

European Industrial-Scale Circular Bioeconomy Platform for Agri-Food Residue Valorisation

Concept Note - ECIV Marketplace: Integrating Circular Infrastructure, Translational Research and Digital Systems to Convert Agri-Food Residues into Sustainable Feed and Soil Solutions

Lead Organisation

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Project Overview

This concept proposes the demonstration and deployment of an industrial-scale European circular bioeconomy platform converting agri-food processing residues into sustainable aquaculture feed ingredients and regenerative soil inputs through industrial insect bioconversion.

The platform integrates circular bio-industrial infrastructure, digital feedstock intelligence, aquaculture innovation, frass research, soil validation and rural adoption systems, enabling the translation of research and emerging science into commercial applications at Technology Readiness Levels (TRL) 6–8.

By transforming regional agri-food residues into reliable feed and soil products, the platform aims to strengthen Europe’s strategic autonomy in sustainable aquaculture feed supply while advancing circular nutrient systems in agriculture.

Expressions of interest from research institutions, industry partners, and regional innovation organisations are welcome.

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The platform integrates circular bio-industrial infrastructure, digital feedstock intelligence, aquaculture innovation ecosystems, frass research and soil system validation, rural farming adoption systems, workforce development, and interregional knowledge transfer, creating a scalable European model for the industrial deployment of circular bioeconomy value chains.

The project focuses on system integration and translational innovation, combining proven industrial technologies with emerging scientific advances to accelerate deployment of circular bioeconomy solutions at Technology Readiness Levels (TRL) 6–8.

1. Strategic Positioning

The project proposes the development of an industrial-scale circular bioeconomy platform converting agri-food processing residues into:

- Sustainable Aquaculture Feed Ingredients
- Regenerative Soil Amendments Derived from Insect Frass

The innovation pipeline is supported by research and development activities and translational research partnerships with academic and research institutes, enabling the translation of emerging science into commercial applications.

The platform integrates:

- Circular Bio-Industrial Infrastructure
- Digital Feedstock Intelligence
- Aquaculture Innovation Ecosystems
- Frass Research and Soil System Validation
- Rural Farming Adoption Systems
- Workforce Training — Skilling, Upskilling and Reskilling for the Green and Blue Economy
- Interregional Knowledge and Best Practice Transfer

The novelty lies in integrating circular infrastructure, digital systems, and biological innovation into a scalable industrial platform, enabling efficient and reliable production systems capable of supporting emerging circular value chains.

Insights generated may support further applications of insect-derived ingredients in other livestock sectors, including poultry and pigs, subject to national regulatory frameworks.

2. Feedstock Strategy

The system valorises agri-food residues, with dairy processing streams serving as a stable anchor feedstock within a broader agri-food residue system.

Feedstock Category	Streams	Strategic Role
Anchor Feedstock	Dairy Processing Residues, Whey Permeate	Stable Volumes and Regional Clustering
Complementary Feedstocks	Distillery Spent Grains, Brewery Residues, Bakery Waste, Vegetable Processing Residues	Nutrient Balance and Supply Resilience

This approach improves feedstock security, nutritional balance for insect bioconversion, and industrial scalability.

3. Project Leadership and Core Platform Roles

Project coordination and platform leadership will be provided by CIREVON SCOTLAND LTD (Cirevon), working with cross-national consortium partners responsible for key elements of the circular platform architecture.

At this stage Vaste Technologies Ltd (Vaste) and the Scottish Aquaculture Innovation Centre (SAIC) have confirmed interest in participating in the consortium.

Organisation	Role in Project	Functional Responsibility
Cirevon	Project Coordinator and Industrial Platform Lead	Consortium Coordination; Development and Deployment of Circular Bio-Industrial Infrastructure; Integration of Feedstock Systems, Digital Intelligence, and Product Markets
Vaste	Digital Systems Partner	Development of the Digital Feedstock Intelligence Platform Supporting Feedstock Mapping, Logistics Optimisation and Supply Forecasting
SAIC	Aquaculture Innovation Partner	Validation of Insect-Derived Ingredients for Aquaculture Feed Systems and Engagement with Aquaculture Industry Stakeholders

Together these partners provide industrial, digital and sector innovation capacity, forming the foundation of the circular platform.

4. Project in One Sentence

An industrial-scale European circular bioeconomy platform integrating digital feedstock intelligence, insect bioconversion infrastructure, aquaculture innovation, and frass-based soil systems to convert agri-food residues into sustainable feed ingredients and regenerative soil solutions.

