target sectors encompass educational institutions as well as organisers of culinary training and courses. The innovator has a stable customer base within the education sector, primarily among preschools and early elementary schools, which receive supplies of fruits and juices. These institutions typically operate their kitchens, where access to high-quality, healthy products is essential. They can incorporate the new products as raw materials for meal preparation and into educational activities (for instance, utilising apple flour for baking cookies or pancakes). Furthermore, educational and training institutions possess the flexibility to integrate these products into workshops aimed at developing new recipes and applications. Strategic partnerships with the Biocircular Apple Farm, which organises pilot projects and experiments in bioeconomy and efficient by-product utilisation, will be crucial for effectively reaching this demographic. The number of such institutions in the Radom region is estimated to be approximately 40.

The final key sector the innovator targets includes speciality stores, health food stores, and herbal shops. These outlets' customers are generally environmentally conscious individuals prioritising waste valorisation within their value systems. They seek food products with high nutritional value, transparent and natural production processes, and functional properties (such as elevated fibre content and low glycemic index). These stores represent a natural market for apple pomace-based products, with an estimated 50 present in the region, according to own research of the Task Group.

From a political standpoint, the advancement of the innovator's activities may benefit from incentives and grants (Horizon EU Farm to Form, Soil Mission, CBE JU) related to the implementation of circular economy practices and valorisation of agricultural waste. Such programs could significantly aid the development of product offerings, mainly through funding dedicated to research and development. Public programs advocating for healthy eating and educational initiatives focused on nutrition (EIT Food, NUTRITECH program), may further stimulate demand for apple pomace-based products. However, it is essential to continuously monitor food safety policies and regulations at both national and EU levels, as they may pose challenges or restrict product development opportunities over time.

Economically, the Innovator faces two contrasting forces: the rising trend toward sustainable practices, waste valorisation, and the demand for healthy, natural food versus the considerable costs associated with implementing these solutions. Increasing and unpredictable energy costs, critical for drying and processing apple pomace, and high inflation could deter businesses from adopting these products.

Socially, the growing health awareness encourages consumers to select natural products abundant in fibre and nutrients. Interest in circularity is gaining momentum, leading consumers to support environmentally friendly brands that minimise waste. The increasing popularity of vegetarian, vegan, and functional diets presents new opportunities for apple pomace-based products to cater to these preferences. Educational institutions play a pivotal role in shaping ecological and health-conscious behaviours among children and young adults, thus preparing them for more informed consumer choices.

Technologically, the drying and processing of apple pomace require continuous innovation to improve efficiency and quality, which is vital for successfully integrating these products into the human food market.

Business model canvas – Apple Pomace Innovations

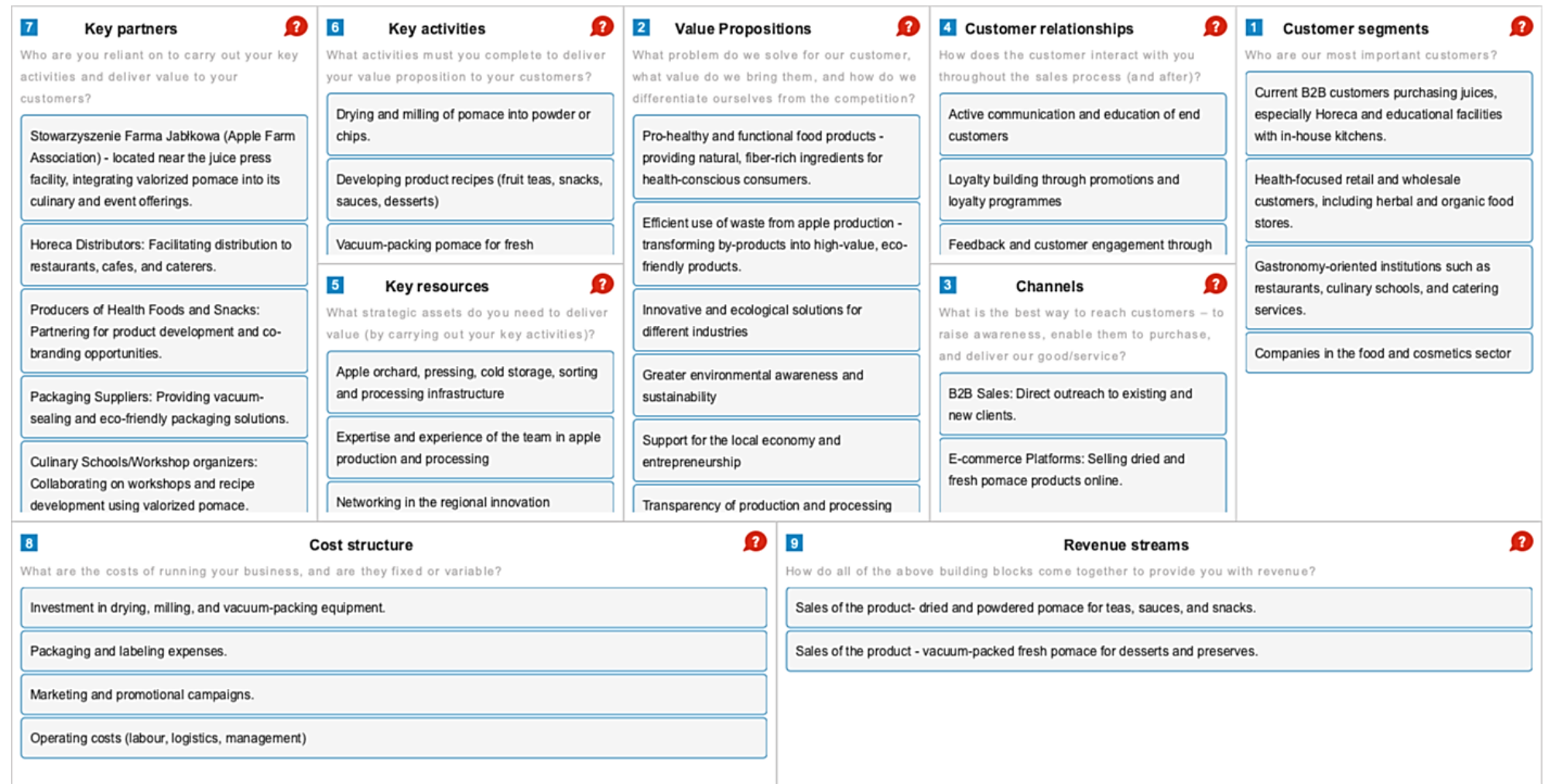


Figure 6 Business Model Canvas for Apple Pomace Innovations. Source: Own elaboration on the MAF+.

Key partners

The Apple Farm Association is a key strategic partner for the MB company. It is located in Wieniawa village and is an educational and testing centre for bioeconomy-related solutions. The association organises cooking workshops, outdoor lessons, and events focused on developing and testing innovative solutions. It will significantly contribute to designing and creating products based on apple pomace and formulating new recipes.

The innovator plans to collaborate with the Apple Farm association and a catering school in Radom to establish mutually beneficial partnership. This collaboration will enhance solutions development and testing in the laboratory and practical class settings. The primary intended recipients of the apple pomace-based products will be stakeholders in the HoReCa sector. Consequently, the company aims to cultivate partnerships with retail outlets and wholesalers that cater to this sector and with companies dedicated to sustainable food packaging solutions.

Furthermore, the company seeks to collaborate with local food producers to facilitate the creation and promotion of apple pomace-based products.

Key activities

Key activities will encompass the production of vacuum-packed pomace and milled and unmilled dry pomace, as well as their subsequent packaging and distribution. In the initial phase, sales are intended to focus on the existing customer base; however, as the business expands, efforts will also be directed toward acquiring new customers and implementing marketing strategies.

A significant aspect of the operations will also involve enhancing the product portfolio. This will entail developing new recipes, creating innovative products, and exploring alternative uses for the raw material.

Key resources

The company has access to fruit orchard spanning 24 hectares, where several varieties of apples are cultivated. From these apples, a high-quality apple juices are produced, as well as blends, mixing apples with other fruits and vegetables. By utilising modern orchard techniques and innovative solutions, the company has established a strong reputation and a recognisable brand.

The team's expertise, which includes decades of experience in orchard management and juice production, is a vital asset to the company. Thanks to the premium quality of its products, the company has received numerous awards and solidified its position in the region, maintaining a stable network of customers.

The company's customer base primarily consists of business clients, including those in the HORECA industry, institutions, and entrepreneurs, enabling easy access to the market. Additionally, as a local innovator eager to explore new solutions, the company has developed an extensive network of contacts within the regional innovation system. This network can be beneficial for creating new recipes and introducing new products to the market.

Value proposition

The objective is to introduce health-promoting and functional food products characterised by their natural composition and high-fibre content, effectively addressing the preferences of health-conscious consumers. Another advantage for those who value social responsibility is the efficient use of waste from apple production, whereby by-products are converted into high-value organic products.

This innovative approach aims to launch environmentally friendly products that are applicable across various industries. It fosters heightened environmental awareness and sustainability while supporting the local economy and encouraging entrepreneurship. The company seeks to cultivate customer trust through transparent production and processing methods while providing customisation options that enable clients to integrate apple pomace into their culinary recipes and events.

Furthermore, the products are assured to be fresh and durable; vacuum-packed pomace preserves the highest quality for immediate use, while dried products exhibit an extended shelf life.

Customers relationship

The company specialises in delivering their products to different types of customers and has developed well-established processes and standards. Considering that the launched products are niche offerings with limited market recognition outside the specialist sector, the Innovator intends to augment sales through targeted communication and educational initiatives. These will provide customers with comprehensive solutions and application recipes for their usage.

Furthermore, the Innovators anticipate implementing a system of incentives and promotions to facilitate the introduction of new products, for instance, sampling programmes, social media campaigns, loyalty programmes or discounts. They are also committed to fostering continuous product improvement by actively seeking and integrating customer feedback.

Channels

In the initial phase of operation, the primary channel for distribution and customer engagement will involve thoroughly exploring the existing B2B customer base. This base will be incrementally expanded to incorporate acquiring new clients within this sector.

Furthermore, the company will leverage its partnership with the Apple Farm Association to feature its products at events and workshops organised by Biocircular Apple Farm. These products will also be accessible through the company's electronic distribution channels as part of regional product sales and at external events such as fairs and festivals.

Additionally, products will be distributed through retail outlets specialising in organic and regional goods, like Dolina Rumianku.

Customers segments

The primary target audience for the new products comprises business customers, specifically those within the HORECA sector, as well as institutions collaborating with the Innovator that operate their canteens. Additionally, the products are designed for retail customers through direct sales and specialised shops and wholesalers, as well as groups and institutions seeking innovative solutions within the culinary domain, using the product as a raw material for their operations. Ultimately, the Innovators aim to identify opportunities for extensive product utilisation in the food and cosmetics industries, either through selling the raw material or engaging in collaborative product development.

Cost and revenue streams

Revenue will be generated by selling finished products, including dried pomace in the ground and unground forms and vacuum-packed undried pomace. These products will be positioned as foundational ingredients for desserts and preserves.

The successful implementation of this initiative will require investment in equipment for drying, grinding, and vacuum packing the pomace. Additionally, distribution will incur costs related to product packaging and labelling. As the business develops, resources must be allocated to marketing and logistics. In the initial phase, logistics expenses will be minimised by leveraging sales to the existing customer base, including those purchasing juices.

Furthermore, operational costs, such as electricity and employee salaries, will represent significant ongoing expenditures.

Changes in the Business Model Canvas

The innovation concept underwent a minor modification during the formulation of the business model. The initial proposal involved launching ready-made consumer products, such as jellybeans and functional bars. However, in light of significant market saturation with similar products, including those offered by established brands with extensive distribution networks, the Innovators opted to process on-site and market it as a raw material suitable for culinary applications.

The foundational concept of developing new functional products has been partially preserved as a supplementary activity within a partnership with the Biocircular Apple Farm. This collaboration encompasses ongoing workshops and experimental initiatives. The products and recipes generated through this partnership may be incorporated into the company's product portfolio, facilitating organic growth in alignment with market demands.

2.2.4 Relevant considerations for the future

The strengths of the innovator are rooted in its well-established brand, reputation within the juice pressing market, and stable network of clients and product buyers. For an extended period, the innovator has implemented sustainable and environmentally friendly production methods, which have cultivated customer trust in the business and the quality of its products. This solid foundation mitigates risks associated with the introduction of new product lines. Nevertheless, market saturation with similar products, despite the increasing demand for natural goods and heightened awareness of ecological and social responsibility, may present significant challenges to scaling operations and achieving profitability.

The business model employs a conservative approach, emphasising gradual growth while meticulously monitoring market needs and trends. Although the company benefits from low raw material costs, given that the materials are by-products of juice production, processing expenses—particularly those attributable to elevated electricity prices and stringent food safety regulations—pose considerable risks to profitability. Furthermore, consumer hesitance regarding products from materials typically classified as waste could impede proactive product development.

In the initial phase, the Innovators intend to pursue a cautious market entry strategy, eschewing significant investments in production and marketing efforts. Concurrently, in collaboration with the Biocircular Apple Farm, the innovators aim to actively investigate potential applications for apple pomace, both as a raw material for diverse industrial sectors and for creating new formulas and products within their operations.

3 Reflections on the SCALE-UP Innovation Support Programme

For Polish innovators who participated in the program, it was a valuable and constructive experience, enabling fundamental changes in the functioning of their enterprises in both cases. Collaboration with experts helped uncover untapped potential. The framework designed within the SCALE-UP project significantly contributed to enhancing the competencies of the innovators, equipping them with practical and valuable business knowledge, and helping them identify strong development potential for the coming years.

The dynamic development of new technologies, digitalisation, and challenges related to climate change and the transition towards a sustainable economy pose significant challenges for rural areas, particularly in the Mazovia Region. There is a notable disparity in development dynamics and access to knowledge between regional Mazovia and the capital. From the perspective of the Radom subregion, where one of the identified issues is relatively low access to professional development services, the Innovation Support Program in its developed form provided innovators with the opportunity to comprehensively develop solutions with the support of industry experts. This significantly enhanced their business value and minimised the risks associated with introducing new solutions to the market. While business modelling tools proposed in the MAF+ are commonplace in enterprise operations or consulting firms, they introduce new value to the agricultural sector.

A strong point of the programme was its structured and coherent form. Regular, cyclical meetings of working groups, knowledge transfer, and work on specific areas enabled the iterative development of solution concepts. The programme's implementation period initially clashed with the orchard work season, posing a challenge for systematic actions. However, by early autumn 2024, efforts in the programme were intensified and prioritised appropriately. From a project implementation perspective, language issues also proved challenging, which could be mitigated in future programmes by adapting supporting tools for multilingual use. This did not negatively impact the project's execution but was an operational inconvenience that was resolved at the Task Force level (tasks were carried out offline, translated into English, and then entered into the system). The ability to download individual exercises was also a very convenient aspect for physical workshops with innovators (some were conducted online, while others were held in a traditional format).

From a substantive perspective, a groundbreaking outcome of the SCALE-UP Project for the innovators was the revaluation of apple pomace, not as waste but as a resource that could become a raw material for other industrial sectors. For the innovators, it also provided an additional source of revenue and a practical, forward-thinking solution for managing pomace within the circular economy framework.

For the Apple Farm Association, participation in the project was a milestone in the entity's development. For several years, the Association had intended to structure activities related to educational and integrative events at the farm and give them a business framework. Through an organised approach to assessing their potential and limitations, the Association was able to plan and implement specific actions to mitigate the risks of excessive investments and misalignment of offerings with the needs and capabilities of their audience. Collaboration with universities will create a synergistic effect, allowing scientists to test their theoretical knowledge in practice, thus enhancing the quality of their teaching. At the same time, their support for the association will provide a deeper understanding of many aspects of the bioeconomy, increasing the attractiveness of the offerings.

