PROSPER

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Circular Bio-based Europe Joint Undertaking

Bio-based Industries Consortium

Co-funded by the European Union

Bioplastic recycling - Policy context, Economy & Technologies

27/11/2025

Steven De Meester

Introduction to the PROSPER project

Closing the loop to make bio-based plastics circular

CBE JU contribution: € 7.5 million

Duration: June 2024 – May 2028

Feedstock: used biobased plastics

Main products: sorted and recycled bio-based plastics

PROSPER will demonstrate the techno-economic feasibility of the sorting and recycling of bio-based plastics in 4 actual waste sorting plants in Spain, France and Italy to generate new packaging from the recycled bio-based plastics

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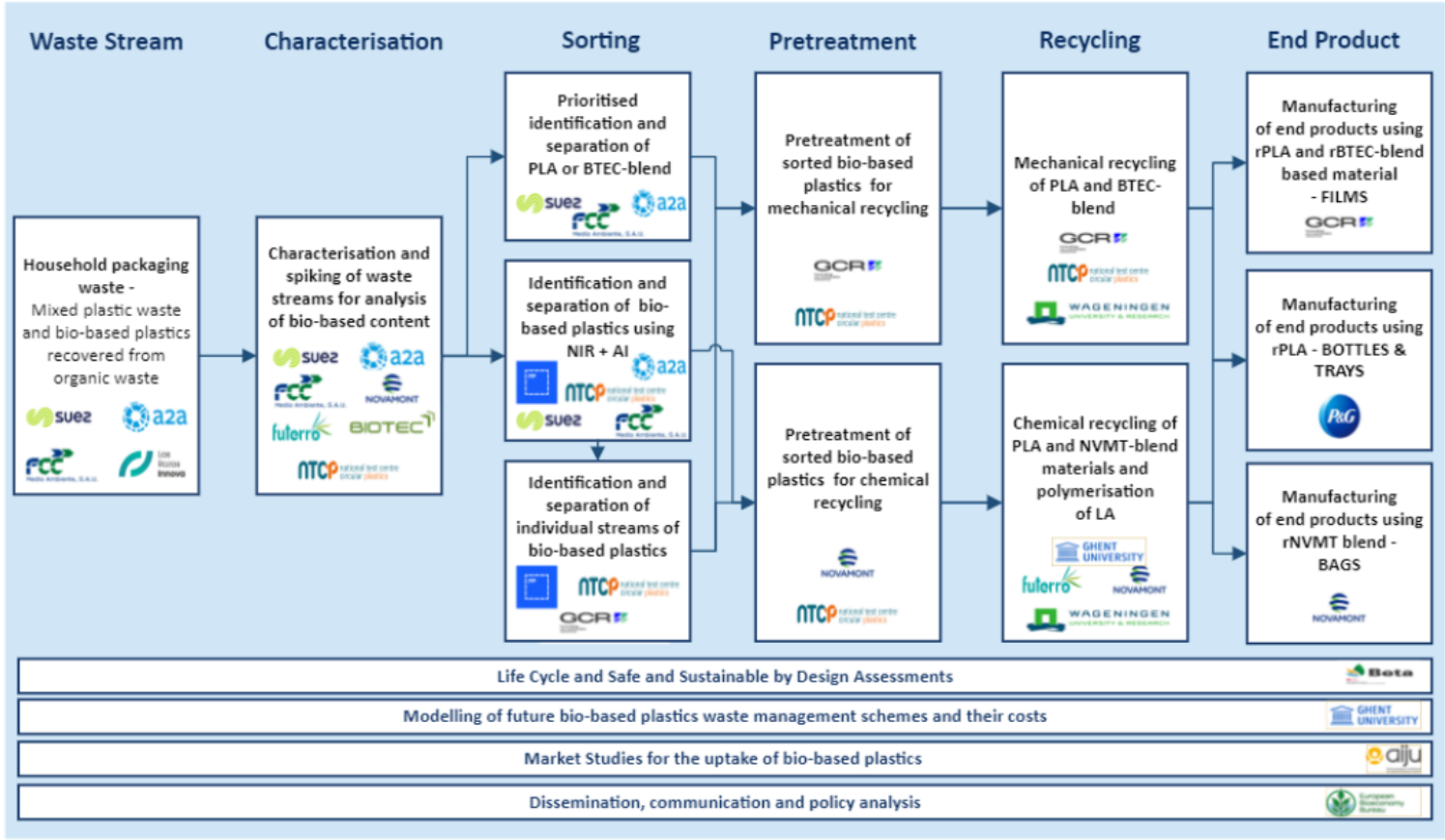
Our partners


