



**Integrated solution for innovative biodegradation
control of agricultural plastic mulches**

Green solutions with black plastic.



**Newsletter
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Dr. Alejandro Arribas Agüero

Project coordinator
CETEC

Since many years, a common image of the landscapes of our region, as well as of many others in which the agriculture is its natural means of life, has been the constant presence of remains of black plastic dragged by the wind along the roads, the fields or the limits of the small towns in the rural surroundings.

These remains are the witness of an agricultural practice spread throughout the environment of the countries of the Mediterranean coast, required by the farmers to maintain the adequate productivity rate of their lands, but with the terrible counterpart of unstoppable contamination and degradation of agricultural land.

The constant presence of mulch cover remains one of the main culprits in the loss of agricultural land yield. Its elimination is practically impossible and its presence in the soil prevents the correct penetration of the water in the substrates, as well as constitutes a serious problem for the proper rooting of the crop.

In this environment, the possibility of developing a project like BIOMULCH allows all participating agents to open a door of hope to the disappearance of this worrying and problematic environmental pollution. The benefit to be gained from the success of this project will not only impact on the partners of the project, but also on the whole of our society and our future generations, which we hope to open the door to a better future, free from constant and growing environment degradation.

It is my greatest wish, as Coordinator of BIOMULCH that, at the end of this project, Europe can collect some valuable fruits of it, that fully compensate the support and confidence shown with our bet for the future.



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About the BIOMULCH project



The BIOMULCH team

Nowadays, mulching is an essential technique used in agriculture to satisfy the worldwide growing demand for agricultural products. It consists of covering the soil surface in order to modify climate conditions and favouring the crops. Conventional mulch is made of polyethylene plastic with important limitations: the plastic has to be removed after the harvest (time consuming, expensive & 10-20% remaining at soil) and it is difficult to be recycled due to its high contamination by ground, stones or waste, being the most part (45.2%) placed in landfills. Therefore, plastic mulches cause serious problems of environmental and economic concerns. Other developed mulch alternatives are not sufficient: oxodegradable (based on polyethylene, are a risk of accumulation in environment) and biodegradable (do not guarantee total degradation under uncontrolled conditions and they are three times more expensive).

There is a market demand to find alternatives. Our innovative product, BIOMULCH, will be a

biobased mulch with controlled biodegradation (independent from temperature, humidity and soil conditions) and being cost competitive overing the current agriculture market needs. BIOMULCH will be commercialised as a kit and will guarantee the farmers the complete mulch film biodegradation when is exactly required by them. The mulch film will be fully degraded in a 30-40 days period with our innovative mulching technique.

As a result, it is expected an important growth for consortium companies, obtaining a total turnover above €354M in 2018-2022. Also it is expected an important benefit for UE, above 759M euros by 2022, derived from savings for farmers and waste savings. BIOMULCH counts already with letters of support of prestigious companies which are very interested in its business model.



Mulching is an essential technique used in agriculture to satisfy the worldwide growing demand for agricultural products.

Partners

TECHNICAL SUPPORT AND PLASTIC VALIDATION. Project Coordinator.

CETEC – PLASTICS & FOOTWEAR TECHNOLOGY CENTRE OF MURCIA

COMPOUND FILM MANUFACTURER
FKUR KUNSTSTOFF GMBH

MICROORGANISMS SOLUTION MANUFACTURER
THATCHTEC

MULCH FILM MANUFACTURER. Technical Manager. Commercialisation & Exploitation Manager
MORERA & VALLEJO INDUSTRIAL, S.L.

VALIDATION OF BIOMULCH AT REAL FIELD. Dissemination and Communication Manager.
ADESVA – TECHNOLOGICAL CENTRE FOR AGRO-INDUSTRY



Project details

Call: H2020-FTIPilot-2016-1

Duration: Dec 2016 - Nov 2018

Total budget: 1 976 993,75 Euro

EU contribution: 1 613 667,50 Euro

Biomulch will:

save time,

reduce costs,

make the waste handling easy,

have competitiveness with the conventional mulch films.



