UNLOCK

Author: **Laura Nieto Cuervo**
Date: **12 November 2024**

Networking event in Brussels report

This project has received funding from the Bio-based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement Nº 101023306

Technical References

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Project Title	Unlocking a new feather bioeconomy for keratin-based agricultural products.
Project Coordinator	Sarah Montes, CIDETEC
Project Duration	48 months

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[1] PU = Public
PP = Restricted to other programme participants (including the Commission Services)
RE = Restricted to a group specified by the consortium (including the Commission Services)
CO = Confidential, only for members of the consortium (including the Commission Services)

Document history

V	Date	Beneficiary	Author
1	08 November 2024	G!E, UNIMOS	Laura Nieto Cuervo, Katarzyna Kowalska
2	11 November 2024	CIDETEC	Sarah Montes – review

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3	12 November 2024	G!E	Laura Nieto Cuervo v2

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Summary

The UNLOCK project aims at creating a feather-based bioeconomy for keratin-based agricultural products. The overall objective is to contribute to replacing fossil-based raw materials with biobased, renewable material by valorising current unused and underused by-products of poultry processing.

This deliverable includes a summary of the organisation and success of the UNLOCK Networking Event on Advancing Circular Economy in Agriculture, which took place in Brussels on 22nd October 2024 at Silversquare Bailli, headquarters of Greenovate!Europe's partner.

The main objective of the networking event led by G!E was to bring together industry leaders, experts, and stakeholders from across Europe to explore the transformation of agricultural waste into innovative, eco-friendly products. Our discussions highlight sustainable methods for repurposing agricultural by-products into valuable bioplastics and other bio-based materials in the framework of the UNLOCK project but also from 2 invited projects: Waste2Func and BRILIAN.

The event unfolded around 3 main sections: presentations from the experts, networking times and the exhibition area. These activities were aimed at gathering first-hand insights into the latest UNLOCK developments and deepening the understanding of specific target customer segments.

Dissemination played an essential role, supported by the creation of a special booklet showcasing the project's innovations and products. Additionally, the event was livestreamed, allowing a wider audience to participate, and the full recording is now available on Greenovate!Europe's YouTube channel for continued access and engagement.

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1.Introduction

The European poultry sector produces around 3.6 million tons of waste feathers annually, mainly valorised in low added value products. In line with EU Bioeconomy strategy, the UNLOCK project aims to transform this waste into valuable raw material to create a new sustainable value chain.

The UNLOCK project is led by CIDETEC and driven by a well-balanced consortium of 15 partners that covers the whole value chain, from feedstock and supply chain analysis to processes, end-product fabrication and sustainability assessments.

The main objective of the UNLOCK project is the design and demonstration of an economically and environmentally sustainable supply-chain for a feather-based bioeconomy which will generate innovative bio-based functional materials for agricultural applications.

The initiative is working on the creation of bio-based products for agriculture, such as:

- Seed trays
- Mulch films
- Hydroponic foams
- Nonwoven geotextiles

And to do it, is using three different technologies for feather treatment:

- Mechanical grinding
- Steam explosion
- Microbial fermentation.

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2. Objectives

The UNLOCK Networking Event, organised as part of the project's broader communication, dissemination, and exploitation efforts, aimed to advance several strategic objectives:

1. **Showcasing UNLOCK's Innovative Solutions:** The event provided a platform to highlight the advancements achieved by the UNLOCK project, particularly in transforming agricultural waste such as feathers, into sustainable bioplastics and bio-based products. A dedicated booklet[1] was developed to disseminate information on these innovations, ensuring that stakeholders had a comprehensive understanding of the project's achievements.

2. **Fostering Collaboration Among Projects and Initiatives:** By bringing together experts and stakeholders from diverse sectors, the event sought to stimulate collaboration and knowledge exchange with other projects focused on circular economy, sustainable innovations, and the bioeconomy. The exhibition area and presentations allowed participants to discover synergies and share knowledge on bio-based advancements, fostering collaborative opportunities across industries.

