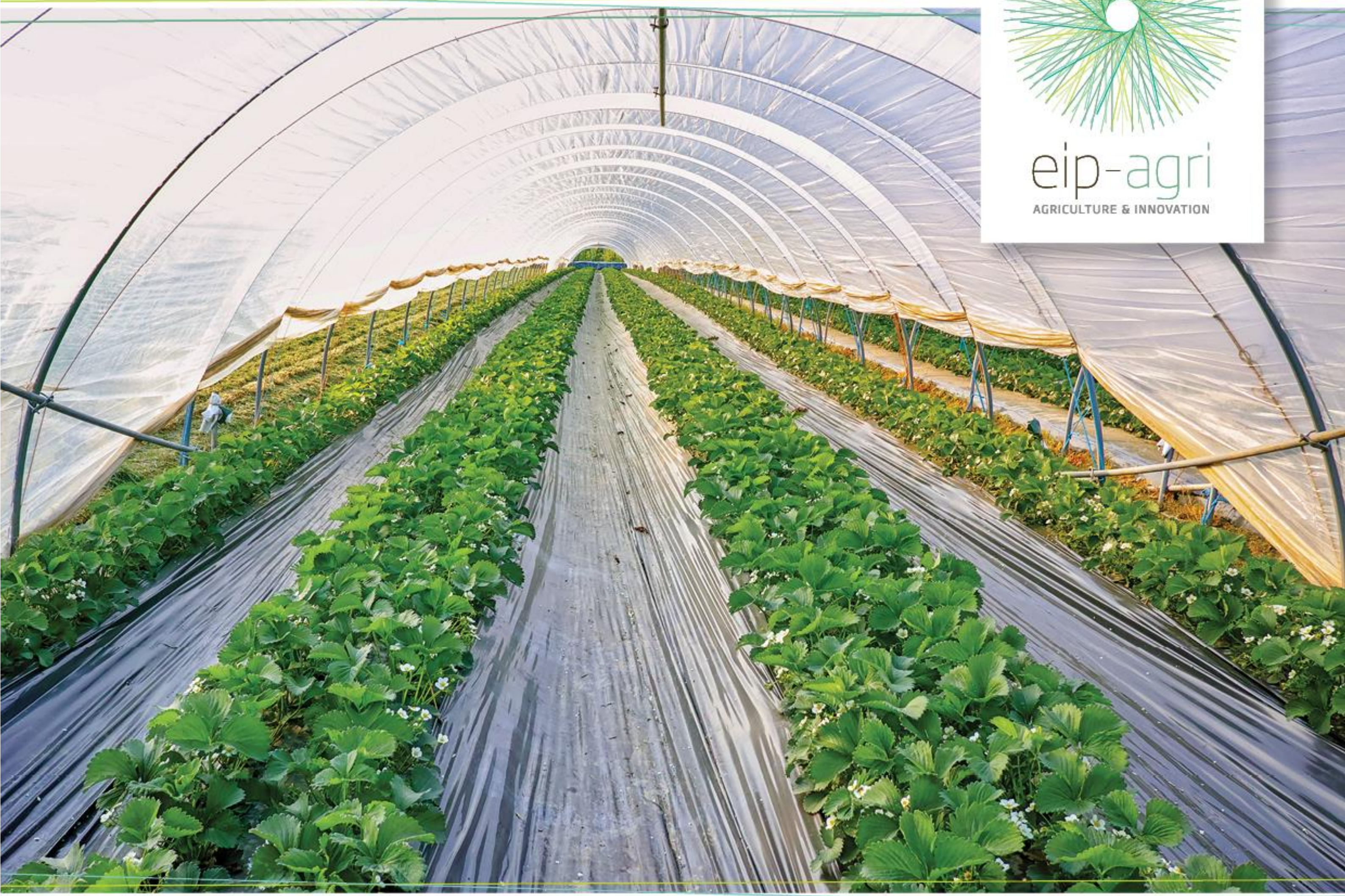

EIP-AGRI Focus Group
Reducing the plastic footprint of agriculture

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Minipaper C: New plastics in agriculture

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1. Introduction

There are a multitude of uses for various plastic products in agriculture including containers, trays, pots, packaging, tunnel coverings, drip irrigation tubing and mulch films More information about these uses is provided in **Minipaper A**. Particularly large amounts of plastic are used as mulches that are applied to the soil surface in vegetable production systems (e.g., tomato, cucumber, watermelon, strawberry) to reduce the weed competition, increase water and fertilizer use efficiency and soil temperature, and to enhance crop yield (Brodhagen et al., 2015).

