

# Industrial innovation in the bio-based textile field

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Project Officer

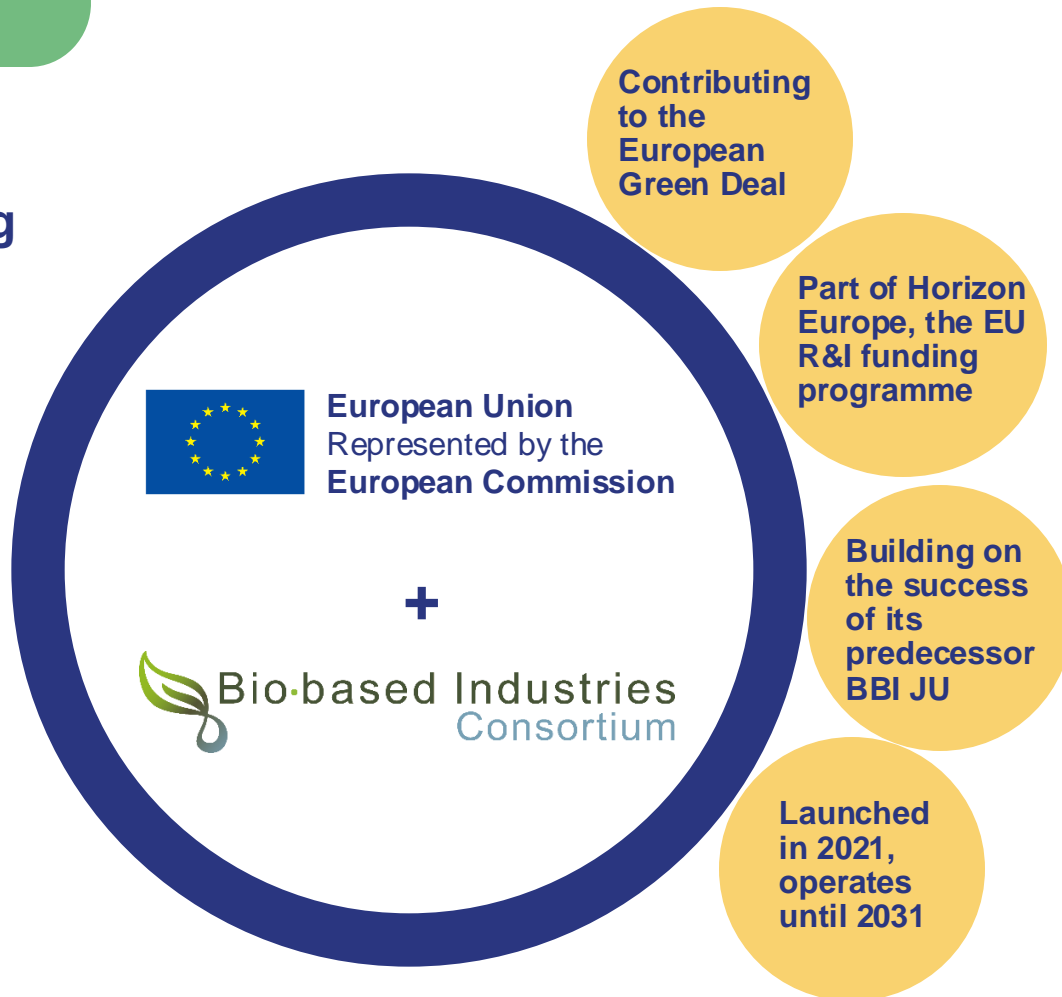
Brussels, 26 June 2024



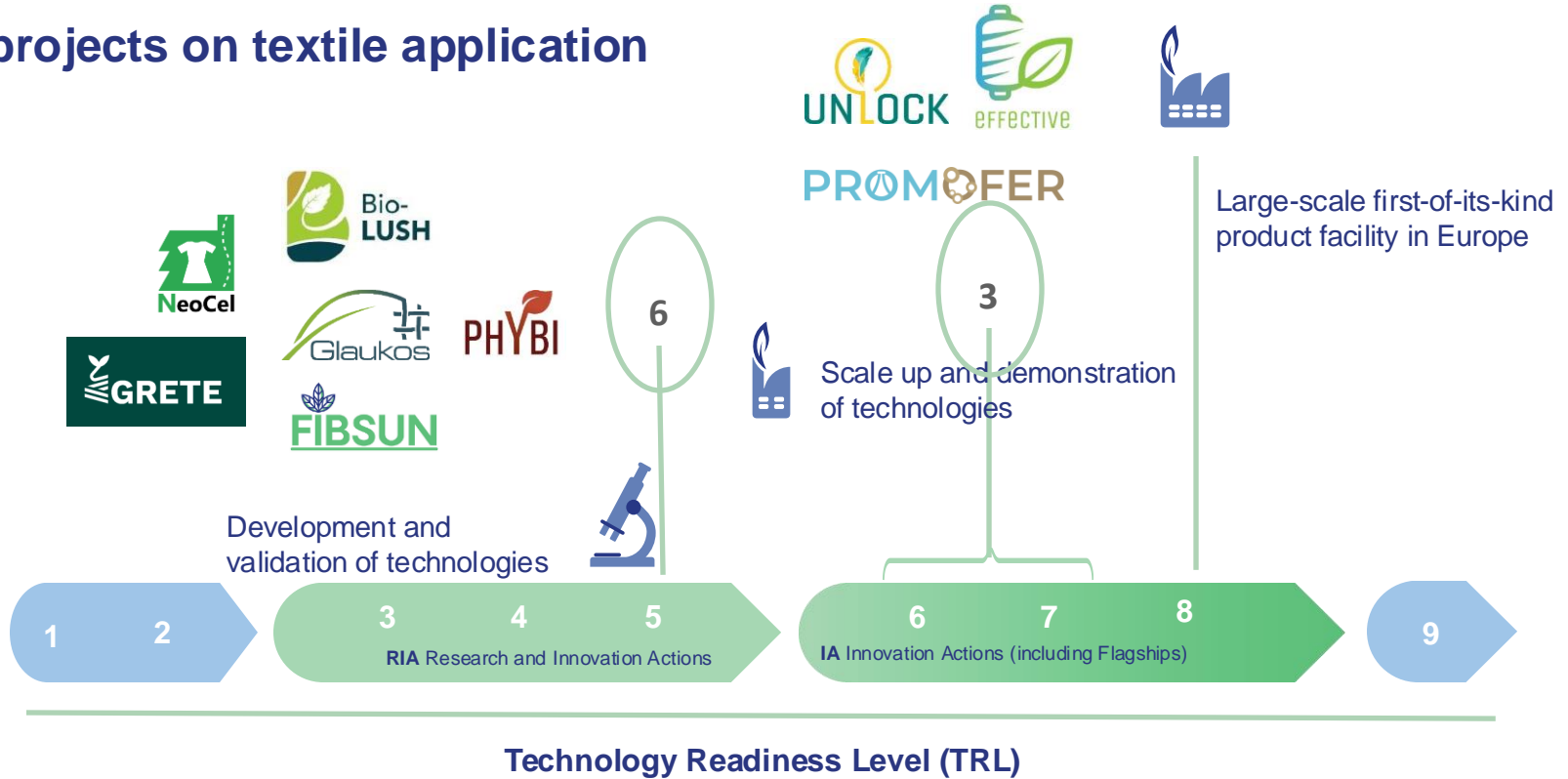
# Circular Bio-based Europe Joint Undertaking

€2 billion public-private initiative

CBE JU is funding projects that deliver bio-based solutions – materials and products made from waste and biomass – in an innovative, sustainable and circular way



## CBE projects on textile application



# What is CBE JU textile portfolio about?

1. **Alternative fibres source and feedstock suitability, availability and sustainability**
2. **Biorefinery innovation** (i.e., exploitation of side streams, processing of post-consumer biowaste, cellulose extraction, etc.)
3. **Additives, finishings & coatings**
4. **End-of-life (EoL) management of bio-based textile**