"The economic yield of BIOMULCH will be higher than current commercial mulches due to the important advantages that our product offer: no removal, no waste management, no contamination and no fallow."



Federico Mesa
Project technician
CETEC

What is the role of CETEC in the BIOMULCH Project?

Cetec has two roles in the Biomulch project as a project coordinator and beneficiary partner. Project coordinator is the responsible for administrative management and technical coordination of the project. Cetec is the interlocutor between project partners and European Commission. Cetec must ensure the correct project execution. As a beneficiary partner will transfer its developed technology to accelerate PLA biodegradation to the consortium, providing technical support and carry out all plastic validation tests during the project. They will be able to adapt the innovation to other types of plastics or to other fields.

What are the challenges that the BIOMULCH project address in terms of biodegradable agricultural plastic mulches?

Our integrated solution supposes the development of completely biodegradable mulch film based on compounding techniques and selection of natural additives (enzymes and microorganisms-linkers). It will be designed to have a determined degradation capacity by selected microorganisms (that will be inoculated in the soil through irrigation), independently of abiotic (temperature, humidity) and biotic (microorganisms in the soil) conditions of the crop area. Therefore, it will ensure an adequate response to agriculture crops needs, avoiding removing activities and soil contamination. BIOMULCH will be the solution to an important

problem in agriculture, the use of polyethylene plastic as mulch film, which cause economic, environmental and technical problems derived from its removal. By doing so, BIOMULCH will contribute to a more environmentally friendly agricultural practices and environmental management schemes (biodiversity, landscape preservation and water and soil quality) in line with H2020 work programme objectives.

How will this innovative biodegradation control of agricultural plastic mulches benefit the industry?

Our solution will be a new way of mulching, commercialized as a "kit" containing: The biodegradable mulch film (bobbins of 50 kg) that will be able to be installed by the farmer in the same way that conventional polyethylene mulch film. A solution containing the specific microorganisms (in bulk or bottle format) which will be added by the farmer to the irrigation system. Once the solution will be applied to the mulch film, it will be fully degraded in a period of 30-40 days. The economic yield of BIOMULCH will be higher than current commercial mulches due to the important advantages that our product offer: no removal, no waste management, no contamination and no fallow.

What to expect in the coming months?

For CETEC, once we have reached the objectives for the first wp, now we want to scale the new formulations. We have to work very close with FKUR and Morera&Vallejo to ensure the optimal properties of the new materials.

“Biodegradable mulch film (...) should guarantee crop yield as well as quality performance during the use that is comparable to traditional plastic films.”



Nushin Behzadifar
Master of engineering
FKuR

What is the role of FKUR in the BIOMULCH Project?

FKuR is one of the leading producers of Bioplastic-Compounds for a wide range of applications in Europa. FKuR's role in the BIOMULCH project is the development and compounding of new functional formulations for the use in biodegradable mulch films. Especially the use of innovative functional additives will create new products with exceptional properties.

What are the challenges for the BIOMULCH project in terms of its compounds?

The compounding of biodegradable materials with high bio-based content in combination with newly developed functional additives requires precise knowledge of material processing. Optimized processing conditions regarding temperature profile, retention time and shear stress are necessary to avoid the degradation of the polymer, additives and especially microorganisms. Furthermore, achieving a high volume throughput in combination with excellent dispersion of the components has to be achieved in scale-up compounding.

What are the characteristics of the perfectly biodegradable mulch film?

Thanks to its complete biodegradability, the mulch film does not have to be removed or disposed after harvesting. This enables substantial cost savings for labor, storage and transportation. It is essential that the biodegradable mulch film does not pollute soil or leaves a visual impact.

Even though it should not biodegrade too quickly during its protective function on the surface of the field and the excellent relation remains between degradation and performance. Biodegradable mulch film can be used in various environmental conditions, for the cultivation of different species of plants and during different seasons. It should guarantee crop yield as well as quality performance during the use that is comparable to traditional plastic films.



FKuR compounding line

What to expect in the coming months in terms of biomulch compounds development?