In Europe, agricultural plastic waste was estimated at more than 1.3 million tonnes in 2011, and only one-half of this was recovered for recycling and secondary uses (Plastics Europe et al., 2012). There are few recycling facilities that will accept plastic mulch film because of issues of contamination with soil, vegetation, pesticide, and fertilizer (Brodhagen et al., 2015). This is discussed in more detail in **Minipaper B**. Most plastic residues in European agriculture are composed of polyethylene (Briassoulis et al., 2013) that degrades to produce a large quantity of microplastics (Barata, 2014). Tilling plastic mulch film into the soil used to be considered an acceptable strategy but this is not satisfactory for the commonly used LDPE (low-density polyethylene) and LLDPE (linear low-density polyethylene) materials because these polymers have a very slow degradation rate (e.g., 0.35% in 2.5 years; Albertsson and Ranby, 1979).

The replacement of conventional agricultural plastics by organic products like bark or wood chips is not common because of access to the materials and concerns about their efficacy – there is consequently a demand to develop new plastics that will have a lower environmental footprint. A range of biodegradable materials have been developed for purposes such as mulches (Figure 1) and pots (Figure 2) but work is continuing to make them more cost effective whilst ensuring that their production and use really is sustainable.

Figure 1. The laying of biodegradable mulching film in the field (BioBag, 2020).

Figure 2. Evegreen biodegradable flower pots (Evegreen Ltd, 2020).

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2. Definition of terms

There is a considerable confusion amongst farmers and the general public about the various technical terms used to describe plastics. **Biobased** plastics are those which are produced from renewable resources such as corn starch, straw, sugar or vegetable fats. This is in contrast to conventional plastics that are usually manufactured from a fossil fuel such as petroleum. Not all biobased plastics are **biodegradable**, and a biodegradable plastic does not necessarily need to be biobased, as is illustrated in Figure 3. More characteristics of the various materials are described in Table 1.

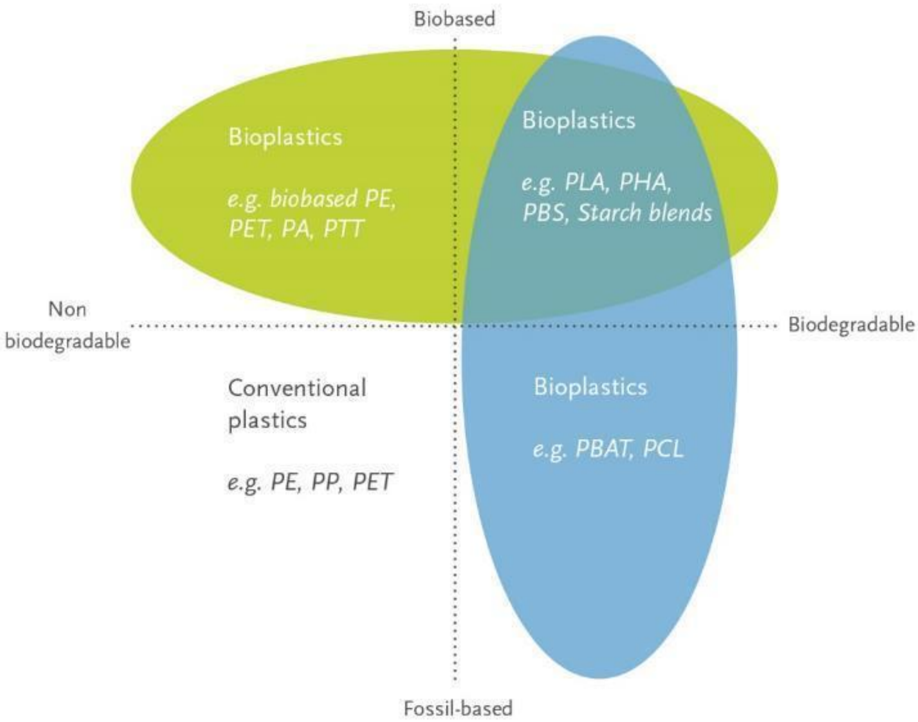

Figure 3. Some key plastics used in agriculture, characterised according to their source materials and biodegradability (European Bioplastics, 2018). The abbreviations are described in Table 1.