# Some examples of CBE JU projects

1. **EFFECTIVE**
2. Glaukos
3. Bio-LUSH
4. FIBSUN
5. UNLOCK



## EFFECTIVE - Advanced Eco-designed Fibres and Films for large consumer products from biobased polyamides and polyesters in a circular EConomy perspective (IA)

**Project lead:** AquafilSLO  
(Slovenia)

<https://effective-project.eu>

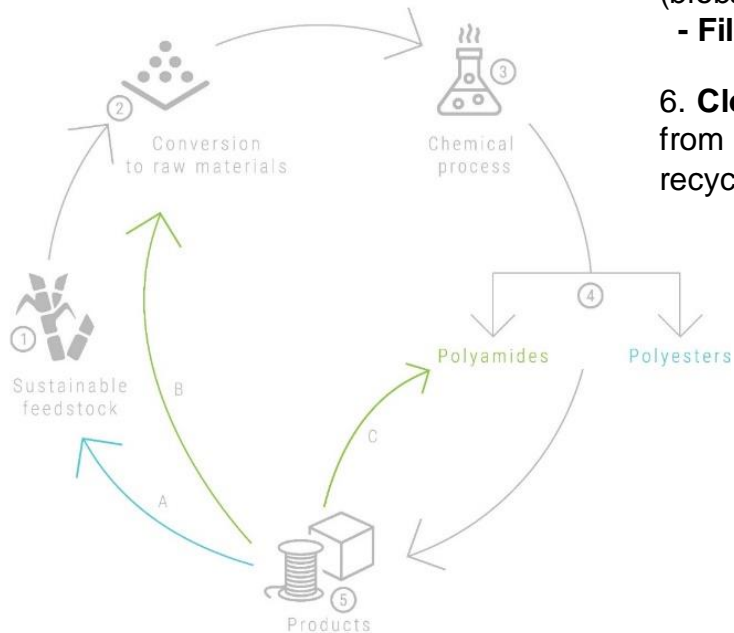
**CBE JU contribution:** € 7,2 M

**Duration:** 01/06/2018 – 30/11/2022

### Main challenge:

Demonstrating the production of innovative bio-based polyamides and polyesters from sustainable feedstock and their validation into large consumers products (i.e. garments, carpets, films for food and non-food packaging applications).





1. Production of **sustainable sugar** and sourcing of **sustainable vegetable oils**.

2-3-4. **Biorefineries: conversion of sustainable feedstock into biobased polymers** (biobased polyamides and biobased & biodegradable polyesters) at pilot and demo/pre-industrial scale.

5. Transformation of biobased polymers into:

- **Textile yarns, fabrics, and garments and textile flooring prototypes** (biobased polyamide);
- **Films for packaging applications** (biobased polyamide and bio-polyesters).

6. **Closing the loop** in the material cycle through composting (compostable films from bio-materials), chemical recycling (bio-based Polyamide 6) and mechanical recycling (bio-based specialty Polyamide).





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# Circular solution for the textile industry (RIA)