Based on the results obtained by our project partners during the previous tasks, FKUR will formulate the BIOMULCH compound with the agreed product requirements. In a first step we will compound the selected formulations in a lab-scale and characterize the processability and mechanical properties. In this project phase, also the processing conditions will be evaluated.

“The microorganisms solution will be sprayed on selected mulch plastic together with enzyme solution...”



Wang Jingjue
*Researcher, biology,
seed technology*
TAHTCHTEC

What is the role of THATCHTEC in the BIOMULCH Project?

Thatchtec is a company focused on the development and commercialization of environmentally-friendly methods based on microorganisms in order to control underused biological communities. Thatcthec actively participates in the Biomulch project, the main responsibility is to select microorganisms that can degrade PLA plastic. The microorganisms solution will be sprayed on selected mulch plastic together with enzyme solution, therefore Thatchtec will also carry out an interaction study between enzymes and microorganisms.

What are the challenges for the BIOMULCH project in terms of the microorganism solution?

The ecological taxonomic studies on the abundance and diversity showed that PLA-degrading microorganisms are not widely distributed in nature. It means that PLA is less susceptible to microbial attack in the natural environment. Secondly, it was found that most PLA-degrading organisms do not utilize the degradation products from PLA degradation; it surprisingly appears to be a “by-product” of the microorganisms' search for nitrogen sources. Therefore, it is the first challenge for Thatchtec to isolate PLA-degrading species from the natural environment. Standard protocols for checking microbial biodegradability of PLA were

not well described in literature; it increases the difficulty to find out the degrading microorganisms.

What are the microbial requirements of the perfect biodegradation?

Amycolatopsis sp. was the first strain for which it was found that it could degrade PLA at room temperature. Since then, the list of PLA-degrading species has grown, and even some thermophilic species have been added to the list, which were isolated from industrial composting at 50-65 °C. All these microorganisms could produce either protease or lipase, which are the main enzymes that can degrade PLA. Some microbial species require additional compounds as inducers, like gelatin or silk fibroin, to trigger the microorganisms to secrete more enzymes.

What to expect in the coming months in terms of the microorganism solution?

Work out a standard protocol for checking biodegradability and clear zone test on agar-PLA plate. Isolating the microorganisms from these agar-PLA plates, and then compare with commercial PLA-degrading strains. Preserve the microorganisms in glycerol solution for longer storage.



Microbial culture (illustration)

"BIOMULCH will be the solution to an important problem in agriculture..."



Manuel Jiménez Díaz

*Plant manager
Morera & Vallejo*

What is the role of Morera & Vallejo in the BIOMULCH Project?

Our role is leader of the industrial and commercial part of the project: we are the ones who will manufacture and sell the outcomes of the project to the final users.

What are the main challenges for the mulch film?

A mulch film, black mulch film in particular, stops weed growth by preventing light transmittance to the soil and also warms the soil. They need to protect crops and soil, not only maintaining the quality of soil but also aiding in the faster growth of plants.

Then, a biodegradable mulching film must accomplish 5 conditions:

1. Its performance and yield must be as similar as possible to polyethylene standard mulching film during its life.
2. Before harvesting, it must not biodegrade at all ahead of time.
3. After its lifetime, it must have a rapid biodegradation.
4. The biodegradation of the film must not affect in any way to the environment.
5. The whole cost of the new cultivation process should be 'comparable' to the whole cost of cultivating with the current polyethylene films.

What kind of improvements does BIOMULCH offer?

BIOMULCH will be the solution to an important problem in agriculture, which is the use of polyethylene plastic as mulch film, which cause economic, environmental and technical problems derived from its removal. BIOMULCH will produce a new cultivation methodology that will control the biodegradation of the mulching film, allowing it to be mixed with the cultivation soil.



"...black mulch film in particular, stops weed growth by preventing light transmittance to the soil and also warms the soil..."

What to expect in the coming months regarding to your role?

We will start producing film at industrial level to perform the first tests. We will also start exploring the commercialization of the new product.

"The time is very important factor..."