For the MB company, the project's outcome is the introduction of a completely new product line that utilises what was previously considered waste but is now viewed as a by-product. This approach will reduce economic as well as social and environmental costs. The managed by-product will become an additional source of revenue and significantly minimise waste produced on the farm, supporting actions related to sustainable development and climate change mitigation.

Both solutions have strong development potential in the coming years, both in business and, importantly, in the educational sector. They will contribute to the growth of knowledge and solutions in the bioeconomy, the realisation of innovative projects, and bridging competency gaps in rural areas.



SCALE^{UP}
community-driven
bioeconomy development

SCALE-UP Innovation Support Programme | Synthesis Report for the French Atlantic Arc Region

February 2025

Sylvie GUILLO, Sophie RABEAU, Nina BAILET



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EXECUTIVE SUMMARY

This report explains the support carried out by AC3A and its network of stakeholders involved in the task forces in the frame of SCALE-UP's innovation support programme (ISP), for two selected innovators in the bio-based building value chain: COPANO and Atelier du Biosourcé.

The French Atlantic Arc region gathers four administrative regions (Normandy, Pays de la Loire, Brittany, New Aquitaine). The bioeconomy value chain in focus is the bio-based building sector, and more specifically bio-based materials derived from hemp, straw, flax and miscanthus. The activities carried out with the stakeholders of this value chain since the launch of the project have allowed to identify several needs to foster its development. Among these needs, the development of new bio-based solutions from agricultural biomass and the training of craftsmen to use bio-based materials for buildings are important.

Following an EOI launched in spring 2023, two innovators have been selected out of 6 candidates to benefit from the ISP: COPANO and Atelier du Biosourcé. COPANO uses straw to produce sustainable bio-based insulating panels that are easy for craftsmen to install. The "Atelier du Biosourcé" is a collective project led by an architect to develop a physical space to share material and knowledge among craftsmen to encourage them to use bio-based materials.

Both have been selected for their very interesting potential for the bio-based building industry and to help respond to the above-mentioned needs to boost the bio-based materials industry.

As part of the SCALE-UP project, AC3A and the task forces members have been supporting the two innovators in their development for 18 months. This support was extremely educational: for the project leaders themselves, but also for the collective dynamic that this has created among the task force members. Through a concrete example, it enabled the various stakeholders in the value chain (from farmers to craftsmen) to cooperate on the subject of bio-based construction.

Table of contents

1	Relevance of the selected innovations for the bioeconomy in AC3A	7
2	Small-scale business models explored	7
2.1	COPANO	7
2.1.1	General description and value proposition of the innovation	7
2.1.2	Stakeholders involved in the ISP	9
2.1.3	Results of the market assessment and business model design process	10
2.1.4	Relevant considerations for the future.....	14
2.2	L'Atelier du Biosourcé / La Fabrik du BTP	15
2.2.1	General description and value proposition of the innovation	15
2.2.2	Stakeholders involved in the ISP	16
2.2.3	Results of the market assessment and business model design process	17
2.2.4	Relevant considerations for the future.....	19
3	Reflections on the SCALE-UP Innovation Support Programme	20
3.1	Barrier Analysis during ISP Implementation.....	20
3.2	ISP Conclusions and Bioeconomy Applications.....	20
3.3	Innovators and ISP Future Directions	21
	References	Error! Bookmark not defined.

Figures

Figure 1 External thermal isolation.....	7
Figure 2 Installation of straw panels as building insulation.....	7
Figure 3 Example of dimensions of existing straw panels used in construction	8
Figure 4 Example of COPANO's straw panels	8
Figure 5 Copy of value proposition from the MAF+ exercise.....	9
Figure 6 Schematic of the solutions offered through the Atelier du Biosourcé and the relevant target groups and values	15

1 Relevance of the selected innovations for the bioeconomy in AC3A

The two selected innovations meet some of the needs identified by the multi-actor platform to boost the bio-based building value chain:

COPANO's solution is a technological improvement. The company uses straw to develop insulation panels that are sustainable not only because they replace fossil-based materials with agricultural coproducts, but also because the company has made sustainability a principle for its development. COPANO is committed to working in short chains, using straw available locally without competing with other uses. The project leader wants to keep his business small-scale and support the development of similar initiatives elsewhere in France by sharing his expertise. The straw panels are sewn without using glue and can be custom-made to the dimensions requested by the craftsmen. Therefore, COPANO's innovation has a great potential to increase the use of bio-based insulation in renovation and new buildings as it is ready to use.

Atelier du Biosourcé is an organisational innovation. The project's aim is to help raise awareness and train users of products such as the one developed by COPANO. This solution has a great potential to develop the use of bio-based materials as it would be a place to share knowledge and equipment, dedicated to craftsmen.

2 Small-scale business models explored

2.1 COPANO

2.1.1 General description and value proposition of the innovation

COPANO specialises in the manufacture of straw insulation panels for construction and renovation. The company is committed to long-term environmental protection. It promotes the values of respect and social responsibility as part of a sustainable development approach.

Straw is currently used as isolate material in construction in the form of 36 cm and 22 cm wide bales. It could be combined with soil as a plaster or wood. This increases its applicability, particularly for thermal renovation of buildings, which is a major energy-saving issue.

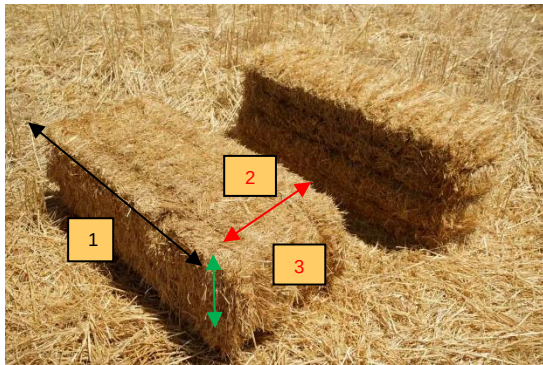


Figure 2 Installation of straw panels as building insulation



Fig. 4 : Isolation thermique extérieure
Source : Livret vert
« La construction en paille »

Figure 1 External thermal isolation



1. Length: 120 cm
2. Width: 37 cm
3. Thickness: 47 cm

Figure 3 Example of dimensions of existing straw panels used in construction



Figure 4 Example of COPANO's straw panels

The COPANO straw panel is an innovation in terms of both form and use. COPANO's panel has dimensions that are easier to handle: the base offering is 120cm wide and 11.5cm thick, and made-to-measure sizes are also possible.

It offers a number of advantages: it is easy to lay, easy to transport and easy to handle. The panel is also adaptable in terms of size: it can be cut to fit small areas. It is also environmentally friendly throughout its life cycle: use of locally produced straw, biogenic carbon storage (7 to 8 kgCO₂/m²), thermal performance ($R = 2.74 \text{ m}^2\text{K/W}$ in 11 cm - $\lambda = 0.042$), summer comfort (density > 110kg/m³), acoustic performance and is totally biodegradable - source: COPANO).

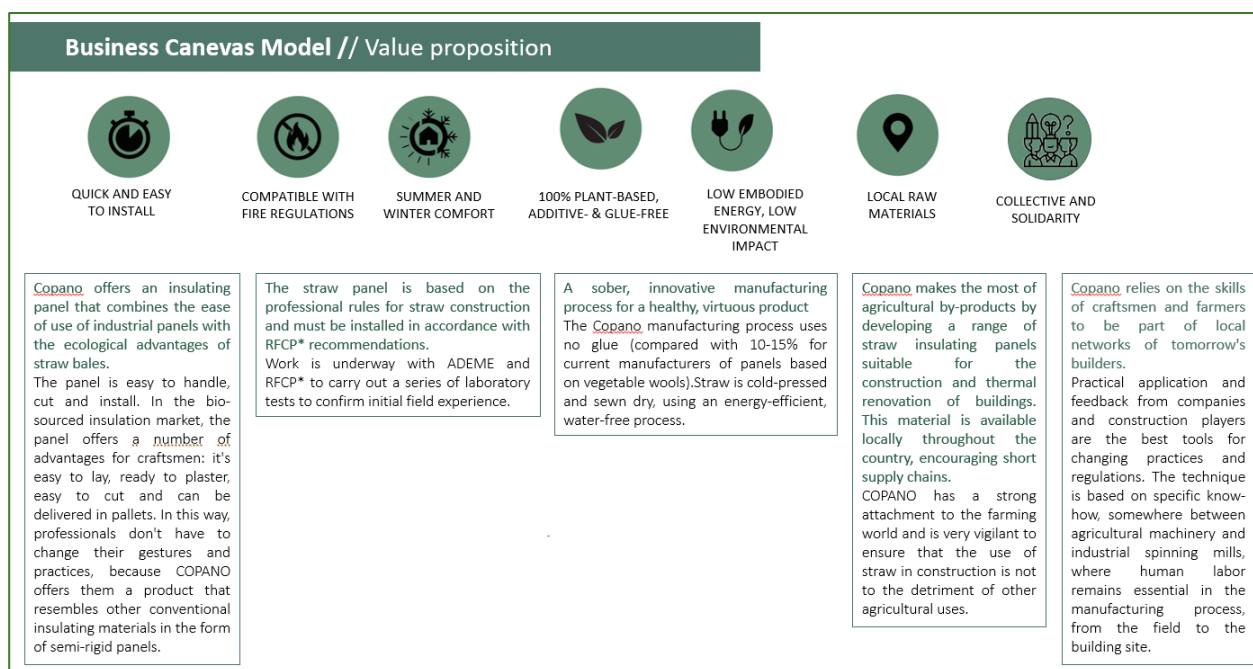


Figure 5 Copy of value proposition from the MAF+ exercise

2.1.2 Stakeholders involved in the ISP

Task force: The MAF+ exercises and other support services for this innovation were carried out by the task force composed by a total of 10 persons, which included team members of the business idea owner COPANO and the SCALE-UP regional partners AC3A, as well as the chamber of agriculture.

The named members of the task force, who support COPANO in its development, are as follows:

- Oriane Pichod, government-qualified architect & public works engineer, and partner of COPANO
- Raphaël Decle, architect and founder of COPANO
- Virginie Baudrit, General Secretary of the Pays de la Loire CAPEB. The CAPEB is a regional union for the building trades. It has in-depth knowledge of the construction market, and particularly of construction by small, local craft firms.
- Alain Lacours, President of the CAPEB des Pays de la Loire and himself a joiner and carpenter.
- Céline Bohers from Collectif Paille Armoricaïn: this is an association of farmers and craftsmen whose aim is to develop the use of straw in construction. It is active in Brittany and Pays de la Loire regions.
- Christelle Burel is an agronomy and organic farming adviser at the Chamber of Agriculture of Brittany. She is helping farmers to set up an industry to develop straw for construction.
- Amélie Giger, founder of Gi-Nov, a company specialising in consultancy and project management. She is responsible for outsourced innovation and services for innovation and R&D projects.
- Elissa Giraudet, Ecoconstruction Project Manager at the Erdre et Gèvres local authority.
- Sylvie Guillo, Circular Economy Officer for the Pays de la Loire Regional Chamber of Agriculture
- Nina Bilet, European project manager, in charge of SCALE-UP at AC3A

Ecologic Institute supported and followed the overall process as task lead.

Business idea owner:

COPANO specialises in the manufacture of straw insulation panels for construction and renovation. It was set up in 2022, and is managed by its founder Raphaël Décle. It does not currently employ any salaried staff directly. Instead, volunteer or self-employed friends help him to make straw panels.

Raphaël is also supported by Oriane Pichod in drawing up the company's business plan and in developing the business, particularly in terms of sales.



Team:

Raphaël Décle¹ is an architect with a degree from National School of Architecture (ENSAG) in Grenoble. He worked for several years in carpentry and has extensive experience in eco-construction using earth and straw. He set up his company in 2022 to facilitate the use of bio-based materials in construction.

Oriane Pichod is a government-qualified architect & public works engineer. She is the founder of Territoire d'âmes, a small consultancy specialising in urban planning, with a particular focus on the role of man in urban development. Oriane is the only employee.

2.1.3 Results of the market assessment and business model design process

Market overview

In France, a number of recent regulatory developments are encouraging the use of agricultural biomass for industrial purposes: the National Low Carbon Strategy, the Energy Transition Law for Green Growth and the National Recovery Plan.² More specifically, the construction sector, which is the 2nd most carbon-intensive sector, is governed by environmental regulations for buildings, known as RE2020³ and stemming from the ELAN law (Evolution du Logement, de l'Aménagement et du Numérique of November 2018)⁴. The RE2020 plan has set 3 objectives: energy saving, reducing the carbon impact of buildings (aiming for neutrality by 2050) and thermal comfort during the summer period.

This regulatory framework is encouraging eco-construction projects using bio-sourced materials, particularly for insulation. In addition, at a more local level, some local authorities are contributing to the development of the bio-based construction sector by choosing, as contracting authorities, to procure bio-based materials for their building projects.

COPANO's market can be defined as: *the market for insulation materials for construction and renovation*, and the company is currently focused on gaining a strong position in the French market⁵. The company's main activity is the construction of insulation panels using straw. The team has also carried out tests using hemp and reed, but these have not yet produced satisfactory results.

Straw construction concerns all types of buildings: from single-family homes to multi-storey buildings, including industrial and commercial buildings. There are currently around 6,000 straw-built buildings in France, with 500 new constructions every year, representing a steady increase of 8% in the number of buildings (source: RFCP – French Network of Straw Construction). The French straw construction industry is the most dynamic in Europe.

¹ https://www.linkedin.com/posts/rapha%C3%ABl-d%C3%A8cle-3a2b36215_voil%C3%A0-un-nouveau-chantier-exp%C3%A9rimental-r%C3%A9alis%C3%A9-activity-7291420611413721088-VuK4?utm_source=share&utm_medium=member_desktop&rcm=ACoAADiTHPMBDsFyhwyDs7yIRM44oFOxPLDDk-0

² <https://www.ecologie.gouv.fr/strategie-nationale-bas-carbone-snbc>

³ <https://www.ecologie.gouv.fr/reglementation-environnementale-re2020>

⁴ <https://www.ecologie.gouv.fr/loi-portant-evolution-du-logement-lamenagement-et-du-numerique-elan>

⁵ <https://www.copano.fr/solutions-constructives>

COPANO has chosen to keep the scope of its sales strategy close to its factory (i.e. Loire-Atlantique and neighbouring departments) to limit the costs and CO₂ emissions associated with transport. The aim is also to source production inputs locally. The expansion model will then be based on setting up COPANO factories in other regions in France.

In the Pays de la Loire region, where COPANO wants to expand initially, 83 out of 27,300 buildings are currently constructed using straw, a very small number. Thus, given the mentioned regulatory push and the resulting demand, the potential for growth is significant. A study on biomass availability in the French Atlantic Arc region (composed of Normandy, Pays de la Loire, Brittany and New Aquitaine) carried out by Sylvie Guillo and Jean-Luc Lafargue and published in 2024⁶, explores biomass produced in these regions and compares it to the market evolution. This report assesses the biomass available according to several market growth assumptions, as well as the opportunity of development for the farmers. This study on the availability of biomass showed that the market for bio-based building materials is growing steadily: +10%⁷, and some actors even think that it will grow by 25% very quickly per year.

Business model canvas

As part of the work carried out during SCALE-UP, the task force has examined and elaborated upon the different aspects of COPANO's business plan using a Business Model Canvas. The main results of the work are shown below.