3. **Exploring Cooperation and Market Opportunities:** Networking sessions facilitated direct interactions with stakeholders, enabling discussions on technological collaborations, project partnerships, and business ventures. The event also aimed to identify available and upcoming funding opportunities to support the commercialisation and market uptake of keratin-based products developed within the UNLOCK project.

4. **Maximizing Outreach Through Dissemination:** To extend the event's impact, a livestream was conducted, allowing a broader audience to participate virtually. The full recording is now available on Greenovate! Europe's YouTube channel, ensuring continued access to the event's discussions and insights for those unable to attend in person.

[1] See Annex 2

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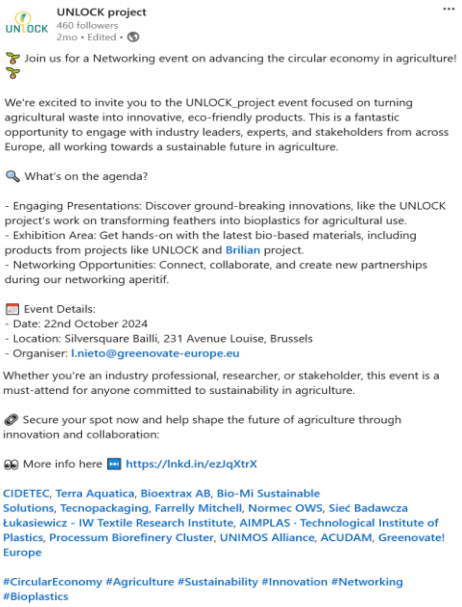
3. Implementation

The UNLOCK Networking Event was organised to bring together a diverse range of stakeholders from across Europe, with the goal of advancing the circular economy in the agricultural sector. The event focused on showcasing innovative methods for transforming agricultural waste into sustainable, eco-friendly products, particularly through the development of bioplastics and other bio-based materials. To maximise its impact, the event was designed with a carefully agenda, including presentations from UNLOCK partners and related projects, an interactive exhibition area, and dedicated networking sessions.

During the summer of 2024, the project team used the additional time to develop a thoughtful and impactful agenda[2]. This involved coordinating with presenters and speakers, organising product and material showcases, and managing attendee registrations. To maximise outreach and engagement, a comprehensive communication campaign was implemented. This included multiple social media announcements, a detailed article on the project's website, and a publication on the **European Circular Economy Stakeholder Platform** and the **Biorefine Cluster Europe**.

Figure 1. Social Media posts



[2] See Annex 1

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These efforts resulted in over 65 registrations, with more than 50 participants attending the event.

In the following sections, we are describing **the Networking event - Advancing Circular Economy in Agriculture** three main activities: Presentations, Networking Time, and Exhibition.

3.1 Presentations

The Event featured a blend of presentations by UNLOCK partners, the Project Officer from CBE JU and representatives from Waste2Func and BRILIAN, offering a comprehensive view of their innovative technologies and products to develop new circular value chains in agriculture and other fields. In the following lines, we are describing the highlights of the agenda:

Welcome and Opening Remarks (14:30 - 14:40)

The event began with an introduction to the UNLOCK project, led by Vicky Mosteyrin from Greenovate! Europe and Sarah Montes from CIDETEC. They set the stage for the day's discussions, emphasizing the project's commitment to promoting circular solutions in agriculture.

European Vision for Circular Economy (14:40 - 14:55)

Simone Maccaferri from the European Commission (or CBE JU) presented the European perspective on advancing circular economy practices within the agri-food sector. This session highlighted policy directions and funding opportunities to support sustainable innovations.

Addressing Challenges in the Feather-Based Economy (14:55 - 15:10)

Daniel Traas from Farrelly & Mitchell discussed the challenges and potential of developing a feather-based bioeconomy, addressing the hurdles that need to be overcome to scale these innovations effectively.