Sometimes a mixture of polymers is used for certain applications. The polymers used to produce biodegradable mulch films are not always entirely renewable but can be a mixture of bio-based constituents with non-renewable biodegradable constituents. Other chemicals such as plasticisers, antioxidants and pigments may also be included that can have an environmental impact as they may leach from the plastics or be released as the plastics degrade. Many polymers that were labelled "biodegradable" in the past are actually only partially degradable through a combination of abiotic (e.g., photo-oxidation, erosion, fragmentation) and biotic processes. For example, pro-oxidant additive containing (PAC) plastics, also known as oxo-degradable plastics mostly consist of LDPE with additives to enhance the abiotic degradation but with low or no degradation by the microorganisms.

For a widespread adoption of biodegradable plastics, for instance as agricultural mulches, dependable biodegradation across variable environmental conditions by the action of native microorganisms is necessary. Polymers used in biodegradable mulch plastics may contain ester bonds or are polysaccharides; these are favourable to microbial hydrolysis (Brodhagen et al., 2015).

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The biodegradation process can be divided in three different steps (Figure 4).

1. The organisms colonize the polymer and grow on its surface.

2. Then the organisms degrade the polymer. They mostly do it by secreting enzymes (e.g. hydrolases) that can depolymerise the polymer. **Depolymerisation** is the break of chemical bounds in the polymer that leads to smaller molecules. The main process of depolymerisation is the catalysis of hydrolyses with enzymes.

3. Finally, the hydrolysis products released from the polymer are used as an energy source or a carbon source for the microorganisms leading for example to emission of CO_2 or the increase of biomass.

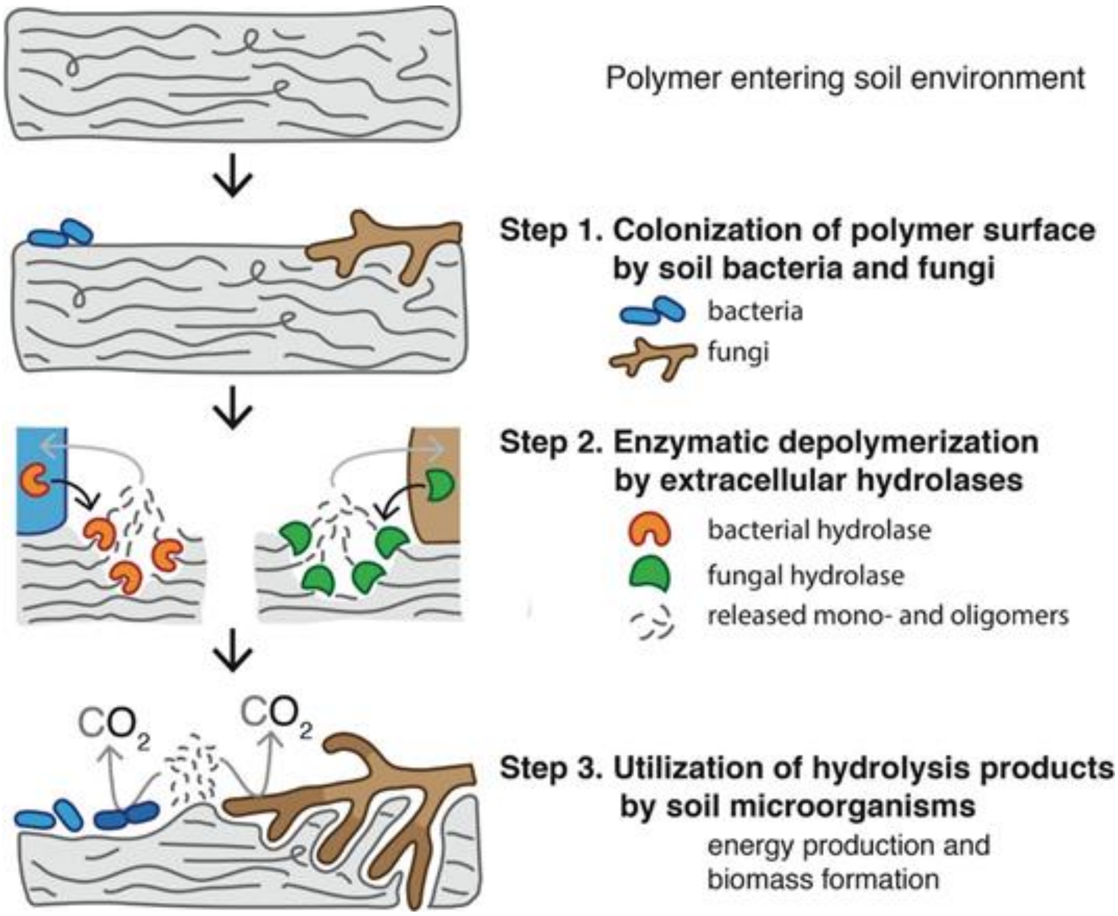

Figure 4. Three fundamental steps involved in polymer biodegradation in soils. (Sander 2019)

