Market potential of NoAW waste-based and biodegradable mulch film and further activities for its actual market launch

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In the course of European H2020 project NoAW (No Agricultural Waste), **a waste-based and biodegradable polymer has been developed** from various agricultural residues**:** a Poly (3- hydroxybutyrate-co-3-hydroxyvalerate) (PHBV). **Agricultural applications have been identified as interesting application and** Ecozept has conducted a **2-stage expert survey to assess in-depth the market acceptance** of the PHBV in three agricultural applications **(coated fertilizer, mulch film and horticultural pot)** and thus verify **the value of directing strategic efforts towards this sector**. The present presents the **synthesis of the core results and conclusions based on the assessment of the experts** on mulch film application.

Current market of biodegradable and bio-based mulch film

Market of biodegradable mulch film is expected to increase in the years to come, especially in Central Europe, Spain and France and the difference of price between biodegradable and PE mulch film should reduce as the fin set up in different countries for the PE treatment and recycling is increasing. The experts consented that it took a long time to stabilize the process of these materials into mulch film and to have reliable film. Large mulch film companies are currently developing bio-based and biodegradable products, notably in Germany, Italy and Spain.

Obstacle to biodegradable or/and bio-based material use in mulch film sector

- Price
- Confusion between degradation and biodegradation
- Biodegradability term is not necessary clear, e.g. conditions of biodegradation and effect on soil
- Previous misleading communication on biodegradable film benefit
- European regulation: no regulatory incentive to use biodegradable or bio bio-based mulch films
- Processability and mechanized placement in field
- Supply of material in constant quality and sufficient quantity
- Adaption of the sector to these limitations and changes

Strengths and weaknesses of PHBV for mulch film from experts' point of view

Market actors were interested by NoAW PHBV, they explained there are more and more issues with PE, e.g. regarding its recyclability, and development of new biodegradable material is required by the market ("it is the future to invest in this type of material").

Strengths and weaknesses of PHBV for mulch film application

	Compared to fossil based material	Compared to other bio-based and biodegradable material
Strengths	Biodegradable in soil and water in natural condition Bio-based and waste-based raw material Evolution of the legislation on biodegradable films and fear about coming restriction of PE legislation	Waste-based raw material Better biodegradation (in natural condition, faster and in different environment) Interesting properties of PHBV : better permeability and flexibility than other PHAs, cheaper than PCL and more stable than PLA High valerate content make material more flexible and should decrease the need of formulation work
Weaknesses	Higher costs Limited technical properties: flexibility, resistance to storage and transport, processability, need for adaption of the producers	Consistent quality of the polymer Higher costs Limited properties of PHBV in general: flexibility (contradiction with high valerate content) and processability

Success factors and obstacles for market acceptance

Key success factors for market acceptance	Obstacles
• Competitive price • Technical properties • Final material compositions and certification • Possibility to colour the material • Adaption to mulch film production and machines • Having a reliable partner in the mulch film sector	• Similar resistance of the film above and in the soil when used and quick biodegradation after use • Not adapted to every crops • Processability of the material into mulch film • Regular quality of the PHBV • Higher costs • Competitive market with established products • Current legislation not restrictive • Doubt on biodegradable product, linked to previous use of oxodegradable materials

Points of clarification

Given the limited information available on NoAW PHBV, it is necessary to refine several elements to assess more precisely its market potential:

- A better picture of its characteristics and price
- Its processability into film and the ability of this film to fulfil its role
- Biodegradation properties of the film, potentially composed of a mixture of materials
- Final composition of the film
- Possibility to certify the material and the final film
- Capacity to supply material in sufficient quantity and quality

This characterization will enable to:
- better segment and confirm/refine the potential markets identified (crops with rather short cycle times, Mediterranean countries and USA, organic farmers);
- to differentiate the interest between PHBV and PHBV composite;
- precise the need of mixtures with other materials.

As several biodegradable and bio-based products are well installed on the market, better technical characteristics or/and a lower price remains fundamental. Several film producers have shown interest in working with NoAW material. The formation of this partnership appears to be the entry point into the sector.

Activities to enter on the market

Characterize material
- ➢Provide reliable data on characteristics to mulch film producers
- ➢Provide samples for testing
- ➢Implementation phase: 3 - 4 months

Assess processability of the material
- ➢Mulch film producers conduct process trials at small scale and then in industrial production conditions
- ➢Trials on potential stabilizers and fillers
- ➢Implementation phase: few weeks step

Field trials
- ➢Conduct trials in various conditions and throughout various production cycles
- ➢Begin on farm scale and then enlarge it to few hundreds hectares
- ➢Implementation phase: next 2-3 years

Marketing and communication
- ➢Build evidence on technical suitability of NoAW material
- ➢Get certification on composition and biodegradability
- ➢Prove there is no negative effect with biodegradation and potentially conduct LCA
- ➢Build sales pitch on proper technicity and ethical difference with other material
- ➢Target distributers of agro-equipment or big growers companies
- ➢Need for legislation adaption, especially regarding non biodegradable material

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Further interesting results from NoAW and other projects can be found at https://noaw2020.eu/ and https://www.ecozept.fr/

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