**Project lead:** Bio Base Europe Pilot Plant,  
Belgium

<http://www.glaukos-project.eu/>

**BBI JU contribution:** € 4,1 M

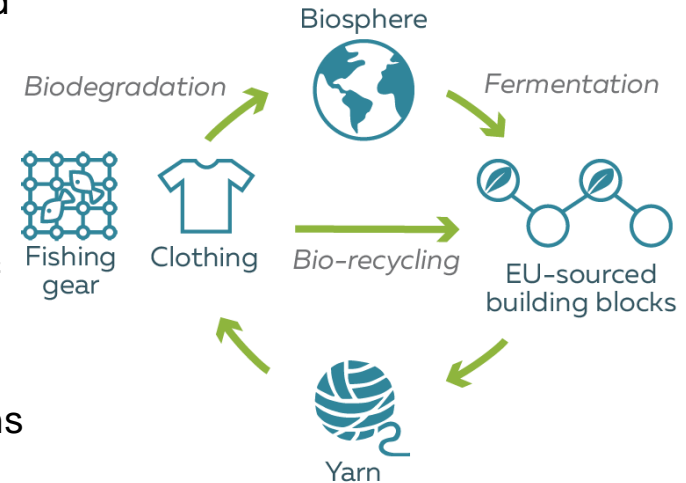
**Duration:** 01/06/2020 – 31/05/2024

## Main challenge:

Develop innovative **textile fibres and textile coatings** with increased biobased content of textile products that reconcile an excellent environmental performance with adequate technical characteristics focusing on microplastic pollution prevention.

## Objectives:

- i) To produce *itaconic acid* as building block through fermentation of industrial side-streams
- ii) To design and produce new polymers by finding the right balance between strength and biodegradability for the targeted applications
- iii) To create bio-based yarns with balanced spinnability, durability, biodegradability



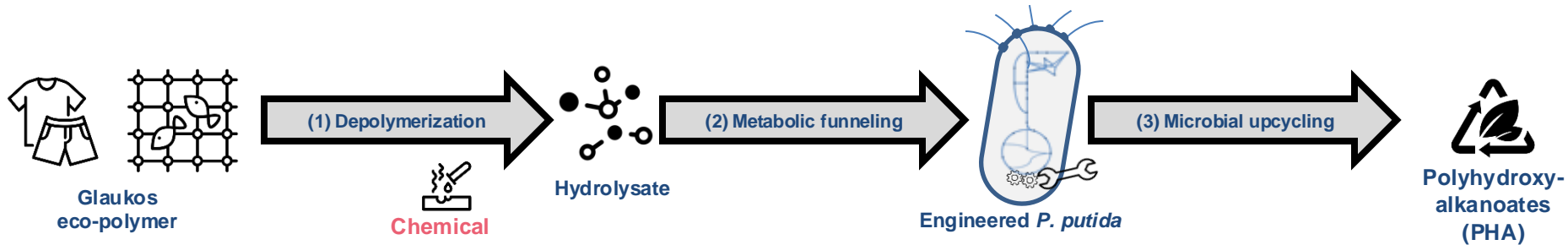
# End-of-Life option: Bio-recycling

## Challenge:

- Environmental degradation is a “last resort” option, ideally, materials are kept in the circular economy

## Glaukos solution and outcomes:

- New plastic-degrading “nylonase” enzymes
- Engineered microbes that can use plastic as feedstock
- Demonstrated degradation of polymers back to monomers, and microbial upcycling of nylon



# Glaukos clothing and gear prototype



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# Biomass valorization for sustainable and high-quality fiber materials (RIA)