Waste Stream
Characterisation
Sorting
Pretreatment
Recycling
End Product
Household packaging waste - Mixed plastic waste and bio-based plastics recovered from organic waste
Characterisation and spiking of waste streams for analysis of bio-based content
Prioritised identification and separation of PLA or BTEC-blend
Identification and separation of bio-based plastics using NIR + AI
Identification and separation of individual streams of bio-based plastics
Pretreatment of sorted bio-based plastics for mechanical recycling
Pretreatment of sorted bio-based plastics for chemical recycling
Mechanical recycling of PLA and BTEC-blend
Chemical recycling of PLA and NVMT-blend materials and polymerisation of LA
Manufacturing of end products using rPLA and rBTEC-blend based material - FILMS
Manufacturing of end products using rPLA - BOTTLES & TRAYS
Manufacturing of end products using rNVMT blend - BAGS
Life Cycle and Safe and Sustainable by Design Assessments
Modelling of future bio-based plastics waste management schemes and their costs
Market Studies for the uptake of bio-based plastics
Dissemination, communication and policy analysis

3 European Recyling Pilots

Italian Pilot

The Italian pilot demonstrating innovative biobased plastics will be managed by A2A and A2A Ambiente, with the cooperation of Novamont SpA.

In Italy, the biobased plastic waste sorted in A2A's waste sorting plant will be tested for large scale pretreatment and chemical recycling (depolymerization) by Novamont SpA.

Spanish Pilot

The Spanish pilot will be managed by FCCMA

In Spain, the biobased plastic waste sorted by FCCMA will be delivered to ENVICO to demonstrate the pretreatment and mechanical recycling through extrusion, handling various plastic grades at scale.

French Pilot

The French counterpart will be managed by SUEZ.

In France, Futerro will demonstrate a depolymerization process of sorted waste PLA.

Further, chemical depolymerization and downstream processing technologies for targeted bio-based plastic waste will be demonstrated.

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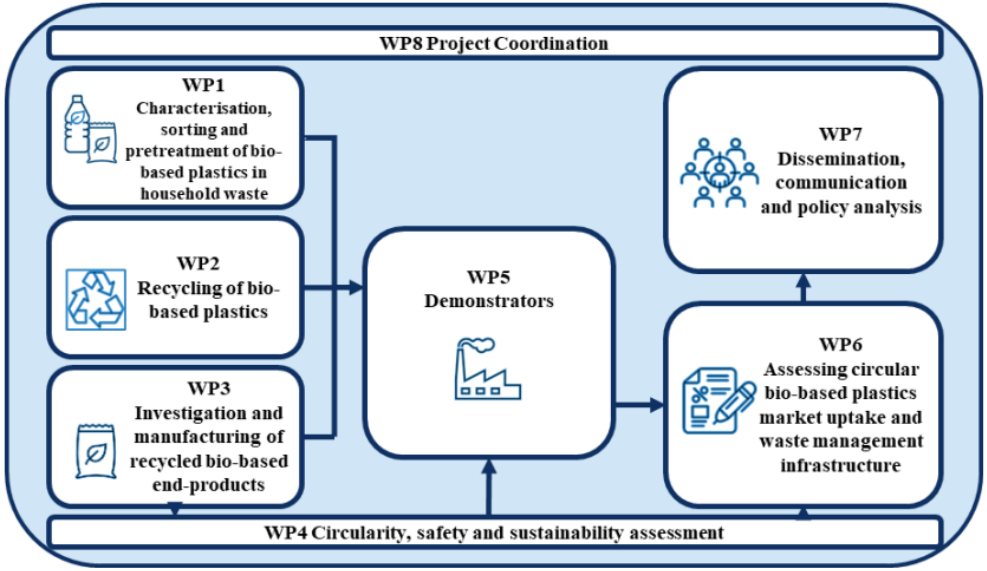


