Ref. Ares(2025)5198194 - 30/06/2025

MAINSTREAM BIO

MAINSTREAMING SMALL-SCALE BIO-BASED SOLUTIONS ACROSS RURAL EUROPE

D4.2

Report on co-creation workshops, mutual learning events and missions

FBCD

30th June 2025

Funded by the European Union

PROJECT INFORMATION

PROGRAMME	Horizon Europe
TOPIC	HORIZON-CL6-2021-CIRCBIO-01-08
TYPE OF ACTION	HORIZON Coordination and Support Actions
PROJECT NUMBER	101059420
START DAY	1 September 2022
DURATION	36 months

DOCUMENT INFORMATION

TITLE	D4.2 Report on co-creation workshop, mutual learning events and missions
WORK PACKAGE	WP4 Evaluation, sharing of best practices, peer-learning and knowledge transfer
TASK	T4.2 Regional workshops to co-create sustainable business model pathways for bio-based solutions T4.3 Cross-regional mutual learning events and missions for good practice sharing and knowledge transfer across regions
AUTHORS (Organisation)	Liselotte Puggaard (FBCD) Anastasios Galatsopoulos (WHITE)
REVIEWERS	Anastasios Galatsopoulos (WHITE) Beatriz Deltoro (INNV)
DATE	June 30th 2025

Funded by the European Union

DISSEMINATION LEVEL

PU	Public, fully open	x
SEN	Sensitive, limited under the conditions of the Grant Agreement	
Classified R-UE/EU-R	EU RESTRICTED under the Commission Decision No2015/444	
Classified C-UE/EU-C	EU CONFIDENTIAL under the Commission Decision No2015/444	
Classified S-UE/EU-S	EU SECRET under the Commission Decision No2015/444	

DOCUMENT HISTORY

Version	Date	Changes	Responsible partner
V0.1	30/04/2025	Initial version	FBCD
V0.2	04/06/2025	Consortium and quality review	MIP leaders, INNV, WHITE
V1.0	28/06/2025	Final version	FBCD
V1.0	30/06/2025	Submission to EC	Q-PLAN

LEGAL NOTICE

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

© MAINSTREAMBIO Consortium, 2025

Reproduction is authorised provided the source is acknowledged.

TABLE OF CONTENTS

TABLE OF FIGURES

LIST OF TABLES

ABBREVIATIONS

AD	Anaerobic digestion
BBS	Bio-based solution
BG	Bulgaria
BM	Business model
CAPEX	Capital expenditure
CE	Circular economy
CML	Cross-regional mutual learning event and mission
DK	Denmark
ES	Spain
GHG	Greenhouse gas
HaaS	Hardware-as-a-Service
IE	Ireland
LAG	Local action group
MAP	Multi-actor partnership
MIP	Multi-action innovation platform
NGO	Non-governmental organisation
NL	Netherlands
OPEX	Operational expenditure
PL	Poland
RDP	Rural development program

RHB	Regional hub for bioeconomy
SaaS	Software-as-a-Service
SE	Sweden
SH	Stakeholders
SUW	Scale-up workshop
T	Task

Executive Summary

From September 2024 to April 2025, MainstreamBIO conducted 7 scale-up workshops (SUW) and 7 cross-regional mutual learning (CML) events and missions across Europe. These sessions brought together diverse rural stakeholders to co-create and share knowledge on scaling small-scale bio-based solutions (BBSs).

The SUWs focused on region-specific planning, helping participants assess solution readiness, share success stories, and develop tailored pathways for local bioeconomy growth. The CMLs, supported by field visits, facilitated cross-regional learning on technology deployment, business models (BMs), and nutrient recycling.

Common challenges included complex regulations, policy misalignment, financial limitations, and resistance to change. Participants proposed practical solutions like advisory services, training, matchmaking platforms, and stronger local engagement and emphasized the importance of local value chains, circular BMs, peer learning and flexible, supportive policy frameworks.

In summary, MainstreamBIO's integrated approach of conducting SUWs and CML events has proven effective in fostering collaboration, innovation, and strategic direction for Europe's rural bioeconomy. Continued support is needed to align policy and strengthen partnerships to unlock the full potential of small-scale BBSs and thereby supporting the development of bioeconomy across Europe.

1. Introduction

This report describes the approach, activities performed, progress and results of MainstreamBIO's tasks T4.2 and T4.3. Each of these tasks include 7 insights, one per focal region of the project, gathered by the leaders of the regional multi-action innovation platforms (MIPs). This document also includes joint findings and conclusions of both tasks. These two tasks jointly fulfil the objective T4.2 according to GA, i.e. to run workshops to open scale up, engage mutual learning and transfer knowledge.

The aim of T4.2 was to organize 7 regional scale-up workshops (SUWs) to co-create sustainable business models (BM) pathways for bio-based solutions (BBSs). In these events, participating multi-actor partnerships (MAPs) and stakeholders discussed experiences, including barriers and success factors, gained through MainstreamBIO to assess the scaling readiness of the solutions supported within their region and co-create sustainable pathways for their further scale-up. Case studies and success stories developed within the project were used as inspiration for fruitful dialogues, brainstorming and problem-solving. Key outcomes from the T4.2 workshops gradually informed T4.3 and are included in this report.

The aim of T4.3 was to organize 7 cross-regional mutual learning (CML) events and missions for good practice sharing and knowledge transfer across regions. Each MIP leader, in collaboration with the task leader, formulated learning topics relevant for their region, revolving around the implementation of small-scale BBSs, BMs, and nutrient recycling practices. Representatives, within the consortium and linked networks and initiatives, were invited to attend the workshops, fostering international exchange. Field visits to deployment sites of small-scale BBSs in rural areas were organised as missions, whereby stakeholders from other regions attended local demonstrations.

Section 2.3 of this report presents the results from the individual SUWs and table 23 summarises the key-findings. Section 3.3 represents the results from the individual CML events.

2. Task 4.2 – regional scale-up workshops

2.1 Introduction - regional scale-up workshops

This section provides a summary of the goals, approach, activities and results of the series of SUWs, organised by MainstreamBIO as part of T4.2 “Regional workshops to co-create sustainable BMs for BBSs bio-based solutions”. These workshops brought together various stakeholders, including local governments, biomass producers, and MAPs, to tackle specific challenges and leverage successes in bio-based innovation. By providing a common ground for collaboration, scale-up workshops enabled participants to share their experiences, identify barriers, and highlight success factors encountered during their journey with MainstreamBIO. This collective knowledge not only enhances the readiness of BBSs for scaling-up but also aligns with the project's goal of developing sustainable BM tailored to regional potentials. Furthermore, the insights gained during these workshops contribute to a comprehensive understanding of the bioeconomy concept, which is essential for catalysing mutual learning across regions and informing policy frameworks that support the uptake of bio-based innovations.

This section presents the experience and information gained in the regional SUWs to inform and facilitate the development of a robust framework for scaling up BBSs across rural Europe. In total, 7 SUWs were conducted in MainstreamBIO's focal regions, each aiming to engage an initial target of 10-15 participants. As the task leader, WHITE was responsible for guiding all MIP leaders and supporting the workshops’ implementation by designing the workshop methodology and developing all the necessary guidelines and reporting templates. Additionally, WHITE monitored the overall progress of the workshops’ implementation phase to ensure their timely completion. MIP leaders were responsible for organising and implementing the SUWs, which included selecting suitable venues, finalising the agenda, inviting participants, and reporting the outcomes back to WHITE.

2.2 Workshops Preparation and Planning

2.2.1 Preparatory activities

Preparatory activities have been underway since the start of T4.2 in M18. WHITE, as the task leader, was responsible for developing the required material and providing guidance to each MIP leader through the entire process to ensure their successful delivery. All workshops were scheduled to be completed by the end of November 2024 (M27), while each partner was responsible for booking the exact date and place of their respective workshop. The image below highlights the key activities carried out from February 2024 (M18) to February 2025 (M30).

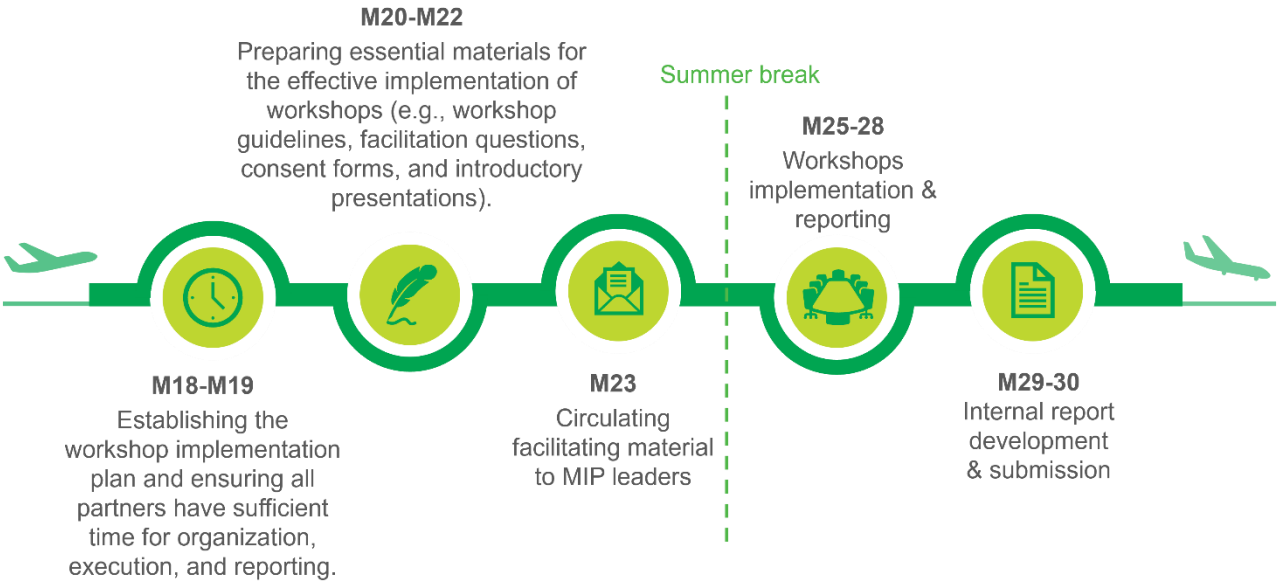


Figure 1. SUW implementation plan.

2.2.2 Workshop's structure

All 7 regional scale-up workshops followed a common structure of three different sessions as illustrated in the image below:

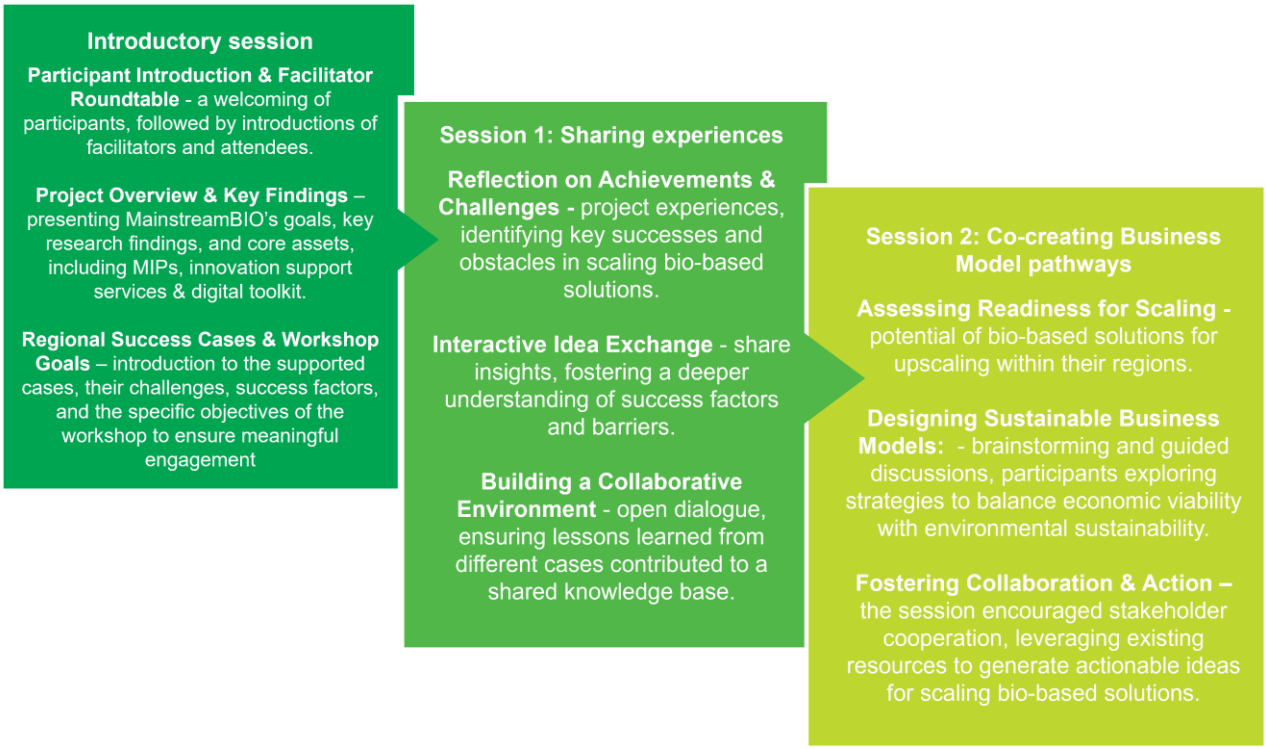


Figure 2. SUW structure.

2.3 Scale-up workshops implementation

Regional scale-up workshops took place from September to November 2024, with an average attendance of 15 participants per workshop. Key insights from each workshop along with a comprehensive analysis of the outcomes derived from them are presented in the next sections.

Table 1 Main information about the SUW.

Region	Organising partner	Date of the event	Format	No. of participants
PL	IUNG	29.11.24	On-site	30
DK	FBCD	17.09.24	On-site	27
SE	RISE	17.09.24	On-site	9
BG	AUP	19.09.24	On-site	11
ES	INNV	25.11.24	On-site	19
IE	MTU	18.10.24	On-site	48
NL	WR	12.11.24	On-site	17
Total				161

During the invitation phase for each scale-up workshop, a significant challenge was ensuring the participation of representatives from each supported case and/or all MIP members. This difficulty mainly stemmed from geographical constraints and time limitations, making it logistically challenging for some to attend in person. To address this issue and ensure that all supported cases were thoroughly presented, the introductory presentation included dedicated slides for each supported case. These slides outlined the name of the case, its background, the specific actions supported by MainstreamBIO, and the associated barriers, challenges, and success factors. This approach ensured that all participants were well-informed about the regional supported cases, enabling them to engage in the co-creation sessions more effectively by sharing relevant experiences and perspectives.

2.3.1 Scale-up workshop in Wąwolnica, Poland

Workshop's aggregate data

General details	
Title	"Innovating Agriculture: From Concept to Market"
Date	November 29th, 2024
Venue	Rozanna Restaurant, Wąwolnica, Poland
Organisers	IUNG
Participants profile	
No. participants	30
Type of participants	Representation of industry, civil society, policy agencies, and academia, providing a comprehensive perspective on the challenges, opportunities, and pathways for advancing BBSs in the region.

Figure 3 Polish SUW presentations.

The event was held alongside a conference presenting the outcomes of the Operational Group “Owoce 4.0” and focused on advancing bio-based solutions in agriculture, particularly in fruit production.

The workshop featured expert lectures and discussions, highlighting key factors for scaling BBSs and innovations, such as BM development and matchmaking services provided by the MainstreamBIO project. With a focus on agricultural entrepreneurs and innovators, especially in the fruit production sector, the workshop successfully engaged a niche audience deeply invested in the topics presented. While broader stakeholder participation was limited, the event demonstrated how collaborative efforts can bridge the gap between innovation and market readiness, underscoring the importance of EU-funded initiatives and tailored business models in promoting sustainable agricultural practices.

Key-insights of session 1 – sharing experiences

First and foremost, participants highlighted the fulfilment of the primary objectives set out in their respective projects as a main achievement, which provided a foundation for further development. Another notable success was the identification of suitable partners for collaboration, which played a pivotal role in advancing the projects. Participants also acknowledged the importance of developing effective business models and scale-up strategies that aligned with the goals of sustainability and economic viability, setting the stage for broader implementation of BBSs.

Parallel to the achievements, several challenges were encountered during the projects’ lifecycle, reflecting the complexity of scaling up BBSs. One major issue was navigating the formal requirements and bureaucratic processes associated with project settlements, which often proved to be time-consuming and resource intensive. Securing a scientific partner also presented difficulties, as did finding qualified personnel to manage and implement complex design projects. Additionally, participants faced unexpected technical problems and struggled with financial obstacles, such as delays in advance payments and tranche disbursements, which created operational disruptions during project implementation.

To overcome these barriers, participants emphasised the importance of employing skilled professionals with expertise in managing and implementing design projects. Establishing broad networks and promoting projects widely were also highlighted as critical steps to ensure knowledge sharing and collaboration. Close cooperation with agricultural advisors and innovation brokers was seen as an effective strategy to gain practical insights and improve project implementation. Furthermore, active participation in workshops, thematic conferences, and related events was deemed essential for building valuable contacts and fostering partnerships.