**Project lead:** University of Stockholm,  
Sweden

<https://biolush.eu/>

**CBE JU contribution:** € 4,5 M

**Duration:** 01/05/2023 – 30/04/2027

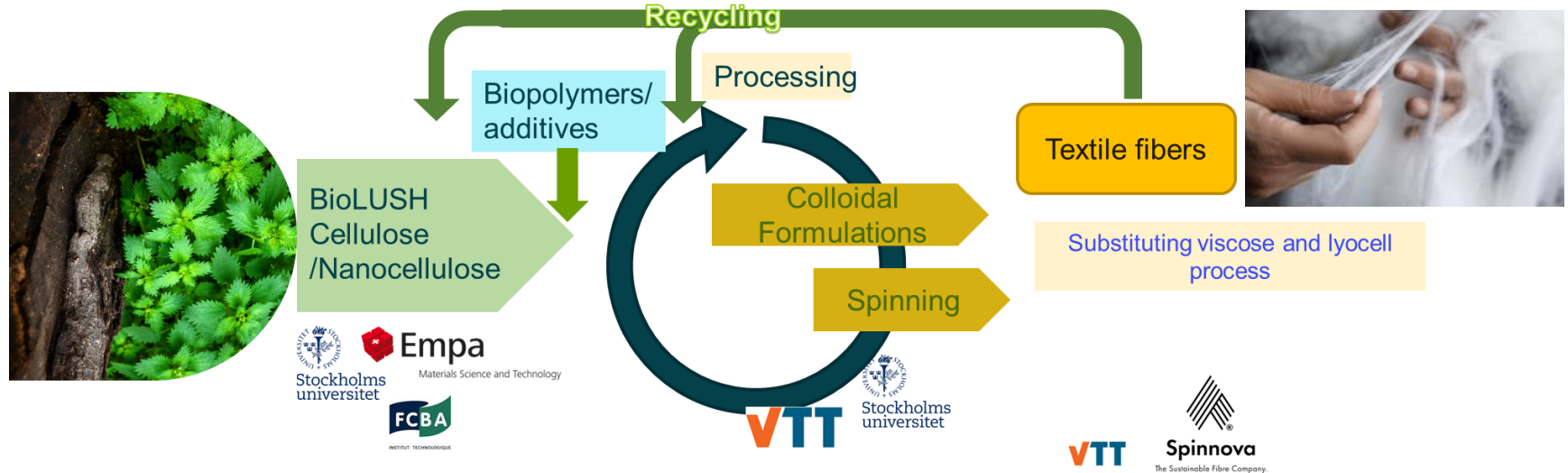
## Main challenge:

By revitalizing marginalized areas and promoting circular biomass valorisation, Bio-LUSH unlocks the **hidden potential of European plant resources**, such as forest residues, marine plants, and weeds, extracting high-quality fibers from them.

## Objectives:

- i) Develop a **flexible, "green/clean" process for converting high-value biomass** from secondary sources and underexplored plant resources, reducing environmental impact.
- ii) Demonstrate market entry potential for high-quality fibers in **textile, food packaging and composites**, promoting sustainable bio-based products.
- iii) Measure the impact of biobased fibers on reducing reliance on fossil resources in European manufacturing,

# BioLUSH Textile Fiber Road Map



- Poplar and nettle as feedstock
- Antimicrobial fibers with dry and wet strength
- Recyclable textile fibers

- Strategies to introduce antimicrobial property into fibers
1. Utilizing lignin nanocellulose
  2. Using antimicrobial agents from eg. nettle to the spinning dope
  3. Post surface treatment of fibers after spinning

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# Novel fibre value chains and ecosystem services from sustainable feedstocks (RIA)