In theory, these plastics should be completely decomposed by soil microorganisms (bacteria and/or fungi) and converted to microbial biomass, carbon dioxide and/or methane and water (Lucas et al., 2008; Bandopadhyay et al., 2018). However, in practice, complete breakdown within a growing season is not always observed (Li et al., 2014). In some cases plastic type can have a greater influence on degradation of mulches than does the production system or abiotic and biotic variables (Li et al., 2014). However, the environmental conditions are important because plastic decomposition is a process of oxidation and hydrolysis and these reactions are inherently dependent upon oxygen and water availability (Brodhagen et al., 2015) whilst microbial activity is more rapid at higher temperatures. Much greater solar radiation, in particular UV radiation, is present in southern than in northern Europe; this will facilitate the photodegradation of plastics that often occurs prior to biodegradation and the difference must be taken account of when making estimations of the lifespan of plastic on and in soil.

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The possible incomplete breakdown of plastics in soil and the ultimate fate of biodegradable mulch plastic constituents and their effects on soil ecosystems are particular concerns for farmers. Some biodegradable plastics require the elevated temperature and more vigorous microbial activity of a large scale composting system, rather than soil, in order to break down within a reasonable timescale. Biodegradation happens much faster above the 'glass transition temperature' of a plastic (e.g. ~55ºC for PLA) – at this point, although still a solid, the firm crystalline structure of the material begins to be lost.

Table 1: Characterisation of types of plastic.

Type of plastic	Characteristics	Break down
Fossil-based, non biodegradable		
PE: polyethylene	The most common plastic in use today – available in many different forms e.g. LDPE and HDPE	Degrades in sunlight to microplastics but scarcely biodegradable
PET: polyethylene terephthalate	Used particularly for bottles and as fibres	Recycling is possible but contamination with other polymers is an issue
PA: polyamides	Nitrogen containing polymers e.g. nylon	Difficult to recycle
PTT: polytrimethylene terephthalate	Particularly used to make textile fibres	Slow
Biobased and biodegradable		
PLA: polylactide	Typically made by polymerising lactic acid from fermented plant starch (e.g. from corn or potato)	Biodegradation is very slow at ambient temperatures but composts well at elevated temperatures
PHA: polyhydroxyalkanoates	Produced by bacterial fermentation of sugar or lipids. More than 150 different monomers can be combined to give materials with extremely different properties	Slow biodegradation at ambient temperatures
PBS: polybutylene succinate	Similar characteristics to polypropylene	Slow biodegradation at ambient temperatures
Starch blends	Combination with another bioplastic modifies their characteristics	Usually readily degraded
Fossil-based, biodegradable		
PBAT: polybutylene-adipate-terephthalate	Flexible and tough, often a replacement for PET	Slow biodegradation at ambient temperatures
PCL: polycaprolactone	Usually used in conjunction with other polymers	Slow biodegradation at ambient temperatures

3. Certification of materials

Certification of biodegradable products is necessary so that end users (e.g. farmers) can be sure that they are buying products suitable for what they need (e.g. will it break down in the soil or does it require the high temperatures of commercial composting systems). Some terms used in certification standards are described in Table 2.

In the European Union (EU) the EN 17033 standard specifies the requirements for biodegradable films made from thermoplastic materials to be used for mulching applications in agriculture and horticulture. It applies to films intended to biodegrade in the soil without creating a negative impact on the environment. In particular, this document defines a classification of biodegradable mulch films according to their useful life on the ground and gives a guide of good practices concerning the use of films. This standard also specifies test methods for evaluating these requirements as well as packaging, identification and marking requirements for films. So-called "oxodegradable" mulch films based on polyethylene do not meet certain requirements of this standard, in particular the biodegradation test. In addition, the FprCEN / TR 17219 standard complements the standard EN 17033. It provides guidance for quantifying the weathering of biodegradable thermoplastic mulch films for agriculture and horticulture in accordance with EN 17033.

Table 2: Bio-terms and their definition

Bio-Term	Definition of the Bio-Term
Biodegradability	The break down into carbon dioxide, water, biomass at the same rate as cellulose (paper).
Disintegrability or fragmentation	The material is indistinguishable in the compost - it is not visible and does not need to be screened out.
No heavy metal content	There is a limit value for the content of potentially toxic elements in compostable plastics (this is to ensure that biodegradable plastics do not contribute to other forms of pollution).
Eco-toxicity	The compost produced from compostable plastics has no negative effects on composting.