Magdalena Torres
(ADESVA)

What is the role of ADESVA in the BIOMULCH Project?

ADESVA will validate the different formulations of biodegradable plastic films on real field. ADESVA will define the characteristics and technical requirements of the crops on which the different films will be tested.

What are the challenges for the BIOMULCH kit in practice?

The challenge is to achieve that the developed film be able to biodegrade in the ground in a very short period of time, since this aim has not yet been achieved with the foils available in the market. The time is very important factor since the time between one cultivation cycle and the following one is only 2 months, in the case of strawberry and raspberry cultivated in Huelva.

How will the use of the BIOMULCH kit happen?

The Biomulch foil will be used exactly like conventional polyethylene mulch. It must be placed at the beginning of the season, at the moment of the forming of beds for the later planting. This mulching must maintain its properties throughout the season, in order to fulfill its mission of the crop protection. Once the cycle is completed, the mulch will be incorporated into the soil by disc harrow, where its biodegradation will begin of the effect of microorganisms.

What are the expectations in environmental and agro-industrial terms?

The expectations (both in environmental and agro-industrial terms) are to sustainably manage the high quantities of plastic waste generated by cultivating berries in the area of Huelva. Moreover, this technique will be able to add organic matter to the typical sandy soils of the zone.



"ADESVA will validate the different formulations of biodegradable plastic films on real field."



CERES for Blue Growth

CERES advances a cause-and-effect understanding of how climate change will influence Europe's most important fish and shellfish resources and the economic activities depending on them. It will provide tools and develop adaptive strategies allowing fisheries and aquaculture sectors and their governance to prepare for adverse changes or future benefits of climate change.

InnoRenew CoE

The InnoRenew CoE's vision is to be a world leader in the application and implementation of renewable materials and sustainable building research. In doing so, the InnoRenew CoE will become a model for international research excellence, industrial outreach, and public engagement.

The mission of the InnoRenew CoE is to advance the state-of-the-art and achieve scientific and innovation excellence through interdisciplinary science.

Nanoremovas

The Nanoremovas project set out to address a crucial challenge for a crucial sector of the Argentinian economy: removing arsenic from the water consumed by cattle farms, to stop it entering the food chain. The consortium, which includes both academic institutions and private sector partners, is planning to use state-of-the-art multifunctional nanostructured materials to do the job.

ANTARES

A new European centre of excellence for the development of advanced technologies in sustainable agriculture and food security will open in Serbia with the aim to boost economic growth in the region.

Global food demand is set to continue increasing in coming years, placing additional pressure on limited natural resources. Innovative agricultural solutions are needed to produce more food from fewer resources and inputs.

The new centre of excellence (CoE) on advanced technologies in sustainable agriculture and food security in Serbia, partially funded by the EU, could lead to solutions. Agriculture and ICT are the two most promising sectors in Serbia, which is in urgent need of innovation-driven economic development.



Eu-PolarNet

Between EU member polar research institutions building on existing networks to create a resource orientated infrastructure access and usage plan. This plan would allow for the co-ordination of data and infrastructure between all the partner organisations.

EU-PolarNet will develop an integrated EU Polar research programme by identifying short and long-term scientific needs and optimising the use of co-ordinated Polar infrastructure for multi-platform science missions whilst fostering trans-disciplinary collaboration on Polar research. EU-PolarNet will also create and sustain ongoing dialogue and co-operation with Polar stakeholders by supporting meaningful interaction to shape future research, exchange key information and foster joint involvement.



STAR-IDAZ/IFAH

Horizon 2020 is funding for five years the Scientific Secretariat for the International Research Consortium (IRC) on Animal Health. The IRC builds on the success of the EU-funded STAR-IDAZ Project (Global Strategic Alliances for the Coordination of Research on the Major Infectious Diseases of Animals and Zoonoses), an exciting initiative to coordinate animal health research globally. The IRC was launched on 27 January 2016 on the occasion of a large conference on agricultural research in Brussels. The Secretariat aims to deliver measurable advances in the control of animal diseases through the alignment of both public and privately funded animal health research around the world.