Regarding balancing measures, participants underlined the need to strike a balance between economic viability and environmental sustainability when scaling BBSs. One effective measure was the utilization of waste biomass, which not only reduced environmental impact but also enhanced resource efficiency. Reducing costs associated with wasted spraying was another significant step towards ensuring both economic and environmental benefits. In addition, analysing business plans with expert input was recognised as a crucial practice to ensure that projects remain economically viable while adhering to sustainability principles.

Effective communication emerged as a key factor for gaining the support of partners and investors. Participants recommended regular meetings and presentations to showcase progress and results, often organising these events locally or on neighbouring farms to engage stakeholders directly. Participation in workshops, conferences, and fairs was also seen as an invaluable opportunity to promote BBSs and build credibility among potential investors and collaborators. The importance of organising more on-field demonstrations to showcase the practical benefits of bio-based practices was also emphasised. These demonstrations, combined with broader awareness-raising campaigns, were deemed crucial for building public understanding and support.

Table 2 Polish SUW – shared experiences

Main achievements	• Fulfilment of the main objectives in the projects; • Finding partners for collaboration; • BM and scale up strategy developed.
Challenges & barriers	• Fulfilling the formal requirements; • Bureaucracy in project settlement; • Difficulties in finding scientific partners & qualified personnel; • Unexpected technical problems; • Financial barriers.
Solving measures	• Employment of skilled workers; • Establishing broad network & promote projects; • Close cooperation with agricultural advisors.
Economic viability & environmental sustainability measures	• Utilization of waste biomass; • Reducing costs resulting from wasted spraying; • Analysis of business plans with experts.
BBS Communication strategies	• Regular meetings; • Local presentations on neighbouring farms; • Participation in workshops, conferences, fairs.
SH engagements & SI	• More demonstrations should be organised.

Key-insights of session 2 – co-creating BM pathways

Sustainability pathways

Participants identified several steps for regional scaling of BBSs and supporting collaboration among stakeholders. A tailored approach to address the specific needs of the region, such as targeted solutions for combating harmful pests, was pointed critical. The versatility of proposed solutions, including the ability to adapt modules for different uses or vehicles, was highlighted as a key factor for scalability. Establishing a strong local team and investing in capacity-building initiatives were also underlined as vital measures to ensure effective project execution, together with maintaining a detailed roadmap and conducting thorough environmental assessments aiming to guide actions and optimize the potential for scaling success.

Accessing and securing funding was recognised as a cornerstone of long-term sustainability for BBSs. Participants suggested a proactive approach, involving regular searches for funding opportunities, active participation in economic missions, and attendance at meetings organised by financing entities. Networking through thematic local initiatives was highlighted to strengthen collaborations and identify shared goals.

The session also shed light on key challenges in scaling BBSs. Sustained access to funding, support for patent creation, and legal guidance during the development process were identified as pressing concerns. To address these barriers, participants proposed leveraging substantive and legal support services and fostering partnerships with entities that specialize in these areas.

Continued substantive support from IUNG-PIB was highlighted as a key enabler provided by MainstreamBIO, offering expert guidance and assistance throughout the development process. Opportunities such as online training, study trips, and participation in workshops planned for 2025 were seen as valuable resources for capacity building and knowledge sharing. Non-financial support was recognised as an equally important component in the successful scaling of BBSs. Substantive care, including expert advice and mentorship, was seen as crucial in navigating complex processes. Training programs and legal care services were identified as critical measures to ensure compliance and address regulatory challenges. Dissemination efforts, including advertising campaigns, presentations, radio appearances, and social media posts, were viewed also as vital strategies for raising awareness and promoting bio-based solutions to a wider audience.

Table 3 Polish SUW – sustainability pathways

Key-steps for scaling-up & SH collaboration	• Tailored strategy to address regional needs; • Adjust modules to different uses; • Broaden the local network & invest in capacity building; • Maintain regional roadmap & environmental assessments.
Long-term sustainability measures	• Access and secure funding opportunities; • Involvement in economic missions; • Attend finance meetings; • Networking with local initiatives.
Pressing challenges & solutions	• Ensure continuous funding; • Patent development and legal support; • Access to existing supporting schemes.

Further supporting measures from MainstreamBIO & MIPs	• Substantive support from IUNG; • Participation in online training, study trips and workshops.
Non-financial support for scaling-up	• More training; • Legal care; • Dissemination, networking efforts.

Business model pathways

The BMs identified by the Polish participants included Software-as-a-Service (SaaS), Hardware-as-a-Service (HaaS), direct rental, and direct sales. Each approach offers unique benefits depending on the target audience and the nature of the solution. For instance, SaaS and HaaS models provide flexibility and scalability, while direct sales and rental models appeal to customers looking for immediate and tangible results.

The co-creation session also emphasised the need to design innovative BMs that integrate CE principles. Participants highlighted the importance of selecting a well-defined target audience to ensure that the product addresses specific needs effectively and highlighted the necessity of having highly qualified personnel. Additionally, maintaining adequate product inventory or the capability to rapidly produce stock was seen as critical for meeting market demands. Specific goals such as increasing revenue, improving market share, enhancing customer satisfaction, and reducing waste were identified as benchmarks for evaluating the success of new BMs.

Strong partnerships and effective market strategies were identified as essential for improving accessibility to BBSs, namely attracting contractors, partners, and customers through targeted promotions, such as participation in exhibitions, workshops, and fairs organised by local initiatives, was deemed a highly effective approach. Establishing connections with a wide range of stakeholders, including representatives from science, administration, and media, was also emphasised as a means to enhance visibility and credibility. Furthermore, participants recognised the value of gaining in-depth knowledge about specific thematic needs to tailor offerings and strengthen market positioning.

Participants underscored the necessity of regulatory and policy changes to support the scaling of sustainable BMs. Proposed changes included enforcing regulations on environmental protection and reducing greenhouse gas emissions, as well as promoting healthy food and lifestyles. Policies aimed at limiting the use of plastics and enhancing food quality certification for exports were also seen as priorities. Additionally, supporting local production and reducing food imports were identified as critical measures to foster regional sustainability.

Table 4 Polish SUW - BM pathways

Ongoing business models	• Software-as-a-service; • Hardware as a Service; • Direct rental; • Direct sales.
New business models & CE	• Targeted audience selection; • Involve highly qualified personnel; • Maintain adequate product inventory;

	• Set specific goals on revenue, market share, customer satisfaction and waste management.
Market accessibility planning	• Establish strong partnerships by contacting related SHs; • Run targeted promotional activities, e.g. workshops, events etc; • Gain in-depth knowledge on specific thematics.
Regulatory & policy gaps	• Establish regulatory and policy schemes supporting environmental protection, healthy lifestyle, products' quality and local production.

2.3.2 Scale-up workshop in Auning, Denmark

Workshop's aggregate data

General details	
Title	"Lowland soil harvesting and workshop in relation to Tripartite agreement"
Date	September 17th, 2024
Venue	Green Museum venue, Auning, Denmark
Organisers	FBCD
Participants profile	
No. participants	27
Type of participants	The stakeholder representation included industry (17), academia and research (4), government and policy agencies (5) and civil society (1).

Figure 4. Danish SUW showcase and discussion.

The introductory session featured several insightful presentations. CurruTek showcased and demonstrated a harvest machine designed for lowland areas, while Knud Tybirk, FBCD shared experiences from harvesting lowland soils in HØSTTEK. Lone Bording from the Danish Society for Nature Conservation discussed the perspectives of the Danish tripartite agreement for lowland

areas, emphasising climate, biodiversity, and economic considerations. Moreover, senior researcher Poul Erik Lærke from Aarhus University, Institute for Agroecology, presented the potential of greenhouse gas effects of lowland harvesting, detailing current knowledge in the field. In addition, Liselotte Puggaard, MIP leader FBCD, introduced the MainstreamBIO project and provided an overview of the workshop objectives and structure.

Key-insights of session 1 – sharing experiences

At the beginning of this session, participants highlighted key achievements in developing specialised machinery for wetland harvesting. The harvesters are optimised for 5,500kg weight, soil-friendly pressure, and adjustability, enabling operations in very wet areas without causing soil damage. Its use promotes biodiversity by removing tall grasses, reeds, and self-sown trees, creating better habitats for wildlife. Additionally, the harvested biomass has multiple applications, including biogas production and as raw materials for bio-based building products, adding significant value to the supply chain. Participants also highlighted several barriers to scaling-up wetland harvesting solutions: the market's readiness for the harvester remains limited, and transporting harvested biomass poses logistical difficulties as conventional tractors and trucks cannot access the terrain. Cooperation among landowners was identified as a significant challenge, given the diverse needs and expectations of stakeholders involved in the value chain.

Following that, several measures to overcome identified challenges were proposed. Establishing a landowner association was suggested to align stakeholder interests and foster collaboration. Participants emphasised the need for awareness campaigns and showcases to highlight the benefits of joining this value chain. They also discussed subsidy schemes tailored to different parts of the value chain and the importance of mapping and classifying lowlands to ensure profitability, recommending a minimum area of 10 hectares for sustainable operations.

The discussion highlighted the importance of adopting a "people, planet, profit" BM to balance societal, environmental, and economic needs. Participants explored the potential of green tripartite agreements, emphasising that tailored subsidy schemes are necessary to support different segments of the value chain effectively. For broader acceptance, it is critical to showcase the benefits of harvesting wetlands, including creating open landscapes, enhancing biodiversity, reducing nutrient runoff, and preserving soil health through the harvester's gentle operation.

Building on the need for stakeholder engagement, participants stressed the importance of targeted communication strategies to effectively present BBSs. Awareness campaigns and demonstrations of the technology's benefits, such as improved biodiversity, nutrient removal from wetlands, and nature restoration, were identified as key tools. Furthermore, the tripartite agreement, which mandates the removal of 140,000 hectares of lowland soils to meet Denmark's greenhouse gas (GHG) reduction targets, underscores the harvester's critical role. Participants also noted the need for investments to scale production, enhance logistics, and refine the business model to attract partners and investors. Engaging local communities, landowners, and civil society is also essential for scaling these BBSs. Non-governmental organisations (NGOs) can play a pivotal role in fostering collaboration as well.

Table 5 Danish SUW - shared experiences

Main achievements	• Optimised harvesters; • Multiple applications for harvested biomass.
Challenges & barriers	• Limited market readiness;

	• Transporting harvested biomass poses logistical difficulties; • Poor cooperation among landowners.
Solving measures	• Establishing a landowner association; • Awareness campaigns & showcases.
Economic viability & environmental sustainability measures	• Adopting a "people, planet, profit" business model; • Establish green tripartite agreements; • Benefits in harvesting wetlands.
BBS Communication strategies	• Awareness campaigns & demonstrations of improved biodiversity, nutrient removal from wetlands, and nature restoration etc.
SH engagements & SI	• Landowners; civil society & NGOs have a high impact on this biobased solution.

Key-insights of session 2 – co-creating BM pathways

Sustainability pathways

Discussions during the session emphasised the need for strategic and collaborative approaches to scale BBSs including development of tailored subsidy schemes to incentivize landowners. Participants proposed drafting an open letter to the new minister of the tripartite agreement, detailing recommendations for the effective handling of the 140,000 hectares of wetlands in Denmark as well as suggesting a link between subsidies and environmental benefits and to cover technology development costs to motivate landowners. Partnerships with key stakeholders such as landowners, local advisory centres, municipalities, local entrepreneurs, transportation companies, and the energy sector were emphasised as necessary for a robust and accessible market.

Long-term contracts, spanning at least five years, were highlighted as necessary to build trust and commitment among landowners. Transportation costs must be incorporated to provide realistic projections for stakeholders. The need for comprehensive land mapping and planning was another key focus area. Participants stressed that land use planning should align with broader goals, such as biodiversity conservation or biomass harvesting, ensuring a clear and unified vision. Discussions also addressed the inclusion of non-agricultural lands like recreational or residential areas into these schemes.

The importance of integrating biomass harvesting into Denmark's energy supply chain was also highlighted. This would ensure a reliable and consistent source of raw material for bioenergy production, helping to secure the sustainability of the project. Key partnerships with landowners, local advisory centres, municipalities, entrepreneurs, transportation companies, and the energy sector were identified as essential to creating a successful value chain and ensuring operational success. A significant challenge noted was the need for comprehensive mapping of the potential for using biomasses from lowlands. This mapping is critical for identifying viable areas for biomass harvesting and ensuring a steady and secure supply to meet market demands. While no further supporting measures from MainstreamBIO and MIPs were discussed, the potential for non-financial support, such as highlighting the natural benefits of wetland harvesting, was emphasised.

Table 6 Danish SUW - sustainability pathways.

Key-steps for scaling-up & SH collaboration	• Open letter to the new minister of the Tripartite agreement; • Subsidy schemes; • Long-term contracts; • Comprehensive land mapping and planning; • Inclusion of non-agricultural lands.
Long-term sustainability measures	• Integrating biomass harvesting; • Key partnerships with landowners, local advisory centres, municipalities, entrepreneurs, transportation companies & the energy sector.
Pressing challenges & solutions	• Need for comprehensive mapping of the potential for using biomasses from lowlands.
Further supporting measures from MainstreamBIO & MIPs	• No comments were shared.
Non-financial support for scaling-up	• Highlighting the natural benefits of wetland harvesting.

Business models pathways

In the discussion on current Danish BMs, no specific details were provided. However, the focus shifted to designing new BMs, particularly the role of circular economy (CE) principles. One key aspect highlighted was the upcycling and utilisation of side streams from biomass harvests, which can further strengthen the business case by adding value to what would otherwise be waste. For market accessibility, the integration of BBSs into Denmark's energy supply chain was identified as essential for long-term success.

Regarding regulatory or policy changes, it was noted that subsidy schemes are crucial but must involve further communication and cooperation with stakeholders to ensure their effectiveness. Additionally, under the tripartite agreement, it is expected that the business models and activities in this bio-based sector will continue to evolve and expand, reinforcing the need for continued support and adaptation from both policy and business perspectives.

Table 7 Danish SUW - BM pathways.

Ongoing business models	• No comments were shared.
New business models & CE	• Designing new BMs aiming to the upcycling and utilization of side streams from biomass and harvests.
Market accessibility planning	• Integration of BBSs into energy supply chain; • Partnerships with key SHs.
Regulatory & policy gaps	• Subsidy schemes must involve communication & cooperation with SHs; • Continuous support and adaptation from policy & business.

2.3.3 Scale-up workshop in Umeå, Sweden

Workshop's aggregate data

General details	
Date	September 17th, 2024
Venue	Clarion Hotel, Umeå, Sweden
Organisers	RISE
Participants profile	
No. participants	9
Type of participants	Representation of business (6) and research & academia (3) sectors, ensuring a well-rounded perspective on regional challenges, opportunities, and pathways for scaling up bio-based solutions.

Figure 5. Swedish SUW.

The workshop included a series of targeted presentations tailored to provide participants with key insights and resources. Highlights included an introduction to the MainstreamBIO project and its digital toolkit, along with an overview of the support services available within MainstreamBIO. In addition, participants delivered presentations showcasing their roles and contributions, emphasising the collaborative efforts driving the region's transition to a bio-based economy. These presentations set the stage for productive dialogues and knowledge exchange throughout the session.

Key-insights of session 1 – sharing experiences

No specific achievements were identified during the first session of the SUW. Discussions were mainly focused on addressing current challenges and exploring potential measures for scaling up BBSs.

Participants identified the availability of infrastructure as a key limitation, creating bottlenecks for progress. Additionally, coordinating the cooperation of multiple stakeholders was noted as a complicated issue, particularly when managing diverse interests and expectations. Another critical barrier is finding skilled individuals with the necessary competencies to drive innovation and implementation effectively.

To overcome these barriers and successfully scale BBSs, participants suggested sharing facilities as a practical approach to optimize resource use and reduce costs. Another proposed measure was to establish mechanisms to facilitate the flow of solutions throughout the scaling process, ensuring smoother transitions from development to implementation. Participants also emphasised the importance of engaging local communities by establishing networks and partnerships.

Table 8 Swedish SUW - shared experiences

Main achievements	• No comments were shared.
Challenges & barriers	• Infrastructure availability; • Stakeholders corporations. • Hard to find skilled individuals with the right competence.
Solving measures	• Facility sharing; • Development of solutions flow mechanisms towards BBS upscaling.
Economic viability & environmental sustainability measures	• No comments were shared.
BBS Communication strategies	• No comments were shared.
SH engagements & SI	• Networks and partnerships establishment.

Key-insights of session 2 – co-creating BM pathways

Sustainability pathways

The co-creation session identified several critical steps towards scaling-up BBSs and enhancing stakeholder collaboration. Participants stressed the importance of developing robust infrastructure and leveraging partnerships with universities, particularly through collaborations that utilize university facilities and involve students in master thesis writing, providing mutual benefits for both academic institutions and companies. Additionally, streamlining development processes through improved coordination across various stages of the value chain was considered essential to enhance efficiency. Strong project management practices were highlighted as necessary to guide start-ups in transitioning from individual-driven efforts to organised, team-based operations, enabling more effective scaling.

Participants emphasised the role of universities and networks in ensuring the long-term sustainability of BBSs. Universities offer infrastructure and collaborative opportunities, such as projects involving students, which can support companies in their scaling efforts. Creating networks where successful start-ups can share their experiences, knowledge, and resources was proposed as another vital strategy to foster learning and support for new ventures.