WP/Task	PROSPER	Responsible partner	Year 1 M1-M12	Year 2 M13-24	Year 3 M25-M36	Year 4 M37-48
			Q1 Q2 Q3 Q4	Q1 Q2 Q3 Q4	Q1 Q2 Q3 Q4	Q1 Q2 Q3 Q4
WP1	Characterisation, sorting and pretreatment of bio-based plastics in household waste	NTCP				
1.1	Sourcing, characterisation and preparation of waste inputs	NTCP	M			
1.2	Identification of different biopolymers using conventional NIR	NTCP				
1.3	Identification of different biopolymers with advanced NIR supported by AI and computer vision	NTCP				
1.4	Design and verification of the new sorting and separation systems	NTCP			M	
1.5	Development and verification of the pre-treatment step for bio-based plastics	NTCP				
WP2	Recycling of bio-based plastics	WR				
2.1	Development and verification of chemical recycling by depolymerization and repolumerisation	UGENT				
2.2	Development and verification of mechanical recycling via compounding extrusion	WR		M		
2.3	Characterisation of recycled bio-based polymers	WR				
WP3	Investigation and manufacturing of recycled bio-based plastic end-products	NVMT				
3.1	Manufacturing of bottles using rPLA	PGBS				
3.2	Manufacturing of packaging films using rBTEC-blend	ENVICO				
3.3	Manufacturing of flexible packaging bags (for tissues and towels) using rNVMT-blends	NVMT				
WP4	Circularity, safety and sustainability assessments	UVIC				
4.1	Environmental Impact Assessment	UVIC				
4.2	Techno-economic Assessment	UGENT				M
4.3	Socio-economic impact assessment	UVIC				
4.4	Safe and Sustainable by Design assessment (SSbD)	UVIC				
WP5	Demonstrators	DMTR				
5.1	Spiking waste for sorting demonstrators	SUEZ				
5.2	NIR-AI-based characterization and sorting for isolation of PBTEC-blend, NVMT-blend and PLA-based materials	DMTR				
5.3	Pretreatment steps for recycling	DMTR			M	
5.4	Mechanical recycling	ENVICO				
5.5	Chemical recycling	DMTR				
WP6	Assessing circular bio-based plastics market uptake & waste management infrastructure	AIJU				
6.1	Estimation of the market uptake potential of the project solutions	AIJU				
6.2	Societal/Citizens and industry acceptance and promoting behavioural changes	AIJU				
6.3	Digital twin of the sorting and recycling	UGENT			M	
6.4	EPR fee determination and modelling the effects of policy interventions	UGENT				
6.5	Business plan/model and exploitation strategy	AIJU				
6.6	IPR management	UGENT				
WP7	Dissemination, communication and policy analysis	EBB				
7.1	Communication and dissemination plan	EBB				
7.2	Project website	EBB	M			
7.3	Production of dissemination materials for a general audience	EBB				
7.4	Production of dissemination materials for a technical audience	EBB				M
7.5	Conferences/workshops	EBB				
7.6	Policy analysis and recommendations	EBB				
WP8	Project coordination	UGENT				
8.1	Coordination	UGENT				
8.2	Day-to-day management	UGENT				
8.3	Data management	UGENT				
8.4	Risk management	UGENT				

Task activity: Milestone: M
Demonstration activity:

Waste characterisation (WP1)