Feather Processing Technologies & Upscaling (15:10 - 15:30)

Jonna Almqvist from RISE Processum delved into the technological advancements and demonstration plants involved in feather processing, showcasing methods for upscaling this sustainable resource.

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Demonstration of Biodegradable Agricultural Products (15:30 - 16:20)

This segment featured in-depth presentations on the development, prototypes, and practical applications of biodegradable products developed within the UNLOCK project. Speakers included Julen Vadillo (CIDETEC), Lorena Arruga (Tecnopackaging), and Justyna Wietecha (Ł-ŁIT). Attendees had the opportunity to learn about the benefits of these innovations for sustainable agriculture.

Figure 2. Pictures of some presentations

Showcasing Related Projects (16:35 - 17:05)

The event continued with presentations from two additional projects:

- **Brilian Project:** Anna Capraro from ENCO highlighted advancements in circular bio-based materials.
- **WASTE2FUNC:** Esthèle Goure from Bio Base Europe presented the project's efforts to convert waste into valuable bio-based products.

Key Achievements of the UNLOCK Project (17:05 - 17:10)

Sarah Montes (CIDETEC) provided a summary of the key milestones and achievements of the UNLOCK project, showcasing its impact on the bioeconomy landscape.

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3.2 Exhibition

Participants had the chance to explore a dedicated exhibition area showcasing a comprehensive range of product samples developed by the UNLOCK project partners. The display covered the entire circular value chain, with a special focus on demonstrating how agricultural by-products, in this case feathers, were transformed into sustainable materials.

The exhibition included sanitised feathers as the raw starting material, followed by feathers processed using three key technologies: steam explosion, mechanical grinding, and microbial fermentation. Each of these techniques was applied to feathers to convert them into a variety of intermediate and end products.

On display were the tangible outcomes of these processes, including feather compounds, sheets of feather-based compounds, hydroponic foams, non-woven geotextiles, biodegradable mulch films, and seed trays.

This hands-on section allowed attendees to directly interact with materials and products, fostering a tangible understanding of the progress being made in bio-based material development.

Figure 3. Pictures the exhibition area

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3.3 Networking times

The event concluded with a networking session, where attendees could explore product samples showcased in the exhibition area at the time they could enjoy a light aperitif. This context provided a relaxed atmosphere for attendees to connect, discuss insights from the day, and explore potential collaborations. This networking session was instrumental in facilitating new collaborations aimed at driving the circular economy forward in agriculture.

Figure 4. Pictures of Networking times

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4. Conclusions

The UNLOCK Networking Event successfully brought together a diverse group of stakeholders, showcasing the potential of innovative, sustainable practices for repurposing agricultural by-products. Attendees gained new knowledge, made valuable connections, and found inspiration to further advance the circular agricultural economy in Europe.

The event was attended by representatives from a broad range of sectors, including network organisations, clusters, and digital innovation hubs; academia and research institutions; industry stakeholders from both traditional and high-tech sectors; policymakers at the regional and national levels; as well as financing and regional development agencies. In addition, participants included professional training, educational, and cultural organisations, alongside members of civil society and consumer groups. This diverse representation ensured a holistic exchange of ideas and fostered cross-sector collaboration to drive circular innovations forward.