The CEN norm EN 17033 on biodegradability of plastic mulch films, as well as several national standards on biodegradable plastics that are based on respiration measurements, includes a biodegradation threshold of 90% in 2 years. Biodegradability is determined by measuring the amount of carbon dioxide produced over a certain time period by the biodegrading plastic. Biodegradation of plastic material to carbon dioxide corresponding or exceeding 90%, means that complete biodegradation has been reached. The remaining share is converted into biomass, which no longer contains any plastic. In other sectors, for instance for detergents, biodegradability is measured according to the same principle (ISO 18606, CEN – CEN /TC 249/WG 7, 2018).

The EU standard EN 13432 requires 90% biodegradation to be reached in less than six months. The USA-standard ASTM D 6400-04 has less stringent thresholds of 60% conversion of carbon chains into carbon dioxide within 180 days for resins made from single polymers and 90% conversion of carbon chains into carbon dioxide for co-polymers or polymer mixes. This property is quantitatively measured using the standard test method ISO 14855: biodegradability under controlled composting conditions.

For biodegradable plastics treated by means of anaerobic digestion, biodegradation can be estimated by following a number of specific standards. According to EN 13432 anaerobic biodegradation and disintegration can be verified as a non-mandatory option:

- **50% biodegradation** is required after two months, when anaerobic fermentation is followed by aerobic composting, during which time biodegradation can continue further. According to the European Bioplastics Association the discussion and standardisation on requirements for anaerobic biodegradation, or preferably anaerobic treatability, is still in an early phase.

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- **Disintegration** is measured with a composting test (ISO 14855) and the test material is degraded, together with organic waste, for three months. By sieving the material to determine the non-biodegraded fragments, less than 10% should remain on a 2 mm screen after 120 days.
- **Eco toxicity** is measured by having concentrations of heavy metals below the limits set by the standards and by testing plant growth by mixing the compost with soil in different concentrations and comparing it with a controlled reference compost.

The certification standards are normally oriented to ensure total biodegradability of bioplastics within industrial processes. Therefore the scale in which the composting process takes place has an influence on the process conditions, and the evolution of the degradation of the biomaterials and the behaviour of bioplastics can be different from industrial plants to small-scale facilities, composting under farm conditions or within home or community composting.

While biodegradable mulch films only have to be strong enough to be laid out on the field, conventional mulch films have to be strong enough to be recovered. Accordingly, a recommendation to only use conventional mulch film thicker than 25µm was added into the scope of the relevant standard EN 13655 when this was revised to make sure they could be collected after use.

4. Plastic mulch biodegradability in the soil

The sustainability of agricultural practices over the long-term requires agricultural, economic and ecological benefits. From the point of view of plant productivity, plastic mulches remain a critical tool for weed suppression, soil moisture retention and soil temperature control. Commercially available plastic mulches containing biodegradable components have been shown to perform comparably to polyethylene films under the field conditions and this substitution of traditional plastics by biodegradable plastics/polymers is an environmentally friendly improvement.

Biodegradability of plastics must result in total disappearance from the soil in a short period by assimilation and mineralization by fungi and bacteria with production of microbial biomass, carbon dioxide and/or methane, and water. However, the permanence of ‘biodegradable’ plastic mulch residues in the soil for longer than the crop season has been observed by some farmers, and this prolonged presence in the subsurface soil layer is a problem for soil tillage. In Portugal it was shown that under dry weather conditions, some biodegradable mulching films debris could remain for more than 2 years in the soil.

One of the members of ACBD Operational Group in Spain (ACBD, 2020) carried out a field experiment on six different "biodegradable" films in southeast Spain. The results of testing show that, though all the films tested were biodegradable, this process needed humidity and organic material. None of them were certified by EN-17033 which lays down that 90% of a mulching film must disappear within 2 years to be called biodegradable. Farmers also observed that the plastic residues on the soil surface could be blown for long distances by the wind. Certain compounds released during (bio)degradation of the mulches may remain in the soil and their effects are still unclear. The EN 17033 standard assesses the ecotoxicity of biodegradable mulch films by checking the effect on plants, and earthworms, and nitrifying bacteria.