Customer segments and distribution channels

COPANO has identified 4 target groups to gain a strong position in the local construction market in the next 3 years:

- **Building craftsmen**, a priority and strategic target in terms of the widespread use of straw in the building industry and feedback on products and installation practices.
- **Local individuals building their own homes**, the target group that got COPANO off the ground. 5% of homes in France are built by the owners themselves⁸. There are no regional figures
- **Public or private contracting authorities** committed to developing the use of bio-based materials in construction (social landlords, municipalities, local authorities, foundations, etc.) to gain access to collective housing and facilities projects. In particular, COPANO is aiming to set up a demonstration site that would serve as a showcase for other customers.
- **Distributors** specialising in and committed to bio-based products, to move up the scale of distribution while meeting COPANO's values.

In terms of customer acquisition, craftsmen and private individuals are the priority for COPANO. At present, these groups are in direct contact with COPANO (word of mouth/quotation requests via the website). In the longer term, these two target groups will be reached via a special materials retailer to ramp up the scale of distribution. COPANO is currently negotiating terms of sales with 'Biosfaire', a specialised (online) store offering ecological building materials to businesses and individual customers⁹.

⁶ This study is available on the website: <https://ac3a.fr/explorer-le-potentiel-de-la-bioeconomie-en-europe/> (in French). The full report in English is available on SCALE-UP website: https://www.scaleup-bioeconomy.eu/Publications/SCALE-UP_D2.1_Biomass_Ecological_Nutrients_-rev-1-.pdf

⁷ *Panorama des marchés « fibres végétales techniques matériaux (hors bois) en France »* - Memento 2020 – réalisé par FRD & IAR - financé par l'ADEME et France AgriMer :

<https://france-miscanthus.org/wp-content/uploads/2020/03/Memento-March%C3%A9s-fibres-v%C3%A9g%C3%A9tales-techniques-mat%C3%A9riaux-2020-va.pdf>

⁸ Les tendances actuelles en autoconstruction en France

⁹ Visit <https://www.biosfaire.fr/> for further information.

Key resources

Human resources:

COPANO is currently working with the Chamber of Commerce and Industry in Loire to get support in building up a consolidated team to scale-up production, carry on with R&D activities, and manage the company.

- Production: recruitment and training of the team of operators
- R&D: prototyping and further development of the machine: experts, engineers and electromechanics are being involved with the support of the ICAM engineering school in Nantes¹⁰.
- Company development and consolidation: financial management, partner management, property management, legal affairs, intellectual property protection, strategic support, etc.

Facilities: la Fabrique 44

- Actually, COPANO works with one machine in a temporary location, where they tested the machine and products. In the short term, COPANO needs to establish itself in another, more permanent location. A 1,000m² building is needed: installation of 2 machines to pool and reduce operating costs and set up a mechanical workshop and storage facilities for raw materials and panels at the end of the production line.
- As part of the process of expansion, COPANO will need to find locations close to farmers to remain virtuous and close to supplies and markets.

Raw materials

- Secure supplies of straw in close collaboration with farmers' networks who can store the raw material in their own premises as COPANO currently does not have room for storage.
- Develop partnerships with farmers to produce straw that meets COPANO's needs (long straw, no stones, no grain, not very dense round-baller, harvested with a harvester without a rotor to reduce tube breakage, 110 €/tonne including transport costs).

Finances

- Seeking funding for R&D and for scaling up in terms of industrial development (prototyping stage): subsidies, grants and debt capital as a priority and, as a last resort, investors, provided that they are in line with COPANO's values (ethical, social economy or circular economy)
- Consolidation of the Fabrique 44 to the optimum size and at equilibrium: financing of the building, building and site development work and spatial planning to locate COPANO in the agricultural zone of the inter-communal local urban development plan, as close as possible to the resource.

Key activities

COPANO's business is the production and sale of insulating straw panels that meet market, environmental and regulatory requirements in terms of quantity and quality. Setting up the Fabrique 44 and consolidating its business model is the first step in creating a regional network for local production of these panels.

The research and development of the product and process in its sector requires a commitment to several activities in parallel:

Improving the process

To make the process viable, we need to continue improving the initial machine to move towards a more efficient, safer and more ergonomic production tool. A turnkey tool that can be replicated while maintaining COPANO's quality and values. The aim is also to improve productivity and reduce production costs so as to sell straw panels -at the very least- at the same price as equivalent

¹⁰ Visit <https://en.icam.fr/?campus=icam-nantes> for further information.

materials such as wood wool. The ultimate aim is to achieve a selling price that is accessible to as many people as possible.

Adapting the product to builders' needs

To best respond to the various demands and needs of the construction sector, it is necessary to explore the product's potential to meet different constraints from the design stage right through to the building site.

Marketing, training and awareness raising

Low-energy and local construction solutions are diverse and often complementary. To raise awareness and provide training in new techniques for the renovation and construction of the future, COPANO is working with existing eco-construction networks.

Making straw panels the rule

Helping to mainstream the use of straw in construction by working on the standards, insurance and regulatory framework for straw in conjunction with the RFCP, the National Network for Straw Construction in France¹¹. Introduce straw panels into professional regulations.

Cost structure

COPANO has identified and quantified its costs, with the main categories being:

Investment costs:

- Purchase and fitting of facilities: manufacturing workshop, storage and prototyping workshop.
- First industrial scale prototype of the machine
- Purchase of a second machine

Operating costs:

- staff costs and manager's remuneration, purchase of raw materials (straw, thread), overheads (electricity, insurance, loan repayments, cost of experts to maintain the machines, cost of premises, purchase of consumables for the workshop, etc.).
- The production cost has been established. COPANO does not wish to provide the figures.

Marketing and communication costs:

- accounting, banking and office automation costs
- R&D investment: external service provider to characterise and register the product within the regulatory and standards framework.

Funding and revenue structure

In collaboration with the task force, COPANO has also identified the following sources of income:

For the launch of the company:

Public grant (winner of the Regional Council's call for circular economy projects in 2023: €150,000) + honorary loan (ILAN: Initiative Loire Atlantique Nord¹²), recoverable advance (BPI) (Banque Publique d'Investissement / Public Investment Bank)¹³

To run the business:

- panel sales
- training, awareness-raising services (paid services)

¹¹ Visit <https://www.rfcp.fr/> for additional information.

¹² <https://www.initiative Loire atlantique nord.fr/prets-0.html>

¹³ <https://www.bpifrance.fr/>

- Equipment licencing (to be further explored as part of the expansion strategy) The question is whether to maintain the know-how as open source -which is the motto of the RFCP- or licensed.

2.1.4 Relevant considerations for the future

COPANO was reassured on several points during the support provided by the task force:

- straw supply: the study of available biomass reassured COPANO that straw was available on a wider scale than the community of municipalities, but rather in neighbouring departments
- protection of the COPANO factory and machine by a patent. The decision was made to register at least one e-Soleau envelope with INPI (national institute of industrial property). This makes it possible to establish proof of the existence of a creation on a given date¹⁴.

COPANO needs to work on its production costs, which are still too high.

COPANO will also be involved in training courses to raise awareness of straw construction among craftsmen, organised by the CAPEB¹⁵ (French professional union bringing together a large number of small building craft businesses in France) in partnership with the CPA¹⁶ (national network for straw construction). This will raise its profile among potential future customers.

The task force has enabled COPANO to establish contacts for launching demonstration projects. COPANO must follow up these contacts.

The next meeting of the task force, scheduled for February 28, 2025, will be the last in this form and within the framework of the SCALE-UP project. COPANO will continue to collaborate with certain members, in particular those from the building sector such as the CPA and CAPEB.

¹⁴ Unlike patent registration, this does not give the applicant any intellectual property rights over the content registered, but it does enable him to obtain a definite date for its creation, and thus to assert this anteriority in the event of litigation. More information here : <https://www.inpi.fr/services-et-prestations/e-soleau>

¹⁵ Confédération de l'Artisanat et des Petites Entreprises du Bâtiment - <https://www.capeb.fr/pays-de-la-loire>

¹⁶ Collectif Paille Armoricaïn - <https://armorique.constructionpaille.fr/>

2.2 L'Atelier du Biosourcé / La Fabrik du BTP

2.2.1 General description and value proposition of the innovation

Initially, the second innovation considered in the project was “L'Atelier du Biosourcé”. L'Atelier du Biosourcé is a concept that fits into the dynamics of the bioeconomy and aims to promote the production and use of bio-based materials for construction. This innovative solution is an organisational innovation. It aims to create a physical space which will facilitate the access of biobased material, equipment, training and knowledge exchange for craftsmen. The objective of this workshop is to raise awareness among stakeholders in the construction sector, encourage their adoption of bio-based materials and create an ecosystem conducive to their development.

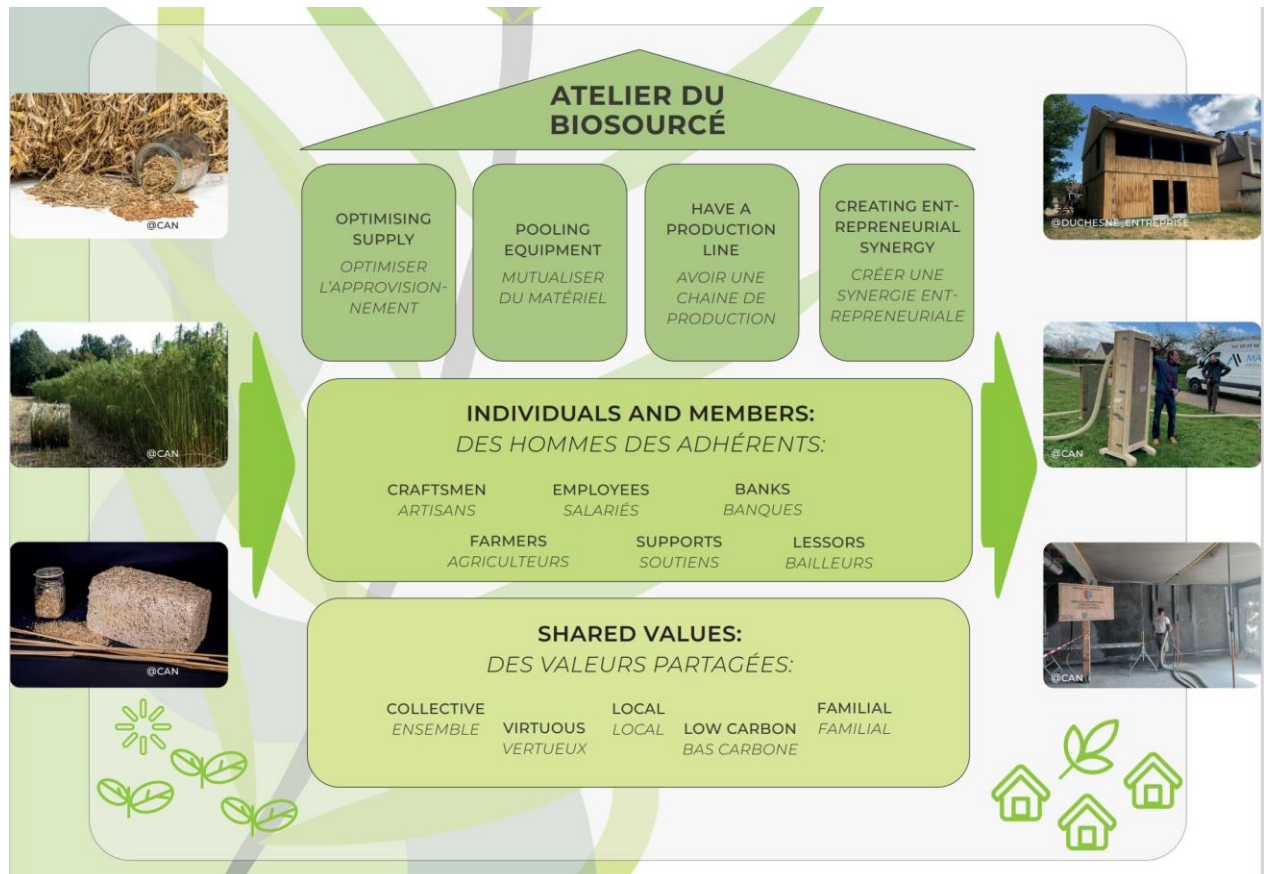


Figure 6 Schematic of the solutions offered through the Atelier du Biosourcé and the relevant target groups and values

The Atelier du Biosourcé offers diverse solutions:

- group purchase
- rental of expensive materials/tools/equipment
- storage places
- training
- exchanges with experts

In June 2024, Harold Duchesne who leads the project “Atelier du Biosourcé” and is the co-manager of Entreprise Duchesne met with another entrepreneur, Gregory Roch from the Atelier G. Roch Architecte. It turns out that Grégory has a very similar project as the “Atelier du Biosourcé”, named “La Fabrik du BTP”. Gregory also recently won an EoI supported by ADRESS NORMANDIE to implement his project. Therefore, it was decided to merge the two projects in one, to be more effective, and Gregory would become the lead organisation instead of Harold Duchesne. Harold Duchesne would still be a member of the Task Force.

Indeed, La Fabrik du BTP (“Bois Terre Paille”, French for wood, earth, and straw) aims to create a collective facility to promote and develop the use of biobased materials in the construction and renovation of buildings by bringing together different players in Normandy (building and civil engineering contractors, the agricultural sector, regional development players, etc.) around shared values and a common dynamic.

It will take the form of a service cooperative specialising in bio-based materials, pooling skills and material resources to make them available to craftsmen in the building industry wishing to adopt low-carbon practices and develop their expertise.

The cooperative will also build on local agricultural supply and processing chains to ensure the supply of high-quality bio- and geo-sourced materials.

The aim is the same as “l’Atelier du Biosourcé”: to facilitate the transition from field to building through cooperation. As such, a merging of the two solutions presented a reasonable option to take advantage of the networks and skills of each, and to avoid a duplication of innovations.

2.2.2 Stakeholders involved in the ISP

Task force: The MAF+ exercises and other support services for this innovation were carried out by the task force composed by a total of 11 persons, which included team members of the business idea owner Harold Duchesne (Entreprise Duchesne) and Gregory Roch (Atelier G. Roch Architecte) and the SCALE-UP regional partners Sophie Rabeau Epszstein (AC3A) as well as:

- Vincent Doussinault et Antoine Pujervie de FIBOIS Normandie,
- Carole Leman et Laure Chaigneau de l’ARPE Normandie,
- Céline Vincent du Village by CA de Caen,
- Stéphane Lagrève du PNR des Boucles de la seine
- Amélie Giger de GI- NOV
- Sandy Louapre de l’ADRESSE Normandie

Ecologic Institute supported and followed the overall process as task lead.

Business idea owner

Enterprise Duchesne is a family business specializing in wood construction, created in 1959. The company Duchesne supports in the design, manufacture and implementation of wood construction in Rouen, France. The company Duchesne has a team of qualified technicians and carpenters as well as experts in the conduction of construction works. Committed to considering sustainable development through eco-construction, they all carry out wood construction work near Rouen by offering environmentally friendly materials at a competitive price.

Atelier G. Roch Architecte is a dynamic company of architectural professionals who specialize in the rehabilitation of buildings. Their team works together to provide innovative and sustainable solutions for their customers. This architect’s firm is sensitive to the use of bio-based materials, such as wood, straw and earth, in construction.

