

National Organic Standards Board
Crops Subcommittee Material Discussion Document
Biodegradable biobased mulch film
August 13, 2020

Summary of biodegradable biobased mulch film

The Crops Subcommittee (CS) is re-issuing this discussion document with updated links and questions below. The CS is now planning to vote on an annotation addressing biodegradable mulch film that is not 100% biobased in Spring 2021.

Past discussion:

Biodegradable biobased mulch film has been on the National List of approved synthetic substances since September 30, 2014, based upon an October 2012 NOSB recommendation. Historical information on this material is as follows:

Reference on the National List: 205.601(b) As herbicides, weed barriers, as applicable (2) Mulches (iii) Biodegradable biobased mulch film as defined in §205.2. Must be produced without organisms or feedstock derived from excluded methods.

Technical Report: [2012 TR](#); [2015 Report](#); [NOP Policy Memorandum 15-1](#); [Supplemental Technical Evaluation Report 2016](#)

Petition(s): [2012](#)

Past NOSB Actions: [10/2012 NOSB Recommendation](#); [Memo to the NOSB with Report on Biodegradable Biobased Mulch Films in Organic Crop Production \(Michigan State University, September 2019\) \(pdf\)](#).

Recent Regulatory Background: Final Rule published 09/30/14 ([79 FR 58655](#)); Sunset renewal notice published 10/08/2019, [84 FR 53577](#)

I. Background from Subcommittee:

Biodegradable biobased mulch films were approved for placement on the National List of approved synthetics (Biodegradable Mulch Film Made from Bioplastics) without detailing if non-biobased content would be allowed. The vast majority of mulch films in this category contain 20% or less of biobased materials, with the remainder consisting of polymers, colorings, and other synthetic materials. There are some products that might meet the biobased aspect of this material's definition at § 205.2 but are either not biodegradable or are not used widely in production due to brittleness or other production issues.

In January 2015, the National Organic Program issued Policy Memorandum 15-1, to clarify that biodegradable biobased mulch film must not contain any non-biobased synthetic polymer feedstocks. The NOSB requested a limited scope Technical Review in 2016. The questions asked for this limited scope TR from 2016 were as follows:

1. What is the effect on overall soil health, including soil biology, when this material biodegrades?
2. What is the cumulative effect of the continued use of this biodegradable biobased mulch film, on soil nutrient balance, soil biological life, and soil tilth, when used in the same area of

the field for 3-5-10 years?

3. What effect does the breakdown of these polymers have on soil and plant life as well as livestock that would graze either crop residues or forages grown the subsequent year after this mulch film was used?
4. Are there different cropping systems, climate, soil types or other factors that affect the decomposition rate (Examples would be long cold winters, or exceptionally dry conditions, such as found in a desert)?
5. Are there metabolites of these mulches that do not fully decompose, and if so, is there an effect upon soil health or biological life?

The TR focused upon biobased biodegradable mulches which contain polymers and the soil and crop health effects they may have as they biodegrade. This supplemental TR was inconclusive, since research on these materials is currently limited, and the questions above were not answered to the NOSB crop subcommittee's satisfaction. In addition, there are fossil-based synthetic fertilizers, used extensively in nonorganic agriculture, that break down in the soil and provide nutrients for plants. The reliance on natural fertility inputs is one of the areas where organic agriculture is different from nonorganic agriculture.

An argument can be made that even though the non-biobased polymers degrading into the soil originate from petroleum (a nonrenewable fossil fuel), the use of this product could be considered environmentally friendly since it replaces plastic mulches that are currently removed at the end of the harvest season and end up in landfills that do not breakdown for decades if not centuries. The biodegradable mulches from petroleum-based polymers save labor and time, as the mulch does not have to be removed from the field and transported for disposal.

The NOSB reviewed this material for its five-year sunset renewal in 2017, and decided to relist it as written, with the understanding that there were no products on the market that were commercially viable made from 100% biobased (no petroleum) materials. The crops subcommittee needed more information that addressed our questions above to consider a change to the annotation. If it remained on the National List, perhaps manufacturers would be able to develop a product that met that requirement of 100% biobased "ingredients", which was the preferred outcome.

The National Organic Program reached out to Dr. Ramani Narayan, a researcher with the Department of Chemical Engineering and Materials Science at Michigan State University, to provide more information beyond the Technical Review that had been done in 2016. The focus of Dr. Narayan's report is the biodegradability of both biobased and petroleum-based mulch films with limited research on the effect of these products degrading into the soil over time. Section 2.7 of the report (available [here](#)) states:

Environmental studies have not shown any adverse impacts associated with the incorporation of biodegradable mulch films (BDMs) into the soil to date. More research is needed to monitor any potential formation of terrestrial micro and nanoplastics from biodegradable mulch films and ensure that there is no residual soil ecotoxicity. There is need for tuning the physicochemical properties of the biodegradable mulch films with the needs of specific cropping systems and climates. The biodegradable mulch films could provide additional environmental benefits by formulating them to deliver macro and micronutrients to the crop as they biodegrade in soil, or deliver pesticides directly into the soil. Sintim et al. showed that there was no significant effect on soil health over two years of monitoring and that the soil microbial communities did not differ much either. They found significant enrichment in

bacterial and fungal gene copies under BDM treatments over 2 years, but no significant change under PE and no mulch. Another important observation was that repeated tillage of BDMs into the soil across 4 years did not impact crop yield significantly and had no major effect on crop quality.