The Secretariat will be run by a partnership of organizations including **Defra** (UK Department for Environment, Food and Rural Affairs), **World Organisation for Animal Health** (OIE), **CAB International**, **BBSRC** (Biotechnology and Biological Sciences Research Council), and **IFAH-Europe** (International Federation of Animal Health – Europe). The IRC will focus on particular diseases such as foot and mouth disease and brucellosis, or aspects related to animal health and welfare such as antimicrobial resistance. The Scientific Secretariat, hosted at OIE Headquarters in Paris, will provide literature reviews and gap analyses to thematic working groups, and support the Scientific Committee and Executive Committee logistically. It will facilitate information exchange within the different partners of the consortium. The Secretariat will

also play an important role in advocacy for the consortium and link with new members.

CropStrengthen

CropStrengthen is one such project. CropStrengthen aims to increase understanding of the molecular basis of abiotic stress tolerance in crops (resistance to non-living environmental factors e.g. drought), and to provide two alternatives to current strategies for increasing food production.



INSPIRATION

The EU-funded project INSPIRATION aims to develop a European research roadmap on sustainable land management practices. The agenda would help focus Europe's research, supporting policymaking on environmentally friendly, socially acceptable and economically affordable soil and land use management.

LIGNODECO

The LIGNODECO project was launched in 2010 with the aim of tapping the full potential of two fast-growing crops found in abundance in Brazil – hybrid eucalyptus clones and elephant grass. By developing new ways of breaking down these crops into biomass, the project team sought to reduce the need for fossil fuels and achieve greater sustainability throughout the paper-making process.

FRESHMON

Water supplies are under threat from agriculture (e.g. fertiliser overuse), economic development (e.g. increased pressure on scarce resources) and climate change (e.g. drought). In Europe, the EU's water framework directive sets out principles for the monitoring of inland and coastal waters with the aim of protecting and improving both their quality and ecological status. The EU-funded FRESHMON project has now made this job easier by offering satellite mapping services to authorities responsible for monitoring lakes and rivers. With more than half a million natural lakes larger than one hectare, and countless smaller ones, EU countries cannot otherwise maintain surveillance of all their inland waters all of the time.

VEG-I-TRADE

The global fresh produce supply chain must take into account climate change in order to ensure food safety, warn EU-funded researchers. This was the key recommendation of the EU-funded VEG-I-TRADE project, which was launched in 2010 to assess the safety of fresh produce in a rapidly evolving context of climate change and expanding international trade.

About H2020 Programme

Horizon 2020 is the biggest EU Research and Innovation programme ever with nearly €80 billion of funding available over 7 years (2014 to 2020) – in addition to the private investment that this money will attract. It promises more breakthroughs, discoveries and world-firsts by taking great ideas from the lab to the market.

Horizon 2020 is the financial instrument implementing the Innovation Union, a Europe 2020 flagship initiative aimed at securing Europe's global competitiveness.

Seen as a means to drive economic growth and create jobs, Horizon 2020 has the political backing of Europe's leaders and the Members of the European Parliament. They agreed that research is an investment in our future and so put it at the heart of the EU's blueprint for smart, sustainable and inclusive growth and jobs.

By coupling research and innovation, Horizon 2020 is helping to achieve this with its emphasis on excellent science, industrial leadership and tackling societal challenges. The goal is to ensure Europe produces world-class science, removes barriers to innovation and makes it easier for the public and private sectors to work together in delivering innovation.

Horizon 2020 is open to everyone, with a simple structure that reduces red tape and time so participants can focus on what is really important. This approach makes sure new projects get off the ground quickly – and achieve results faster.

The EU Framework Programme for Research and Innovation will be complemented by further measures to complete and further develop the European Research Area. These measures will aim at breaking down barriers to create a genuine single market for knowledge, research and innovation.

[Find more information on the programme website:](#)

ec.europa.eu/programmes/horizon2020/

Upcoming Events

221st International Conference on Agricultural and Biological Science (ICABS)

ISER - 221st International Conference on Agricultural and Biological Science (ICABS) is a prestigious event organized with a motivation to provide an excellent international platform for the academicians, researchers, engineers, industrial participants and budding students around the world to SHARE their research findings with the global experts.