Team:

Since 2014, Harold Duchesne has been working for the family-owned company Duchesne. He took over the co-management of the company in 2018. Before, he graduated from the Nancy School of Architecture (ENSA Nancy). He also completed a Masters degree in wood architecture and sustainable construction at the Epinal l’EINSTIB wood school. Then he took a training at the Ceppic de Mont Saint Aignan, at the school of managers, gaining the licence as a “business manager and developer of SMEs.”

Gregory Roch is an architect at Atelier G. Roch Architecte. He graduated from Ecole d’architecture de Paris-Val-de-Seine.

2.2.3 Results of the market assessment and business model design process

Market overview

In the context of the ecological transition, the use of bio-based materials in construction presents major economic and environmental opportunities. These materials, which are derived from renewable resources (wood, hemp, flax, straw, etc.), offer sustainable alternatives to traditional high-carbon materials.

As mentioned in the COPANO project section, France has favourable regulation for the building sector. RE2020 imposes strict standards in terms of energy performance and reduction of greenhouse gas emissions and promotes the use of bio-based materials. The demand is growing. The awareness of sustainable construction among building owners, companies and individuals is increasing. The resources are available locally. Normandy has a high potential in bio-based resources (hemp, flax, wood).

In Normandy, under the impetus of the Normandy Region, ARPE Normandie, URCOFOR Normandie and Fibois Normandie have set up the Wood and Biobased Pact. Its aim is to increase the use of wood in construction in Normandy. The aim of the Pacte Bois et Biosourcés is to commit all public and private developers and builders to using wood and/or biobased materials in their structures, by choosing to reach a target of 30% of French biobased materials on the total floor area of new or renovated buildings, over a period of 4 years. 29 players in the sector, from local authorities to social landlords, have signed up and committed to this dynamic.

In this context, the market for bio-sourced building materials is set to grow. Today, less than 1% of all buildings are biobased; but with adequate resources available, this figure is set to rise.

Business model canvas

The project's progress may seem slight. But before presenting the business plan, it's important to remember that the project has hit several dead ends. First of all, the project started from a TRL 0. It was at this stage an idea on a sheet of paper with a desire to advance the use of biobased materials by building professionals. Then, the project leader decided to spin off the IELO company in Normandy. IELO is a producer of chopped straw for blowing into walls to insulate them. As the spin-off model was not compatible and the investment too important (€4 million), the two ambitions were separated. The Normandy Chamber of Agriculture is still looking for a solution alongside the workshop to set up a spin-off from the IELO project.

As part of the work carried out during SCALE-UP, the task force has examined and elaborated upon the different aspects of L'Atelier du Biosourcé's business plan using a Business Model Canvas. The main results of the work are shown below.

Customer segments and distribution channels

L'Atelier du biosourcé has identified three target groups to find a position in the local construction ecosystem:

- **Building craftsmen**, a priority and strategic target as they should take part of the development of the project. But "l'Atelier du Biosourcé" will also consider the other actors of the building sector. They are also building blocks of the success of this organisational innovation.
- **Institutions like local authorities and public institutions**, in two ways. Firstly, they could be a market for the developed products and the craftsmen who have decided to be part of the project. But also, they could provide funding to get the next step of the project.
- **Local individuals building their own homes**, the target group that will come to "l'Atelier du Biosourcé" for craftsmen and hire them for their project.

The priority is to create the starting core group with motivated craftsmen. The craftsmen will be chosen as they have the same values: collective, local, low carbon, family. Then, it will be possible to add any person who wants to be part of the project such as banks, lenders, etc.

Value Proposition:

The main objective of “l’Atelier du Biosourcé” is to develop the use of biobased material in the building sector. They want to help reluctant craftsmen to get started and remove the obstacles to this process. To do that, they want to offer:

- Awareness and training on the use of bio-based materials: to become more competent in the use of biobased material
- Networking and collaboration opportunities: to exchange of any encountered problems
- Access to resources and concrete examples of eco-construction: to facilitate the sourcing and to show what can be done with such materials.

Key resources

L’atelier will provide to its participants:

- Expertise of stakeholders who can give advice to the novices
- Materials and equipment for demonstrations to facilitate the realisation of construction projects
- Local partner networks to facilitate the access of bigger bid solicitations and public tenders

They will get funds through:

- Membership fees from craftsmen and anyone using “l’Atelier du Biosourcé” facilities
- Workshop/training registration fees
- Government grants
- Sponsorship by partner companies
- Participation of the member of the payment of new facilities. Indeed, each member will have a vote for the choice of new facilities and will have to pay a part of the bill. This will give them some utilisation time of the facilities.

Key Activities

In “l’Atelier du Biosourcé”, the following activities should be offered/realised:

- Production of prefabricated wall
- Facilities rental
- Organization of workshops and practical sessions.
- Creation of educational content.
- Coordination with local stakeholders.

And in the future, l’Atelier du Biosourcé can imagine developing research projects on biobased material in building sector.

Human resources:

“L’Atelier du Biosourcé” is now developed by Grégory Roch since the two projects were merged. But it will be necessary to plan the hiring of new employees to manage the key points of this organization such as the planning of equipment loans, training in the use of the equipment made available or the production of prefabricated walls.

Facilities

L’Atelier du Biosourcé will have to decide which are the most important facilities with their future members. However, it can be expected that the following equipment will be necessary:

- A manufacturing workshop to create prefabricated wall with raw material like straw, hemp or flax. In this room the craftsmen will be able to find raw materials as well as advice.
- A device for handling prefabricated walls to facilitate the installation of prefabricated walls on construction sites

Cost structure

L'Atelier du Biosourcé has begun to identify the main categories:

- **Investment costs** (rental of rooms, equipment):
 - Purchase and fitting of facilities: manufacturing workshop, storage and prototyping workshop.
 - First industrial scale prototype of the machine
 - Purchase of a second machine
- **Operating Costs:** staff costs and manager's remuneration, purchase of raw materials (straw, wood, hemp, flax...), overheads (electricity, insurance, loan repayments, cost of experts to maintain the machines, cost of premises, purchase of consumables for the workshop, etc.).
- **Marketing and communication costs**
 - Accounting, banking and office automation costs
 - Promotion of the organisation

2.2.4 Relevant considerations for the future

L'Atelier du Biosourcé is based on an organizational innovation. Everything which it will develop already exists. However, the association of craftsmen in a cooperation with making available the necessary resources. It is very hard to develop an organisational innovation. L'Atelier du Biosourcé/Fabrik du BTP is still at the first phase which is motivating people to join, and it will need time for the project to become more concrete. Gregory Roch knows all the following steps for the merging of the innovations and the next steps of the project overall.

3 Reflections on the SCALE-UP Innovation Support Programme

3.1 Barrier Analysis during ISP Implementation

For COPANO, the 1st challenge of the innovation support program was to set up the team that would participate in the task force - this participation being on a voluntary basis. The choice of team member profiles was also crucial to providing the right support to the project leader.

Some of the people approached did not agree to take part, either because of a lack of time, or because their time was not financed.

So we had to call on a lot of people. Some people joined at the very end of the project (Elissa Giraudet from the CCEG¹⁷). In fact, COPANO is also supported by the local authority in which it is located, and we realized a little late that it was relevant for her to be part of the working group.

Another constraint was the progress made by the project leader in relation to the task force: the schedules of the project leader and the task force were not always in phase, and some meetings had to be postponed. It's always complex to support without doing. It's up to the project owner to set the pace according to his own progress - including in these reflections.

Within the framework of the "l'Atelier du Biosourcé" project, the main barriers we encountered were as follows:

- Finding available dates for all task force members. Indeed, at each meeting, one or two members were always missing. Even if they were absent from the meetings, they always received the minutes. And we took their comments into account, even after the fact.
- Agreeing on the meaning of words. When filling in the MAF+, we often had questions about semantics. It's not easy to get people from different backgrounds to talk to each other, who may sometimes have different understandings of the same term.
- Developing organizational innovation. We discovered how difficult it is to implement an organizational innovation. Barriers to change, and to innovation on the part of the people who have to implement it, can emerge.

3.2 ISP Conclusions and Bioeconomy Applications

The support provided enabled COPANO to move forward in its thinking, but also in the evolution of its market. The MAF+ tool helped to organize COPANO's thinking and support, even if not all items were addressed and some elements remained confidential. It would have been useful to have had the tool at the start of the support process. COPANO identified the challenges it faced in developing its factory successfully. They were able to define the company's values and where they wanted to go in terms of development.

The support to COPANO also enabled the company to make itself known and expand its network - in particular through contacts with the CAPEB, which represents construction craftsmen in the Pays de la Loire region. COPANO's innovation has enabled the development of a local straw panel production chain in connection with local farmers. This insulating solution fully meets the challenges of the bioeconomy and sustainable development.

"L'Atelier du Biosourcé" is based on the idea of a place that gives everyone easy access to all the biobased materials available. The task force came up with several ideas for its implementation, including the deployment of a chopped-straw unit. In the latter case, it turned out that the director of IELO didn't have the same vision of the spin-off. And this vision was aborted. The workshop therefore turned to a model of a shared facility. Without the SCALE-UP project, all these exchanges and developments would not have been possible. It was the collective that made it possible. Even if there's still a long way to go.

¹⁷ CCEG – local authority (Communauté de Communes d'Erdre & Gesvres) - <https://www.cceg.fr/>

3.3 Innovators and ISP Future Directions

COPANO has planned 3 exploitation actions in the short-term

- Improving the production process
- Secure supplies in connection with farmers' networks
- Develop new factories

The main objective is to develop manufacturing and sales on local and national markets through spin-offs. At the same time, they intend to improve their technological process in order to reduce production costs.

At the time of writing of this report, Grégory Roch, the project leader for the merged innovation of the Atelier and Fabrik, is asking the craftsmen about their needs and preferences regarding the project. He has two models in mind to ensure the financial viability of the initiative: 1) generating income from the rental of material, or 2) setting up a cooperative model comparable to the agricultural "CUMA" for artisans. He is waiting for the respondents' feedback to consolidate its business plan.



SCALE^{UP}

community-driven
bioeconomy development

SCALE-UP Innovation Support Programme | Synthesis Report for Strumica region

March 2025

Emilija Mihajloska, Pavlina Zdraveva



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EXECUTIVE SUMMARY

The SCALE-UP Innovation Support Programme (ISP) for the Strumica region has explored and supported innovative bio-based solutions aimed at fostering sustainability and economic growth in the local agricultural sector. This synthesis report highlights two key innovations developed through the ISP: the Mulching Machine for Fine Grinding Residues and Bio-Based Value-Added Grape Products. These initiatives address pressing environmental and economic challenges by promoting circular bioeconomy principles.

The Mulching Machine, developed by Horti Eko, offers a sustainable alternative to traditional agricultural residue management by converting plant waste into nutrient-rich bio-fertilizers. This innovation reduces environmental pollution, enhances soil fertility, and mitigates flooding risks caused by improper residue disposal. By promoting this solution, the ISP has facilitated business model development and market entry strategies, identifying local farmers and communal enterprises as primary beneficiaries. Challenges such as limited awareness and financial constraints remain, necessitating further educational and funding initiatives to ensure wider adoption. Additionally, the solution aligns with EU sustainability goals, supporting the transition to more eco-friendly agricultural practices and contributing to regional climate adaptation efforts. Future considerations include increasing stakeholder engagement and improving accessibility to financing options to accelerate adoption.

The Bio-Based Value-Added Grape Products initiative, led by the Bojane Agricultural Cooperative, focuses on diversifying grape-derived products such as juice concentrates, grape seed oil, and flavored vinegars. By implementing advanced processing techniques, this initiative not only reduces agricultural waste but also creates higher-value products catering to the growing demand for sustainable, health-conscious goods. Key advantages include economic diversification, job creation, and alignment with circular economy principles. Market analysis suggests strong potential for expansion, with agricultural businesses, local retailers, and environmentally conscious consumers as key target segments. The cooperative's innovation also serves as a model for replication in other regions, demonstrating how agricultural by-products can be leveraged to create sustainable economic opportunities. Future priorities involve strengthening supply chain efficiency, securing strategic partnerships, and exploring additional product lines to enhance market competitiveness.

Throughout the ISP, significant barriers were encountered, including limited financial support expectations, scheduling conflicts, and technical challenges with the MAF+ platform. Adaptive strategies, such as offline exercises and stakeholder engagement, helped overcome these hurdles, demonstrating the program's flexibility and commitment to capacity-building. The insights gained from these challenges underscore the importance of early-stage financial planning and structured mentorship programs to support innovators more effectively. Furthermore, continuous engagement with policymakers and investors is crucial for ensuring sustained momentum beyond the ISP timeline.

Key takeaways from the ISP emphasize the importance of education, policy advocacy, and technological integration to foster sustainable innovations. Moving forward, the innovators aim to secure additional funding, expand market reach, and strengthen collaborations with local and international partners. The ISP's structured approach has provided a foundation for long-term growth, positioning these bio-based solutions as viable models for replication in other regions. By leveraging synergies between innovations and stakeholders, the program has contributed to enhancing Strumica's bioeconomy landscape, paving the way for a more sustainable and resilient agricultural sector. Additionally, lessons learned from this program highlight the need for future initiatives to incorporate dedicated financial instruments, knowledge-sharing platforms, and enhanced training opportunities for innovators to maximise impact.

Table of contents

1	Relevance of the selected innovations for the bioeconomy in Strumica region	7
2	Small-scale business models explored	9
2.1	Mulching Machine for Fine Grinding Residues	9
2.1.1	General description and value proposition of the innovation	9
2.1.2	Stakeholders involved in the ISP	9
2.1.3	Results of the market assessment and business model design process	10
2.1.4	Relevant considerations for the future.....	19
2.2	Bio-Based Value-Added Grape Products.....	20
2.2.1	General description and value proposition of the innovation.....	20
2.2.2	Stakeholders involved in the ISP	20
2.2.3	Results of the market assessment and business model design process	21
2.2.4	Relevant considerations for the future.....	33
3	Reflections on the SCALE-UP Innovation Support Programme	34
3.1	Barrier Analysis during ISP Implementation	34
3.2	ISP Conclusions and Bioeconomy Applications	34
3.3	Innovators and ISP Future Directions	35
	References	Error! Bookmark not defined.

Figures

Figure 1 Horti Eko's logo	10
Figure 2. PESTEL analysis for mulching machine.....	12
Figure 3. Horti Eko market segmentation – part 1	14
Figure 4. Horti Eko market segmentation – part 2	15
Figure 5. Horti Eko market segmentation – part 3	16
Figure 6. Horti Eko Business model canvas	18
Figure 7. Agriculture cooperative Bojane's logo	21
Figure 8. PESTEL analysis of the bio-based value-added grape products.....	24
Figure 9. Agro-cooperative Bojane market segmentation – part 1	25
Figure 10. Agro-cooperative Bojane market segmentation – part 2	26
Figure 11. Agro-cooperative Bojane market segmentation – part 3.....	27
Figure 12. Agro-cooperative Bojane market segmentation – part 4.....	28
Figure 13. Agro-cooperative Bojane market segmentation – part 5.....	29
Figure 14. Agro-cooperative Bojane market segmentation – part 6.....	30
Figure 15. Agro-cooperative Bojane business model canvas	33

Abbreviations

BMC	Business Model Canvas
CTA	Corporación Tecnológica de Andalucía
ISP	Innovation Support Programme
LEAP	Local Environment Action Plan
MAF+	Market Analysis Framework
NGO	Non-Governmental Organisation
PESTEL	Political, Economic, Social, Technological, Environmental, Legal conditions

1 Relevance of the selected innovations for the bioeconomy in Strumica region

The first selected innovation “Mulching Machine for Fine Grinding Residues from Viticulture, Gardening, and Fruit Growing” by Horti Eko, aligns closely with the current situation and dynamics in the Strumica region, a predominantly agricultural area. The region faces challenges with the improper disposal of agricultural residues, which are often burned or dumped in illegal landfills, causing environmental pollution, increasing greenhouse gas emissions, and contributing to water contamination and flooding.