Market accessibility was another critical concern, with participants recognising the need for tailored strategies to help start-ups effectively reach and penetrate the market. Additionally, support from initiatives like MainstreamBIO was seen as vital for integrating more people into scaling processes and identifying the necessary skills to advance these solutions.

Table 9 Swedish SUW - sustainability pathways.

Key-steps for scaling-up & SH collaboration	• Robust infrastructure development; • Leverage stakeholder collaboration; • Improve coordination across value chain stages; • Strengthen project management practices.
Long-term sustainability measures	• Stronger involvement of universities and related networks.
Pressing challenges & solutions	• High costs of infrastructures and challenges in market accessibility; • Promote shared facilities and develop new partnerships • Tailored strategies for start-ups penetration in the market.
Further supporting measures from MainstreamBIO & MIPs	• Better identification of skill gaps related to scaling BBS.
Non-financial support for scaling-up	• Collaborative networks.

Business models pathways

The Swedish participants highlighted the significant challenges companies face with scaling up BBSs, particularly due to the substantial financial investment required to build infrastructure for commercial production. Following this, the co-creation session explored the challenges and opportunities in designing new BMs, particularly those incorporating CE principles. Participants identified certain barriers against implementing circular models, such as difficulties in reversing material flows once progress has been made. Questions arose about accessing these flows and identifying the skills needed to achieve specific goals. Collaborating with universities was seen as a valuable strategy to foster innovation and develop more sustainable business models. Additionally, participants suggested that start-ups could benefit from outsourcing side stream collection or sorting to another company, to potentially increase the amount of material available for them to use. This could only work if the costs of such services are manageable.

Regarding market accessibility, participants emphasised the necessity of building networks and partnerships to support start-ups in navigating market challenges. Finally, the complexity and overlap of current policies were identified as major barriers to the adoption of sustainable BMs. Participants discussed the need for simplified regulations and guidelines of better clarity to help companies understand and comply with requirements.

Table 10 Swedish SUW - BM pathways.

Ongoing business models	• High costs for commercial production infrastructure.
New business models & CE	• Difficulties to move flows back after production progress; • Collaboration with academia towards innovative and sustainable business model development; • Companies handling side-streams as a supportive measure for start-ups.

Market accessibility planning	• Networks and partnerships establishment is necessary.
Regulatory & policy gaps	• Complexity and overlapping of current policies; • Regulations need to be simplified and provide clear guidance.

2.3.4 Scale-up workshop in Plovdiv, Bulgaria

Workshop's aggregate data

General details	
Date	September 29th, 2024
Venue	Jagehoff venue, Plovdiv, Bulgaria
Organisers	AUP
Participants profile	
No. participants	11
Type of participants	Diverse stakeholder groups, representing a range of expertise in agriculture, bioeconomy, and circular economy: industry (6), civil society (2), policy agencies (2) and academia (1).

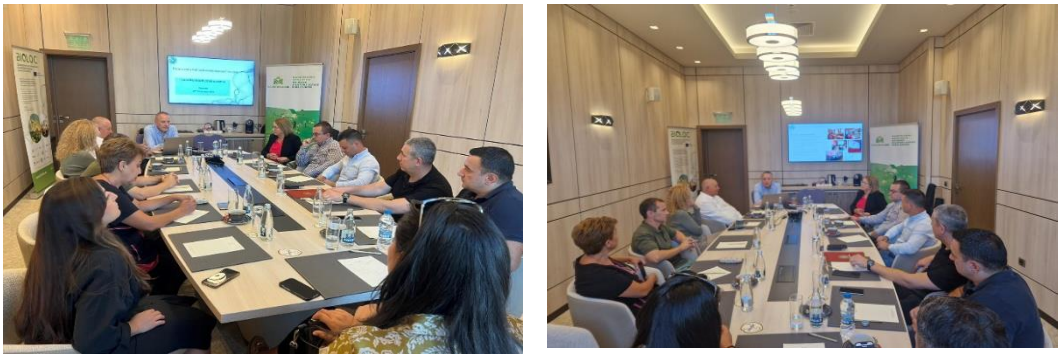


Figure 6 Bulgarian SUW event.

The moderators from AUP for the Bulgarian scale-up workshop were Daniela Gozmanova and Haik Garabedian, while the introductory session was led by Prof. Vladislav Popov. During this session, Prof. Popov outlined MainstreamBIO's vision and objectives, highlighting the project's efforts to engage local stakeholders, including the establishment of a MIP and supporting MAPs. The introduction also emphasised the process of scaling up solutions developed by MainstreamBIO.

Key-insights of session 1 – sharing experiences

During the first session of the SUW, participants highlighted the development of a regional bioeconomy strategy as a key achievement. This strategy was crafted using insights from comprehensive analyses conducted within the MainstreamBIO project, which examined regional

capacities, challenges, and opportunities. Participants acknowledged that this milestone not only reflects the progress made but also establishes a strong foundation for future initiatives.

Despite these achievements, several critical challenges were identified as barriers to scaling up BBSs. First, the lack of qualified personnel, particularly in small companies and agricultural holdings, was recognised as a pressing issue, limiting the capacity for innovation and project implementation. Also, the lack of sufficient cooperation initiatives in the bioeconomy sector emerged as a significant barrier. Participants noted that existing collaboration efforts remain underdeveloped, and further investment is needed to support partnerships among stakeholders. Finally, the role of government support was emphasised, with challenges stemming from the Governor's limited authority to implement bio-based initiatives independently. Participants underscored the necessity for Ministry of the Interior approvals, which often adds layers of bureaucracy and delays to the process.

To address these challenges, participants proposed leveraging MainstreamBIO resources and related projects to provide targeted training programs. These trainings aim to upskill local personnel and address the existing knowledge gaps in small-scale bio-based enterprises. Additionally, presenting more successful case studies was recommended to inspire and guide regional actors. Matchmaking activities were also discussed as a vital tool for connecting local cooperatives with successful entities or cooperatives in other regions. By facilitating knowledge transfer and demonstrating effective models of collaboration, these initiatives are expected to enhance regional capacity, encourage cooperation, and ultimately contribute to scaling up the bioeconomy.

No specific comments or insights were shared regarding strategies to balance economic viability, environmental sustainability, and the broader goals of bioeconomy. This indicates a potential area for further discussion and exploration in future activities, emphasising the importance of developing integrative approaches that align financial, environmental, and societal objectives within the ecosystem of BBSs. Moreover, participants agreed on the need to enhance their communication strategies to effectively promote BBSs to partners and investors. They identified local hubs and entities, such as the regional hub for bioeconomy (RHB) and Trakya Economic Zone, as pivotal platforms for driving the communication and promotion of the scale-up process. The Trakya Economic Zone, an NGO representing the interests of over 100 firms in the Plovdiv district, was highlighted as a unique asset capable of fostering collaboration and interest among key stakeholders. Similarly, the RHB was recognised for its critical role in facilitating dialogue, building trust, and bridging gaps between stakeholders, ensuring a unified approach to advancing bio-based solutions.

Participants stressed the importance of involving local action groups (LAGs) in the scale-up process to strengthen local engagement and enhance regional bioeconomy initiatives. Specifically, the LAGs of Brezovo and Rakavoski expressed their commitment to joining the effort, aiming to actively contribute to the local MIPs and the RHB.

Table 11 Bulgarian SUW - shared experiences.

Main achievements	• Regional bioeconomy strategy developed;
Challenges & barriers	• Lack of qualified personnel; • Lack of sufficient cooperation initiatives; • Governor's limited authority to implement bio-based initiatives independently.

Solving measures	• Targeted trainings development; • Showcase successful case studies; • Matchmaking activities.
Economic viability & environmental sustainability measures	• No comments were shared.
BBS Communication strategies	• Use of local hubs and entities, e.g. RHB & Trakya Economic Zone, as pivotal platforms for driving the communication & promotion of the scale-up process.
SH engagements & SI	• Brezovo & Rakavoski LAGs involvement to strengthen local engagement.

Key-insights of session 2 – co-creating BM pathways

Sustainability pathways

Through the co-creation session, emphasis was initially given to the critical steps required for scaling-up regional bioeconomy initiatives. An important recommendation was the active involvement of LAGs to boost localised efforts and support community engagement. Additionally, participants highlighted the need for more communication between all stakeholders to ensure a seamless flow of information. It was suggested that the RHB serve as the central repository and promoter of all relevant information, ensuring transparency and consistency in stakeholder collaboration efforts.

Sustainability in scaling up BBSs was recognised as dependent on leveraging diverse funding sources and forging robust partnerships. Participants identified the rural development programs (RDPs) measure M.16.1[1] and two National Research Programs (Bioeconomy for Better Life and Intelligent Plant Breeding) as critical funding mechanisms. Furthermore, bilateral projects with local businesses were suggested to ensure resource availability and promote long-term collaboration.

A major challenge in scaling efforts is the lack of cooperation within the bioeconomy value chain. Participants recognized MainstreamBIO's business and technical services from the second open call as valuable support measures. They also suggested that local MIPs should work more closely with the RHB to better share resources and expertise. This would create a more structured and accessible support system for scaling bio-based innovations. Beyond financial resources, participants emphasized the need for non-financial support, including collaboration with sister projects to encourage knowledge exchange and strengthen cross-sector synergies.

Table 12 Bulgarian SUW - sustainability pathways.

Key-steps for scaling-up & SH collaboration	• Involvement of local LAGs; • Improve communication between local stakeholders; • Use of RHB as the central repository.

[11] Link

Long-term sustainability measures	• Use of RDP (e.g. measure M16.1) & national research programs (e.g. “Bioeconomy for better life”; “Intelligent plant breeding”).
Pressing challenges & solutions	• Lack of cooperation among players.
Further supporting measures from MainstreamBIO & MIPs	• MainstreamBIO’s business and technical services, provided during the second open call; • MIPs should align more closely with the RHB.
Non-financial support for scaling-up	• Searching for sister project for non-financial support.

Business models pathways

The Bulgarian co-creation session highlighted that the current BMs for BBSs are largely linear, focusing primarily on economic returns. While these models are effective in generating profits, they fall behind in addressing broader societal objectives such as improving the quality of life for local communities and ensuring environmental sustainability. This gap underscores the need for rethinking the framework of existing business models to align with the dual goals of economic viability and social and environmental responsibility.

Participants stressed the importance of designing innovative business models. These models would emphasize resource efficiency, waste reduction, and sustainability while supporting local development. Small biorefineries were identified as key players in this transformation, offering localised and scalable solutions to demonstrate the practical application of circular principles.

Enhancing market accessibility emerged as a pivotal factor in scaling up bio-based solutions. The RHB was recognised as a valuable platform to foster partnerships and streamline market entry for bio-based products. Participants also recommended leveraging projects funded through Horizon Europe to strengthen market penetration strategies.

The absence of clear legislation supporting the spin-off activities of universities and research institutes in Bulgaria was identified as a significant barrier to innovation and entrepreneurship. This regulatory gap discourages researchers from launching spin-offs through their institutions, leading them to establish independent companies instead.

Table 13 Bulgarian SUW – BM pathways.

Ongoing business models	• Currently linear, focusing primarily on economic returns; • They fall behind in addressing broader societal objectives.
New business models & CE	• Designing new business models based on the principles of circular bioeconomy, especially focused on small bio-refineries.
Market accessibility planning	• RHB was recognised as a valuable platform to foster partnerships & streamline market; • Leveraging EU funded projects.
Regulatory & policy gaps	• Absence of clear legislation; • Discouraging researchers from launching spin-offs; establishment of independent companies instead.

2.3.5 Scale-up workshop in Zaragoza, Spain

Workshop's aggregate data

General details	
Title	"Workshop on Bioeconomy in the Ebro Valley"
Date	November 25th, 2024
Venue	Ebro Valley region, Zaragoza, Spain
Organisers	INNV
Participants profile	
No. participants	19
Type of participants	11 onsite participants and 8 joining online, representing a diverse range of essential perspectives. The group comprised 10 representatives from the industry, 8 from academic and research institutions, and 1 from civil society, ensuring a well-rounded discussion of challenges and opportunities.

Figure 7 Spanish SUW event.

The workshop featured in-depth discussions of two supported cases of MainstreamBIO, cases 23 & 24. Case 23 is focused on an ecological and rotational farming project dedicated to preserving local species. This case outlined plans to launch agrotourism activities, such as guided visits and accommodation services. Challenges identified included navigating market dynamics and securing funding, with proposed next steps involving smaller-scale activities to build momentum for larger ventures. Case 24 explored the development timeline of a bio-based initiative that aims to utilize olive pits as a key resource. Participants learned about its main products, future goals, the associated challenges (e.g., lack of information and high costs) and next steps including pursuing subsidies and identifying potential buyers.

Key-insights of session 1 – sharing experiences

The first session of the Spanish SUW showcased significant progress and highlighted key achievements. Participants agreed that initiating steps towards innovation was a crucial milestone, especially given the limited support for bioeconomy initiatives in Spain. Case 24 was lauded for its potential to become a model for other cooperatives, offering inspiration and guidance for similar

ventures. For Case 23, the unique integration of a slaughterhouse into its operations was emphasised as a standout feature, reflecting a novel approach that combines agricultural practices with innovation.

Challenges faced by the projects were extensively discussed, revealing barriers that could hinder progress. For Case 24, the primary challenge was the lack of clear and unbiased information on green energy technologies, leading to dependency on external advisors and a lengthy decision-making process. Additionally, participants expressed concerns about the credibility of technology providers. Case 23, on the other hand, struggled to design activities with minimal initial investments, highlighting the difficulty in balancing innovation with financial constraints. To address these barriers, participants proposed the establishment of independent public consulting bodies focused on bioeconomy, like Spain's Offices for Community Transfer. Such entities could provide unbiased advice, amplify the reach of these initiatives, and connect them with potential clients and buyers.

Recommendations were also made to ensure economic viability while maintaining environmental sustainability. For Case 24, participants suggested engaging with both technology providers and biomass suppliers to optimize installation designs and ensure a steady supply of biomass, especially during low-production years. As for Case 23, the group emphasised the importance of planning agrotourism activities with veterinary guidance to ensure the slaughterhouse operations remain compliant with food safety standards.

Regarding communication strategies for garnering support from partners and investors, Case 24 discussions were focused on engaging neighbours to establish an energy community to offset the costs of transitioning from fossil fuels to biomass. Emphasis was given to reinforcing the reliability and low maintenance of well-selected biomass systems, as some previous failures in the region have caused scepticism. For Case 23, marketing strategies centred on highlighting their unique characteristics, including the full-cycle meat production process and their ecological farming practices. This uniqueness was seen as appealing to two distinct audiences: entrepreneurs seeking inspiration and tourists desiring a connection to nature. Additionally, their newly installed yurt was identified as a key feature, catering to visitors traveling long distances.

Engaging local communities and creating social impact were also prominent themes in the discussion. Participants suggested Case 24 conduct surveys in nearby towns to gauge interest in forming an energy community, which could also generate a new part-time job. As for Case 23, participants mentioned their potential to teach other cattle growers how to navigate the establishment of their own slaughterhouse, e.g., permits, building aspects to consider, time management, etc. They also mentioned how this Case is suitable to raise social awareness, especially for urban audiences, on how meat is produced. However, while social visits to the slaughterhouse were discouraged due to potential discomfort, specialised visits for interested groups were seen as a viable option, adding educational value while maintaining respect for public sensitivities.

Table 14 Spanish SUW - shared experiences.

Main achievements	• Case 24 as a lighthouse for other cooperatives; • Case 23 and the importance of having all the life cycle, i.e. the slaughterhouse in their premises.
Challenges & barriers	• Case 24 – lack of clear and unbiased information on green energy options (dependency on external advisors, lengthy decision-making process, concerns about the credibility of technology providers); • Case 23 – difficulties in designing low investment activities.

Solving measures	• Creation of independent public consulting bodies focused on bioeconomy;
Economic viability & environmental sustainability measures	• Case 24 - better designing of the installation, supported by technology providers & biomass suppliers; • Case 24 - learn more about the operation needs; • Case 23 - define a way to visit the slaughterhouse without compromising their meat production.
BBS Communication strategies	• Case 24 – energy community establishment to partially cover the cost from changing from fossil fuels to biomass; • Case 23 – marketing the uniqueness of having an in-house meta production process & being an ecologic farm.
SH engagements & SI	• Case 24 - survey the nearby towns on the interest in creating an energy community; • Case 23 - potential to teach other cattle growers how to navigate the establishment of their own slaughterhouse and breed traditional local cattle races to support their conservation.

Key-insights of session 2 – co-creating BM pathways

Sustainability pathways

Spanish participants emphasised the importance of initiating innovation by acting as lighthouses for other initiatives, thereby inspiring energy and willingness to embrace BBSs. A key step identified was quantifying current needs, such as resource consumption and seasonal requirements, to inform the design of sustainable BMs. Attendees discussed creating clear pathways to target BMs by evaluating how new activities could align with these quantified needs. For instance, whether the volume of olive pits available would suffice to meet maximum energy requirements (Case 24) and how tourism activities could fit into the cattle cycle's demanding phases (Case 23).