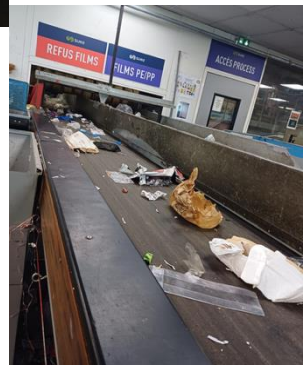
Characterization Campaigns

France

- SUEZ – Sorting centre - Characterization:
  - Context: characterization campaign of waste streams from SUEZ sorting centre in Poitiers (capacity: 30,000 tones of treated waste per year)

Reference	Mass (kg)	Sample Mass (kg)	Bioplastics mass (kg)	% bioplastics
Films bale	169	104	0.27	**0.26**
Mixed plastics bale	190	129.5	0.07	**0.06**
Bale of residues (films + rigids)	508	137	0	**0**
Film refusal sampled on conveyor	94.5	54.6	1.1	**2.0**
Rigid refusal sampled on conveyor	49.5	49.5	0	**0**

Bioplastic bags



Films refusal
SUEZ sorting centre

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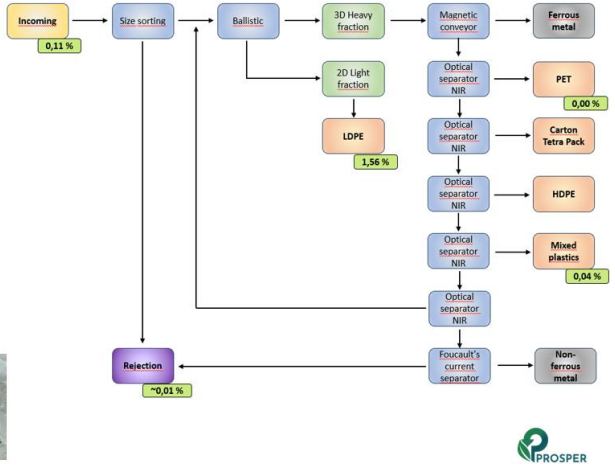
Characterization Campaigns

Italy

- Sampling period: April 11, 2025 – May 22, 2025
- Around 4400 kg of household plastic packaging waste analyzed
- Among 33 different samples, bioplastic content ranged between 0.21% to 1.80%
- The month of May considered to be similar to the yearly average with a bioplastic content of 0.95%

Spain

- In total 5 different streams are characterized
- 10 samples collected over April-May 2025
- Bioplastic in the input is around 0.11%
- All bioplastics found in the streams were bags

