

MEMORANDUM TO THE NATIONAL ORGANIC STANDARDS BOARD

September 9, 2023

FROM: Jennifer Tucker, Ph.D.
Deputy Administrator
National Organic Program (NOP)

SUBJECT: Work Agenda Request: Biodegradable Biobased Mulch Film (BBMF)

The National Organic Program (NOP) requests that the National Organic Standards Board (NOSB or Board) continue to work on, and facilitate public discussion about, the topic of biodegradable biobased mulch film (BBMF) in organic crop production.

BBMF is a weed barrier that naturally biodegrades in the soil after use. BBMF is intended to reduce labor and the need for non-recyclable plastic mulches that do not biodegrade. Currently, the United States Department of Agriculture (USDA) organic regulations (National List) require BBMF products to meet specific criteria regarding excluded methods, biobased content, compostability, and biodegradability. While technically allowed as a synthetic material in organic crop production, no known products meet the requirements of the current regulatory listing – making it allowed, but not actually useable.

The Board's goal with BBMF has been to reduce plastic waste on organic farms; BBMF was originally added to the National List based on a Board recommendation with that intent. The Board has discussed the use of BBMF as an alternative to disposable plastic mulch many times, with BBMF on their biannual meeting agendas in 2012, 2017, and 2019-2021. Most recently, the Board issued a [2021 recommendation](#) proposing to change the biobased content requirement (the percent of polymer feedstocks used to make BBMF that must be from renewable sources) in the current BBMF listing on the National List from 100% to 80%. Like the existing regulatory listing, there are currently no BBMF products that meet the requirements in the Board's 2021 recommendation.

NOP shares the goal of reducing plastic waste as a means of meeting the USDA organic requirements for conserving natural resources and environmental stewardship – outlined in [7 CFR 205.200](#). The USDA has programs and research focusing on the development and expansion of markets for biobased products, including the [National Institute of Food and Agriculture \(NIFA\) Bioproduct Pilot Program](#), USDA [BioPreferred Program](#), and several Agricultural Research Service (ARS) projects. Because rulemaking requires intensive USDA staff time and effort as well as broad stakeholder support, the NOP prefers to only conduct rulemaking if it supports the organic community in a practical way. Because there are no commercially available BBMF products that could meet the current recommendation, NOP has determined that it will not implement the 2021 recommendation as is. Instead, the NOP asks the

Board to continue work on the topic of BBMF and submit a revised recommendation that addresses the questions outlined below.

Background

BBMF products are used in agriculture as physical weed barriers. They are laid as a thin layer on top of the soil to suppress weeds while also controlling soil moisture, temperature, and crop pests. BBMF products can be used in a wide range of crops including berries, brassicas, melons, onions, squash, and tomatoes. In general, biodegradable mulch films are made from biobased or fossil-fuel-derived (*e.g.*, petroleum) polymer feedstocks combined with other pigments and processing aids. The most common biobased feedstocks are thermoplastic starches (TSP) extracted from natural materials like high-amylose starch, polylactic acid (PLA) produced by chemical synthesis from cornstarch, and polyhydroxyalkanoates (PHA) produced by microorganisms.¹

BBMF products are intended to be left in the field after use, where they naturally biodegrade in the soil. BBMF is an alternative to traditional plastic mulch (sheets of plastic used as weed barriers) made from fossil-fuels (*e.g.*, polyethylene (PE) plastic mulch). The USDA organic regulations require the removal of plastic mulch from the field at the end of the growing or harvest season, resulting in waste build-up in landfills, as the plastic is typically non-recyclable. The recommendation to allow organic farmers to use BBMF products as an alternative to plastic barriers was intended to save labor and reduce plastic waste.