Biodegradable plastic mulches could offer an environmentally sustainable alternative to conventional polyethylene mulch. Results indicate that biodegradable plastics require no removal from the field at post-harvest, but they must be completely degraded in the soil during the season, either on the surface or in subsurface soil - this is not usually observed in practice. Laboratory studies demonstrated that chemicals released from some biodegradable mulches can alter the development of cultivated plants but these effects depend on the mulch composition. However, there is not enough knowledge on the contribution of these inputs as important nutrients to enhance plant development and soil health. Although there is no significant contribution of biodegradable plastic mulches to total soil organic carbon, the incorporation of those materials in soil may result in enhanced microbial activity and diversity which will affect the organic matter dynamics (Martin-Closas et al., 2014; Bandopadhyay et al., 2018). Short- and long-term studies for a better understanding of degradation of biodegradable plastic mulches and their impact on nutrient biogeochemistry in soil surface and deeper layers are needed.

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The ecotoxicological effects of the intermediate decomposition products of biodegradable plastics (e.g. adipic, succinic and lactic acids and 1,4-butanediol) on cultivated plants grown with mulches are still poorly developed and little data is available, especially with regard to monitoring of plant growth and root development. Roots are generally more sensitive to such chemicals than shoots and leaves (**Martin-Closas** et al., 2014).

The use of biodegradable mulches in agriculture is growing, but field studies about the consequences on their use in the long-term are scarce. For instance, in order to reach their functional properties, certain additives (e.g. plasticizers, dyes) are included in mulch composition but the fate of these compounds when released into the soil during mulch biodegradation is uncertain. These additives can represent up to 15% of the polymer weight (Briassoulis et al., 2013). Therefore, there is an urgent need for evaluation of the environmental impact of these materials in the short to the long-term, especially on soil quality and health. This information would help to choose the mulches with lowest environmental impact.

It is possible to accelerate the biodegradation process by inoculating the plastic, or the soil, with certain types of microorganisms. This process is known as bioaugmentation. For PLA this process has been shown to work using *Geobacillus thermoleovorans* (Castro-Aguirre et al, 2018). One idea is to encapsulate such organisms within the film mulch at the production stage. It is also possible to add certain enzymes produced by fermentation (e.g. lignolytic oxidases) on their own without the bacteria or fungi that produce them. However, this approach will add cost and there is a danger that it may cause the plastic to degrade prematurely, thus reducing its effectiveness.

Conventional plastics such as polythene are known to release methane, a greenhouse gas, as they degrade in sunlight (Royer et al. 2018). There have been few studies of gaseous emissions resulting from the breakdown of biodegradable plastics. The intention of their use is that they decompose to CO_2, a greenhouse gas. However, the amount released on an area basis will not be that great as mulch films are so thin. More significant could be the emissions associated with growing the crops used to make bioplastics (due to soil cultivations, fertilisers, harvesting operations etc), industrial manufacturing processes and transport (Escobar et al 2018).

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5. Examples of the use of biodegradable plastic in European agriculture

In this section several 'case study' examples from several farming systems (e.g. field vegetables, polytunnels, dairy production) in locations across Europe are presented. Good practices described below also show the importance of the certification of biodegradable plastic used in the European agriculture.

Figure 5. After harvest the commercial PLA film remained largely intact on the surface, except where it had been mechanically damaged although it had degraded at the sides of the bed where it was tucked into the ground

***Five Acre Farm**: Becca Stevenson is the manager of Five Acre Farm, an organic community supported agriculture scheme in the English Midlands. Weed control is a particular issue and weeds are largely managed by mechanical cultivations, including ploughing, and hand labour. Woven polypropylene mulches that can be reused for many years are also used. The plant spacing has been standardised so the same planting holes can be used each time. These mulches are effective but they can be heavy to move around and require weighing down with bricks. As an alternative Becca has begun using PLA film mulch, laid along the beds by tractor. This has usually been successful – the mulch is in place just for one season at a time for allium, bean and brassica crops. A disadvantage is that it can be slow to break down after incorporation (Figure 5). A recent innovation is to sow white* clover in the wheelings between the mulched beds as this *area can be difficult to keep weed free in other ways. Five Acre Farm is working with Coventry University **https://organic-plus.net** and Innovative Farmers **https://www.innovativefarmers.org** on research projects concerned with developing alternatives to conventional plastic mulches (Figure 6)*

Figure 6. Comparative trial of a range of biodegradable film mulches at Five Acre Farm in the UK. A commercial crop of onions grown through a woven polypropylene mulch can be seen on the left