Securing resources, forming partnerships, and accessing funding were also pivotal topics, were participants highlighted the need to identify local actors for potential symbiotic relationships, such as establishing an energy community for Case 24, which could attract neighbours based on regional energy demands. Engaging with regional organizations, including sectorial and civil society groups, was seen to gain broader insights into regional needs, competitor activities, and consumer expectations. Collaboration with stakeholders during infrastructure design was another recommended approach, as it can help optimize layouts and prevent costly inefficiencies, such as poorly placed biomass hoppers. Regarding funding, attendees stressed the importance of public support not only for capital expenditure (CAPEX) but also for operational expenditure (OPEX), which often include expensive spare parts and maintenance.

Participants identified the lack of accessible technical and market information as a significant barrier, making it difficult for initiatives to choose the most suitable technologies and strategies. A proposed solution was to establish a public, unbiased advisory body - a central point of contact for bioeconomy-related issues - to guide stakeholders through technical and market complexities. Another challenge was the high OPEX associated with running bio-based technologies and services. To mitigate this, attendees recommended promoting public funding for OPEX during the initial years of deployment. Lastly, the lack of social cohesion in rural areas was highlighted as an obstacle to fostering cooperation and knowledge sharing. Suggestions to address this included connecting with local

administrations, such as action groups or counties, and incentivising local producers to adopt bioeconomy practices.

Further supporting measures from MainstreamBIO and MIPs were also discussed. Participants proposed introducing additional innovation rounds to support more initiatives, leveraging word-of-mouth and the visibility of successful cases to attract broader participation. Building connections with local administrations was also highlighted to strengthen collaboration and amplify the impact of bioeconomy initiatives. In terms of non-financial support for scaling BBSs participants emphasised the importance of free innovation support services, covering both technical and market needs. Pressing public administrations to expand the scope of subsidies - such as those for OPEX and access to technical advisors - was seen as crucial for enabling sustainable growth. To address the complexity of technology selection, the creation of clear, unbiased comparisons of available technologies, tailored to non-technical users, was proposed.

Table 15 Spanish SUW – sustainability pathways.

Key-steps for scaling-up & SH collaboration	• Spark the energy and willingness to start innovating; • Quantify current needs; • Create a path to the target BMs; • Evaluate how the new activities cover requirements.
Long-term sustainability measures	• Reflect on local actors to establish a symbiosis with the initiative; • Contact regional organizations with a wider overview of deployed initiatives to find support and connections; • Collaboration with stakeholders during infrastructure design; • Public support not CAPEX but also OPEX.
Pressing challenges & solutions	• Lack of technical and market information → establish a public, unbiased advisory body; • Costs of running certain technologies and services → promote funding of OPEX; • Lack of social cohesion in rural areas → connections with local administrations and associations.
Further supporting measures from MainstreamBIO & MIPs	• New innovation rounds so more initiatives could be supported now that the initiative is gaining traction; • Pursue connection with local administrations.
Non-financial support for scaling-up	• Providing more free innovation support services; • Pressing public administration to widen the range of subsidies; • Creating clear comparisons between different technologies.

Business model pathways

The Spanish participants agreed that the current BMs of both cases are effective. Case 24's model, having been operational for nearly 80 years, is robust and sustainable in its existing form. Similarly, Case 23's model effectively supports the initiative through meat production, with plans for agrotourism seen as a valuable additional income stream.

Discussions highlighted the potential of integrating CE principles to enhance sustainability and financial viability. For Case 24, transitioning from fossil fuels to biomass was identified as a key opportunity. Since the cooperative already produces olive pits as a biomass source, this shift would significantly reduce expenses while creating a reliable, long-term energy solution. In low-yield years, the accumulated savings from using biomass would offset the costs of purchasing additional olive pits externally. Additionally, participants suggested forming an energy community with neighbouring entities. As for Case 23, participants focused on diversifying income through agrotourism. Suggestions included developing a dedicated website to promote their services, tailored to different market segments. For urban audiences, the focus would be on the ethical treatment and quality of life of animals, while for rural stakeholders involved in meat production, the highlight would be guided tours of the slaughterhouse, offering insights into obtaining and managing their own facilities.

Strong partnerships were seen as a cornerstone for improving accessibility and promoting the initiatives effectively. Regarding Case 24, municipalities, neighbourhood associations, and nearby companies using biomass boilers were identified as valuable collaborators. For Case 23, engaging with eco-tourism associations such as “Biela y Tierra” (Rod and Land), farmer associations like the Regional Association of Cooperatives, and public entities, including counties and local action groups such as AGUJAMA (Association for the Development of Gúdar-Javalambre and Maestrazgo), was considered crucial.

The necessity of supportive regulatory and policy frameworks tailored to small-scale initiatives was also emphasised. Recommendations included implementing targeted subsidies for OPEX during the initial years of deploying new technologies or services to reduce financial burdens and foster long-term sustainability. Additionally, establishing a centralized public advisory body to provide technical and economic guidance, network connections, and unbiased support for bio-based initiatives was proposed, serving as a one-stop resource for entrepreneurs in the bioeconomy. Tailored legislation addressing the unique challenges of small-scale initiatives was deemed essential as well, ensuring equitable opportunities for innovation and growth by accounting for their limited resources and capacity.

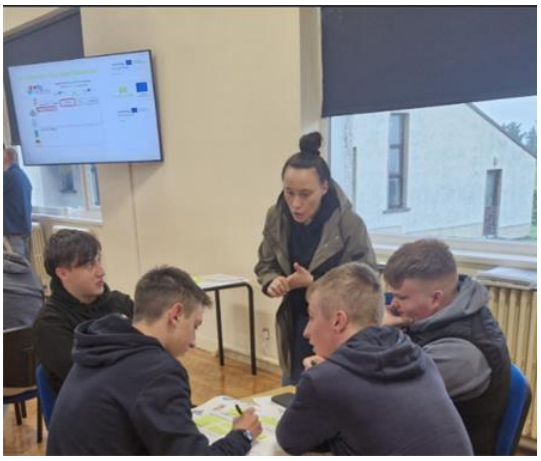
Table 16 Spanish SUW – BM pathways.

Ongoing business models	• Case 24 – BM is effectively working for 80 years; • Case 23 - effective BM supporting the initiative, with agrotourism as an extra income.
New business models & CE	• Case 24 - changing from fossil fuels to biomass; • Case 23 - creating a dedicated website for the agrotourism services, with clear differences based on the target market.
Market accessibility planning	• Case 24 - municipalities, associations of neighbours, and nearby companies using biomass boilers; • Case 23 - eco-tourism associations, farmer associations & public bodies.
Regulatory & policy gaps	• Create specific subsidies to support OPEX; • Create an advisory public organism for entrepreneurs and small companies implementing bioeconomy; • Define legislation with specific focus on small-scale initiatives.

2.3.6 Scale-up workshop in Cork, Ireland

Workshop's aggregate data

General details	
Title	"Smart Farming and Bioeconomy: Shaping Tomorrow's Agriculture"
Date	October 18th, 2024
Venue	Clonakilty College, Cork, Ireland
Organisers	MTU
Participants profile	
No. participants	48
Type of participants	2 MIP members, 1 MAP member, and 2 moderators, representing a diverse group of stakeholders mainly from the farming industry, academia, and local cooperatives, to explore BBSs for the future of agriculture.



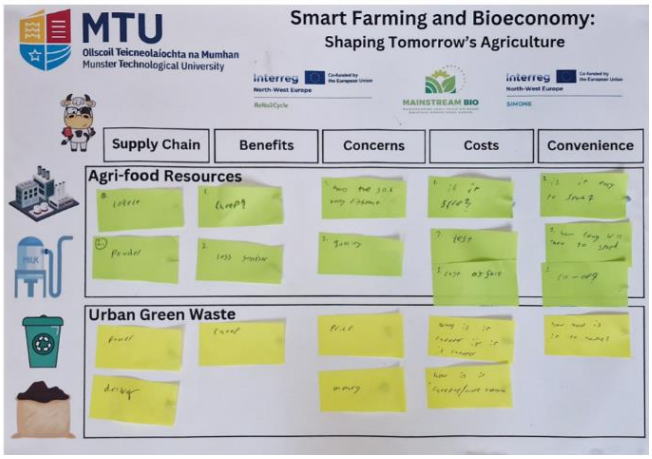


Figure 8 Irish SUW event.

The workshop opened with discussions on nutrient recycling solutions and anaerobic digestion (AD) technology, with a strong focus on the importance of collaboration between farmers, industry representatives, and research institutions. A notable part of the workshop was the use of the 'smart farming and bioeconomy canvas', which helped participants map out and evaluate the supply chain, benefits, concerns, costs, and convenience of bio-based practices. This allowed for an in-depth analysis of agri-food resources and urban green waste, with participants identifying both opportunities and challenges in scaling BBSs. Divided into groups, participants discussed the regulatory and financial challenges that bio-based developments face, including the need for access to grants and overcoming the cost barriers associated with new technologies.

Key-insights of session 1 – sharing experiences

The first session of the Irish workshop focused on sharing practical achievements and challenges in implementing bio-based solutions. Participants emphasised the importance of collaboration among farmers, industry, and research institutions, particularly in the development of nutrient recycling

practices and the adoption of AD technology. These discussions are particularly timely in Ireland, aligning with the publication of the country's first biomethane strategy in 2024. One notable achievement highlighted during the session was the gathering of data on various types and sizes of AD systems. This information helps identify scalable and context-specific options for different agricultural and urban settings. The integration of nutrient recycling practices using agri-food waste and urban green waste with AD systems was recognised as a milestone toward reaching sustainability goals.

While participants acknowledged several achievements, they also identified significant challenges to scaling BBSs. Developing AD systems is a complex process, further complicated by regulatory barriers. Funding and policy alignment remain critical barriers, as national regulations often do not align seamlessly with EU standards. Participants noted the specific challenges smaller AD systems face in Ireland's climate, where efficiency depends heavily on scale and temperature, making such systems less practical in cooler conditions. Additionally, logistical issues such as transporting harvested biomass from remote locations was highlighted as a challenging factor for success.

Participants suggested several measures to address these challenges, such as adopting a cooperative approach, supporting collaboration among stakeholders to streamline efforts. Engaging government bodies to simplify regulations and offer clear guidelines was identified as a key step to facilitating progress. Financial incentives, including targeted grants and subsidies, were recommended to balance the high costs of adopting AD systems and nutrient recycling practices. To better relate economic viability with environmental sustainability, leveraging by-products like digestate as additional revenue streams was proposed. Participants also stressed the importance of showcasing successful case studies to build trust, demonstrate feasibility, and attract investors. Engaging local communities and cooperatives emerged as critical for promoting sustainable agricultural practices and scaling BBSs.

Table 17 Irish SUW - shared experiences.

Main achievements	• Collaboration amongst farmers, industry and research institutions; • Gathering data on various types and sizes of AD systems; • Integration of nutrient recycling practices.
Challenges & barriers	• Complexity in the development of AD systems; • Lack of funding and policy alignment; • Non-adaptability of smaller AD systems and IR's climate.
Solving measures	• Adopting cooperative approach; • Engaging government bodies; • Simplify regulations.
Economic viability & environmental sustainability measures	• Develop financial incentives; • Leveraging by-products; • Support the gradual adoption of AD technology.
BBS Communication strategies	• Showcasing successful case studies; • Engage and negotiate with key-stakeholders; • Align bio-based solutions with national and EU sustainability goals.

SH engagements & SI	• Engagement of local communities (e.g. Irish MIP members) and cooperatives.

Key-insights of session 2 – co-creating BM pathways

Sustainability pathways

Establishing a cooperative structure emerged as a pivotal step, emphasising the need for a framework that allows stakeholders to share responsibilities and actively participate in scaling initiatives. Moreover, engaging both the farming community and the broader local population was also highlighted as crucial for gaining support and ensuring buy-in for BBSs. Such engagement builds trust and aligns community efforts with regional sustainability goals, also facilitating stakeholder collaboration.

As for the resources and partnerships for long-term sustainability, access to funding and development of dedicated strategies towards new partnerships were identified as critical. Participants emphasised leveraging funding opportunities by collaborating with institutions like the Department of Agriculture and climate action programs to secure essential financial resources. A notable suggestion was to allocate funding to pilot a small-scale AD demonstrator within the community. This initiative could showcase the benefits of AD technology, fostering understanding and acceptance among residents. Community engagement and education were also seen as essential for sustaining bio-based initiatives, with a focus on building long-term relationships to drive acceptance and active participation in sustainable practices. Aligning financial resources with community-focused projects, BBSs can achieve greater scalability and impact.

Securing adequate funding was identified as a key challenge by the participants for scaling BBSs, particularly for smaller organizations like Dingle Hub, a non-profit community enterprise connecting innovative, forward-thinking people and organisations, which often lack access to national funding reserved for universities. Participants also noted that the lengthy and uncertain funding application process, sometimes taking up to two years, poses a significant barrier. Collaborative partnerships with institutions, such as the Department of Agriculture and academic faculties, were seen as critical to overcoming these challenges. However, strengthening funding proposals and streamlining the application process were suggested as effective solutions to improve access to financial resources. Expanding educational and development grant availability while minimising rejections due to minor technicalities would further support scaling efforts.

Participants recognised the valuable contributions of the MainstreamBIO consortium and MIPs in addressing challenges and enhancing the scalability of BBSs. The consortium has provided critical networking and capacity building opportunities, enabling stakeholders to connect and share insights. Direct community support, engaging directly with local communities, alongside collaborations with universities, ensures that efforts align with real-world needs. The consortium's emphasis on a bottom-up approach, which resonates strongly with Dingle Hub's philosophy, further reinforces community involvement as a cornerstone for the success and scalability of BBSs.

Non-financial support was highlighted as equally important as funding in achieving the successful scaling of BBSs. Participants emphasised the need for skilled workforce development to manage and operate complex systems like AD plants. Specialised training programs and skill-building initiatives are essential to address the technical demands of such systems. A well-defined and clear regulatory framework was also identified as a critical enabler for scalability, ensuring compliance with industry standards and providing a solid foundation for the growth of BBSs. Through transparency and reduced complexity, the regulatory framework can support innovation and adoption of sustainable practices.

Table 18 Irish SUW - sustainability pathways

Key-steps for scaling-up & SH collaboration	• Establishing a cooperative structure; • Engage with farming community and local population; • Facilitate stakeholder collaboration, from farmers to residents.
Long-term sustainability measures	• Access to funding; • Development of dedicated strategies towards new partnerships • Collaborating with institutions; • Funding to pilot small-scale AD demonstrators; • Build long-term relationships; • Align financial resources with community-focused projects.
Pressing challenges & solutions	• Lack of adequate funding; • Lengthy and uncertain funding application process; • Strengthen funding proposal and streamline application process; • Expand educational and development grant availability.
Further supporting measures from MainstreamBIO & MIPs	• Direct community support; • Better emphasis on bottom-up approach.
Non-financial support for scaling-up	• Develop skilled workforce; • Provision of specialised training programs and skill-building initiatives; • Establish a well-defined and clear regulatory framework.

Business models pathways

In the Irish region, the prevailing BM for BBSs centres on small-scale AD systems are typically based on manure supply from approximately 150 cows. These systems align with community expectations, making them more socially acceptable and easier to integrate within local areas. Additionally, the “proof of concept” approach for small-scale AD systems was recognised as a significant strength of the current model. Demonstrating that AD can operate effectively on a smaller scale, both social and logistical challenges could be addressed.

With new business models being crucial for enhancing the scalability and profitability of BBSs in the region, participants proposed integrating diverse waste streams, such as food waste, wool washing residues, grass, and silage, into the AD process. Developing specific “recipes” for combining these materials can help optimize the process while significantly reducing waste disposal costs. For instance, exporting food waste from areas like Dingle is currently costly, but incorporating it into a local AD system could offer substantial cost savings while supporting sustainability. Efficiently processing multiple waste streams together requires careful testing and development of these “recipes” to ensure compatibility and effectiveness.

Participants also emphasised the need to leverage by-products from bio-based systems to ensure affordability and market accessibility. Products such as digestate, a natural fertilizer, and CO_2, which can be sold for various industrial uses, present valuable revenue streams. Maximising the use of

outputs from these systems in agriculture and other sectors, such as (agro-)tourism, enhances their market competitiveness. Additionally, promoting the health and environmental benefits of bio-based products increases their appeal and broadens their market reach. Strategies focused on creating multiple revenue streams help lower production costs, making BBSs more accessible and affordable to consumers.

The importance of grassroots engagement to support the growth and adoption of sustainable BMs was also stressed. Tailoring strategies to meet specific regional needs is crucial, as solutions effective in one area, such as West Kerry, may not be universally applicable. Participants recommended close collaboration with local councils and planning authorities to reduce barriers and streamline the implementation of BBSs. Open communication between local authorities and communities was identified as a key driver for success. Encouraging dialogue fosters mutual understanding and trust, which are critical for scaling BBSs and ensuring their long-term sustainability.

Table 19 Irish SUW - BM pathways.