While this section points out possible negative issues with some polymers used in the biodegradable mulch, the vast majority of the report focused on the positive aspects when the mulch does biodegrade. There is discussion that the current regulation protects organic integrity and would not allow the use of excluded methods (some of the polymers are extracted from petroleum through the use of bacteria created through excluded methods), and does not allow materials to be used that “contribute to contamination crops, soil or water.” Organic producers in the European Union are allowed to use this petroleum based biodegradable mulch with no requirement on the percentage of bio-based ingredients. The EU will be reviewing these mulches in 2024 with possible changes to their annotation. The Crops Subcommittee has reviewed Dr. Narayan’s report, but feels there are questions that still need to be answered and invites the public to provide input on these issues.

The NOP also rescinded policy memorandum 15-1 in October 2019, stating that it was redundant with current regulations. The requirement for 100% biobased feedstocks is articulated in the preamble of the final rule ([79 FR 58655](#)) and the status quo remains. Removal of the policy memorandum provides an opportunity for the NOSB to revise the current definition (§ 205.2) to reduce the biobased content requirement. The NOSB, through this discussion document, hopes to gain insight from the public on possible approaches.

II Questions:

1. Is the biodegradability of the mulch film the main issue, or should a future annotation include other issues?
2. Is there information on the toxicity or effect of all secondary metabolite residues as the product breaks down?
3. What is your opinion on mulch films that could be engineered to include macro or micro-nutrients or pesticides that would then make the mulch film provide more benefits than just a mulch?
4. Is the risk/benefit of keeping plastic mulches out of landfills part of the Organic Food Production Act criteria the NOSB should consider when reviewing this material?
5. Are there any studies that track the impact on livestock or wildlife (terrestrial, avian and aquatic) that might be attracted to consume pieces of the biodegradable plastic before it has completely degraded in 2 years or secondary metabolites that remain in the soil and are taken up by crops?
6. Should a future annotation try to include consideration that different soils and climates might not be able to meet the biodegradability standard set in the annotation, and how would certifiers be able to verify the use of the material met the biodegradability standard?

Supplemental information and questions requested:

New research includes publications reported by the Small Fruit Horticulture Department, Western State University (WSU), Mount Vernon, WA 98273. Links to publications include: <https://smallfruits.wsu.edu/plastic-mulches/>

Additional Questions:

1. Is there any new research on BDM film use that has not been previously submitted to the NOSB?
2. Is there any evidence that BDM films contribute to microplastic pollution in soils and freshwater or marine ecosystems?
3. Are their adequate sampling and laboratory methods available to determine whether BDM film use contributes to microplastic pollution in soils and freshwater or marine ecosystems?
4. Is the availability of biodegradable mulch a make-or-break situation for the viability of your organic system? Why?
5. Plastic films are heavily used in organic berry production systems. What other organic production systems are dependent on plastic films?
6. Are any conventional growers using BDM and what is their experience with these materials?
7. If the NOSB recommended off-site composting of BDM, would municipal compost facilities want to receive BDM since a large proportion of the mass is supposed to be converted to CO₂ within 2 years (based on the international standard)?
8. Do non-biodegradable polyethylene or other films used in organic agriculture contribute to organic farm soil microplastics pollution even if removed at the end of the growing season?
9. Would it be feasible to gather up and remove BDM film at the end of the season for on-farm or off-farm composting?

Please comment on which of the following mutually exclusive options for regulating BDM films that are not 100% biobased you think is best:

1. Continue with the current annotation with no change;
2. Allow BDM film use followed by ploughing into soil (with some consideration for off-site transport), with monitoring and assessment to determine whether there are adverse impacts; or
3. Allow BDM film use but require that it be gathered up at the end of the season followed by on-farm or off-farm composting, if feasible; or
4. Allow BDM film use but restrict its use in certain environments where biodegradation may not occur in a reasonable time.

The Crops Subcommittee looks forward to reviewing any new information and your comments.

Vote in Crops Subcommittee:

Motion to accept the biodegradable biobased mulch film discussion document

Motion by: Asa Bradman

Seconded by: Rick Greenwood

Yes: 7 No: 0 Abstain: 0 Absent: 1 Recuse: 0

Approved by Jesse Buie, Crops Subcommittee Chair, to transmit to NOSB August 13, 2020