1-2 September, 2017, Dublin, Ireland

5th International Conference on Bioplastics

Bioplastics are chain-like molecules made up of repeating chemical blocks and can be very long in length. Depending on the nature of the repeating unit they are made of polysaccharides, proteins of amino acids, and nucleic acids of nucleotides. The studies are more concerned to Green Chemicals, Noble Advances in Bioplastics, Methods of production of Bioplastics, Bioplastics Types, Biocomposites, Biomaterials & Biopolymers, Plastic Pollution and Waste Management, Applications of Bioplastics. Advanced studies are being made to improvise developments in Bioplastics Technology, Waste Management, Biodegrade ability, and much more.

7-9 September, 2017, Paris, France

Agricultural Film 2017

Agricultural Film 2017 will discuss the above issues and present research findings and possible solutions to the problems faced by today's protected agriculture.

26-28 September, 2017, Barcelona, Spain

3rd International Conference on Polymer Science and Engineering

Polymer Science and Engineering 2017 aims at sharing new ideas and new technologies amongst the professionals, industrialists and students from research areas of Polymer Science, Nanotechnology, Chemistry and Physics to share their recent innovations and applications in various fields and indulge in interactive discussions and technical sessions at the event.

2-3 October, 2017 Chicago, USA

10th International Conference on Agriculture & Horticulture

This revered conference will be focusing on the theme "Agriculture for the Future".

2-4 October, 2017 London, UK

2nd International Conference on Advances in Chemical Engineering & Technology

Eurochemical Engineering 2017 is the conference where Chemical Engineers and Biotechnologists gather to discuss about the applications of chemical engineering in life sciences and challenges in achieving the results.

16-17 November, 2017 Paris, France

ICEESD 2018 : 20th International Conference on Ecosystems, Environment and Sustainable Development

The ICEESD 2018: 20th International Conference on Ecosystems, Environment and Sustainable Development aims to bring together leading academic scientists, researchers and research scholars to exchange and share their experiences and research results on all aspects of Ecosystems, Environment and Sustainable Development.

1-2 February, 2018, Melbourne, Australia

11th World Congress on Agriculture & Horticulture

This revered conference will be focusing on the theme "Innovations and Advancements in Agriculture Research".

5-7 March, 2018 Paris, France

3rd International Conference on Environmental Sustainability, Development, and Protection (ICESDP'18)

The goal of ICESDP'18 is to gather scholars from all over the world to present advances in the relevant fields and to foster an environment conducive to exchanging ideas and information.

8-10 April, 2018, Budapest, Hungary

Global Summit on Agriculture & Horticulture

Agricultural Engineering conference is advanced to create improvements in sustainable agriculture which is totally eco-friendly.

09-10 July, 2018 Sydney, Australia

10th International Conference on Sustainable Development and Planning

Sustainable Development and Planning 2018 will bring together academics, policy makers, practitioners and other stakeholders from across the globe to discuss the latest advances in the field.

4 - 6 September, 2018, Siena, Italy

Glossary

Biodegradable

Material (of sewage constituents, packaging material, etc) capable of being decomposed by bacteria or other biological means.

Enzyme

Any of various proteins, as pepsin, originating from living cells and capable of producing certain chemical changes in organic substances by catalytic action, as in digestion.

Mulch

A covering, as of straw, compost, or plastic sheeting, spread on the ground around plants to prevent excessive evaporation or erosion, enrich the soil, inhibit weed growth, etc.

Mulching

An essential technique used in agriculture to satisfy the worldwide growing demand for agricultural products. It consists of covering the soil surface in order to modify climate conditions and favouring the crops.

PLA

Poly(lactic acid) is a biodegradable and bioactive thermoplastic aliphatic polyester derived from renewable resources, such as corn starch (in the United States and Canada), cassava roots, chips or starch (mostly in Asia), or sugarcane (in the rest of the world).

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Project partners



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