Ongoing business models	• Small-scale AD systems, based on approximately 150 cows; • Aligned with community expectations, using a “proof-of-concept” approach.
New business models & CE	• Develop specific “recipes” for integrating food waste, wool washing residues, grass, and silage into the AD process; • Export food waste & incorporate it in local AD systems; • Processing multiple waste streams.
Market accessibility planning	• Leverage by-products from bio-based systems; • Promote the health and environmental benefits; • Establish dedicated strategies to process multiple waste streams.
Regulatory & policy gaps	• Grassroots engagement to support the growth and adoption of sustainable BMs; • Develop strategies tailored to meet specific regional needs; • Establish close collaboration with local councils and planning authorities; • Promote open communication amongst local authorities & communities.

2.3.7 Scale-up workshop in Lelystad, Netherlands

Workshop’s aggregate data

General details	
Title	"Inspiration possibilities of biobased application in rural areas and what is needed for the further roll out”
Date	November 12th, 2024
Venue	Runderweg 6 & Edelhertweg 1, Lelystad, Netherlands.

Organisers	WR
Participants profile	
No. participants	17
Type of participants	Academia (11), government (1), biomass producers (4), and businesses (1). Key participants included representatives from MTU, WUR, Horizon Flevoland, Agri cycling, and Worm systems.

Figure 9 Dutch SUW event.

The event was structured as a mutual learning event in the morning and a scale-up workshop in the afternoon. Key presentations included insights from a representative from Agri cycling company[2] who discussed the challenges and opportunities in creating circular agricultural systems, followed by a representative from the project "Bio4Africa" who provided a short project concept presentation. The workshop aimed to facilitate discussions on sustainable BMs, stakeholder collaboration, and the role of legislation in scaling BBSs. A site visits showcased pilot demonstrations by AlgaNed and GoGrass, emphasising practical applications.

Key-insights of session 1 – sharing experiences

While no main achievement was marked, session 1 successfully identified key challenges to scaling BBSs, including product demand, balancing environmental and financial goals, and the need for supportive legislation, while also recognising additional barriers such as partner communication, small-scale efficiency, logistical constraints, and evolving technology requirements based on scale, feasibility, and cost.

To address these challenges, the session proposed measures focused on the early identification of key markets and stakeholders to foster product development. Emphasis was placed on prioritising scalable and cost-efficient technologies for both small and large operations, adopting an iterative approach for gradual improvements in efficiency and circularity, and focusing on the main revenue-driving product during initial efforts. Localisation was highlighted as practical, while leveraging non-local solutions where economies of scale are more advantageous.

For economic viability and environmental sustainability, the session stressed the importance of identifying the main revenue-generating products while addressing key environmental concerns. It

[2] https://www.agricycling.nl/

recognised the time and knowledge required for the full valorisation of streams and advocated for legislation to regulate environmentally harmful products, ensuring fair competition.

Communication strategies centred on maintaining regular engagement with stakeholders, including partners, investors, and customers, through social media and newsletters. Social and stakeholder engagement focused on building sustainable and consistent interest to maximise long-term benefits, moving away from reliance on one-off interactions or purchases, which are insufficient for sustaining bio-based products.

Table 20 Dutch SUW - shared experiences.

Main achievements	• N/A
Challenges & barriers	• Product demand; • Balancing environmental and financial priorities; • Legislative support; • Communication between partners; • Lack of efficiency & sustainability in small scale; • Location and logistical constraints.
Solving measures	• Identify key markets and SHs to foster product development; • Focus on cost-efficient technologies for all-scale operations; • Adopt an iterative approach that allows gradual efficiency & circularity improvements; • Prioritise the main revenue-driving product; • Emphasise localisation when practical; • Leveraging non-local solutions of more advantageous economies.
Economic viability & environmental sustainability measures	• Revenue-generating product identification; • Address key environmental concerns; • Advocate for legislation to regulate environmentally harmful products.
BBS Communication strategies	• Maintain regular communication with SHs via social media etc.
SH engagements & SI	• Build sustainable/consistent interest to maximise long-term benefits; • Avoid reliance on one-off interactions or purchases.

Key-insights of session 2 – co-creating BM pathways

Sustainability pathways

Scaling up BBSs requires several key steps, including ensuring sufficient demand for bio-based products to drive innovation and change, demonstrating technological feasibility and a viable business case at scale, and providing a clear legal framework for operations. Additionally, reconnecting rural and urban spheres is essential for collaboratively addressing societal-level environmental challenges.

For long-term sustainability, it is crucial to secure a reliable supply of raw materials and logistical support while engaging stakeholders in product and process development. Improving biochemical equipment, which lags mechanical equipment at smaller scales, is necessary. Prioritising local production is encouraged, but larger, more distant factories may be required when economies of scale are advantageous. Practices such as the sugar industry's use of bio-paper packaging can eliminate external dependencies and enhance competitiveness. Initial subsidies for green and bio-based industries are essential to support their early stages and ensure long-term market competitiveness.

The session identified pressing challenges and potential solutions, including the need for legislation that supports the implementation of innovative technologies like nutrient recycling. Financial hurdles must be addressed by shifting priorities from purely economic gains to integrating environmental considerations for farmers and consumers. A lack of ownership and responsibility for environmental issues must be tackled by clearly defining ownership to ensure accountability for processes and solutions.

Further supporting measures include facilitating the creation of a favourable legislative framework, assisting in the development of business cases for small-scale bio-based systems, and sharing examples of successful scaled-up BBSs. To support scaling-up, the session emphasised the importance of non-financial support such as enhanced networking efforts, which can foster collaboration and innovation within the bio-based industry.

Table 21 Dutch SUW - sustainability pathways.

Key-steps for scaling-up & SH collaboration	• Ensure sufficient demand for bio-based products to motivate innovation; • Demonstrate technological feasibility and business case; • Provide a clear legal framework for operations; • Reconnect rural and urban spheres to collaboratively address societal/ environmental problems.
Long-term sustainability measures	• Secure a reliable long-term supply of raw materials & logistical support; • Engage stakeholders in product and process development; • Improve biochemical equipment; • Prioritise local production where feasible but acknowledge the need for larger, more distant factories for advantageous economies; • Adopt practices (e.g. sugar industry using bio-paper packaging) eliminating external dependencies and competition on price; • Subsidise green and bio-based industries during initial stages;
Pressing challenges & solutions	• Legislation tailored for new technologies & nutrient recycling; • Overcome financial hurdles by shifting priorities from purely economic gains to integrating environmental considerations; • Address the lack of ownership and responsibility by clearly defining ownership to ensure accountability for processes and solutions.
Further supporting measures from	• Facilitate the creation of a favourable legislative framework; • Assist in developing business cases for small-scale bio-based systems; • Share examples of previously successful scaled-up bio-based solutions.

MainstreamBIO & MIPs	
Non-financial support for scaling-up	• Enhanced networking efforts.

Business model pathways

Current Dutch BMs in agriculture and related industries are largely linear, focusing on extraction and production without encouraging care for natural resources like soil and water. Effective methods such as air stripping to extract ammonia for fertiliser exist but require scaling up to meet demand. The livestock sector in the Netherlands faces a surplus of animal manure, while the feed market depends heavily on unsustainable soy imports from Brazil, contributing to deforestation. These challenges highlight the need for more sustainable approaches to production and resource management.

Designing new BMs demands a cultural shift in purchasing behaviours and better connections between rural producers and urban consumers. Recycling nutrients back into the soil and adopting CE principles are essential for sustainability. Farmers could diversify revenue streams by using alternative protein sources like algae or insects. Policies like mandating 20% green biogas in natural gas mixes could promote greener solutions. Stimulating small-scale innovations and fostering collaboration across stakeholders, including feedstock providers, technology developers, and policymakers, is critical for scaling up sustainable practices.

For market accessibility, forming strategic partnerships early is vital for enhancing both technical and business cases. Greater involvement between citizens and farmers can foster collaboration and awareness. Regulatory changes should balance legislative requirements to prevent stifling innovation while ensuring safety and trust. There is a need to internalise the environmental costs of single-use products, ensuring fair competition for BBSs. Tackling greenwashing and offering legal protection for genuine environmental claims can also help differentiate sustainable practices and foster trust in the market.

Table 22 Dutch SUW - BM pathways.

Ongoing business models	• Linear extraction and production discourage care for natural resources; • Air stripping extracts ammonia for ammonium sulphate fertiliser; • Surplus animal manure in the Netherlands; • Feed market is heavily reliant on unsustainable imported soy.
New business models & CE	• Shift societal purchasing culture; • Improve stream connections between rural producers and urban consumers; • Recycle nutrients back to soil & adopt circular systems; • Foster environmental ownership and responsibility; • Develop revenue streams using alternative protein sources (e.g., algae, mealworms); • Advocate a national legal requirement to ensure that a minimum of 20% green gas is mixed in with natural gas;

	• More efforts to stimulate the implementation of small-scale bio-based solutions in an early phase.
Market accessibility planning	• Form strategic partnerships early for product and process development; • Strengthen citizen-farmer collaboration.
Regulatory & policy gaps	• Balance legislation to avoid stifling innovation while ensuring safety; • Internalise the environmental cost of single-use products for fair competition; • Address greenwashing and protect true circular/environmental claims.

2.4 Discussion

2.4.1 Session 1 – sharing experiences

Key takeaways:

Early innovation steps matter – Local initiatives showed strong alignment with regional needs, using resources like biomass and local expertise.

Inspiring best practices – Some projects were seen as “lighthouses,” with unique features like olive pit energy or farm-integrated slaughterhouses.

Key challenges persist – Bureaucracy, limited funding, lack of unbiased advice, and skilled personnel remain major barriers.

Progress, but more needed – MainstreamBIO helped address some issues, but structural problems like finance and regulation require continued effort.

Suggested solutions – Public consulting bodies, matchmaking services, training, local government support, and awareness campaigns were proposed.

Effective stakeholder engagement is local and strategic – Strong partnerships and community involvement are key to scaling solutions.

During this session, participants from all workshops emphasised the importance of initial steps toward innovation as critical achievements. Across the regions, initiatives showcased their progress in aligning with local needs and leveraging available resources, such as biomass or local expertise. For instance, some cases were recognised for their potential to serve as "lighthouses" for similar initiatives, inspiring broader adoption of bio-based solutions, while unique project features (e.g., integration of slaughterhouses into farm operations or the utilization of olive pits for energy production), stood out as exemplary milestones.

Common challenges included navigating bureaucratic processes, limited access to unbiased technical information, and the difficulty of securing reliable funding streams. Participants highlighted the barriers posed by insufficient collaboration among stakeholders and a lack of skilled personnel to implement complex projects. Moreover, the credibility of technology providers and fragmented market knowledge added further layers of complexity.

The above-mentioned barriers demonstrate a clear linkage with previously identified challenges of project’s research task (e.g., T1.2), reflecting both progress made and ongoing challenges in the uptake of bio-based solutions. While MainstreamBIO activities have aimed to address key obstacles such as limited access to finance, lack of policy incentives, and insufficient infrastructure, the persistence of challenges related to bureaucratic processes, fragmented market knowledge, and

stakeholder collaboration indicates that some difficulties remain. Notably, the workshops revealed that, while efforts to improve stakeholder engagement and knowledge dissemination have had a positive impact, issues such as securing reliable funding streams and accessing unbiased technical information continue to hinder progress. This suggests that although MainstreamBIO has contributed to mitigating certain barriers (e.g., through project's innovation support services), structural issues like financial accessibility and regulatory complexities require sustained attention beyond the project's scope.

To address these issues, participants across regions suggested the establishment of public consulting bodies to provide unbiased technical and market advice. The need for matchmaking services to bridge gaps between local initiatives and stakeholders was also widely recognised. Training programs, knowledge-sharing platforms, and greater involvement of local governments were proposed as essential measures to overcome these barriers and promote sustainable scaling. These arguments align with previous MainstreamBIO results indicating that the identified barriers, combined with the experience gained through MainstreamBIO, have informed further suggestions of actionable measures, though some systemic challenges, particularly related to finance and regulatory frameworks, may require continued efforts.

The same applies to the stakeholder engagement approaches proposed during the workshops, which focused on enhancing effectiveness through targeted networking and the strategic establishment of partnerships, particularly with local communities. This could be efficiently achieved via dedicated awareness-raising campaigns and demonstration showcases, ensuring practical exposure and fostering stronger connections to support MainstreamBIO's objectives.

2.4.2 Session 2 – co-creating BM pathways

Key takeaways:

Co-creation is key to scaling bio-based solutions - Strategies must align local resource needs with sustainable business models.

Strong partnerships are essential - Collaborations with communities, associations, and public bodies enhance reach, efficiency, and impact.

Funding challenges persist - Participants stressed the need for subsidies covering both capital and operational costs.

Public advisory bodies are valuable - One-stop sources for technical, market, and policy guidance can support project development.

Regional diversity matters - Local adaptations, such as agrotourism or energy communities, highlight the need for tailored approaches.

Showcasing success builds trust - Real-life case studies help attract investment and community buy-in.

CE principles are central - Shifting from linear to circular models through waste reduction and side-stream use is a shared goal.

Policy support must match local needs - While some regions face legal barriers, others need cultural or financial incentives proving no one-size-fits-all solution works.

EU projects are key enablers - Initiatives like Horizon Europe can strengthen market access and innovation.

Tailored, region-specific strategies are essential - Sustainable growth depends on flexible policy frameworks and local relevance.

The second session centred on co-creating actionable strategies for scaling BBSs, with discussions revealing both shared strategies and region-specific adaptations. Key steps identified included quantifying local resource needs and designing business models that align these needs with sustainable practices. Participants widely agreed on the importance of leveraging partnerships, especially with local communities, sectoral associations, and public institutions, to amplify the reach and impact of initiatives. Collaborations during infrastructure planning were emphasised as a means of optimising costs and operational efficiency.

Resource access and funding challenges emerged as critical concerns, with a common call for subsidies that address both capital and operational expenditures. Participants claimed public funding mechanisms that support operational costs, such as maintenance and spare parts, during the initial phases of new bio-based technologies. In addition, attendees highlighted the value of public advisory bodies that could act as one-stop resources for technical, market, and policy guidance. Unique regional insights included the incorporation of agrotourism activities to diversify income streams and the formation of energy communities to reduce reliance on fossil fuels. These approaches illustrated the adaptability of bio-based solutions to varying socioeconomic contexts and community dynamics. Participants also stressed the importance of showcasing successful case studies to build trust and attract investment.

While all workshops underscored the significance of collaboration, stakeholder engagement, and technical expertise, the discussions also highlighted varying regional priorities. For example, the emphasis on energy communities in some regions contrasted with the focus on agrotourism and local food systems in others. Similarly, while shared barriers such as regulatory hurdles and funding gaps were noted across workshops, their specific manifestations and proposed solutions often reflected unique regional dynamics. Overall, the workshops demonstrated the critical role of tailored, region-specific strategies underpinned by shared principles of sustainability, economic viability, and community engagement.

A key common point among all regions was the recognition of the need to transition from traditional, linear business models toward more sustainable, CE-driven approaches. Participants across all target regions consistently emphasized the importance of resource efficiency, waste reduction, and the integration of side streams to enhance both environmental sustainability and economic viability. Additionally, the role of partnerships and stakeholder engagement emerged as a critical factor in scaling up bio-based solutions, with strong networks identified, also at this point, as essential for fostering innovation, facilitating market access, and addressing local socio-economic challenges. The importance of leveraging EU-funded projects, such as Horizon Europe, to strengthen market strategies was also recurrently highlighted.

However, notable differences emerged based on regional contexts, reflecting the varying stages of development of bioeconomy and local socio-economic dynamics. For instance, while Bulgaria and Poland identified regulatory gaps and the absence of supportive legislation as major barriers, the Netherlands and Denmark focused more on the need for cultural shifts in consumer behaviour and enhanced subsidy schemes to promote sustainability. Ireland and Spain showcased strong examples of localized models (e.g., small-scale AD systems and agrotourism, demonstrating how bio-based business models can effectively align with community expectations and regional strengths.

These discussions clearly demonstrate that while the bioeconomy sector is advancing, its full potential remains untapped due to persistent structural and regulatory barriers. The strong focus on

CE principles and localized solutions reflects a growing maturity in understanding the complexity of bio-based business models. However, the varying degrees of regulatory support and market readiness across regions indicate that a one-size-fits-all approach is ineffective. Tailored strategies, rooted in regional contexts and supported by flexible policy frameworks, are essential for driving sustainable growth. This reinforces the value of project's activities, as not only facilitates knowledge exchange but also helps identify targeted interventions that can accelerate the adoption and scalability of BBSs within the European bioeconomy landscape.