This solution directly addresses these issues by proposing the use of mulching technology to fractionate agricultural residues into fine particles that can be reintegrated into the soil as bio-fertilisers. This bio-based approach is not only low-cost but also highly beneficial to the region's agricultural and environmental health. Key advantages include:

- A significant reduction in environmental pollution from burning and illegal dumping of plant material.
- Enrichment of soil with nutrient-rich bio-fertiliser, reducing dependency on artificial fertilisers and improving soil health.
- Mitigation of flooding risks by preventing residue deposition in rivers and water bodies.
- Preservation of beneficial soil microflora, supporting sustainable agricultural practices.

The adoption of this innovation has the potential to transform the region's approach to agricultural waste management, aligning it with modern, sustainable practices. By valorising available biomass, the solution supports the circular economy and strengthens the bio-based value chain in Strumica. Additionally, it could significantly reduce costs for local farmers by providing access to affordable, locally sourced compost while also contributing to the region's environmental sustainability goals.

The developers of this innovation play a crucial role in its successful implementation. With their expertise, established regional connections, and commitment to advancing sustainable practices, they are well-positioned to drive its adoption. However, due to limited awareness of this technology among local farmers, significant efforts in education and market penetration are required. This highlights the importance of the Innovation Support Programme (ISP) in developing a robust business model to ensure the solution's scalability and integration into the local agricultural ecosystem.

Overall, the mulching machine has the potential to not only address critical environmental and agricultural challenges in Strumica but also enhance the region's innovation profile and contribute to sustainable economic development by creating new opportunities in the bio-based value chain.

The second innovative initiative, Bio-Based Value-Added Grape Products, introduced by the Bojane Agricultural Cooperative, presents a transformative opportunity for the Skopje region and beyond. This solution not only aligns with the sustainability goals of the region but also offers a replication potential for areas like Strumica, where grape production is highly concentrated. By addressing diversification and waste management challenges, the initiative exemplifies how regional synergies can enhance mutual benefits and foster a circular economy.

At its core, the initiative focuses on transforming grape harvests into a variety of bio-based products, including grape juice concentrates, raisins, cold-pressed grape seed oil, and flavoured vinegars. Utilising advanced processing techniques such as drying and cold pressing, these products retain the health benefits and unique characteristics of locally cultivated grapes. This innovation underscores a commitment to quality and sustainability, enhancing the cooperative's reputation as a leader in innovative agricultural practices.

Key contributions of the initiative include:

- Valorisation of biomass: By utilizing agricultural residues and harvests to produce high-value products, the initiative supports the circular bioeconomy and reduces waste. This model complements the mulching machine solution discussed earlier, which could process similar waste types, demonstrating the potential for integrated applications across regions.

- **Economic diversification:** By introducing value-added products, the cooperative enables year-round income streams and reduces dependency on fresh grape sales. The initiative offers higher profit margins by capitalising on the growing demand for natural and health-oriented products.
- **Employment opportunities:** The processing and production of bio-based products requires skilled labour, generating new jobs in Skopje and potentially in replication areas like Strumica. This contributes to regional economic development and workforce empowerment.
- **Innovation profile:** The adoption of state-of-the-art processing methods and sustainable practices enhances the cooperative's innovation profile. It positions the region as a hub for pioneering bio-based solutions, attracting attention and investment from broader markets.
- **Community and environmental benefits:** By promoting sustainable practices and reducing reliance on artificial additives, the initiative supports environmental preservation and public health. The cooperative's role extends beyond agriculture, fostering a sense of community and shared progress.

The strategic alignment of this initiative with regional dynamics and resources underscores its potential as a model for replication and expansion. Synergies with other solutions, like the mulching machine, highlight opportunities for mutual reinforcement, further enhancing the region's capacity to address environmental and economic challenges collaboratively.

2 Small-scale business models explored

2.1 Mulching Machine for Fine Grinding Residues

2.1.1 General description and value proposition of the innovation

The innovative mulching solution offers a transformative approach to agricultural and waste management practices. Designed for versatility and efficiency, the mulcher attaches to a tractor and shreds agricultural residues into fine particles, which are afterwards incorporated into the soil. This process not only enriches soil composition and fertility but also helps regulate soil temperature, retain moisture, and prevent erosion. These features collectively improve crop yields while reducing reliance on artificial fertilisers, promoting sustainable farming practices.

The key benefits of the solution include reduced physical fatigue for farmers, significant time savings, and the elimination of harmful practices such as residue burning, which reduces smoke pollution. The ease of attachment and user-friendly operation make the machine accessible to farmers and communal enterprises alike, enhancing its practicality and effectiveness under diverse weather conditions.

For **farmers**, the mulcher addresses critical needs, including improving soil quality and reducing the use of synthetic fertilisers, resulting in better market prices for crops. It also enables farmers to complete tasks in just two hours instead of days, meeting their demand for economic and time efficiency. However, challenges such as the high cost of the equipment and limited availability for renting must be addressed to maximise adoption.

For **communal enterprises**, the solution offers a pathway to streamline waste management by minimising unregulated dump sites and landfill waste. It improves the efficiency of vehicle and labour use, optimising budget spending while enhancing the environmental and public image of municipal utilities. By fostering a cleaner environment and well-maintained public spaces, the mulcher contributes to higher-quality community services.

In both applications, the mulcher demonstrates its potential to replace inefficient and environmentally harmful practices. By promoting sustainability, reducing reliance on artificial inputs, and offering a user-friendly, high-impact solution, this innovation aligns with modern demands for circular economies and responsible resource management. Its capacity to address both agricultural and communal challenges positions it as an asset for diverse stakeholders seeking to enhance productivity, sustainability, and environmental stewardship.

2.1.2 Stakeholders involved in the ISP

Task Force: The MAF+ exercises and other support services for this innovation were carried out by the Task Force composed by a total of six persons, which included team members of the business idea owner from NGO Horti Eko and the SCALE-UP regional partners – SDEWES-Skopje, as well as experts from CTA supporting the Task Force especially on the cost-volume-profit analysis. Ecologic Institute supported and followed the overall process as task lead.

Business idea owner:

ZPGCV Horti Eko Strumica (“Horti Eko”) is a farmers’ association established in 2010, serving agricultural businesses in Strumica, Vasilevo, Bosilovo, and Novo Selo in the south-east planning region. Its mission focuses on improving agricultural production and rural living standards by uniting farmers under shared goals.

The organisation emphasizes youth involvement, with over 75% of its activities dedicated to young farmers in Strumica. It fosters teamwork, communication, and capacity building to economically empower these individuals while enhancing their quality of life. Through these efforts, ZPGCV Horti Eko Strumica contributes significantly to the region’s agricultural and community development.



Figure 1 Horti Eko's logo

Team:

Tome Timov is the main innovator and a key contributor to the development of the bio-compost machine idea, bringing critical technical expertise to the project. As a teacher in an agricultural high school, he also provides an academic perspective, enriching the project with educational and research insights. In addition to his roles in innovation and education, Tome Timov is an active member of the Regional Stakeholder Platform in Strumica, further strengthening collaboration and knowledge-sharing within the region. His multifaceted contributions help bridge technical, academic, and community-focused aspects of the project.

2.1.3 Results of the market assessment and business model design process

Market overview

The market for bio-based solutions in sustainable agriculture in North Macedonia is currently putting focus on innovative products –such as green fertilisers– to replace traditional agricultural inputs and adjust management practices. This market is becoming increasingly animated in regions where environmental sustainability and resilience to climate change are becoming critical priorities.

Based on the PESTEL analysis (see Figure 2), several key factors influence this market. North Macedonia currently does not have a dedicated national strategy for bioeconomy. However, several laws and strategic documents are in place that align with the principles of bioeconomy and support its development in various sectors.

Key legislative frameworks that contribute to bioeconomy-related activities include:

- Law on Agriculture and Rural Development – regulates sustainable agricultural practices and rural economic growth.
- Law on Quality and Safety of Fertilizers, Biostimulators, and Soil Conditioners – ensures the safe use of products that improve soil fertility and agricultural productivity.
- Law on Organic Production – promotes environmentally friendly farming and organic food production.

While these laws set the foundation for sustainable agricultural and environmental practices, a comprehensive bioeconomy strategy would provide a more structured and integrated approach to maximizing the potential of biological resources in North Macedonia.

From a policy perspective, while the EU promotes bioeconomy initiatives with ambitious goals for reducing the use of synthetic fertilisers, national climate adaptation policies remain underdeveloped. Government support has also diminished recently, posing challenges for innovators. However, local policies, such as the Local Environmental Action Plan (LEAP)¹, offer opportunities to promote bio-based practices and drive adoption. LEAP is a strategic document designed to protect and improve the environment within a municipality. It aligns with the area's economic, social, and cultural development, prioritizing both short-term and long-term environmental measures for the benefit of present and future generations. The main goal of LEAP is to ensure a clean and healthy environment for the residents of Strumica by implementing structured measures and activities within a defined

¹ <https://strumica.gov.mk/leap/>

timeframe and budget. The plan is valid for six years, after which it is reviewed and updated based on new developments and conditions. The municipal council, led by the mayor, is responsible for monitoring implementation, proposing changes, and reporting annually to the Ministry of Environment and Physical Planning. Additionally, in line with the Aarhus Convention, public participation is essential in setting priorities and making environmental decisions, ensuring transparency and community involvement in shaping sustainable policies.

In spite of the current global economic downturn, economic factors reveal a viable market in North Macedonia, with financially capable consumers of agricultural inputs. Nevertheless, the lack of public subsidies and grants for bio-based solutions forces businesses to rely on internal funding for new machinery and adjusted operations, limiting the accessibility of these innovations. Addressing these gaps will be crucial for market growth.

Social conditions reveal an aging population that often undervalues agriculture as a financially attractive sector. However, younger generations and environmentally conscious consumers show growing interest in sustainable practices. Despite this, limited awareness and entrenched habits among many people in the region create a need for educational efforts to drive behavioral change, particularly in areas like waste management and resource conservation.

From a technological perspective, the adoption of advanced tools, such as GPS tracking and online apps, provides companies with a competitive advantage. While there is little direct competition currently, future competitors entering the biomass feedstock sector may create challenges. Incorporating these technologies into bio-based solutions will enhance usability and appeal to the target audience.

Environmental drivers are a central focus in this market. The reduction of artificial fertilisers and the promotion of green alternatives are key measures to address climate change and improve soil health. The target market is also vulnerable to extreme weather events, such as droughts and heatwaves, which makes the adoption of bio-based solutions even more pressing. Additional environmental benefits include improved air quality and reduced waste through sustainable practices.

Legal considerations emphasize the need for strict compliance with health and safety regulations. Providing training to users of bio-based technologies is essential to ensure proper implementation and minimise risks. Adhering to these requirements will help innovators establish trust and credibility within the market.

Overall, the target groups for this market include farmers and agricultural businesses, policymakers and institutions, and environmentally conscious consumers. These groups share a common need for sustainable practices, financial incentives, and awareness-building efforts to foster the adoption of bio-based solutions. While the market presents significant opportunities, such as favorable local policies and growing environmental interest, threats like reduced government prioritisation and limited financial support must be addressed for long-term success.

	Description	Examples	Issues identified by the innovator (bullet points or flowing text)
P	Political conditions refer to all existing or potential government policies and strategies (local, regional, national or supra-national level) that could impact your organization.	- Climate change and adaptation policies - Infrastructure, procurement, environmental policies - Government support or subsidies likely - Political priorities, both of the current government and the broader public	- A national climate change adaptation policy has not yet been adopted. - Some local policies, such as LEAP, are in place to support the bio-based sector. - Positive impacts on bio-based practices are expected from any political initiatives. - Although bioeconomy is a high priority for EU accession by 2030 (with targets to reduce artificial fertilizer use by 30-40%), it has been given lower priority by the new government.
E	Economic conditions include any issues related to the economy (local, national, and global) in your organization's home or target markets that could affect your organization and its success.	- Interest rates and predicted trends - Economic growth - Inflation and currency exchange rate trends - Access to funding and loans - Government and consumer spending	- Grants and subsidies for bio-based solutions are lacking. - Finances within organizations are used for purchasing machinery. - A target market exists, and consumers are financially viable.
S	Social conditions are those that arise from the side of consumers and can influence the demand for your organization's products and services.	- Demographic changes, such as aging population or increase in education levels - Change in preferences, such as <u>growing interest</u> in environmental issues - Change in attitudes, values, or ethics, e.g. re. privacy, communal <u>action</u>, or environmental protection	- An aging population is a major issue, as younger people do not view the agriculture sector as financially important in the region. - Interest in environmental issues is growing; however, despite some efforts from the government and institutions, awareness and habits among people remain limited. - Educational efforts are essential, as behavioral changes are needed, particularly in areas like waste separation.
T	Technological conditions cover all technological developments that could affect your organization, including both industry/market-specific developments and general trends.	- Technological developments in your industry - Competitors with more <u>technologically-advanced</u> offerings - Important and relevant general <u>trends</u> (e.g. increased smartphone penetration, IT connectivity, online sales)	- A modern technological solution is being implemented. - There is no current competition, though future competition for biomass feedstock is possible. - An online reservation app is included as an added advantage. - GPS coordination is used to track the machine. - Proper maintenance is ensured for optimal functionality.
E	Environmental conditions include all ecological or environmental issues that could affect your business.	- Climate change impacts in your target markets - Likelihood of extreme weather events such as <u>drought</u>, <u>flooding</u>, heat wave etc. impacting you/your customers - Ongoing availability of important environmental input e.g. clean water	- The use of artificial fertilizers will be reduced by replacing them with green fertilizers. - Green fertilizers are a measure to increase resilience to climate change. - Soil moisture will be retained, reducing the need for watering, improving organic soil composition, and minimizing open burning, which will enhance air quality in the region. - Heat waves primarily affect the elderly, who are a key target group for this solution. - Waste quantities will be reduced, helping to decrease illegal landfills.
L	Legal conditions include all potential changes to the legal environment in which your organization operates.	- Consumer laws - Competition law - Employment law - Health and safety legislation - National level and international (European) level	- Compliance with health and safety legislation will be ensured. - Training will be provided to customers for proper machine usage.

Figure 2. PESTEL analysis for mulching machine

Horti Eko's innovation solution has been designed to address specific needs across diverse market segments, and careful consideration was given to identify the most promising groups (see Figure 3,

Figure 4, Figure 5). By evaluating key criteria such as the urgency of the need, the solution's ability to meet it, accessibility to the customer group, the competitive landscape, and the potential profitability, we have identified sectors where the solution can make the greatest impact.

One of the standout groups is the agriculture sector, which emerged as the most promising target market. This segment has a pressing need for innovative solutions to optimise operations and reduce costs, making them highly willing to adopt new technologies. Horti Eko's offering aligns seamlessly with their requirements, and the sector's size and profitability further reinforce its attractiveness.

Another highly aligned group is communal enterprises. These organisations are not only accessible but also demonstrate a strong potential for adopting the solution. Their needs align closely with what Horti Eko offers, and their substantial market presence adds to their appeal.

Local authorities also present opportunities, though with some limitations. While they exhibit a moderate level of need and are relatively easy to access, the presence of competitors and concerns about profitability reduce their priority as a target group.