***LIFE BioTHOP project**: Slovenian hop producers/farmers are using 100 % biodegradable twine for securing the hop plants (Figure 7). The aim of this project is to replace the PP twine in the hop fields with the biotwine made of a renewable material, polylactic acid (PLA), that can be degraded by on-farm composting together with the hop plant biomass for use as a soil amendment (Figure 8 and 9). Alternatively hop biomass after harvest can be used not only for compost but also as raw material (Figure 10) to produce range of biodegradable products (e.g. bio-composites for planting pots (Figure 11), and packaging trays). This 'upcycling' adds considerable value to what would otherwise be a farm waste. The demonstration region is Lower Savinja valley in Slovenia, and it presents an example of good practice for all hop-growing regions not only in the EU but also across the world. The goal of the project is to follow the circular economy and resource efficiency and to completely upcycle the hop waste in hop production and to improve energy efficiency by 25 % by using the biopolymeric composites. Considering the emission of the greenhouse gasses a great reduction compared to conventional plastic production is expected.* https://www.life-biothop.eu/

Figure 7. Testing of biodegradable twine in hop fields in Slovenia (LIFE BioTHOP Brochure, 2020, Photo: Čeh. B.)

Figure 8. Testing the composting of bio degradable twine for its further use in bean production. Picture after 11 weeks of composting (LIFE BioTHOP PLA twine, 2020, Photo: Čeh, B.)

DAY 0 DAY 35

Figure 9. Composting and degradation of PLA biodegradable twine (LIFE BioTOP, 2020, Photo: Luskar L.)

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Figure 10. Biocomposite formulation from hop waste residues developed by TECNOPACKAGING (LIFE BioTHOP, Photo: Žepič Bogataj, V.)

Figure 11. First generation of biodegradable planting pots for hop-growing sector developed by TECOS Ltd (LIFE BioTHOP, Photo: Žepič Bogataj, V.)

LIFE MULTIBIOSOL. *The project aimed to develop a new bioplastic film made from renewable raw materials that are not petroleum based, eliminating the need for costly waste management by creating a certified product by TUV Austria as "OK biodegradable SOIL". In addition the aim was to reduce the carbon footprint of agricultural plastics and finally to improve soil and crop quality by adding oligoelements to the plastic product.* ***www.multibiosol.com***

LIFE CITRUSPACK *aims to demonstrate that sustainability and efficiency can be applied to agricultural and industrial practices by developing the potential of waste in order to diversify and grow farmers/producers' income by means of its valorisation into a series of new value chains. The specific objectives of CITRUSPACK are implementing a circular economy between all sectors involved by maximising. the use of citrus juice production waste by-products, demonstrating how natural fibres from peels (orange, lemon and clementine) can be used as a cheap and natural additive for the reinforcement of 100% biobased and biodegradable plastic bottles and jars. In addition, completing the cycle by using other substances from the pulp residues as natural antioxidants, pectins or essential oils in creams replacing other compounds.* ***www.citruspack.com***

The EU AGROBIOFILM project *(Development of enhanced biodegradable films for agricultural activities). This project, conducted in Portugal and Spain, tested innovative black Agrobiofilms with different thicknesses in horticultural crops, including vines. The overall conclusions indicated that Agrobiofilm mulches can be recommended for horticultural production (e.g. strawberry, bell-pepperand muskmelon); the Master-Bi (CF04P grade) is viable for vinyards. A Portuguese manual on Agrobiofilms was published:* ***http://agrobiofilm.eu/temps/docs/10_12_15_04_handbook_agrobiofilm_vportugues.pdf***

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6. Cost benefit analysis of use

As of 2020, biodegradable plastics generally cost more than their conventional equivalents. This is partly because of the lack of economies of scale at all stages of production and distribution and because the technology is less developed. It is likely that if biodegradable plastics become more widely used in agriculture and other sectors then their price will decrease. However, even with the current higher price, the extra cost of the material can be offset by removing the need for removal from the field and then disposal of the used plastic. It may also be possible to use much thinner films as there is less need for mechanical integrity if there is no need to collect the plastic at the end of the growing season. A comparative analysis of the cost of conventional and biodegradable mulch with other practical information can be found in **Minipaper D**. Even if a biodegradable plastic appears to be a cost effective alternative to using polythene or polypropylene, other approaches could also be considered. For example, instead of the mulches to suppress weeds, a change in production system such as crop rotation or cultivation practices could be considered to increase resilience by reducing the need for off-farm inputs.