Table 23. Summarised key-findings

	Shared experiences						Sustainability Pathways					Business model pathways			
Region	**Achievements**	**Challenges/ Barriers**	**Solving measures**	**Ec. Viability/ env. sustainability**	**BBS com. strategies**	**SH engagement/ SI**	**Scaling-up/ SH collab.**	**Sustainability meas.**	**Challenges/ solutions**	**Further support by MainstreamBIO**	**Non-financial support**	**Ongoing BM**	**New BM & CE**	**Market access. plans**	**Law & policy gaps**
BG	Ongoing bioeconomy strategy	•Low qualified personnel & cooperation initiative; •Limited governor's authority	•Targeted trainings Showcase success cases; •Matchmaking activities.	No comments	Local hubs and entities for driving the communication of the scale-up process.	Brezovo & Rakavoski LAGs involvement	LAGs involvment; Improve SHs communication Regional Bioeconomy Hub as central repository.	Rural Development Programme	Low cooperation among players.	MIPs alignment with Regional Bioeconomy Hub	Synergies with sister projects	•Linear; focusing on economic returns •Not fully addressing societal objectives	To be based on circular bioeconomy principles	•Use Regional Bioeconomy Hubs •Leveraging EU funded projects	•No clear legislation •Researchers not encouraged for new spin-offs
DK	Optimised harvesters	•Market not ready; •Logistical barriers to biomass transfer; •Poor SH cooperation	•Establish landowner association •Awareness campaigns & showcases.	•"People, planet, profit" business model; •Green tri-partite agreements; •Wetlands benefits	Awareness campaigns & demonstrations	Landowners; civil society & NGOs involvment	•Contact minister of Tri-Partite agreement; •Subsidy schemes/Long-term contracts; •Land mapping and planning;	•Biomass harvesting; •Engage landowners, local advisory centers, municipalities, entrepreneurs, transportation & energy sector.	Mapping the potential for using biomasses from lowlands.	No comments	Highlighting the nature benefits of wetland harvesting	No comments	New BMs aiming to the upcycling and utilization of biomass side streams	•Integrate BBS in energy supply chain; •Partnerships with SHs	•Subsidy schemes communication & cooperation with SHs; •Support from policy & business.
SE	No comments	•Infrastructure availability; •SHs cooperations; •Hard to find skilled individuals	•Facilities sharing •Develop flow mechanism for BBS upscaling	No comments	No comments	Establish networks & partnerships	•Infrastructure development; •SHs collaboration; •Coordination across value chain stages; •Strengthen project management	Involvement of universities and related networks	oHigh costs of infrastructures / Barriers in market access •Shared facilities / New partnerships •Strategies for start-up market entry	Better identification of skill gaps related to scaling BBS	Collaborative networks	High costs for infrastructures	•Difficulties to move flows back after production •Collaborate with academia for new BMs •Side streams handling by companies	•Networks & partnerships	•Complex & overlapping policies; •Regulations to be simplified and provide clear guidance.

	Shared experiences						Sustainability Pathways					Business model pathways			
Region	**Achievements**	**Challenges/ Barriers**	**Solving measures**	**Ec. Viability/ env. sustainability**	**BBS com. strategies**	**SH engagement/ SI**	**Scaling-up/ SH collab.**	**Sustainability meas.**	**Challenges/ solutions**	**Further support by MainstreamBIO**	**Non-financial support**	**Ongoing BM**	**New BM & CE**	**Market access. plans**	**Law & policy gaps**
IR	•Collaboration amongst farmers, industry & research; •Information on AD systems; •Integration of nutrient recycling	•AD systems complexity; •Lack of funding; •Non-adaptability for small AD systems	•Adopt cooperative approach; •Engage government; •Simplify regulations	•Financial incentives; •Leverage by-products; •Support AD tech. adoption	•Showcase success case; •Engage key-SHs; •Align BBS with EU goals	Local communities' engagement	•Establish cooperation structures; •Engage with farm community •Support SHs collab.	•Access funding; •Strategies for partnerships; •Collab. with institutes; •Funding AD demos; •Long-term relations; •Align financial resources and community goals	○Lack of funding; ○Hard applications processes •Strengthen fundings and procedure's; •Expand education & Grant availability	•Community support; •Emphasis on bottom-up approach	•Skilled workforce; •Training programs; •New-clear regulations	•Ongoing small AD systems; •Community expectations alignment	•Ways to integrate food waste, grass, silage in AD process; •Process multiple waste streams	•Leverage by-products; •Promote health and environmental benefits; •Dedicated strategies for multiple waste streams	•Grassroots engagement; •Tailored strategies for regional needs; •Close collaboration with local authorities; •Communication with SHs
NL	No comments	•Product demand; •Balancing environmental/ financial priorities; •Legislative support; •Communication between SHs •Low efficiency & sustainability in small scale; •Location/ logistical constraints.	•Key markets for product development; •Cost-efficient technologies for all-scale operations; •Prioritise revenue-driving product; •Emphasise localisation • Inspiration from advantageous economies.	•Revenue-generating product identification; •Address key environmental concerns; •Advocate legislation for environmentally harmful products.	Communication with SHs	•Build sustainable/consistent interest to boost benefits; •Avoid reliance on one-off interactions	•Ensure demand for BBS; •Demonstrate Tech. feasibility; •Provide clear legislation; •Reconnect rural and urban regions	•Long-term raw materials supply; •Engage SHs in product development; •Improve biochemical equip.; •Prioritise local production; •Adopt independent practices; •Subsidise green and BB industries	•Legislation for new tech.; •Shift priorities for environmental benefits to overcome financial hurdles; •Define clear ownership processes and solutions	•Assistance for BBS business cases; •Shared success stories of BBS	Enhanced networking	•Air stripping extracts ammonia; •Surplus in animal nature in NL; •Heavy reliance on unsustainable soy import	•Societal purchasing culture; •Improve rural & urban stream connections •Nutrient recycling for CE; •Develop revenue streams; •Legal requirements to 20% green gas mixed with natural gas	•Strategic partnership for product development; •Citizen-farmer collaboration	•Balance legislation to ensure innovation^& safety; •Fair competition through proper costs on single-use products; •Address greenwashing

	Shared experiences						Sustainability Pathways					Business model pathways			
Region	**Achievements**	**Challenges/ Barriers**	**Solving measures**	**Ec. Viability/ env. sustainability**	**BBS com. strategies**	**SH engagement/ SI**	**Scaling-up/ SH collab.**	**Sustainability meas.**	**Challenges/ solutions**	**Further support by MainstreamBIO**	**Non-financial support**	**Ongoing BM**	**New BM & CE**	**Market access. plans**	**Law & policy gaps**
PL	• Networking; • BMs and scale-up strategies developed	•Hurdles in finding scientific & qualified partners; •Tech. problems; •High costs	•Skilling workforce; •Establish network; •Cooperate with agri-advisors	•Utilize waste biomass; •Reduce costs; •Analyse BMs with experts	•Regular meetings; •Showcase case studies in local farms; •Workshops & ARCs	More demos	•Tailored strategies for regional needs; •Adjust modules for various uses; •Broaden network & capacity building; •Maintain regional roadmap	•Funding opportunities; •Attend finance meetings; •Networking with local initiatives	•Continuous funding; •Patent development; •Legal Support; •Access supporting schemes	Participation in online trainings, study trips and workshops	•More trainings; •Legal care; •Dissemination; •Networking efforts.	•Software-as-a-service; •Hardware as a Service; •Direct rental/sales.	•Targeted audience selection; •Involve qualified personnel; •Adequate product inventory; •Set specific goals on revenue, market	•Strong partnerships by contacting related SHs; •Targeted promotional activities; •Gain in-depth knowledge	Regulatory and policy schemes supporting environmental protection, healthy lifestyle, products' quality and local production.
ES	•C24 lighthouse for cooperatives; •Important slaughterhouse in C23 premises	•C24 lack of clear/unbiased information on green energy options; •C23 difficulties in low investment activities	•Create independent public consulting bodies for bioeconomy	•C24 design installation, with expert's support; •C24 more knowledge on operation needs; •C23 sustainable slaughterhouse without meat production compromising	•C24 energy community establishment; •C23 communicate market uniqueness of in-house meta production processing	•C24 local survey on energy community development interest; •C23 knowledge transfer on slaughterhouse establishment	•Quantify current needs; •Create BMs pathways; •Evaluate requirements' coverage by new activities	•Contact regional organizations with overview of the initiatives; •Collaborate with SHs on infrastructure design; •Public support on both CAPEX & OPEX	○Lack of tech info → establish unbiased advisory body; ○High costs → promote OPEX funding; ○Lack of societal cohesion → connect with local admins.	•More innovation rounds; •Support connection with local admins.	•Provide free innovation support services; •Public admins should widen the range of subsidies; •Clear comparison of different techs.	•C24 effective BMs for 80 years; •C23 effective BM for agroturism as extra income	•C24 change from fossil fuels to biomass; •C23 dedicated website for agroturism services	•C24 - municipalities, associations of neighbours, & nearby companies using biomass boilers; •C23 – eco-tourism associations, farmer associations & public bodies.	•Subsidies to support OPEX; •Advisory public organism for bioeconomy entrepreneurs and small companies; •Legislation with specific focus on small-scale initiatives.

3. Task 4.3 – Cross-regional mutual learning workshops

3.1 Introduction

The CML events and missions for good practice and knowledge transfer across regions are an important component of the MainstreamBIO project's objectives of fostering mutual learning and knowledge transfer pathways as well as international exchange for bio-based solutions. The aim of the events, including field visits, was to share good practices, and to exchange knowledge and experience within implementation of small-scale bio-based solutions, business models and nutrient recycling practices. The events also aimed to bring representatives of linked networks and initiatives together to foster international exchange.

In total, 7 cross-regional learning events and missions for good practice sharing and knowledge transfer across regions were organized. Each aimed to engage 10-20 participants, including about 5 international participants. MIP leaders were responsible for organising and implementing the learning events, which included selecting suitable venues, finalising the agenda, inviting participants, and reporting the outcomes back to FBCD. The mutual learning workshops, including field visits, were organized during the timeframe between M25-M27 of the project (Sep-Nov 2024). Partners invited representatives of linked networks and initiatives to attend the workshops, fostering international exchange.

3.2 Workshops Preparation and Planning – methodology

3.2.1 Focus of the event and target audience

The CML events and missions aimed to bring together a diverse group of participants with interest in gaining knowledge about small-scale BBS. These events were designed to foster international exchange of expertise and promote the projects' main goal of setting bio-solutions into mainstream practice across rural Europe and thus support the development of bioeconomy of Europe. Participants could be MAPs and stakeholders from the target regions involved in the project and representatives of linked networks and initiatives in the regions (e.g., primary producers, agricultural students, researchers, entrepreneurs, policymakers, industry representatives, and community leaders).

3.2.2 Preparatory activities

Preparatory activities have been underway since the start of T4.3 in M18. As the task leader, was responsible for guiding all MIP leaders and supporting the events' implementation by designing the workshop methodology and developing all the necessary guidelines and reporting templates. Additionally, FBCD monitored the overall progress of the workshops' implementation phase to ensure their timely completion. The learning topics of each workshop were defined by FBCD in collaboration with each MIP and always revolved around the implementation of small-scale BBSs, BMs and nutrient recycling practices.

Based on the defined learning topics, individual invitation letters were prepared, addressing each of the 7 events, highlighting learning topics and practical information such as venue, date, contact info etc. Partners invited local stakeholders as well as representatives of linked networks and initiatives to attend the workshops, fostering international exchange (external invitees). Costs for international

invitees were covered by the MIP partner, i.e. travel cost and hotel was covered by Spain for the Spanish participants traveling to CML in the other MIP regions. Despite this, international participation in all CML were difficult and not all MIPs were able to attract international participation in the CML events. The main reason for this unforeseen challenge was found to originate from topics covered, i.e. the learning topics were too specific to appeal to a broad group of stakeholders including international stakeholders. Moreover, the travel time to attend a meeting for 1 day attendance showed to be a challenge in the recruitment for international participants. To overcome this, MTU, as the last MIP organizing the CML, tested a program covering multiple topics and site visits along with the inclusion of a network event. Hence the program lasted two days, which attracted more international participants. This decision was made in collaboration with all MIP and task leaders.

All workshops were scheduled to be completed no later than April 2025 (M32). 6 workshops were completed by the end of November 2024 (M27) and 1 was completed in the beginning of April 2025. The illustration below illustrates the preparation and implementation phase of the workshops.

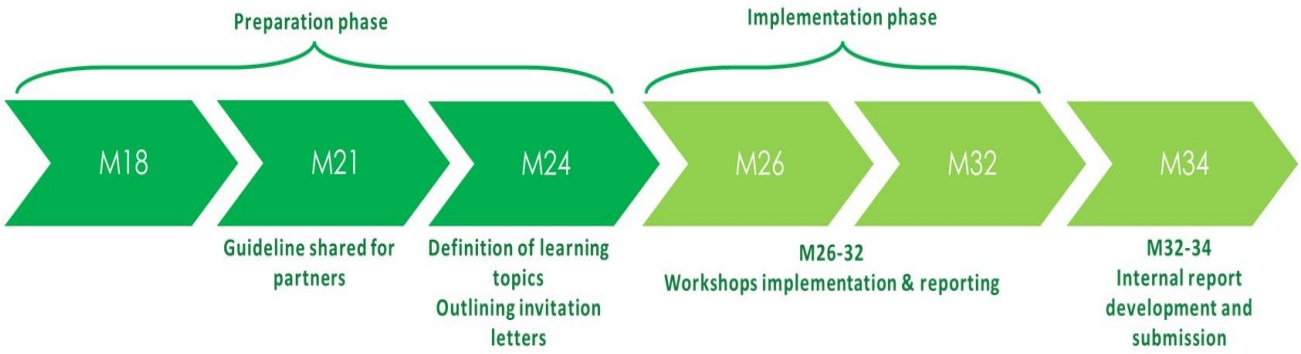


Figure 10 CML events implementation plan.

3.2.3 Structure of the events

All events followed a common structure described in Table 24:

Table 24. Event structure

Stage of the event and structure	Content
Initial presentation	Welcome & objectives of the workshop. Roundtable to introduce facilitators and participants. Presentation of MainstreamBIO and its core ideas and main results so far.
Session 1: Sharing experiences	Presentation of selected cases or topics by invited speakers.
Session 2: Workshop – knowledge exchange	Workshop and discussion groups. Facilitate sharing of good practice and knowledge transfer within implementation of small-scale BBSs, business models and nutrients recycling practices.
Field visit	Field visits, facilitated by an external host or guide to deployment sites of small-scale BBSs in rural areas will be organised as missions, whereby stakeholders from other regions will attend local demonstrations.

3.3 Event implementation/Action plan and organization

The MainstreamBIO CML events and missions took place from October 2024 (M26) to April 2025 (M32), with an average attendance of 18 participants per workshop. This section presents the key insights gathered from each CML event along with an analysis of the outcomes derived from them.

Table 25. Main information about the mutual learning events and missions in chronological order.

Region	Organising partner	Date of the event	Format	No. of participants
PL	IUNG	16.10.24	On-site	24
DK	FBCD	27.11.24	On-site	21
SE	PROC	12.11.24	On-site	16
BG	AUP	08.11.24	On-site	11
ES	INNV	20.11.24	On-site	17
IE	MTU	09.04.25	On-site	24
NL	WR	12.11.24	On-site	17
Total no. of participants				130

3.3.1 Mutual learning event in Puławy, Poland

Organizational information

General details	
Title	**Innovative fertilization methods**
Date	**October 16th 2024**
Venue	**Puławy Science and Technology Park, Poland**
Organisers	IUNG (Magdalena Borzęcka, Małgorzata Wydra, Piotr Skowron, Damian Wach)
Invitation letter	Are you interested in learning more from other actors involved in bioeconomy across Europe and do you have interest in innovative fertilization methods, Agriculture 4.0 compostable food packaging, bioplastics, and many other innovative ideas? We welcome you to join us at this event during the 'Bioeconomy Challenge, Poland'.
Learning topics	Nutrient recycling practices. Planteo – Innovative solutions for the production og organic fertilizers. Innovative methods of plant stimulation using mineral fertilizers and bio stimulants.
Participants profile	

No. participants	24
Type of participants	Onsite participants were 2 farmers and advisors, 3 producers, 2 regional actors, 3 industry experts, 10 in academia, 2 technology providers and 2 entrepreneurs.

Key insights and findings

“Innovative fertilisation methods” was the selected topic of the workshop and invited Polish entrepreneurs to present their bio-based solutions, namely: organic fertilisers produced from digestate and plant stimulation products dedicated for agricultural production. The workshop also hosted a presentation from the Interreg Baltic Sea Region project CiNURGi: Circular nutrients for a sustainable Baltic Sea Region. The participants included representatives of business, academia, advisory services and non-governmental organisations interested in the topic, covering several European countries and initiatives to foster international exchange of knowledge.

The host of the event and moderator of discussions was Magdalena Borzęcka, who welcomed the workshop participants and, after a short introduction of guests, presented the aim of the event and delivered a presentation on: Mainstreaming small-scale bio-based solutions across rural Europe via th MIP and tailored innovation support. Participants had a chance to get acquainted with the MainstreamBIO toolkit and its main functionalities, with the main focus on the sustainable fertilisation and nutrient recycling practices.

The introduction was followed by a presentation by Piotr Skowron on Nutrient Recycling Practices identified and disseminated in the MainstreamBIO project, as well as presentation of the CiNURGi project and its main findings in the area of sustainable fertilisation.

After that, two entrepreneurs identified by the project as success stories presented their products: one of them being Agnieszka Różańska with Innovative solutions for the production of organic fertiliser and Anna Ogar who presented “Innovative methods of plant stimulation using mineral fertilisers and biostimulants”. Both presentations met with a lot of interest from the audience. After delivering their presentations, each presenter answered more specific questions from the audience on how their products and business models were developed, what kind of barriers they encountered in the process, some suggestions appeared on the improvements in terms of marketing strategy and reaching the customers, followed by a general discussion on that topic.

The first part of the workshop was concluded with a short questionnaire, in which participants expressed their opinions on the workshop and insights on how to foster mutual learning and knowledge sharing.