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5. Annexes

- **Annex 1: Agenda of the event**
- **Annex 2: UNLOCK Booklet**
- **Annex 3: Posters**

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AGENDA

Networking Event: Advancing Circular Economy in Agriculture

Tuesday 22 October 2024 | 14:30-18:15 CET | Brussels

Event Summary	This networking event will bring together industry leaders, experts, and stakeholders from across Europe explore the circular economy in agriculture, emphasizing the transformation of agricultural waste into innovate, eco-friendly products. **Discussions will centre on sustainable methods for repurposing agricultural by-products into valuable bioplastics and other bio-based materials.** This event will feature engaging presentations from UNLOCK partners and other leading projects, a dedicated exhibition area to showcase product samples, a networking opportunity to foster collaboration.
Format	In person event in Brussels (Silversquare Bailli, Avenue Louise 231 – Room: Atlantis)
Agenda	
14:30 14:40	**Welcome and introduction to UNLOCK** – Vicky Mosteyrin, G!E and Sarah Montes, CIDETEC
14:40 14:55	**The European vision for Circular Economy in the Agri-Food sector** – Simone Maccaferri, EU Commission or CBE JU
14:55 15:10	**EU's feather-based economy: the challenges ahead** – Daniel Traas, Farrelly & Mitchell
15:10 15:30	**Technologies in Feather Processing and Upscaling. Demonstration Plants** – Jonna Almqvist, RISE Processum
15:30 16:20	**Demonstration of biodegradable agricultural products from UNLOCK (presentation of prototypes and their development and practical application and benefits)** – Julen Vadillo, CIDETEC; Lorena Arruga, Tecnopackaging; Justyna Wietecha, Ł-ŁIT.
Coffee Break 15 min	
16:35 16:50	**Brilian project** – Anna Capraro, ENCO
16:50 17:05	**WASTE2FUNC** – Esthèle Goure, Bio Base Europe
17:05 17:10	**Highlights of UNLOCK** – Sarah Montes, CIDETEC
17:10 18:15	**Networking and products exhibition**
REGISTER HERE	

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UNLOCK

Releasing the potential of feathers

UNLOCK project solutions

BBI JU

Bio-based Industries Consortium

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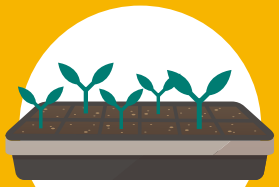
The UNLOCK project

The European poultry sector produces **3.6 million tonnes of waste feathers** annually, mainly valorised in low added value products. In line with the **EU Bioeconomy Strategy**, the UNLOCK project aims to transform this waste into a valuable raw material to create a new sustainable value chain.

The initiative will create bio-based products for agriculture, such as:



Forest and seed trays

Mulch films

Hydroponic foams

Nonwoven geotextiles

UNLOCK uses three different technologies for feather treatment based on the desired end-product: mechanical grinding, steam explosion and microbial fermentation.

3 **different technologies** for feather treatment

Since feathers are nearly **90% keratin**, these materials offer additional benefits: they are designed to be zero waste, biodegradable, and enrich soils with organic nitrogen.

Feathers contain nearly
90% Keratin

From storage to treatment efficiency, product performance to market readiness, **UNLOCK finds solutions to every hurdle along the value chain to create a feather-based bioeconomy**.

UNLOCK

Treatment technologies

Treated feathers
microbial fermentation

Treated feathers
steam explosion

Treated feathers
mechanical grinding

End-products

Keratin pebbles
biodegradable foam

Mulch
films

Seed
trays

Non-woven
geotextiles

Poultry sector analysis by Farrelly and Mitchell

Feather Waste Sources and Management in the EU

In 2020, the EU poultry sector produced 13.6 million tonnes of meat, with 67% coming from **France, Germany, Italy, Poland, and Spain**. These target countries generated approximately **480,000 tonnes of feathers annually, out of 620,000 tonnes across the EU**.

620,000 ton
of waste feathers generated annually across the EU

A limited number of licensed establishments (0.5-3.98%) currently manage feathers or feather-related products, underscoring the **need** for more specialised **entities to handle poultry feather waste and support a bio-based economy**.

Challenges in the Feather-Based Economy

Key **hurdles** in feather value chains include maintaining feather quality, developing the infrastructure required for the novel value chain, and logistics.

Eliminating moisture content and contamination in the feathers through incentivising processors to invest in additional processes will be key to **advancing the novel value chains**.