**Project lead:** LUKE, Finland

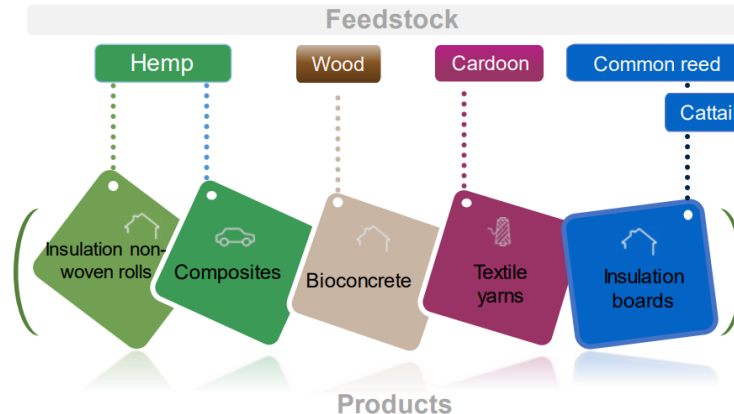
<https://www.fibsun.eu>

**CBE JU contribution:** € 4,5 M

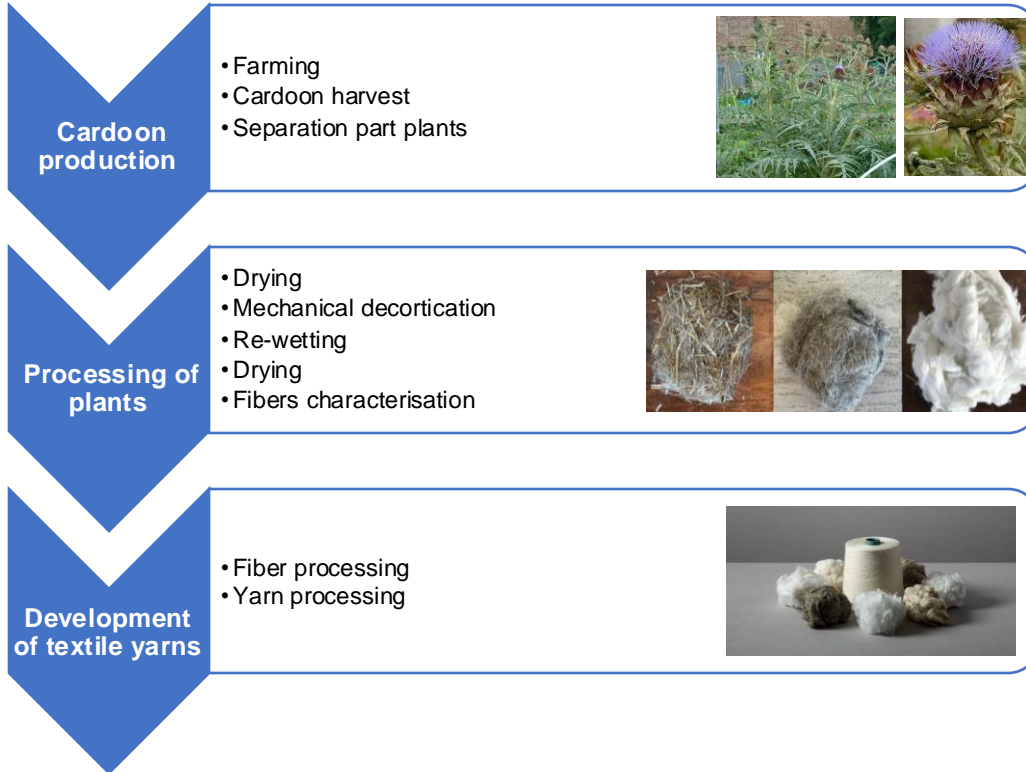
**Duration:** 01/06/2023 – 31/05/2027

## Main challenge:

FIBSUN aims to support the development of resilient and competitive production systems and enhanced provision of **ecosystem services from degraded soils** through five sustainable fibre value chains for construction, automotive and textile sectors.



## Value chain for cardoon/processing of cardoon



FIBSUN aims to **promote soil improvement** by using novel crop plants.

**Cardoon** has important characteristics, while providing ecosystem service:

**Strength**  
**Flexibility**  
**Lightweight**  
**Biodegradability**  
**Availability**

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# Unlocking a new feather bioeconomy for keratin-based agricultural products (IA)