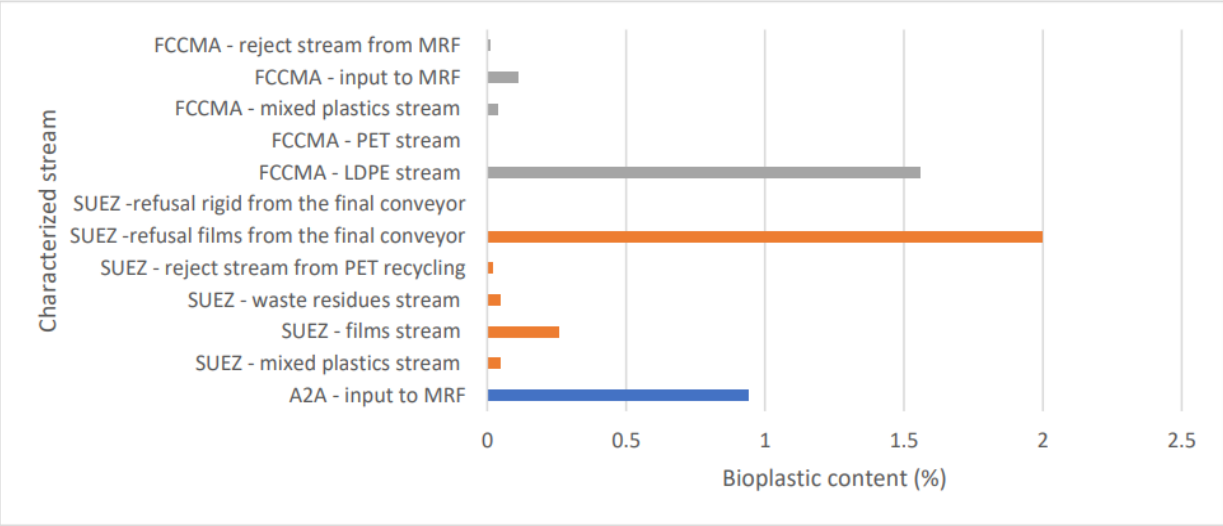


Characterization Campaigns

Summary of characterisation

- Let's face it; Bioplastics in packaging are marginal, typically below 1%
- More details can be found in D1.1

➔ Let's demonstrate their circularity to allow more market penetration



Characterization Campaigns

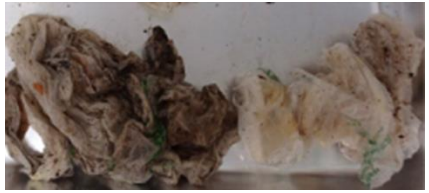
- **France**
- SUEZ – Composting plant – Characterization results

PE films

Characterization of plastic waste collected through visits

- Mainly detected in the feedstock reception area
- Main bioplastic found => PBAT shaped as bags
- Detection of coffee caps made with bioplastic => PHB

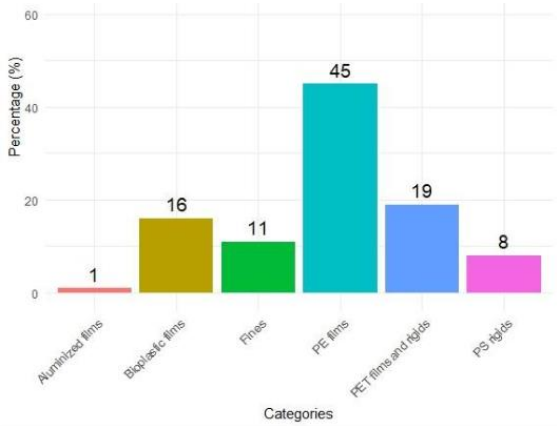
Coffee cap



Bags

Characterization of plastic fractions collected from monthly characterization of organic waste

- Presence of bioplastics shaped as bags
- Warning: detection of non-bioplastic items and sorting errors



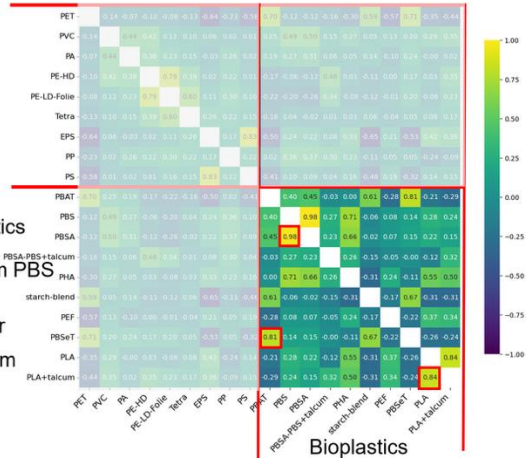
Composition of plastic fraction collected during monthly characterization managed by Vallet site

Bioplastic films (PBAT)

Waste sorting and recycling work (WP1-2)

Waste sorting

- Bioplastics are well distinguishable from bioplastics
- PBSA undistinguishable from PBS Using NIR
- PBAT and PBSeT are similar
- PLA is similar to PLA + talcum



Scanning trial with Dutch waste

- The objective of the trial was to have an understanding of share of bioplastics in Dutch waste stream
- Trial completed in June 2025
- Around 600 kg of mixed film and 800 kg of sorting residue stream processed
- Around **0.44%** area bioplastics in sorting residue