Some of these issues were examined within the AGROBIOFILM project (Agrobiofilm Consortium, 2013)(**https://cordis.europa.eu/project/id/262257/reporting**). This included consideration of mulch film thickness and the effects of additives with respect to durability under a range of conditions. Biodegradable plastics could also be considered for other agricultural purposes such as irrigation pipes: for example in Portugal alone about 1,900 t of drip irrigation tapes are used for tomato production, either as high or low density polyethylene, and this plastic material is generally replaced annually (Silva, 2016). Sometimes redesigning a product or using alternative manufacturing techniques is needed rather than just substituting one plastic material for another. The need for a change of pipe wall thickness was described by Hiskakis et al., (2011) when using Mater-Bi biodegradable plastic.

7. Conclusions and recommendations for further work

The use of soil biodegradable plastics is one of the options to reduce the footprint of plastics in agriculture, although other practices are also important to reduce reliance on plastics whenever this can be done. The use of these degradable plastics removes the need to gather up film mulches at the end of the growing season. However, it is important to be aware of the likely rate of decomposition of the product and to match the product to the situation so that weed suppression is sufficient whilst the crop is growing but that the material degrades rapidly after harvest. To facilitate the uptake of new forms of plastic further work is needed in the following areas:

- Certification schemes should provide assurance that the biodegradable plastics will perform as expected, although this will depend to some extent on soil and weather conditions. Manufacturers should provide guidelines about degradation speed. A short-lived crop (e.g. lettuce, 3-4 months) has not the same needs as a long-lasting crop (e.g. artichokes, 8-12 months). Ideally these guidelines would be adapted to regional conditions throughout the EU.
- Appropriate regulations assuring a safe used of biodegradable plastics must be further adjusted and improved, according to ongoing research results.
- Dissemination and communication among the stakeholders, including interactive education and training and peer-to-peer learning.

Further research is needed about the information concerning the release and persistence of microplastic fragments from novel materials. Developing a simple and user friendly digital tool or approach to monitor microplastic in soil would provide the farmer the information about the possible expectations when cultivating films on their land to enable them to take more responsible decisions and choices.

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You can contact Focus Group members through the online EIP-AGRI Network.
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The European Innovation Partnership 'Agricultural Productivity and Sustainability' (EIP-AGRI) is one of five EIPs launched by the European Commission in a bid to promote rapid modernisation by stepping up innovation efforts.

The **EIP-AGRI** aims to catalyse the innovation process in the **agricultural and forestry sectors** by bringing **research and practice closer together** – in research and innovation projects as well as *through* the EIP-AGRI network.

EIPs aim to streamline, simplify and better coordinate existing instruments and initiatives and complement them with actions where necessary. Two specific funding sources are particularly important for the EIP-AGRI:

- ✓ the EU Research and Innovation framework, Horizon 2020,
- ✓ the EU Rural Development Policy.

An EIP AGRI Focus Group* is one of several different building blocks of the EIP-AGRI network, which is funded under the EU Rural Development policy. Working on a narrowly defined issue, Focus Groups temporarily bring together around 20 experts (such as farmers, advisers, researchers, up- and downstream businesses and NGOs) to map and develop solutions within their field.

The concrete objectives of a Focus Group are:

- ✓ to take stock of the state of art of practice and research in its field, listing problems and opportunities;
- ✓ to identify needs from practice and propose directions for further research;
- ✓ to propose priorities for innovative actions by suggesting potential projects for Operational Groups working under Rural Development or other project formats to test solutions and opportunities, including ways to disseminate the practical knowledge gathered.

Results are normally published in a report within 12-18 months of the launch of a given Focus Group.

Experts are selected based on an open call for interest. Each expert is appointed based on his or her personal knowledge and experience in the particular field and therefore does not represent an organisation or a Member State.

*More details on EIP-AGRI Focus Group aims and process are given in its charter on:
http://ec.europa.eu/agriculture/eip/focus-groups/charter_en.pdf

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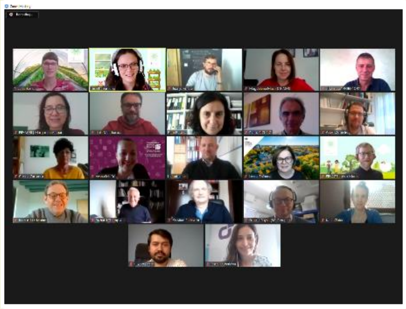

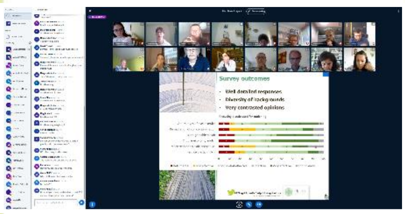

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