**Project lead:** CIDETEC, Spain

**BBI JU contribution:** € 5,1 M

<https://unlock-project.eu/>

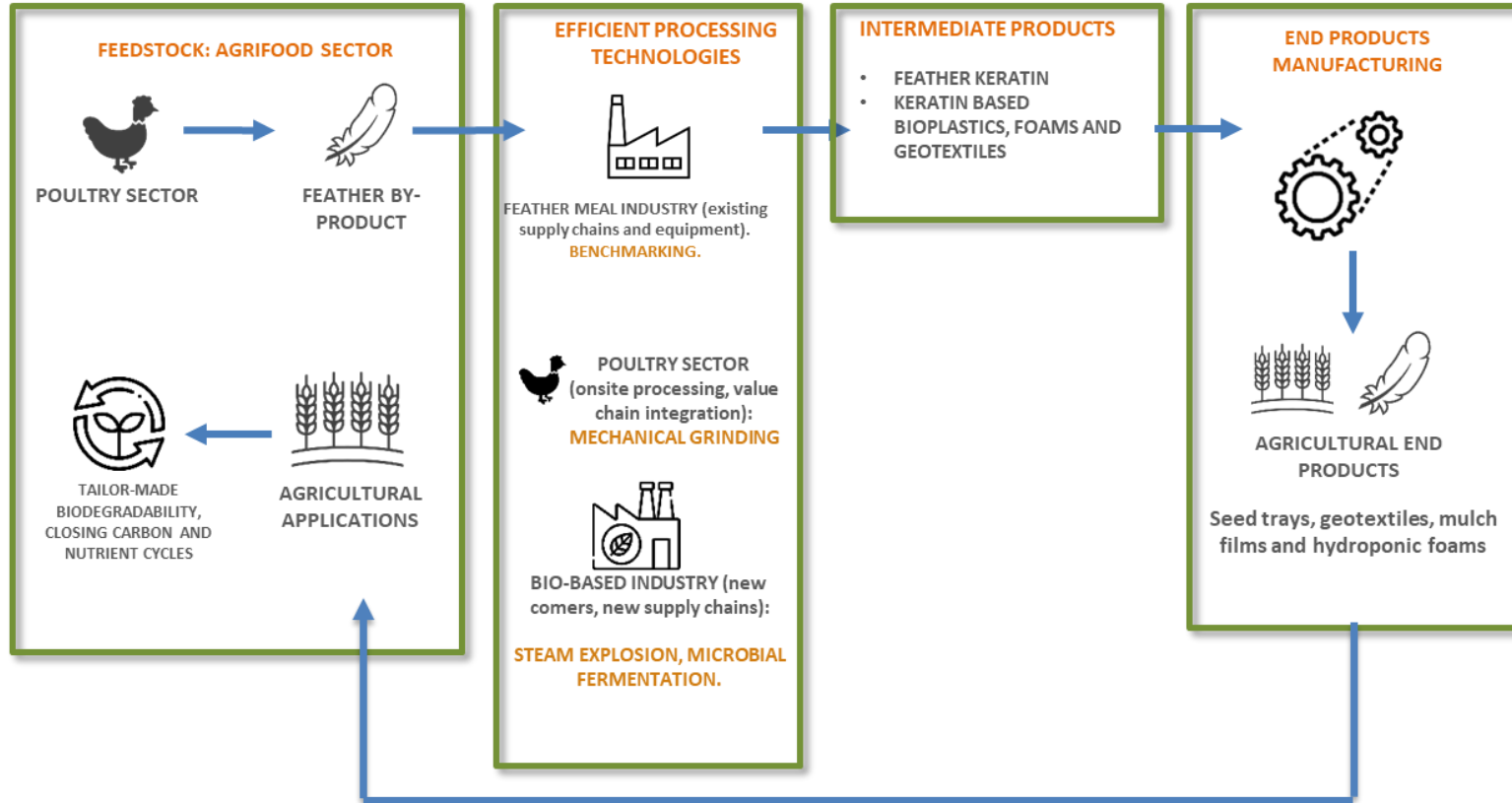
**Duration:** 01/05/2021 – 30/04/2025

## Main challenge:

Design and demonstrate an economically and environmentally sustainable supply-chain for a feather-based bioeconomy which will generate innovative functional materials for agricultural applications

## Objectives:

- i) Optimise **feather conversion technologies**
- ii) **To generate innovative bio-based functional materials** for agricultural applications with significant advantages derived from the use of feather keratin: i) tailor-made biodegradation, ii) input on organic nitrogen to soil, iii) zero waste generation at their end of life and iv) cost competitive materials.
- iii) **To manufacture feather-based end-products for agricultural sector**



Geotextiles



Mulch films



Forest and seed trays



Hydroponic foams

# Future outlooks for the textile portfolio

- 1. Upscaling the TRL of novel fibres biorefineries**
- 2. Enhancing or adapting functionalities, processes, and pilot manufacturing of existing bio-based fibers, including those of synthetic origin**
- 3. Upscaling and broadening the scope of innovative bio-based chemicals and processes to substitute hazardous chemical/coatings/additives**



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Joint Undertaking

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