In contrast, environmental organisations and research institutions face more challenges. Environmental organisations show moderate interest, but their profitability potential is limited, making them less ideal as a target group. Similarly, researchers—despite having some accessibility and moderate need—are already being served by competitors, reducing their attractiveness as a focus area.

The broader context of these target groups highlights several influencing factors. Regulatory shifts are pushing sectors like agriculture and communal enterprises to adopt sustainable practices. Economic pressures, especially in resource-intensive industries, are creating demand for cost-effective solutions. Technological advancements are making it easier for organisations to implement these innovations, while societal emphasis on sustainability continues to grow.

In conclusion, the agriculture sector and communal enterprises stand out as the primary focus for Horti Eko's solution. They offer the best combination of need, alignment with the solution's capabilities, and market potential. Local authorities may serve as a secondary target, while researchers and environmental organisations, though valuable in their own ways, might require tailored strategies or further refinement of the solution to be effectively engaged.

This narrative serves as a guiding framework for Horti Eko to prioritise its efforts and effectively meet the needs of its most aligned customer groups.

Market Segment	Criteria	Comments	Rating*					Total Score
			1	2	3	4	5	
Segment 1: Local authorities	[C1] The customer group has a pressing need and is willing to act upon it.				3			15
	[C2] Our offering can satisfy that need.					4		
	[C3] We can easily communicate/access the customer group.						5	
	[C4] There are no known competitors addressing this need.		1					
	[C5] The customer group is substantial and potentially profitable.			2				
*A rating of 1 denotes the statement is totally inaccurate; 5 denotes the statement is totally accurate.								

Figure 3. Horti Eko market segmentation – part 1

Market Segment	Criteria	Comments	Rating*					Total Score
			1	2	3	4	5	
Segment 2: <i>Agriculture</i>	[C1] The customer group has a pressing need and is willing to act upon it.						5	19
	[C2] Our offering can satisfy that need.						5	
	[C3] We can easily communicate/access the customer group.				3			
	[C4] There are no known competitors addressing this need.		1					
	[C5] The customer group is substantial and potentially profitable.						5	
<i>*A rating of 1 denotes the statement is totally inaccurate; 5 denotes the statement is totally accurate.</i>								

Market Segment	Criteria	Comments	Rating*					Total Score
			1	2	3	4	5	
Segment 3: <i>Researchers (universities or extramural research institutions)</i>	[C1] The customer group has a pressing need and is willing to act upon it.				3			12
	[C2] Our offering can satisfy that need.			2				
	[C3] We can easily communicate/access the customer group.					4		
	[C4] There are no known competitors addressing this need.		1					
	[C5] The customer group is substantial and potentially profitable.			2				
<i>*A rating of 1 denotes the statement is totally inaccurate; 5 denotes the statement is totally accurate.</i>								

Figure 4. Hort Eko market segmentation – part 2

Market Segment	Criteria	Comments	Rating*					Total Score
			1	2	3	4	5	
Segment 4: <i>Environmental organisations</i>	[C1] The customer group has a pressing need and is willing to act upon it.			2				13
	[C2] Our offering can satisfy that need.				3			
	[C3] We can easily communicate/access the customer group.					4		
	[C4] There are no known competitors addressing this need.		1					
	[C5] The customer group is substantial and potentially profitable.				3			
*A rating of 1 denotes the statement is totally inaccurate; 5 denotes the statement is totally accurate.								

Market Segment	Criteria	Comments	Rating*					Total Score
			1	2	3	4	5	
Segment 5: <i>Communal enterprises</i>	[C1] The customer group has a pressing need and is willing to act upon it.					4		18
	[C2] Our offering can satisfy that need.						5	
	[C3] We can easily communicate/access the customer group.					4		
	[C4] There are no known competitors addressing this need.		1					
	[C5] The customer group is substantial and potentially profitable.					4		
*A rating of 1 denotes the statement is totally inaccurate; 5 denotes the statement is totally accurate.								

Figure 5. Horti Eko market segmentation – part 3

The pressing needs of these target groups are shaped by macro-environmental conditions such as:

- Regulatory Changes: Increasing regulations on sustainability and environmental impact are driving demand in sectors like agriculture and communal enterprises.
- Technological Advancements: Emerging technologies are creating opportunities to improve operational efficiencies in agriculture and local authorities.

- **Economic Trends:** Rising costs in resource-intensive sectors like agriculture are creating a need for innovative solutions that optimise resources and reduce expenses.
- **Social Awareness:** Growing emphasis on sustainability and green initiatives is encouraging communal enterprises and environmental organisations to adopt eco-friendly solutions.

Market size and growth rate estimations, Porter's Five Forces, and the Competitiveness Heat Map – exercises offered to the innovator as part of the ISP– were not performed, as Horti Eko's solution is in its early stages of development. At this stage, the innovator's focus and priority is on identifying initial opportunities and aligning with customer needs. These exercises are expected to be revisited as the solution matures and suitable funding is secured, which might happen after the SCALE-UP project ends.

Business model canvas

The Business Model Canvas (BMC) for the innovation focuses on creating a sustainable agricultural model in Strumica, emphasizing community empowerment, youth involvement, and environmental responsibility. The key partners include other members of Horti Eko Strumica, which facilitates training and community-building among young farmers, and farmers themselves, who are essential in implementing sustainable farming practices. Citizens serve as consumers and advocates for local, eco-friendly products, while NGOs provide critical resources and expertise. The Municipal Utility Company helps with waste management, aligning with environmental goals, and the Ministry of Agriculture supports the initiative through data and financial assistance.

The activities that drive the project include identifying farmers' challenges, conducting market and environmental research, and establishing demo farms to showcase machinery in real farming conditions. Farmer education is crucial, as it ensures the adoption of sustainable techniques. The project also promotes green fertilising using bio-fertilisers to enhance soil health and involves acquiring necessary farming machinery.

The value proposition focuses on economic growth and environmental sustainability, offering farmers increased productivity and healthier soils through eco-friendly technologies. Citizens benefit from supporting local, sustainable agriculture, which in turn fosters a circular economy. Customer relationships are built on trust and collaboration, with ongoing education and support, while the customer segments include young farmers, citizens, and organizations focused on sustainability.

Key resources include technical expertise for research and training, business planning for strategic growth, and financial connections to secure funding. The project uses various channels, including direct engagement with farmers and partnerships with local authorities and NGOs, to ensure information and support reach the target audience.

The cost structure is composed of fixed costs such as the initial machine investment (€2,500) and variable costs like machine transport (€500) and land rental (€10 per acre). Revenue streams are generated by renting machinery to farmers at €10 per acre, ensuring financial sustainability while keeping farming accessible.

This first version of the BMC laid the foundation for a successful innovation in Strumica, focusing on collaboration, education, and the adoption of sustainable practices. As the ISP sessions and MAF+ exercises continue during the project, the canvas evolved, with adjustments based on market feedback and operational insights. As the ISP programme came to end, the latest BMC is presented on

Figure 6 .

7) Key Partners Horti Eko Strumica: Key facilitator of training, empowerment, and community-building among young farmers; drives sustainable agricultural practices and economic growth within the Municipality of Strumica through youth-focused initiatives. Farmers: Central to implementing sustainable practices; apply new technologies and training (e.g., mulching machine) to improve productivity, soil health, and environmental sustainability. Citizens: Important as a consumer base advocating for local, eco-friendly agricultural products; their support	6) Key Activities Problem Identification: Identify challenges faced by farmers to target effective solutions. Market Research: Assess supply and demand feasibility, ensuring sufficient farmer interest. Environmental Research: Investigate environmental benefits of sustainable practices and equipment. Demo Farms: Showcase machine functionality in real farming conditions. Farmer Education: Provide training on sustainable practices and equipment use. Green Fertilizing: Apply bio-fertilizers on agricultural land to enrich soil. Machine Acquisition: Purchase or rent machinery essential for sustainable farming practices.	2) Value Propositions Reduced Fertilizer Costs: Lower expenses with increased use of organic alternatives. Waste Reduction: Minimize agricultural waste through sustainable practices. Biomass Reuse: Transform residues into valuable bio-fertilizers. Soil Enrichment: Improve soil health naturally with organic inputs. Air Quality Improvement: Decrease open field burning, leading to cleaner air. Affordable Organic Alternatives: Provide cost-effective, eco-friendly fertilizers as an alternative to conventional mineral fertilizers.	4) Customer Relationships Direct Communication: Utilize both informal and formal channels with stakeholders and farmers. Field Demonstrations: Showcase machine functionality and benefits on-site.	1) Customer Segments Farmers: Includes vegetable growers (cabbage, peppers), crop farmers (corn), vine growers, fruit growers, and gardeners. Municipal Utility Company: Supports waste management and environmental efforts in agriculture.
boosts community awareness and adoption of sustainable practices. NGOs with an Agricultural Focus: Provide critical resources, expertise, and advocacy, supporting Horti Eko's efforts to expand sustainable practices and foster networks across the agricultural sector. Municipal Utility Company: Essential for managing waste and recycling in agriculture, assisting with disposal of agricultural residues, and promoting environmental initiatives aligned with Horti Eko's mission. Ministry of Agriculture: Offers data on registered farmers and financial support, enabling strategic outreach, resource allocation, and economic support for sustainable development projects in Strumica.	5) Key Resources Technical Expertise: For conducting market and environmental research. Business Planning: Development of a solid business plan. Financial Connections: Access to funding and financial support mechanisms.		3) Channels Word of Mouth: Spread information through farmer networks. Demo Projects: Showcase equipment and methods on-site. Community Events: Engage local audiences with hands-on learning. Field Trips: Provide immersive experiences in sustainable practices. Local Media: Feature on agricultural TV shows. Specialized Social Media: Use targeted platforms for agriculture. SCALE-UP Trainings: Offer structured growth and development sessions.	
8) Cost Structure Fixed Costs: - Machine cost: average €2,500. Variable Costs: - Machine parts and transport, amortization: €500. - Renting: €10 per acre, depending on the field size.	9) Revenue Streams Revenue: €10 per acre			

Figure 6. Horti Eko Business model canvas

2.1.4 Relevant considerations for the future

In our final discussions, the Task Force members emphasized the importance of utilising the business plan that was developed as a key tool for advancing the innovation. The plan serves as a strategic framework for the project, providing a clear path forward for sustainable agricultural development in Strumica. Moving forward, the primary focus for the innovator will be on exploring new financing opportunities to secure the necessary funds to purchase additional machinery. This step is critical to scaling up operations and increasing the capacity to serve more farmers.

In addition to securing financing for machinery, the innovator will also need to explore market expansion strategies. This could involve investigating potential avenues for entering new markets where sustainable farming practices are gaining traction. By diversifying the market reach, the innovator can increase demand for the services and products offered, thus creating more opportunities for growth.

A key component of this market expansion will be to attract new farmers to the initiative. Engaging more farmers is essential for expanding the impact of the project, and the innovator will need to focus on communicating the benefits of adopting sustainable practices, such as improved productivity and better environmental outcomes. By providing clear incentives, such as training, access to equipment, and financial support, the innovator can encourage more farmers to join the movement.

Additionally, there may be opportunities to develop a wider product palette by introducing new services or agricultural technologies that complement the current offering. This could include options for customised farming solutions, additional training programs, or even bio-based fertilisers to further enhance soil health.

In parallel, the innovator should continue conducting research and development (R&D) to stay ahead of market trends and technological advancements. This would not only improve the effectiveness of existing practices but also identify new opportunities for innovation that can drive growth and strengthen the project's position in the market.

Finally, establishing strategic alliances with relevant stakeholders, including NGOs, agricultural tech firms, and local authorities, can provide additional resources, expertise, and market access. Collaborative partnerships will be key to ensuring the long-term success and sustainability of the project.

By focusing on financing, market expansion, and farmer engagement, the innovator can take the next steps towards scaling the innovation and making a lasting impact in Strumica and beyond.

2.2 Bio-Based Value-Added Grape Products

2.2.1 General description and value proposition of the innovation

The Bio-based Value-added Grape Products from Bojane's vineyards represent an innovation in sustainable agriculture and food production in North Macedonia in the Skopje region. This initiative focuses on transforming locally grown grapes into a diverse range of high-quality products, including grape juice concentrates, raisins, cold-pressed grape seed oil, and flavoured vinegars. By utilising advanced processing techniques, these products preserve the natural health benefits of the grapes, such as antioxidants and nutrients, enhancing dietary quality and overall wellness.

The innovation focuses on around sustainability and local sourcing, with an emphasis on using eco-friendly methods that help maintain natural qualities and nutritional value. This approach aims to offer a healthier option for consumers while also contributing to the local economy and minimizing the environmental impact compared to imported or mass-produced alternatives.

Key benefits of the solution include providing reliable, accessible, and health-promoting food options that align with sustainable lifestyles. Consumers can enjoy a taste of nature with every use, connecting to the essence of Bojane's vineyards while enhancing their daily meals with flavourful and health-conscious choices. The products are positioned as a superior alternative to current substitutes in the market, which are often imported, less sustainable, and more costly. By offering the same product quality at a lower price and with a reduced environmental impact, this initiative addresses a significant market gap.

Despite the clear advantages, potential customer concerns such as cost, availability, and authenticity of eco-friendly claims are acknowledged. The initiative aims to build trust through transparency in production practices and consistent delivery of high-quality products.

This bio-based innovation delivers more than just products, it empowers consumers to make eco-conscious choices while directly supporting local agricultural communities. By integrating sustainable practices into food production, this solution not only contributes to a healthier planet but also redefines the value of local resources in global markets.

2.2.2 Stakeholders involved in the ISP

Task Force: The MAF+ exercises and other support services for this innovation were carried out by the Task Force composed by a total of 5 persons, which included team members of the business idea owner from Agricultural cooperative Bojane and the SCALE-UP regional partners SDEWES-Skopje, as well as experts from CTA supporting the Task Force especially on the CVP analysis. Ecologic Institute supported and followed the overall process as task lead.

Business idea owner:

The Agro Cooperative Bojane is a cooperative that focuses on enhancing agricultural productivity and fostering collaboration among local farmers in the Saraj region. It was established in 2011, and it specializes in table grapes and grape products. The cooperative aims to strengthen market competitiveness while creating a sustainable model for agricultural development that can inspire similar initiatives across other regions.



Figure 7. Agriculture cooperative Bojane's logo

Team:

Fexhri Selami, Project Coordinator at Agro cooperative Bojane, has over a decade of experience in project implementation and agricultural development. With a strong passion for sustainable agriculture, he has successfully led numerous initiatives to improve the agricultural landscape in the Bojane region. Fexhri's hands-on approach and expertise in fostering collaboration have been pivotal in advancing innovative solutions that strengthen local supply chains and enhance community resilience. Under his guidance, the cooperative has adopted cutting-edge practices such as solar-powered irrigation systems and modern agronomic techniques. These innovations have transformed traditional farming approaches, addressing critical challenges like water scarcity and energy efficiency while laying the groundwork for a sustainable agricultural future.

2.2.3 Results of the market assessment and business model design process

Market overview

As shown on Figure 8, the PESTEL analysis underscores the complex environment in which the Bio-Based Value-Added Products initiative operates, highlighting both challenges and opportunities. Political conditions can significantly impact on the Bio-Based Value-Added Products initiative, especially through local and national government policies. Local policies like zoning laws (Bojane is in the first protection zone of the Rashce Spring region – the main water supplier in Skopje) can directly affect costs and capabilities, via restrictions on pesticide use, taxes, and subsidies for sustainable practices. Nationally, regulations on labor, food safety, and trade can influence production and marketing strategies both at home and abroad. While these limitations can increase operational complexities, they also provide a unique opportunity to showcase sustainable agricultural practices that align with government and public priorities.