For the second part of the event, participants were invited to join the Bioeconomy Challenge organised in the same location as part of the BioRural project. During the Bioeconomy Challenge, 12 teams of innovators from Poland, Lithuania and Latvia presented their business ideas for bio-based solutions. Participants invited by MainstreamBIO had a chance to learn about the potential of different European regions in the area of rural bioeconomy, discuss various innovative ideas among themselves and with the competitors.

Most of the participants were actively engaged in the discussion. Questions and valuable comments that followed presentations of success stories proved that they were interested in the topic. However, not everyone expressed their opinions and asked questions on the forum. Some discussions

continued in smaller groups during the coffee breaks, which was probably beneficial to those participants and allowed for better exchange of knowledge, but it could also benefit the whole group if further discussion was encouraged during the workshop with some follow up questions. On the other hand, a long discussion was not planned to allow guests to take part in the neighbouring event and learn about the innovative business ideas presented at the Bioeconomy Challenge, which constituted a time constraint. This gave the participants an opportunity to watch the pitch competition where a lot of interesting ideas were discussed. Many of them continued the discussions in smaller groups, inspired by the ideas presented.

Presentation of the Toolkit, developed under MainstreamBIO, was well received. Some of the participants already knew it and had an opportunity to use it, others found it quite easy to navigate, with a lot of well organised knowledge. Due to the topic of our workshop, special focus was given to the section of the Toolkit devoted to nutrient recycling practices. Participants found it very interesting and useful to practitioners.

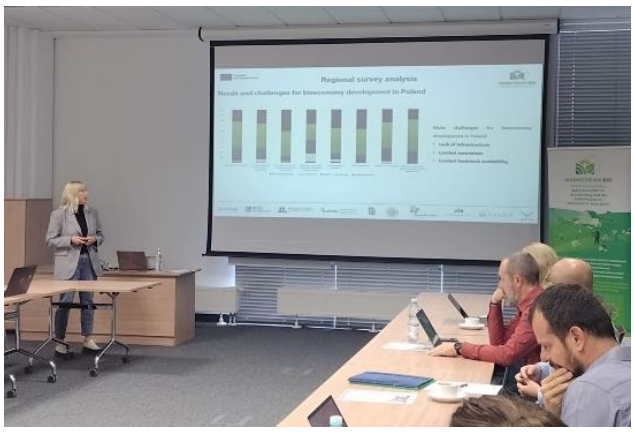


Figure 11 CML event Poland.

3.3.2 Mutual learning event in Herning, Denmark

Organizational information

General details	
Title	**Harvest and utilization of biomass from grasslands, scrublands, peatlands - workshop and guided tour at Agromek 2024**
Date	**November 27th 2024**
Venue	**Agromek Agricultural fair, Herning Denmark**
Organisers	FBCD (Liselotte Puggaard, Elena Sørensen Skytte)
Invitation letter	Are you interested in learning more from other actors involved in bioeconomy across Europe and do you have interest in utilization of biomasses from agriculture from both development of technologies to harvest, processing and product development and are you interested in expanding your international network? Then, we welcome you to join us at this event during

	the largest agricultural trade fairs in Northern Europe Agromek 2024 in Herning, Denmark.
Learning topics	Innovative Biomass Applications: technology, logistics and product implementation. Biodiversity Impact: Understand how biomass utilization can enhance biodiversity and nature. Carbon Tax Opportunities: Explore how peatland biomass can align with the Danish Green Three-Parties Agreement for a sustainable future. Live Demonstrations & Exhibitor Visits at Agromek 2024.
Participants profile	
No. participants	21
Type of participants	Onsite participants were 1 producer, 3 regional actors, 7 industry experts, 4 in academia, 3 technology enthusiasts and 3 entrepreneurs.

Key insights and findings

The Danish Mutual learning event and mission was organised as a joint part of the agricultural fair Agromek in Herning 2024. This fair is the biggest fair in Northern Europe, taking place every second year. It serves as a key platform for professionals in the agricultural sector, including farmers, suppliers, and industry experts, to showcase the latest innovations, technologies, and solutions in agriculture, horticulture, and livestock production. This year, 43.197 people visited Agromek during the 4 days the fair was running, from 26th to 29th November 2024, with more than 550 exhibitors and 3.833 international visitors. The focus of the Danish Mutual learning event and mission was to explore diverse biomass applications, focusing on grasslands and agricultural innovation.

First part of the workshop took place in a meeting room at Messecenter Herning, hosting Agromek, where project manager Liselotte Puggaard introduced the agenda and the MainstreamBIO project. The learning topics of the Danish Mutual learning event and mission was harvest and utilization of biomasses from grasslands, scrublands and peatlands. To engage sharing of practice and experience within this field with the participants. Knud Tybirk was the first invited speaker about the GUDP prestige project, HØSTTEK. The aim of this project is to develop a harvester suitable for harvest on peatlands. Additionally, a short film was showcased highlighting the effect of harvesting peatlands on climate and biodiversity. A success story from the HØSTTEK project is that the machine has been developed as a tool-carrier, i.e. different tools can be mounted, thereby increasing the variety of usage. Transportation costs have been lowered. The grass protein can be used as an adhesive in wooden boards, and wax has been taken out of the grass fibres to substitute formaldehyde-based glue and has shown promising results, though the procedure is still in progress and requires further optimization.

The second talk was a presentation by Lasse Hinrichsen, about the potential and perspectives of miscanthus as a biomass. Growing of miscanthus is not widespread in Denmark or EU. It is estimated that appr. 25.000 ha of miscanthus is established in Europe already. Lasse Hinrichsen highlighted the rising demand for biomass for both bioenergy and animal bedding, but it was also

emphasized that the cascade utilization of biomass is crucial with all types of biomass and sectors. Miscanthus has several features such as being a renewable crop with minimal environmental impact and has a large potential supply capacity. Moreover, it diversifies farmer's income and has a potential in scaling the biogenic industry. Miscanthus is well suited to grow on poor soil, is drought and flood-resistant, can be used for prevention erosion, has a low input requirement, has a long growing season +8^{o}C, stores carbon in its rhizomes, prevents nutrient leaching, promotes biodiversity and has a long lifecycle with low nutrient requirement (up to 20 years).

Before lunch, a collaborative Workshop was conducted where participants shared experiences with harvesting and utilizing different types of biomasses, barriers, and proposed solutions in groups. The following questions were asked:

What are your experiences with harvest and utilization of biomasses?

What are the barriers and challenges?

Suggestions for solutions, lessons learned and success factors.

The group discussions gave the following insights:

Agriculture in Ireland is mainly based on grassland, followed by forestry and arable land, with a strong focus on food and dairy production. There is an emphasis on cooperative models for machinery use and local processing. Concerns include biomass sustainability, post-harvest nutrient management, and the challenge of uniting the arable and forestry sectors into cooperative business models.

Spain practices all types of agriculture and some forestry, with most agricultural residues used for energy. Farmers face strict regulations and need localized transformation plans. The country's biogas strategy is geared toward large-scale facilities, though there are significant business model challenges around transportation. Farmers are generally reluctant to adopt changes unless economic benefits are clear. Other issues include regulatory gaps, limited consumer interest in biomaterials, and a strong focus on bioenergy over biomaterials.

Denmark is dealing with outdated farming laws and limited protein processing capabilities. There is an ongoing debate about prioritizing land use for food production versus biogas. ESG goals encourage biomaterial use, but profitability is still uncertain. Denmark has a strong biogas infrastructure and expertise in straw logistics, and there's a growing interest in both grass protein value chains and Miscanthus production. Cooperative models are also a priority here.

The meeting emphasized innovation in biomass utilization, with promising developments like HØSTTEK's machinery and Miscanthus applications. Challenges include logistical, regulatory, and market barriers, underscoring the need for cooperative business models, improvement of incentives as well as community involvement.

The second part of the workshop took place at Agromek at two preselected stands first at AJ Energi & Strø, working with bedding for farm animals based on rape straw, but have recently started to produce bedding material and building material from Miscanthus and collaborates with several companies and farmers. The second visit was at Dalgas, which is an international construction, trading, and service company with broad specialist competencies within biomass utilization, trading, logistics for energy purposes but also work in the field of waste management, biodiversity, nature restoring in and outside local communities.

The workshop enabled the participants to discuss different perspectives on utilization and applications of biomasses for different usage and hereby created contact with both national and international participants. On the second part of the workshop, during visits for the two pre-selected exhibition stands at Agromek, further contacts were established. During the workshop and lunch, participants took great advantage of the possibility to network and discuss issues around the table.

Figure 12 CML event Denmark.

3.3.3 Mutual learning event in Örnsköldsvik, Sweden

Organizational information

General details	
Title	**Opportunities and barriers for bioeconomic growth for SMEs in rural Northern Sweden**
Date	**November 12th 2024**
Venue	**RISE Processum, Hörneborgsvägen 8, 891 22 Örnsköldsvik, Sweden**
Organisers	PROC (Johanna Källman, Jonna Almqvist, Agnes Forsberg & Lisa Sundvall)
Invitation letter	Are you interested in learning more from other actors involved in bioeconomy across Europe and do you have interest in utilization of biomasses from agriculture from both development of technologies to harvest, processing and product development and are you interested in expanding your international network? Then, we welcome you to join us at this event in Örnsköldsvik, Sweden
Learning topics	Swedish biorefinery implementations – examples of small-scale companies and what is missing for them to grow.

	The Swedish conditions with the forest as the biggest source of bio-based raw material. Accessibility of biomasses from forestry, connection with big industries, price and waste. Biorefinery cluster in Sweden - exchange possibility - cluster exchange.
Participants profile	
No. participants	17
Type of participants	Onsite participants were 3 biomass producers, 3 industry experts, 10 in academia and 1 civil society.

Key insights and findings

The mutual learning event in Sweden started with an introduction of the MainstreamBIO project by Johanna Källman following with presentations from Erica Almgren Stenberg (Vallakokerskan), Thomas Storsjö (Biocompost) and Abiodun Yusuf Ojoola (Win Win Avfall) about their experiences as start-up companies, what is missing for them to grow as well as the innovation support they had received/was about to receive through MainstreamBIO and how it will help them to expand their businesses.

In the second session Jonas Markusson held a presentation about a Nordic wood biorefinery case. Helena Näsström presented the work that North Sweden Cleantech is doing as well as talked about industrial symbioses and the possibilities with it and mentioned the site in Örnsköldsvik, High coast Innovation Park, as a good example of industrial symbioses. North Sweden Cleantech is a platform that strengthens small and medium-sized enterprises in green technology, clean energy, and sustainable solutions in northern Sweden, aiming to create or already creating products and services that promote a sustainable transition. After that Jonna Almqvist presented the possibilities with RISE Bioeconomy Arena.

After the presentations a workshop about Opportunities and barriers for bioeconomic growth for SMEs in rural Northern Sweden was held. The workshop was a collaboration with the EU-project BIOMODEL4REGIONS. Eleonora Borén and Barbro Kalla, representing BIOMODEL4REGIONS, started off the workshop segment with an introduction of the proposal for a Swedish Bioeconomy strategy as well as the aim and the framework for the workshop.

All participants were active and engaged. They asked questions to the speakers and did participate in the workshop. They also engaged in the mentimeter1 survey during the day giving feedback on the question whether the Mutual Learning Workshop enables the participants to create international contacts.

After lunch it was a field visit to Cinis Fertilizer. Cinis Fertilizer is a Swedish green-tech company producing an environmentally friendly mineral fertilizer, potassium sulphate, by recycling industrial waste products from battery manufacturing and recycling, as well as the pulp industry and other industries. The patent protected technology uses half as much energy as today's production methods

[1] https://www.mentimeter.com/

and the result is a fertilizer with a low carbon footprint, a unique and circular contribution enabling sustainable agriculture.

The company's scale-up journey has involved multiple stages. Initially, Cinis Fertilizer focused on laboratory and pilot-scale production, proving the viability of their technology. As demand for sustainable fertilizers grew, they moved to a commercial scale by building larger production facilities and this year they opened their first one, in Köpmanholmen close to Örnsköldsvik.

Figure 13 CML event Sweden.

3.3.4 Mutual learning event in Sofia, Bulgaria

Organizational information

General details	
Title	**Carbon farming in Bulgaria**
Date	**November 8th 2024**
Venue	**Sofia, farm of Victor Asenov, ul. Krivinski pat, 1540 Sofia, Bulgaria**
Organisers	AUP (Petar Borisov and Haik Garabedian)
Invitation letter	Are you interested in learning more from other actors involved in bioeconomy across Europe and do you have interest in carbon farming? Then, we welcome you to join us at this event in Sofia, Bulgaria, the farm of Victor Asenov (the winner of Young Farmer competition, 2018).
Learning topics	Bio-based technologies for reduction of carbon footprint. Presentation of Oxy-hydrogen generation system for carbon offset. Management of carbon farming.
Participants profile	
No. participants	11

Type of participants	Onsite participants were 4 farmers and, 1 producer, 1 regional actors, 1 industry experts, 3 in academia and 1 entrepreneur.

Key insights and findings

The event commenced with a welcome address by Prof. Borisov, who briefly introduced the MainstreamBio project. In his presentation, Prof. Borisov outlined the project's key objectives, focusing on promoting sustainable bio-based innovations among small and medium-sized enterprises in the agri-food sector. He emphasized the importance of knowledge exchange, cooperation between stakeholders, and the adoption of green technologies in rural areas.

Following the introduction, the host of the event, farmer Victor Asenov, gave an overview of his agricultural enterprise. Mr. Asenov presented the main features of his farm, placing particular emphasis on its innovative energy system. His greenhouse, spanning nearly 2,9 ha, is equipped with a state-of-the-art oxy-generator. This technology plays a crucial role in the farm's energy efficiency strategy by generating heat required for maintaining optimal growing conditions inside the greenhouse. The complete heat generation installation was on display, allowing participants to see first-hand how the system functions in practice.

During the technical presentation, participants showed the greatest interest in the oxy-generator. They actively engaged with Mr. Asenov, asking questions about the system's installation, operation, energy output, and cost-effectiveness. The demonstration of the heat generation system sparked lively discussions about the broader applicability of such technology in other greenhouse operations and its contribution to reducing the carbon footprint of agricultural production.

In the afternoon, the focus shifted to a training session on carbon farming. The session introduced participants to the principles and practices of carbon farming, highlighting its role in climate change mitigation and the economic opportunities it offers for farmers. Particular attention was given to the process of measuring, reducing, and certifying carbon emissions. Many participants expressed strong interest in obtaining carbon footprint certificates for their own farms, recognizing the potential benefits in terms of market differentiation and sustainability compliance.

The event concluded with an open discussion on the future of carbon footprint management in agriculture. Participants exchanged ideas on best practices, challenges in implementation, and potential support mechanisms. The discussion highlighted the growing awareness and commitment among farmers to adopt sustainable practices and contribute to the broader goals of environmental protection and climate resilience.


Figure 14 CML event Bulgaria.

3.3.5 Mutual learning event in Madrid, Spain

Organizational information

General details	
Title	**Discover how to make sustainable and profitable agritourism a reality**
Date	**November 20th 2024**
Venue	**Agroturismo El Capriolo (Tr.ª Mayor, 17, 28743 Garganta de los Montes, Madrid)**
Organisers	INNV (Beatriz Deltoro)
Invitation letter	Are you interested in learning how other European initiatives implement sustainable, profitable agrotourism? Then, we invite you to join us at MainstreamBIO's cross-regional mutual learning event in Madrid, Spain! We look forward to having you in Spain!
Learning topics	How to detect and overcome the main barriers in agrotourism. Characteristics of a successful agrotourism initiative. Mutual benefits between agrotourism and ecotourism. Impact of tourism on agricultural activities.
Participants profile	
No. participants	17
Type of participants	Onsite participants were 1 primary producer, 2 regional actors, 6 industry experts, 5 in academia, 2 technology enthusiasts and 1 entrepreneur.

Key insights and findings

The event included three presentations: one on MainstreamBIO, one on agrotourism initiatives identified by the Horizon Europe project BIO2REG, and another one on the hosting success case: Agroturismo El Capriolo. Participants were not particularly active, but they responded well to the dynamization proposed by Beatriz Deltoro (moderator). The moderator posed a series of questions that allowed a comparison of the experiences of different countries (mainly Spain, Bulgaria and Denmark). Among the experiences that were discussed or compared were the number of workers needed to maintain the agrotourism business, the prices of the experience, the type of public they had, the support (or lack of it) of the local administrations, or the role of women in the business.

After the presentations and discussion, the attendees visited the facilities of Agroturismo El Capriolo, an initiative that has transformed from a generations-old goat farm to three activities: cow farm for meat production, multi-species farm (e.g., goat, donkeys, ducks…) to bring urban people closer to animals, and hosting space couple with activities to learn about and from nature.

Participation and willingness to talk depended a lot on confidence and the individual. Thus, a pre-discussion activity could be included in next events to help participants get to know each other a little and build confidence. Specific facts about agrotourism in Spain could have been presented to attract attention and encourage participants to give their opinion about their countries, instead of just talking about it by word of mouth. The language barrier also played a role (everyone spoke English, but at different levels).