Keratin-based bioplastics will face competition in the market, and developing product differentiation and consumer acceptance will be critical.

Solutions for Supply Chain Challenges

UNLOCK proposes **innovative solutions**, including additional feather management processes and developing focussed business strategies to address the various potential hurdles.

Find out more:

Analysis of Feather Waste Sources and Management in the EU

EUs Feather-based Economy: The Challenges Ahead

Supply chain solutions for the main scenarios detected in the target countries

Feather treatment technologies

Mechanical grinding

What is it?

The physical process to mechanically reduce feather size.

Purpose

It is used to produce feather fibers for UNLOCK geotextiles and to feed other technologies such as **Steam Explosion processes** to homogenise the size of the material.

A demo-scale mechanical grinding plant with a capacity of 200 kg/h is under construction in Kutno (Poland).

Sanitised feathers

Ground feathers

Steam explosion

What is it?

A physical process that uses temperature and pressure to treat feathers.

Purpose

To break down feather structure. It is used to produce **biodegradable plastics** for agriculture (mulch films, seed trays and hydroponic foams).

In the continuous reactor at the Biorefinery Demo Plant in Sweden, it was possible to produce 20 kg/h of treated feathers.

Steam explosion continuous reactor

Steam explosion treated feathers

Microbial fermentation

What is it?

A bioprocess whereby some bacteria are able to produce feather-digesting enzymes that will fractionate keratin.

Purpose

To obtain keratin fibers for the production of **hydroponic foams**.

Demo plant is also located in Sweden with a reached capacity of 600L of batch production.

Reactor for microbial fermentation

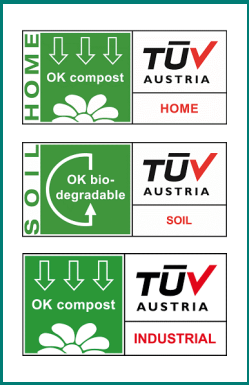
Feathers treated by microbial fermentation

Products based on treated feathers for agricultural applications

Plastics used in agriculture are not sufficiently recycled due to contamination at use phase, and so far biodegradable alternatives are not widely used.

To replace conventional non-biodegradable agricultural plastics, UNLOCK will demonstrate the production of sustainable keratin-based end-products with tailored biodegradability properties at the end-of-life.

All project end-products biodegradability under different conditions is being tested by NORMEC OWS.



Maximising the impact of UNLOCK's results

Seed trays

Composition

Blend of biodegradable plastics with steam explosion treated feathers.

Application

Containers for greenhouse growth of plant materials.

Advantages

Compostable in industrial conditions and input of Nitrogen to soil. Under development biodegradable in soil materials.

Production process

CEDROB

Feather collection and sanitation

RISE PROCESSUM

Treated feathers: Steam explosion

CIDETEC/BIOMI

Compounding

BIOMI

Extruded sheets

ACUDAM

Thermoforming

Mulch films

Composition

Blend of biodegradable plastics with steam explosion treated feathers.

Application

Soil protection in different crops (prevents the growth of weeds, loss of moisture, etc.). Replaces polyethylene (PE) film.

Advantages

Biodegradable in soil, input of Nitrogen to soil.

Production process

CEDROB

Feather collection and sanitation

RISE PROCESSUM

Treated feathers: Steam explosion

CIDETEC/BIOMI

Compounding

TECNOPACKAGING

Blow extrusion

Non-woven geotextiles

Composition

Biodegradable fibers (synthetic and natural) combined with mechanically ground feathers.

Application

Crop protection, avoiding soil erosion, weed growth prevention. It replaces polypropylene geotextiles.

Advantages

Compostable in industrial conditions and input of Nitrogen to soil.