Economically, the initiative is influenced by local and global trends, including inflation, consumer spending power, and access to funding. These factors shape everything from production costs to market demand, with economic stability in local communities proving pivotal to the success of premium, sustainable products.

Social factors present significant opportunities, as rising consumer awareness around health and environmental sustainability creates demand for natural, eco-friendly grape-based products. Trends like localism and clean eating further bolster the appeal of the cooperative's offerings, fostering stronger community support and diversified revenue streams for farmers.

Technological advancements are key drivers of innovation for the initiative. The adoption of sustainable processing techniques, renewable energy solutions, and precision farming technologies enhances product quality, reduces environmental impact, and ensures efficient operations. Digital platforms and e-commerce further expand market reach and streamline customer engagement.

Environmentally, the initiative faces challenges such as climate change and resource scarcity. However, its commitment to sustainable practices, including renewable energy, composting, and

circular economy models, positions it as a leader in eco-conscious agriculture. These practices not only mitigate environmental risks but also resonate with increasingly eco-aware consumers.

The legal framework requires adherence to regulations governing food safety, environmental impact, labor conditions, and trade. Compliance ensures operational stability, while intellectual property protections safeguard the cooperative's innovative practices, securing a competitive edge.

Together, these factors illustrate a dynamic landscape where the cooperative's emphasis on sustainability, innovation, and community-driven solutions positions it for long-term success while addressing critical challenges head-on.

	Description	Examples	Issues identified by the innovator (bullet points or flowing text)
P	Political conditions refer to all existing or potential government policies and strategies (local, regional, national or supra-national level) that could impact your organization.	- Climate change and adaptation policies - Infrastructure, procurement, environmental policies - Government support or subsidies likely - Political priorities, <u>both of the current government and the broader public</u>	Political conditions can significantly impact our Bio-Based Value-Added Products initiative, especially through local and national government policies. Local policies like zoning laws (Bojane is in the first protection zone of the Rashtice Spring region), with very restricted activities that can be affected, including pesticide use, taxes, and subsidies for sustainable practices, directly affect our costs and capabilities. Nationally, regulations on labor, food safety, and trade can influence our production and marketing strategies both at home and abroad. It's crucial for us to understand and navigate these political conditions to mitigate risks and seize opportunities, ensuring our initiative remains adaptable and successful within the political landscape. On the other hand, the restrictive conditions of the protected area are considered an added value from the perspective of introducing sustainable grape processing practices.
E	Economic conditions include any issues related to the economy (local, national, and global) in your organization's home or target markets that could affect your organization and its success.	- Interest rates and predicted trends - Economic growth - Inflation and currency exchange rate trends - Access to funding and loans - Government and consumer spending	Economic conditions play a significant role in shaping the success of our Bio-Based Value-Added Products initiative. These conditions can range from local economic stability and national economic policies to broader global economic trends, each impacting various aspects of our operation. 1. Local Economy: The strength of the local economy affects consumer spending power. In a robust economy, local consumers may be more willing to spend on premium, sustainable products. Conversely, during economic downturns, discretionary spending on premium items might decline. 2. National Economy: National economic trends influence factors like inflation rates, interest rates, and unemployment levels. These elements affect our cost structures, such as how much we pay for resources and labor, and they can also influence consumer purchasing power.

S	Social conditions are those that arise from the side of consumers and can influence the demand for your organization's products and services.	- Demographic changes, such as aging population or increase in education levels - Change in preferences, such as <u>growing interest</u> in environmental issues - Change in attitudes, values, or ethics, e.g. re. privacy, communal <u>action</u>, or environmental protection	Social conditions refer to the trends and behaviors in society that can affect the demand for our Bio-Based Value-Added Products initiative. These conditions encompass a range of factors, including demographics, consumer preferences, health and environmental awareness, and cultural trends. 1. Health Trends: Increasing awareness and concern regarding health and wellness can drive demand for our natural and nutritious grape-based products, like grape juice concentrates and grape seed oil. 2. Environmental Awareness: As consumers become more conscious of their environmental impact, there is growing demand for products that are sustainably sourced and produced. Our commitment to sustainable practices aligns with these values, appealing to eco-friendly buyers. 3. Localism: A trend towards supporting local businesses and products can enhance the appeal of our products, which are sourced from local grape growers and produced within the community. 4. Cultural Shifts: Changes in dietary preferences and lifestyles, such as the rise in vegetarianism or clean eating, can influence consumer preferences for our products. 5. Diversified revenue streams: The viticulturists make the farming business their primary revenue possibility.
T	Technological conditions cover all technological developments that could affect your organization, including both industry/market-specific developments and general trends.	- Technological developments in your industry - Competitors with more <u>technological-ly-advanced</u> offerings - Important and relevant general <u>trends</u> (e.g. increased smartphone penetration, IT connectivity, online sales)	Technological conditions encompass all the advancements and innovations that can impact our Bio-Based Value-Added Products initiative. These include both specific developments within the agricultural and food production industries and broader technological trends: 1. Processing Technologies: Innovations in food processing technology, such as advanced drying techniques and cold pressing for oil extraction, can enhance the efficiency and quality of our products. Embracing these technologies helps retain the nutritional value of grapes while increasing production capacity. 2. Sustainable Technologies: The adoption of green technologies in production and packaging can reduce our environmental footprint and appeal to eco-conscious consumers. This includes biodegradable packaging and energy-efficient machinery.
			3. Digital and E-commerce Platforms: The rise of digital marketing and online sales platforms allows us to reach a broader audience and streamline our sales processes. Implementing e-commerce solutions and utilizing digital marketing strategies can significantly boost our market presence and customer engagement. 4. Agricultural Tech: Advances in agricultural technology, such as precision farming tools and <u>agro-meteorological</u> stations, can improve grape yield and quality. Using technology to monitor and optimize growing conditions ensures a consistent supply of high-quality raw materials. - The cooperative has introduced renewable energy solutions in the table grape irrigation systems <u>and also</u> introduced an agrometeorological station as a precise farming practice.
E	Environmental conditions include all ecological or environmental issues that could affect your business.	- Climate change impacts in your target markets - Likelihood of extreme weather events such as <u>drought</u>, <u>flooding</u>, heat wave etc. impacting you/your customers - Ongoing availability of important environmental input e.g. clean water	Environmental conditions are critical to the strategy and operations of our Bio-Based Value-Added Products initiative, affecting everything from the sourcing of raw materials to production processes and market positioning. 1. Climate Change: Shifts in climate patterns can impact grape cultivation, affecting yields and quality. Adapting our agricultural practices to be more resilient against unpredictable weather and climate conditions is crucial. 2. Resource Scarcity: The availability and cost of natural resources like water and soil nutrients, which are essential for grape growing, could be influenced by environmental degradation and policy changes aimed at conservation. 3. Regulations on Environmental Impact: Increasingly strict environmental regulations may dictate more sustainable practices in agriculture and manufacturing. Compliance with these regulations not only affects operational costs but also shapes our brand's market appeal as environmentally responsible. 4. Consumer Expectations: Growing consumer awareness and concern about environmental issues drive demand for products made with sustainable practices. Our commitment to eco-friendly processes and packaging can differentiate our products in a competitive market. 5. Implementing sustainable practices: The cooperative aims at implementing circular economy, composting facilities, grape pruning mulching, improving air quality, and reducing open fires by raising awareness about organic waste burning.

L	Legal conditions include all potential changes to the legal environment in which your organization operates.	• Consumer laws • Competition law • Employment law • Health and safety legislation • National level and international (European) level	Legal conditions encompass all the potential changes and existing regulations in the legal environment that can influence our Bio-Based Value-Added Products initiative. These legal aspects are crucial for ensuring compliance and avoiding potential liabilities: 1. Food Safety Regulations: Adhering to national and local food safety standards is essential. These regulations govern the production, processing, packaging, and labeling of food products, ensuring that they are safe for consumption. 2. Environmental Laws: Compliance with environmental laws related to waste management, pollution control, and sustainable resource use is critical. These laws not only affect production practices but also help in maintaining our brand's commitment to environmental stewardship. 3. Labor Laws: Understanding and following labor regulations that govern worker rights, wages, and working conditions is vital. This ensures fair treatment of employees and avoids legal disputes. 4. Trade Regulations: If the products are marketed both domestically and internationally, compliance with trade regulations, including tariffs and import/export restrictions, must be managed meticulously. 5. Intellectual Property Rights: Protecting the proprietary technology or processes developed by our cooperative through patents or trademarks can secure our competitive advantage and prevent infringements.
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Figure 8. PESTEL analysis of the bio-based value-added grape products

The target group selection process highlights the diverse market segments considered for the Bio-Based Value-Added Products initiative, assessing their potential through criteria such as pressing needs, accessibility, competition, and profitability. As shown on Figure 9, Figure 10, Figure 11, Figure 12, Figure 13 and Figure 14 ten segments were evaluated, with each presenting unique opportunities and challenges.

The Agriculture sector emerged as the strongest candidate with the highest total score (24), driven by its clear pressing need, direct accessibility, and lack of competitors. This segment aligns closely with the initiative's goals, offering substantial opportunities for sustainable and profitable collaboration.

The General public, Manufacturing industries, Tourism sector, and Researchers scored moderately high (19–20). These groups show significant potential due to their demand for eco-friendly, sustainable solutions and ease of access. The general public, stands to benefit from the wide range of products offered on the market, while researchers are primarily interested in opportunities for innovation and partnership.

Lower scores were observed among Local, Regional, and National authorities, Civil defense organisations, and Environmental organisations (8–17). These segments, though relevant, face challenges such as limited profitability or accessibility, regulatory constraints, or a lesser immediate need for the offered solutions.

The analysis underscores the importance of prioritising the agriculture sector while strategically engaging with secondary markets like the general public and researchers. Macro-environmental conditions such as growing environmental awareness, technological advancements, and sustainability regulations present opportunities, while challenges like economic fluctuations and policy restrictions must be carefully managed. This balanced approach ensures that the initiative remains impactful and adaptable across diverse market segments.

Market Segment	Criteria	Comments	Rating*					Total Score
			1	2	3	4	5	
Segment 1: <i>Local authorities</i>	[C1] The customer group has a pressing need and is willing to act upon it.				3			16
	[C2] Our offering can satisfy that need.				3			
	[C3] We can easily communicate/access the customer group.						5	
	[C4] There are no known competitors addressing this need.					4		
	[C5] The customer group is substantial and potentially profitable.		1					
<i>*A rating of 1 denotes the statement is totally inaccurate; 5 denotes the statement is totally accurate.</i>								

Figure 9. Agro-cooperative Bojane market segmentation – part 1

Market Segment	Criteria	Comments	Rating*					Total Score
			1	2	3	4	5	
Segment 2: <i>Regional authorities</i>	[C1] The customer group has a pressing need and is willing to act upon it.			2				9
	[C2] Our offering can satisfy that need.			2				
	[C3] We can easily communicate/access the customer group.		1					
	[C4] There are no known competitors addressing this need.				3			
	[C5] The customer group is substantial and potentially profitable.		1					
<i>*A rating of 1 denotes the statement is totally inaccurate; 5 denotes the statement is totally accurate.</i>								

Market Segment	Criteria	Comments	Rating*					Total Score
			1	2	3	4	5	
Segment 3: <i>National authorities</i>	[C1] The customer group has a pressing need and is willing to act upon it.			2				10
	[C2] Our offering can satisfy that need.			2				
	[C3] We can easily communicate/access the customer group.				3			
	[C4] There are no known competitors addressing this need.			2				
	[C5] The customer group is substantial and potentially profitable.		1					

**A rating of 1 denotes the statement is totally inaccurate; 5 denotes the statement is totally accurate.*

Figure 10. Agro-cooperative Bojane market segmentation – part 2

Market Segment	Criteria	Comments	Rating*					Total Score
			1	2	3	4	5	
Segment 4: <i>Agriculture</i>	[C1] The customer group has a pressing need and is willing to act upon it.						5	24
	[C2] Our offering can satisfy that need.						5	
	[C3] We can easily communicate/access the customer group.						5	
	[C4] There are no known competitors addressing this need.						5	
	[C5] The customer group is substantial and potentially profitable.					4		
<i>*A rating of 1 denotes the statement is totally inaccurate; 5 denotes the statement is totally accurate.</i>								

Market Segment	Criteria	Comments	Rating*					Total Score
			1	2	3	4	5	
Segment 5: <i>Manufacturing industries</i>	[C1] The customer group has a pressing need and is willing to act upon it.					4		18
	[C2] Our offering can satisfy that need.					4		
	[C3] We can easily communicate/access the customer group.				3			
	[C4] There are no known competitors addressing this need.				3			
	[C5] The customer group is substantial and potentially profitable.					4		
<i>*A rating of 1 denotes the statement is totally inaccurate; 5 denotes the statement is totally accurate.</i>								

Figure 11. Agro-cooperative Bojane market segmentation – part 3

Market Segment	Criteria	Comments	Rating*					Total Score
			1	2	3	4	5	
Segment 6: <i>Tourism sector</i>	[C1] The customer group has a pressing need and is willing to act upon it.				3			17
	[C2] Our offering can satisfy that need.					4		
	[C3] We can easily communicate/access the customer group.				3			
	[C4] There are no known competitors addressing this need.				3			
	[C5] The customer group is substantial and potentially profitable.					4		
*A rating of 1 denotes the statement is totally inaccurate; 5 denotes the statement is totally accurate.								

Market Segment	Criteria	Comments	Rating*					Total Score
			1	2	3	4	5	
Segment 7: <i>Civil defence and emergency response organisations</i>	[C1] The customer group has a pressing need and is willing to act upon it.			2				8
	[C2] Our offering can satisfy that need.		1					
	[C3] We can easily communicate/access the customer group.			2				
	[C4] There are no known competitors addressing this need.			2				
	[C5] The customer group is substantial and potentially profitable.		1					
<i>*A rating of 1 denotes the statement is totally inaccurate; 5 denotes the statement is totally accurate.</i>								

Figure 12. Agro-cooperative Bojane market segmentation – part 4

Market Segment	Criteria	Comments	Rating*					Total Score
			1	2	3	4	5	
Segment 8: <i>General public</i>	[C1] The customer group has a pressing need and is willing to act upon it.					4		20
	[C2] Our offering can satisfy that need.					4		
	[C3] We can easily communicate/access the customer group.						5	
	[C4] There are no known competitors addressing this need.					4		
	[C5] The customer group is substantial and potentially profitable.				3			
*A rating of 1 denotes the statement is totally inaccurate; 5 denotes the statement is totally accurate.								

Market Segment	Criteria	Comments	Rating*					Total Score
			1	2	3	4	5	
Segment 9: <i>Researchers (universities or extramural research institutions)</i>	[C1] The customer group has a pressing need and is willing to act upon it.				3			19
	[C2] Our offering can satisfy that need.					4		
	[C3] We can easily communicate/access the customer group.						5	
	[C4] There are no known competitors addressing this need.					4		
	[C5] The customer group is substantial and potentially profitable.				3			
<i>*A rating of 1 denotes the statement is totally inaccurate; 5 denotes the statement is totally accurate.</i>								

Figure 13. Agro-cooperative Bojane market segmentation – part 5

Market Segment	Criteria	Comments	Rating*					Total Score
			1	2	3	4	5	
Segment 10: <i>Environmental organisations</i>	[C1] The customer group has a pressing need and is willing to act upon it.				3			17
	[C2] Our offering can satisfy that need.					4		
	[C3] We can easily communicate/access the customer group.					4		
	[C4] There are no known competitors addressing this need.					4		
	[C5] The customer group is substantial and potentially profitable.			2				
<i>*A rating of 1 denotes the statement is totally inaccurate; 5 denotes the statement is totally accurate.</i>								

Figure 14. Agro-cooperative Bojane market segmentation – part 6

Assessments such as market size and growth rate estimations, Porter's Five Forces, and the Competitiveness Heat Map have not yet been undertaken for the Bojane solution, given its current stage of early development. The primary focus at this phase is to pinpoint initial opportunities, evaluate market dynamics, and ensure the solution addresses the critical needs of selected target groups. These analyses may be revisited and further developed, after SCALE-UP is completed, depending on the innovator's decision to continue advancing and refining the business model as the solution progresses.