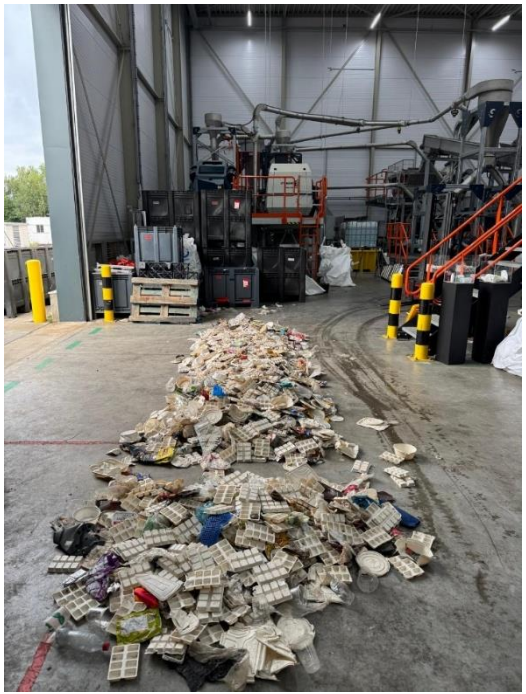
  0.12% area bioplastics in mixed film

3. Biopolyester film: bi

Sorting trial with bioplastic spiked streams

Output

PLA rigid
Purity: 95%



Biopolyester rigid
Purity: 83%

Biopolyester film
Purity: 70%

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Waste sorting

PROSPERBIOPLASTICS.EU

The PROSPER project has at its principle aim the sorting and recycling of bioplastics found in municipal waste streams. The failure of current recycling systems to recognise bioplastics is a major barrier to the growth of the use of bioplastics as they are rarely recycled unless through organic waste systems, which few countries have. When mixed with other plastics, they are very difficult to separate and this causes contamination of both streams. Hence they are considered less "circular", a negative perception as the EU advances circular economy policies.

In this article, the PROSPER consortium is proud to announce its first test results undertaken by NTCP of the Netherlands of sorting bioplastics from a plastic waste mix.

The conclusions are that the trial proved that bio-based plastics – in both film and rigid forms – can be successfully detected and separated from conventional plastics like PET and PE. The separated bioplastics included PLA from Futerro and starch blends and a range of biopolyesters from Biotec. The materials were sorted in such a way that they can be used in downstream mechanical and chemical recycling.

"This is an important milestone," says the PROSPER team. "Creating a dedicated stream of bio-based plastics is the first step towards building a large-scale recycling system tailored to these materials."

For photos please see the website link.

This project is co-funded by the Circular Bio-based Europe Joint Undertaking (CBE JU) under the Horizon Europe program and the Bio-based Industries Consortium (BIC), Grant Agreement 101157907.

For more information please contact newman@bioeconomybureau.eu or Marcel van Eijk, R&D Manager at NTCP, mvaneijk@ntcp.nl.

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First recycling trials

- Initial focus on recycling of PLA recyclate
- Extrusion following developed protocol (200-210 degrees and 3.5 kg/h throughput)
- Frequent changing of melt filters required due to contaminations
- White granulate produced
- Sheet extrusion and thermoforming to produced first recycled products

Outlook

Outlook

- WP1 will continue the good work on sorting and add AI work. Also heavy focus on washing
- WP2 in full speed now!
- WP3 mainly as feedback WP
- WP4 first screening results attempted and first methodological feedback/planning (e.g. on SSbD)
- WP 5 start-up preparation

  ➔ Crucial discussions on planning now starting up to prepare the start of WP 5
- WP 6 Market uptake and consumer acceptance work starting up. Digital twin first results available, but now being expanded (both methodological as well as in terms of scenarios)
- WP 7 Further dissemination. Physical meeting with advisory board and more and more policy interaction planned
- WP 8 Continue the management practices from first year

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Thank you.

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