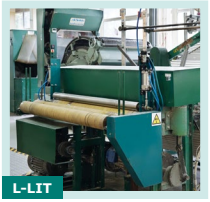
Production process

CEDROB

Feather collection and sanitation

CEDROB/L-LIT

Treated feathers: mechanical griding

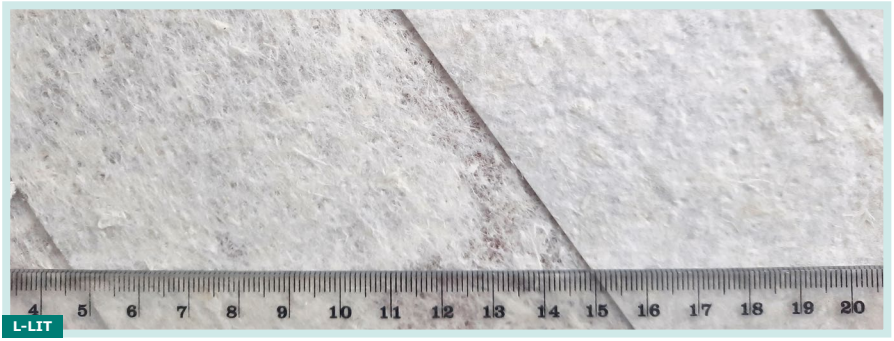


L-LIT

Nonwoven needling

L-LIT

Calender



L-LIT

Biodegradable Foams for Hydroponic Crops – Keratin pebbles

Composition

Foamed biodegradable plastic with treated feathers (microbial fermentation and/or steam explosion treated feathers).

Application

Substrate for hydroponic crops. It replaces clay pebbles current substrates.

Advantages

Depending on the formulation, foams with different types of end-of-life are obtained: compostable in industrial conditions or biodegradable in soil.

Production process


CEDROB

Feather collection and sanitation


RISE PROCESSUM


BIOEXTRAX

Treated feathers: Steam explosion/ microbial fermentation


BIOMI/AIMPLAS

Compounding


AIMPLAS

Foaming by extrusion


TERRA AQUATICA


AIMPLAS

Partners

cidetec surface engineering

CEDROB

T.A. Terra Aquatica

Bioextrax

Tecn packaging

FARRELLY MITCHELL Food & agribusiness specialists

Normec OWS

Łukasiewicz Institute of Biopolymers and Chemical Fibres

processum PART OF RISE

UNIMOS alliance

Greenovate! EUROPE

ATLANTiS ENVIRONMENT & INNOVATION

ACUDAM ACOMPANYEM PROJECTES DE VIDA

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Products based on treated feathers for agricultural applications

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Composition

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Application

Containers for greenhouse growth of plant materials.

Advantages

Compostable in industrial conditions and input of Nitrogen to soil. Under development biodegradable in soil materials.

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ACUDAM

Thermoforming

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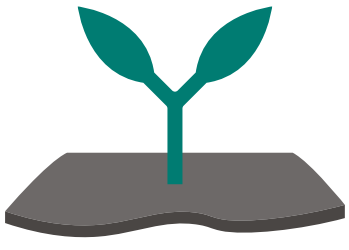
Products based on treated feathers for agricultural applications



Mulch films

Composition

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Application

Soil protection in different crops (prevents the growth of weeds, loss of moisture, etc.). Replaces polyethylene (PE) film.

Advantages

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Compostable in industrial conditions and input of Nitrogen to soil.

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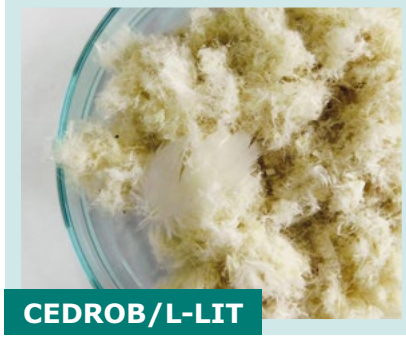
CEDROB