Business model canvas

The Business Model Canvas for the grape-based product innovation highlights a comprehensive strategy tailored to health-conscious consumers, local businesses, and supermarkets (see Figure 15). These customer segments value eco-friendly, high-quality products that emphasize health benefits and sustainability. The value proposition centres on offering grape juice concentrates, raisins, grape seed oil, and flavoured vinegars, combining unique flavours with environmental responsibility.

Distribution channels include supermarkets, cooperative-owned stores, and online platforms, ensuring accessibility while fostering customer relationships through subscription-based services and responsive support. Key resources such as fertile agricultural land, advanced processing facilities, skilled labour, and sustainable packaging solutions are complemented by partnerships with local grape growers, government entities, supermarkets, and packaging suppliers.

Core activities involve securing raw materials, developing innovative products, ensuring quality control, and implementing sustainable practices that are integrated throughout the entire production process to minimize environmental impact and promote resource efficiency. This includes sourcing raw materials from local grape growers to reduce transportation emissions and support regional agriculture. Advanced processing techniques, such as cold pressing and drying, are utilized to maximize yield while preserving the natural qualities of the grapes. Additionally, eco-friendly packaging solutions are explored to minimize waste, and strict quality control measures ensure that products meet both health and sustainability standards. By prioritizing these practices, the initiative not only enhances product

quality but also reinforces its commitment to environmental responsibility and long-term sustainability. Fixed costs cover salaries, facility rentals, and equipment, while variable costs include raw materials, seasonal labor, utilities, and marketing efforts. Revenue streams rely on product sales, subscription services, and seasonal or limited-edition items that drive excitement and additional income.

Initially, the focus was on defining the value proposition and identifying customer needs. As ISP sessions progressed and MAF+ exercises were completed, the canvas evolved to emphasize sustainability, refined channels, and strengthened partnerships. Key activities and resources were adjusted to incorporate advanced processing techniques and eco-friendly practices, resulting in a well-rounded, customer-centric strategy aligned with modern consumer and environmental demands.

7) Key Partners	6) Key Activities	2) Value Propositions	4) Customer Relationships	1) Customer Segments
Local Grape Growers: Integral for securing a consistent and high-quality grape supply, which is fundamental to the production of your value-added products. Local Government: Key for ensuring compliance with agricultural and food production regulations, and potentially beneficial for accessing local grants or subsidies that could support sustainability initiatives. Supermarket Chains: Essential for achieving extensive market penetration and consumer accessibility, acting as a primary channel for the distribution and retail of your finished products. Packaging and Branding Suppliers: Vital for the development of packaging solutions that not only protect the	Ensuring minimal stock: Establishing and maintaining relationships and contracting with local grape growers to ensure a consistent and quality supply of grapes. Product Development: Designing and testing various product formulations, such as grape juice concentrates, raisins, grape seed oil, and flavored vinegars, to ensure they meet quality standards and consumer preferences. Processing and Production: Purchasing and implementing state-of-the-art processing techniques like advanced drying and cold pressing to convert raw grapes into the final products. Quality Control and Testing: Conducting rigorous testing to ensure that all products meet health, safety, and quality standards before they reach the market in correlation with the Agency for Food and Veterinary.	For our business plan on the Bio-Based Value-Added Products initiative, the value propositions focus on solving the problem of the limited availability of diverse and healthy food options/supplements. By offering high-quality, grape-based products like grape juice concentrates, raisins, grape seed oil, and flavored vinegars, our initiative provides significant health benefits and supports overall wellness. We differentiate from competitors by emphasizing locally sourced grapes and sustainable production methods, appealing to consumers who prioritize environmental friendliness and local business support. Advanced processing techniques ensure the preservation of natural qualities and health benefits, setting our products apart in a market where consumers increasingly seek health-oriented and innovative dietary options.	Customers interact with the cooperative through educational marketing, direct sales at local markets, online platforms, and cooperative-owned seasonal street market stalls. Post-purchase, engagement continues with feedback surveys, a support hotline, and regular updates via email and social media to ensure satisfaction and foster community loyalty.	Health-conscious consumers: individuals looking for natural and healthy dietary options. Eco-Friendly Buyers: Customers who prefer products that support environmental sustainability. Local Supporters: Residents who buy locally to support community businesses. Specialty Market Shoppers: consumers seeking unique, high-quality culinary products. Online shoppers are people who value the convenience of shopping from home. Retailers and distributors: businesses that provide access to broader markets, such as supermarkets and specialty stores.

integrity of the products but also enhance brand recognition and appeal through innovative design.	Marketing and Branding: Developing marketing and branding strategies to promote the unique benefits and features of the grape-based products to target consumers. Distribution and Sales: Setting up efficient distribution channels to ensure that products are available to consumers through supermarkets and other retail outlets. Sustainability Practices: Implementing sustainable practices in all aspects of the operation, from grape cultivation to product packaging, to reinforce the ecological and health benefits of the products. 5) Key Resources Agricultural Land and Grape Vineyards: Access to fertile agricultural land suitable for growing high-quality grapes, either owned or leased. (owned by the members of the cooperative) Processing Facilities: modern facilities equipped with advanced technology		3) Channels The best channels to reach customers include online platforms for wide reach and convenience, local markets and cooperative-seasonal stalls and festivals for direct sales, and social media for raising awareness and engagement.	
	for juicing, drying, oil extraction, and vinegar production. Supply Chain and Distribution Networks: robust logistics for efficient distribution of products to supermarkets and other sales outlets. Skilled Labor: trained professionals and skilled workers in agriculture, production, quality control, and distribution. Research and Development Team: Experts in food technology, nutrition, and agriculture to innovate and improve product lines. Marketing and Sales Teams: specialized personnel to handle marketing campaigns, brand management, and sales strategies. Customer Service Staff: Teams to manage customer inquiries, feedback, and after-sales service to ensure customer satisfaction. Sustainable Packaging Materials: Access to sources of environmentally			

	friendly packaging materials that align with the brand's sustainability goals. Financial Resources: Adequate capital for initial setup, ongoing operations, and future expansions or innovations. Partnerships and Alliances: Relationships with key stakeholders like local governments, suppliers, and distribution partners to enhance business operations.			
8) Cost Structure Fixed Costs: Salaries for permanent staff at least 3 people (processing, administration, marketing) Rent/payments for land, facilities for processing products, and office or administration premises. Purchasing of equipment for seed oil, grape vinegar, resins, and grape seed flour. Variable Costs: Costs of raw materials (grapes, packaging) Seasonal labor during harvesting and processing peaks Utilities (water, electricity) depending on production volume Marketing and promotional expenses, trainings which can vary based on campaigns and market reach efforts		9) Revenue Streams Sales: The core revenue comes from selling grape juice concentrates, raisins, grape seed oil, and flavored vinegars through various channels like online platforms, local markets, and cooperative-owned stores. Yearly based contract: Offering subscription-based deliveries for regular customers provides a steady revenue stream and builds customer loyalty. Partnerships and Collaborations: Collaborating with local businesses and supermarkets can open additional sales channels and promotional opportunities that boost product visibility and sales. Seasonal and Limited-Edition Products: Introducing seasonal products or limited-edition items can generate excitement and increase sales during specific times of the year.		

Figure 15. Agro-cooperative Bojane business model canvas

2.2.4 Relevant considerations for the future

The innovator plans to use the finalised business model as a foundational tool to make more accurate financial projections and gain deeper insights into market needs. By refining their understanding of customer segments, value propositions, and revenue streams, the innovator can better align their offerings with market demand and anticipate necessary investments. This strategic framework will also assist in identifying opportunities for expansion, such as developing a wider product palette, exploring additional R&D, or forming new alliances to enhance business reach.

Furthermore, the innovator sees this approach as a potential replication model for Strumica, where similar practices could be applied to strengthen local business ecosystems. By leveraging the success of this model, they aim to encourage growth and innovation within Strumica. Looking ahead, the connection between the two selected ideas is expected to flourish, with plans for collaboration and synergy between the projects, fostering shared growth and mutual benefits in the future.

3 Reflections on the SCALE-UP Innovation Support Programme

3.1 Barrier Analysis during ISP Implementation

During the ISP implementation in North Macedonia, several barriers were encountered, each posing unique challenges that required adaptive strategies to overcome. The first significant obstacle arose when one of the initial innovators withdrew from the programme. This was due to a misunderstanding on their part regarding financial support. Although it had been clearly communicated that the ISP does not provide direct funding to individual business ideas, the innovator had expected such support. Instead, the programme aimed to assist innovators in identifying and, where possible, connecting with funding mechanisms, such as the opportunities provided at the Entrepreneurship Event. To address this, another innovator was engaged. While they were not originally from the target region, their solution was closely aligned with the region's needs and demonstrated strong potential for replication in Strumica.

Another challenge involved scheduling conflicts. The innovators' busy schedules made it difficult to conduct meetings as frequently as initially planned. However, with a flexible approach and persistent coordination, the team successfully organised over six meetings with each innovator during the ISP, ensuring meaningful engagement despite the constraints.

A further barrier stemmed from general assumptions and expectations around funding in such innovator programmes. Many entrepreneurs anticipated monetary prizes that would support the further development of their ideas. Since the program did not offer such prizes, the program focused on emphasizing the non-monetary benefits it provided, such as networking opportunities, capacity-building, and guidance in accessing alternative funding sources.

Lastly, technical issues with the MAF+ platform presented a practical challenge. In response, the coordinators team introduced an offline method for completing exercises. While this solution required additional time and effort, it ensured that the program could continue without significant disruptions.

Through addressing these barriers, several important lessons were learned. Clear and consistent communication is critical to managing expectations and ensuring that all participants understand the programme's offerings. Flexibility in scheduling and methodologies can significantly improve engagement when faced with unforeseen challenges. Moreover, effectively highlighting the value of non-monetary incentives can sustain motivation among participants. Finally, having contingency plans for technical issues can prevent delays and maintain momentum throughout the program.

3.2 ISP Conclusions and Bioeconomy Applications

The implementation of the ISP yielded valuable insights and outcomes, particularly in advancing bioeconomy initiatives and sustainable innovation. The ISP successfully facilitated the development of two innovative solutions with strong bioeconomy applications. These solutions address pressing challenges in agriculture and sustainability, demonstrating the potential for economic growth while preserving environmental integrity. The first innovation focused on bio-based solutions for sustainable agriculture, specifically promoting green fertilisers as alternatives to traditional inputs. This solution targets regions like Strumica, where environmental resilience and climate adaptation are becoming critical priorities. By leveraging a detailed market analysis and engaging key stakeholders, the initiative emphasized the value of bio-based practices in improving soil health and reducing reliance on artificial fertilisers. The second innovation centred on value-added products derived from grape processing, including juice concentrates, grape seed oil, and flavoured vinegars. This initiative targeted health-conscious consumers, local businesses, and supermarkets, offering products that align with growing demand for eco-friendly, high-quality goods.

The ISP proved effective assistance in fostering innovation and creating actionable strategies for both initiatives. It guided the innovators in understanding market dynamics and refining their business models. Moreover, the programme facilitated meaningful engagement with stakeholders, enabled the identification of key market opportunities, and emphasized the importance of sustainability in driving long-

term success. The iterative development of Business Model Canvases ensured that each solution was adapted to real-world conditions, balancing economic feasibility with environmental impact.

Both innovations offer significant potential for bioeconomy applications. The green fertiliser initiative supports sustainable agriculture by improving soil health and reducing chemical dependencies, directly addressing climate change and promoting circular economy principles. Its adaptability across various agricultural contexts makes it a valuable tool for regions seeking to transition toward more sustainable practices. The grape-based value-added products initiative demonstrates how products from traditional agricultural practices can be transformed into profitable, eco-friendly goods. By emphasizing composting, and resource efficiency, the solution serves as a model for integrating sustainability into agricultural value chains.

The ISP underscored several opportunities for advancing sustainable innovation:

- **Education and Awareness:** Both solutions revealed the need for educational efforts to raise awareness about the benefits of bio-based practices and sustainable products, particularly among farmers and consumers in traditional markets.
- **Partnership Development:** Collaborations with local authorities, NGOs, and private sector stakeholders emerged as critical for scaling solutions and accessing funding or resources.
- **Policy Advocacy:** Engaging with policymakers to advocate for supportive regulations and financial incentives can accelerate the adoption of bio-based innovations.
- **Technological Integration:** Incorporating advanced tools, such as precision farming and sustainable processing techniques, enhances the usability and appeal of bio-based solutions.

The ISP has laid a strong foundation for fostering bioeconomy applications and sustainable innovations with a potential for creating economic value while addressing critical environmental challenges. By addressing barriers and leveraging opportunities, these solutions can drive meaningful progress toward a more sustainable and resilient future.

3.3 Innovators and ISP Future Directions

The ISP has made an impact on both innovations, serving as a foundation for their growth and alignment with sustainable development goals. By providing structured guidance, comprehensive business models, and an opportunity to collaborate, the programme has enabled both innovators to develop clear strategies and actionable plans. These contributions are poised to generate lasting benefits, both within their respective sectors and in the broader bioeconomy landscape.

For the first innovator, the ISP has been instrumental in creating a strategic pathway to advance sustainable agriculture in Strumica. The business plan developed through the programme has become a central tool, guiding efforts to secure funding, expand market reach, and engage more farmers in sustainable practices. This focus on farmer engagement is particularly crucial, as their participation will drive the adoption of environmentally friendly techniques and improve agricultural productivity. The second innovator has also benefited from the ISP, using the finalised business model to refine their approach to market needs and financial planning. This strategic framework has not only clarified their short-term goals but also paved the way for broader aspirations, including the potential to replicate their cooperative model in Strumica. The ISP's support has allowed the innovator to focus on product diversification and building strong customer relationships, ensuring their long-term viability in a competitive market.

Looking ahead, the ISP has outlined a clear trajectory for both innovations, with short-, medium-, and long-term goals designed to maximise their impact. In the short term, both innovators will concentrate on implementing their business plans and leveraging partnerships established during the programme. The first innovator will prioritise securing funding for additional machinery, a critical step in scaling their operations. Meanwhile, the second innovator will focus on product testing and gathering customer feedback to refine their offerings further. Both will work on strengthening their relationships with key stakeholders, including local authorities, NGOs, and private-sector partners, to ensure a solid foundation for growth. Medium-term goals will center on scaling their respective operations and exploring collaborative opportunities. The first innovator plans to attract more farmers to their initiative, emphasizing the benefits of sustainable farming practices and access to innovative technologies.

Concurrently, the second innovator will expand their product portfolio and refine their distribution channels to reach a broader audience. Collaboration between the two projects will also play a crucial role, with joint efforts aimed at maximising their collective impact. Over the long term, both innovations aspire to drive significant regional and national change. The first innovator envisions transforming Strumica into a hub for sustainable agriculture, empowering local farmers and fostering economic resilience. The second innovator aims to expand their cooperative model beyond its current scope, offering eco-friendly products that align with modern consumer demands while strengthening local business ecosystems.