5. Work Package Structure

WP	Title	Purpose
WP1	Feedstock Systems & Resource Mapping	Mapping Agri-Food Residues and Development of Feedstock Ecosystems
WP2	Digital Feedstock Intelligence	Digital Mapping, Logistics Optimisation and Supply Forecasting
WP3	Industrial Bioconversion Platform	Insect Bioconversion Trials and Industrial Scaling Pathway
WP4	Aquaculture Ingredient Validation	Feed Trials, Aquaculture Sector Engagement and Optimisation of Aquafeed Formulations
WP5	Frass Research & Soil Systems Validation	Frass Characterisation, Soil Health Testing and Agronomic Validation
WP6	Rural Farming Systems & Adoption	Farm Trials, Farmer Engagement and Workforce Development for the Green and Blue Economy
WP7	Interregional Policy Development & Knowledge Transfer	Interregional Collaboration and Circular Bioeconomy Policy Exchange

6. Impact

Impact Category	Key Outcomes
Environmental Impact	Reduction of Agri-Food Waste Streams; Circular Nutrient Flows Through Frass Utilisation; Improved Soil Health and Soil Biology; Reduced Dependence on Synthetic Fertilisers
Economic Impact	Development of Circular Bio-Industrial Infrastructure; Creation of New Markets for Agri-Food Residues; Production of Sustainable Feed Ingredients for Aquaculture

Impact Category	Key Outcomes
Aquaculture Innovation Impact	Optimisation of Aquafeed Formulations and Process Reliability to Produce Consistent High-Quality Protein Meal and Lipid Offtakes
Industrial Process Impact	Efficient and Reliable Bioconversion Processes Optimising Production Cost, Product Quality and Supply Consistency
Rural Development Impact	Farmer Adoption of Circular Soil Amendments; New Revenue Streams from Agri-Waste Valorisation; Development of Regional Bioeconomy Clusters
Workforce Impact	Workforce Development Supporting the Transition to the Green and Blue Economy
Innovation Impact	Integration of Digital Infrastructure, Industrial Biotechnology, Aquaculture Feed Innovation and Soil System Innovation

7. Circular Value Chain

Agri-Food Residues



Feedstock Ecosystem Coordination



Digital Optimisation (Feedstock Logistics and Supply Modelling)



Efficient and Reliable Circular Bioconversion Infrastructure

Outputs:

- Aquaculture Feed Innovation and Formulation Optimisation
- Consistent High-Quality Protein Meal and Lipid Production
- Frass Research and Soil System Validation

The platform emphasises process efficiency, reliability, and cost optimisation, ensuring consistent industrial-scale production and dependable supply for downstream markets.

8. Quadruple Helix Structure

Helix	Role
Industry & Digital	Industrial Platform Development, Digital Feedstock Intelligence and Aquaculture Innovation

Helix	Role
Academia / Research	Aquafeed Ingredient Trials, Frass Science, Soil Systems and Agricultural Validation
Government / Policy	Regional Innovation Ecosystems and Interregional Collaboration
Community / Rural Economy	Farmer Engagement, Agricultural Adoption Systems and Workforce Development

9. European Replication Pathway

The platform is designed as a replicable industrial circular bioeconomy model across European agri-food ecosystems.

Transferable Components

Platform Element	Replication Potential
Digital Feedstock Intelligence	Adaptable to Regional Waste Streams
Industrial Insect Bioconversion	Scalable Modular Infrastructure
Circular Feed and Soil Products	Adaptable to Local Agricultural Systems
Ecosystem Building	Cross-Sector Bioeconomy Partnerships
Workforce Development	Skills Development for the Green and Blue Economy

Regional Perspective

Initial collaboration will focus on Northern European agri-food and aquaculture ecosystems, where strong dairy sectors and advanced aquaculture industries support circular feed innovation.

European Region	Relevance
Northern Europe	Dairy and Food Processing Residues; Circular Nutrient Systems
Atlantic Aquaculture Regions	Sustainable Aquaculture Feed Value Chains
North Sea & Baltic Sea Regions	Aquaculture Production Systems and Feed Innovation
Southern European Systems	Longer-Term Opportunities for Agricultural Residue Valorisation

10. Implementation Roadmap

Phase	Objective
Phase 1	Industrial Demonstration Platform for Circular Bioeconomy Deployment
Phase 2	Regional Circular Bioeconomy Hub
Phase 3	European Circular Bioeconomy Platform

11. Strategic Value

Strategic Area	Contribution
EU Circular Economy	Scalable Circular Bioeconomy Infrastructure and Nutrient Cycling
Sustainable Food Systems	Sustainable Aquaculture Feed Ingredient Production
Agricultural Sustainability	Soil Health Improvements Through Frass-Based Inputs
Regional Development	Circular Value Chains and Rural Bioeconomy Clusters
Innovation Ecosystems	Integration of Digital Platforms, Biotechnology and Agri-Food Systems
Interregional Collaboration	Cross-Regional Collaboration Supporting Supply Continuity for Emerging Circular Bioeconomy Industries

Working across regions will help ensure reliable supply for aquaculture and agricultural offtake partners, strengthening confidence in emerging circular feed and soil markets.

In Summary

The project establishes an industrial-scale circular bioeconomy platform integrating:

- Digital Infrastructure
- Circular Biotechnology
- Agri-Food Ecosystems
- Aquaculture Innovation
- Frass-Based Soil Regeneration Systems

The platform demonstrates how integrated infrastructure and translational innovation can transform agri-food residues into strategic resources, enabling replicable circular bioeconomy value chains across Europe.