The guests related to agrotourism businesses in Spain, Bulgaria and Denmark had the opportunity to get to know each other and share experiences that they found interesting. However, at the end of the event there was no apparent exchange of contacts for future conversations.

Despite efforts to attract participants to the event, the number of participants directly related to agrotourism was not as high as expected. The learning topic, although interesting, did not attract as many guests from other countries as expected.

Figure 15 CML event Spain.

3.3.6 **Mutual learning event in Cork, Ireland**

Organizational information

General details

Title	**Knowledge transfer of bioeconomy across Europe on utilization of agricultural biomasses in the dairy and grassland sectors.**
Date	**April 9th 2025**
Venue	**Munster Technological University & Farm Zero C**
Organisers	MTU (Dragica Grozdanic and James Gaffey)
Invitation letter	Are you interested in learning from other stakeholders involved in the bioeconomy across Europe, particularly in the dairy and grassland sectors? Would you like to explore the utilization of agricultural biomasses, from developing technologies for harvesting and processing to innovative product development? This is also a great opportunity to expand your international network and connect with experts focused on sustainable dairy farming and grassland management. Then, we welcome you to join us at this event at Munster Technological University, Farm Zero C dairy farm in April 2025 in Cork, Ireland.
Learning topics	Understanding how Farm Zero C is working to achieve net-zero carbon emissions on a commercial dairy farm and what strategies are employed to reduce carbon footprints. Learning how Farm Zero C measures and monitors their carbon emissions, biodiversity levels, and overall environmental impact.
Participants profile	
No. participants	24
Type of participants	Onsite participants were 2 farmers, 4 primary producers, 6 regional actors, 2 industry experts, 6 in academia, 2 entrepreneurs and 2 NGOs.

Key insights and findings

The Irish CML event was organised and combined with a networking event, and it was held from 9th to 10th of April 2025, and brought together 22 stakeholders including representatives from Denmark, Poland, Greece, Sweden, the UK, and Ireland. The group encompassed a wide range of sectors from academia, industry, policy, NGOs, farmers, and advisors offering a broad spectrum of regional perspectives and expertise. The event was highly interactive and well-received, with participants showing strong engagement during both formal sessions and informal conversations. The combination of concise presentations, a collaborative engagement workshop, and a site visit created a balanced structure that encouraged both knowledge and insights sharing and relationship-building. The event was firstly hosted at Munster Technological University, MTU in Cork Campus with a field visit to the innovative Farm Zero C site. The final CML workshop's primary objective was to highlight good practices and common challenges in rural bioeconomy development, particularly regarding local biomass use, waste valorisation, and circular business models.

The first day began with a series of project presentations that provided a shared foundation for the discussions to follow. Dragica Grozdanic (bioeconomy researcher at MTU and Irish MIP representative) introduced the MainstreamBIO project, outlining its goal of embedding small-scale bio-based solutions into mainstream rural practices across the EU. This was followed by Dr. Thanos Balafoutis, who presented the BioRural project and its work in closing rural bioeconomy gaps. Dr. Clodagh Carr offered an overview of the N-POWER project, focusing on nutrient reduction in agriculture and environmental systems. Lastly, David Robert Newman provided broader policy perspectives through his work on the BRILIAN project and within the European Bioeconomy Bureau.

These presentations set the tone for the collaborative workshop that followed. Participants were invited to reflect on how local crops and residues could be better utilised, what innovations they had seen or implemented, the barriers to wider adoption, and what they would change in their local systems if given the opportunity.

These following questions were addressed:

- Have you or anyone you know experimented with using local crops, or crop residues (“waste”) in new ways?
- What kinds of resources are easily available in your area that could be used better?
- Have you seen a great example of someone turning waste into something useful that could be used as a suggestion for solutions?
- What are the barriers and challenges that hold people back in your region from trying out new ideas in farming, food, or waste use?
- If you had a magic wand to change one thing in your local farming or food system, what would it be?

A variety of examples emerged during the group discussions. For example, straw was noted for its diverse applications in construction, bioethanol production, and improving soil health. Participants also highlighted the upcycling of plant (lentil) based yogurt, potato starch, and legume residues as natural (N) fertilizer, along with the use of grass pulp and hemp fibres for textiles, insulation, and packaging. Biogas production from digestate was another widely shared practice.

When discussing underutilised resources, participants identified key materials in their regions. These included grass, manure, and cereals in Ireland; grass and forestry residues in Denmark; cotton and citrus waste in Greece, despite associated fermentation challenges; and land and soybeans in Brazil. Other assets, such as salix (willow), cow crops, and the potential for better solar utilisation, were also mentioned. Several ongoing projects and real-world examples of circular innovation were referred to, including the BioRural project’s work with wheat straw. Many of the earlier examples were reiterated as evidence of what’s already working on the ground. The conversation also turned to barriers hindering wider bioeconomy adoption. These challenges fell into several categories. At the policy and regulatory level, participants refer to EU bureaucracy and misaligned national incentives. From an economic perspective, static value chains, limited farm income, and price pressures from retailers were seen as significant obstacles. Social and cultural factors such as resistance to change, generational fatigue, and the under-recognition of farmers’ roles also emerged. Finally, knowledge gaps and advisory infrastructure were seen as limiting innovation, with bio-based alternatives like biofertilizers often viewed as less reliable than conventional inputs.

When asked what they would change if they had a “magic wand,” responses ranged from the restructuring of advisory services (particularly in Greece) to increased responsibility among large agri-food companies (as noted by Danish participants). Across all regions, there was a shared call for reduced bureaucracy, more localised processing, stronger cooperative models, and better integration between education, research, and practical farming.

In the afternoon, the group visited Farm Zero C, a pioneering initiative led by Carbery Group and BiOrbic focused on creating a climate-neutral dairy farming model that can be replicated across the dairy and grassland sector. Located on Shinagh estates dairy farm in Bandon, Co. Cork, the farm emphasizes the integration of innovative, climate-friendly practices to reduce emissions and promote environmental sustainability. Key strategies include inhibition of methane production in animal diets and slurries, improvement of soil health, sustainable grassland production practices to reduce fertiliser use and improve diversity, improved animal genetics, the use of renewable energy, such as solar and wind power incorporation of bio-based technologies and products. The tour was led by Mary Kate Doherty and James Gaffey, who provided valuable insight into how innovation and sustainability are integrated into everyday operations, and how the upcoming Rural BioRefarmeries concept will build on these foundations. Participants showed strong interest in the farm’s strategies for methane reduction, renewable energy use, and the broader implications for supporting local farmers. This real-world example helped to contextualise many of the themes discussed earlier in the day and highlighted the importance of practical, scalable models in driving forward rural bioeconomy solutions.

The workshop fostered meaningful dialogue among participants from different countries, allowing them to reflect on shared challenges and region-specific opportunities related to farmers’ needs, resource use, and circular innovation. Through guided discussions around five core questions, stakeholders exchanged examples, compared regional barriers, and explored creative solutions. The open and participatory format created a valuable space for peer learning, encouraging both practical exchange and deeper connections among participants. Throughout the event and even during dinner, participants actively took advantage of opportunities to network and engage in lively discussion around the table. Many participants found the workshop inspiring and appreciated the exchange of ideas. However, there is room for improvement, particularly in making interactions more structured and dynamic, providing access to materials beforehand, balancing presentations with more active exchanges, and broadening stakeholder involvement. These reflections offer valuable insights for shaping better futured knowledge exchange events.

Figure 16 CML event Ireland.

3.3.7 Mutual learning event in Lelystad, The Netherlands

Organizational information

General details	
Title	**Inspiration day in biobased applications in the rural area**
Date	**November 12th 2024**
Venue	**Runderweg 6 & Edelhertweg 1, Lelystad, The Netherlands**
Organisers	WR (Rommie van der Weide, Matthew Booth, and Bert Annevelink)
Invitation letter	Are you interested in learning more from other actors involved in bioeconomy across Europe and do you have interest in utilization of biomasses from agriculture from both development of technologies to harvest, processing and product development and are you interested in expanding your international network? Then, we welcome you to join us at this event in Lelystad, The Netherlands.
Learning topics	Opportunities for small-scale bio-based applications in rural areas. Site visit to WR-ACRRES pilot plant. Current inspiration and experiences from practice in scaling up grass processing on the farm.
Participants profile	
No. participants	17
Type of participants	Onsite participants were 3 biomass producers, 3 industry experts, 10 in academia and 1 civil society.

Key insights and findings

The session opened with a round of introductions, allowing participants to share their backgrounds and areas of interest followed by a presentation by Rommie van der Weide on MainstreamBIO, covering its background, objectives, and regional insights. Findings from the Netherlands and Ireland were shared, with a focus on enabling conditions, barriers to implementation, and the role of value chains in regional bio-based development.

Following this, Aleksandra Augustyniak (MTU) presented the Bio4Africa project, which runs pilot cases in Uganda, Ghana, Senegal, and Ivory Coast. The project explores the use of alfalfa and pak chong residues to extract high-value antioxidants from whey brown juice. Fresh pak chong showed the most promising results. A brief discussion followed, focusing on infrastructure challenges in rural African settings.

Participants then visited demo sites at Edelhertweg 1, engaging in discussions on GoGrass and AlgaeNed technologies. Topics included algae production on side streams, grass valorization, and

innovative bioprocessing involving insects, worms, and algae. The visits provided practical insights into process steps and operational models.

There was broad interest in deeper mutual learning on topics such as algae for nutrient recycling, biomass for insect production, and bio-based building materials. However, the limited timeframe (half a day) made in-depth discussion challenging.

A recurring theme was the importance of a consumer-oriented approach. Participants stressed that even the most sustainable innovations must be marketable. Bio-based products need to meet real consumer demand, backed by solid business models. Case studies showing successful market penetration of eco-alternatives were suggested as valuable for future events.

Figure 17 CML event The Netherlands.

3.4 Outcome and key takeaways from the workshops

The 7 CML events, held under the MainstreamBIO project during October 2024 until April 2025, brought together diverse actors from across Europe to exchange experiences, ideas, and innovations in the rural biobased solutions. The workshops demonstrated that while regional contexts differ, there is a shared urgency and opportunity to scale bio-based solutions that support rural sustainability, economic diversification, and environmental goals.

Participants widely agreed that building local value chains is essential for advancing the bioeconomy. From nutrient recycling in Poland to grass and peatland biomass in Denmark and Ireland, the ability to harvest, process, and market bio-based products locally is key in making bioeconomy models economically viable. Further discussion is needed on how to design region-specific supply chains that reduce dependency on large-scale, centralized processing systems.

Successful initiatives often emerge from partnerships between farmers, researchers, local authorities, and SMEs, which highlights the importance of multi-actor collaboration platforms, as established during MainstreamBIO. Future discussions should focus on how to build and sustain these partnerships, especially in regions where the bioeconomy is still emerging.

Participants in several countries, notably Ireland, Spain, and Denmark, cited regulatory barriers, complex bureaucracy, and lack of alignment between EU and national policies as major barriers. There is a clear need for dialogue around simplifying policy frameworks, creating targeted incentives, and improving coherence between environmental and economic strategies.

Whether discussing carbon farming in Bulgaria or agrotourism in Spain, many participants questioned how bio-based solutions can become financially sustainable without consistent market demand and support. Key points for further debate include:

- How to create consumer trust and demand for bio-based products?
- How to design business models that work for small producers?
- What funding mechanisms or subsidies are most effective?

Resistance to change, whether due to generational habits, scepticism toward new technologies, or lack of time and capacity, was a recurring theme. Spain and Ireland emphasized the need to shift farmer mindsets and the importance of peer learning, demonstration projects, and cultural change. This calls for deeper discussion on how to support transition through education, training, and storytelling.

Field visits, such as to Cinis Fertilizer in Sweden or Farm Zero C in Ireland, were praised for making complex concepts tangible. Participants noted that seeing real-world examples helped them envision how bioeconomy solutions might work in their own context. This underscores the value of demonstration projects and living labs and invites further exploration into how to scale these models and emphasizes that innovation must be linked to practical applications and demonstrations. All workshops confirmed the value of face-to-face interactions, both formal and informal. Participants highlighted how these events inspired new thinking and connections.

In summary, the workshops revealed a rich landscape of regional innovation and enthusiasm for the bioeconomy. At the same time, they brought to light key discussion points that must be addressed to unlock the full potential of small-scale bio-based solutions. These include aligning policy with practice, fostering economic viability, supporting social transition, and strengthening local infrastructure and collaboration. Moving forward, these takeaways should serve as the foundation for more targeted policy recommendations, focused working groups, and follow-up initiatives aimed at mainstreaming the rural bioeconomy across Europe.

4. Joint outcomes, discussion and conclusions T4.2 and T4.3

The MainstreamBIO project is advancing the rural bioeconomy across Europe through a combination of mutual learning, regional scale-up workshops, and multi-actor collaboration. These efforts aim to support the development, adoption, and scaling of small-scale bio-based solutions, stakeholder engagement, and sustainable transformation of the bioeconomy.

The SUWs played a crucial role in advancing the project's goal of integrating small-scale bio-based solutions into rural regions. These workshops brought together diverse stakeholders, such as local authorities, biomass producers, and MAPS, to address specific challenges and build on successful innovations. By creating a collaborative environment, the workshops enabled participants to exchange experiences, identify obstacles, and highlight key success factors encountered throughout their involvement with MainstreamBIO.

Likewise, the CML events and missions were also a key part of the MainstreamBIO project’s efforts to promote knowledge exchange and international collaboration around bio-based solutions. These events, including field visits, were designed to showcase best practices and facilitate the sharing of experiences related to implementing small-scale bio-based technologies, business models, and

nutrient recycling strategies. They also served as a platform to connect representatives from related networks and initiatives, strengthening international cooperation and learning.

MainstreamBIO's integrated approach has proven effective in identifying both the potential and the challenges of scaling small-scale bio-based solutions across rural Europe. Throughout both the co-creation and mutual learning workshops, participants emphasized the importance of early innovation steps and utilizing local resources and side streams.

Although the MainstreamBIO project has made progress in tackling some barriers, challenges such as regulatory complexity and limited financial access remain. Participants proposed practical solutions including the establishment of public advisory bodies for technical and policy guidance, matchmaking platforms to connect stakeholders, targeted training programs, and stronger involvement from local governments. Awareness campaigns and demonstration showcases were also recommended to build trust and visibility.

The workshops emphasized the importance of CE principles and locally adapted business models, such as agrotourism, energy communities, and nutrient recycling. Flexible policy frameworks were seen as essential to support these efforts. A consistent theme across regions was the need for strong local value chains, multi-actor collaboration involving farmers, SMEs, researchers, and public authorities, and strategies to overcome cultural resistance and regulatory inconsistencies. Demonstration projects and peer learning were highlighted as effective tools for scaling up rural bio-based solutions.

Overall, the findings underscore that tailored, region-specific strategies, supported by robust partnerships and adaptive policies, are essential for unlocking the full potential of the European rural bioeconomy.

The project

MainstreamBIO is a Horizon Europe EU funded project, which sets out to get small-scale bio-based solutions into mainstream practice across rural Europe, providing a broader range of rural actors with the opportunity to engage in and speed up the development of the bioeconomy. Recognizing the paramount importance of bioeconomy for addressing key global environmental and societal challenges, MainstreamBIO develops regional Multi-actor Innovation Platforms in 7 EU countries (PL, DK, SE, BG, ES, IE & NL). The project aims to enhance cooperation among key rural players towards co-creating sustainable business model pathways in line with regional potentials and policy initiatives. MainstreamBIO supports 35 multi-actor partnerships to overcome barriers and get bio-based innovations to market with hands-on innovation support, accelerating the development of over 70 marketable bio-based products and services. Furthermore, the project develops and employs a digital toolkit to better match bio-based technologies, social innovations and good nutrient recycling practices with available biomass and market trends as well as to enhance understanding of the bioeconomy with a suite of educational resources building on existing research results and tools. To achieve these targets, MainstreamBIO involves 10 partners across Europe, coming from various fields. Thus, all partners combine their knowledge and experience to promote the growth of bioeconomy in a sustainable and inclusive manner.

Coordinator: **Q-PLAN INTERNATIONAL ADVISORS PC (Q-PLAN)**

Partner		Short Name
Q-PLAN INTERNATIONAL	Q-PLAN INTERNATIONAL ADVISORS PC	Q-PLAN
MTU Ollscoil Teicneolaíochta na Mumhan Munster Technological University	MUNSTER TECHNOLOGICAL UNIVERSITY	MTU
WAGENINGEN UNIVERSITY & RESEARCH	STICHTING WAGENINGEN RESEARCH	WR
IUNG Institute of Soil Science and Plant Cultivation State Research Institute	INSTYTUT UPRAWY NAWOZENIA I GLEBOZNAWSTWA, PANSTWOWY INSTYTUT BADAWCZY	IUNG
RI. SE	RISE PROCESSUM AB	PROC
AGRARIAN UNIVERSITY-PLOVDIV	AGRAREN UNIVERSITET - PLOVDIV	AUP
Food & Bio Cluster Denmark	FBCD AS	FBCD
innovarum	EURIZON SL	INNV
DRAXIS ENVIRONMENTAL TECHNOLOGIES	DRAXIS ENVIRONMENTAL SA	DRAXIS
WHITE	WHITE RESEARCH SPRL	WHITE