Feather collection and sanitation


CEDROB/L-LIT

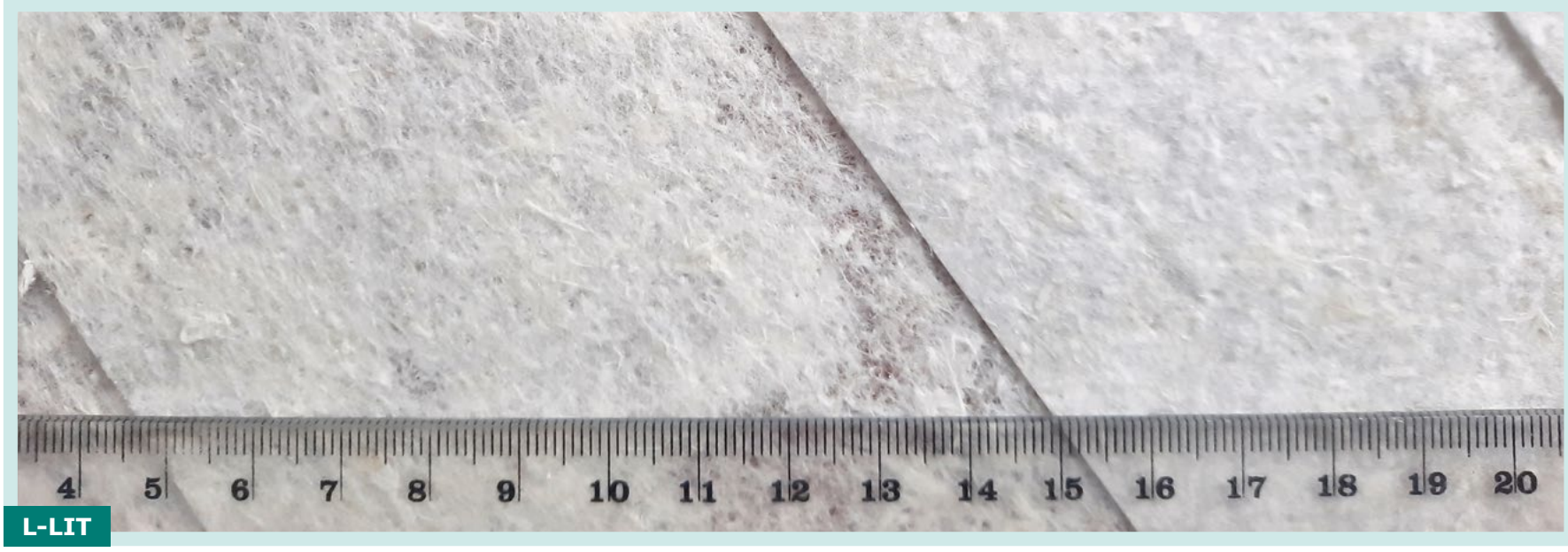
Treated feathers: mechanical griding


L-LIT

Nonwoven needling


L-LIT

Calender



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Products based on treated feathers for agricultural applications

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Advantages

Depending on the formulation, foams with different types of end-of-life are obtained: compostable in industrial conditions or biodegradable in soil.

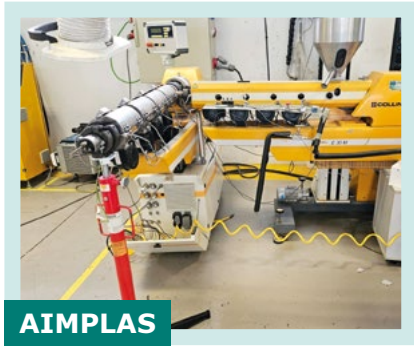
Production process


CEDROB


RISE PROCESSUM


BIOEXTRAX


BIOMI/AIMPLAS


AIMPLAS

Feather collection and sanitation

Treated feathers: Steam explosion/ microbial fermentation

Compounding

Foaming by extrusion


TERRA AQUATICA


AIMPLAS

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