The current USDA organic regulations allow BBMF products that meet specifications for excluded methods, compostability, biodegradability, and biobased content ([§§ 205.601\(b\)\(2\)\(iii\)](#) and [205.2](#)). These regulations reference a variety of third-party testing standards from ASTM International, European Committee for Standardization (EN), and the International Organization for Standardization (ISO). The USDA organic regulations state that BBMF products:

- 1) Must not be produced using [excluded methods](#).²
- 2) Must be [compostable](#):
 - a) [ASTM D6400](#): Standard Specification for Labeling of Plastics Designed to be Aerobically Composted in Municipal or Industrial Facilities.
 - b) [ASTM D6868](#): Standard Specification for Labeling of End Items that Incorporate Plastics and Polymers as Coatings or Additives with Paper and Other Substrates Designed to be Aerobically Composted in Municipal or Industrial Facilities.
 - c) [EN 13432](#): Requirements for packaging recoverable through composting and biodegradation—Test scheme and evaluation criteria for the final acceptance of packaging.
 - d) [EN 14995](#): Plastics—Evaluation of compostability—Test scheme and specifications.
 - e) [ISO 17088](#): Specifications for compostable plastics.
- 3) Must [biodegrade](#) by at least 90% in less than two years:
 - a) [ISO 17556](#): Plastics—Determination of the ultimate aerobic biodegradability of plastic materials in soil by measuring the oxygen demand in a respirometer or the amount of carbon dioxide evolved.

- b) [ASTM D5988](#): Standard Test Method for Determining Aerobic Biodegradation of Plastic Materials in Soil.
- 4) Must be **biobased**:
 - a) [ASTM D6866](#): Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis.

BBMF was added to the USDA organic regulations in 2014 in response to a petition and NOSB recommendation. When BBMF was added, NOP explained in the preamble to the final rule that 100% of feedstocks used to make BBMF products must be derived from renewable materials (biobased), not fossil-fuels. Because no products actually aligned with the rule listing, in 2019, the NOP asked the Board to work further on this topic and develop a recommendation for next steps. Public comments submitted to the Board reported that 20-50% was a more feasible biobased content percentage for BBMF.³

After reviewing public comments and deliberating at their meeting, the NOSB issued a [2021 recommendation](#) to reduce the required minimum biobased content to from 100% to 80%. At the time, the Board acknowledged that 80% was not currently available, calling the percentage “aspirational.” In the 2021 recommendation, the Board also recommended requiring organic farmers to switch to BBMF products with higher biobased content whenever they become commercially available. Other historical NOSB and NOP work on BBMF is included in [Appendix A](#).

When the NOP receives recommendations from the Board, subject matter experts vet the proposal and conduct further research, which may include discussions with other federal agencies. Occasionally, new research or information becomes available between the time the Board has submitted the recommendation and the time NOP staff begin their vetting process. NOP also balances NOSB recommendations against other high-priority rules, staff capacity, impact to industry, and stakeholder support.

After speaking with industry and subject matter experts, NOP determined that the organic industry would be unable to meet the Board’s 80% biobased requirement recommendation for BBMF in the near future. Based on our analysis, the NOP has identified the following challenges:

- 1) Eighty percent biobased BBMF products are not available. Only <50% biobased BBMF products are commercially available in the United States.^{4,5}
- 2) Biobased content has no impact on biodegradability.^{6,7} Some biobased components only biodegrade under high temperatures.^{8,9} These high temperatures may be produced in a composting environment but not naturally in the field. It is our understanding that a hypothetical 80-100% biobased mulch film must use components that make it unable to meet the biodegradable requirements. For these reasons, researchers stated that developing 80% or higher biobased content mulch film products for commercial use that are functional and biodegradable is not currently possible.⁶
- 3) The USDA organic regulations require BBMF products to meet 90% biodegradation within two years. Researchers have indicated that this requirement does not account for differences between in-field and laboratory conditions. Products that meet the current biodegradation

requirements may be too fragile and become brittle and fragmented before the end of the growing season. A BBMF product that lasts all growing season may take longer than two years to biodegrade, depending on the agricultural location and climate.^{6, 9}

- 4) Currently, the USDA organic regulations require BBMF products to be compostable and biodegradable. Biodegradation is a process that happens naturally in the field over time, while composting is an actively managed process that involves human labor. The NOP believes these two requirements may be in conflict with each other for several reasons. The NOP questions whether requiring both compostability and biodegradability is necessary.
 - a) Requiring compostability may result in products that, while strong and last all season, do not biodegrade in the field. As BBMF products are designed to be left in the field to biodegrade, requiring compostability may be unnecessary. Requiring BBMF products to be sent to composting facilities after use is contrary to the intent of saving labor. In addition, not all regions may have access to commercial compost facilities.
 - b) There appears to be conflicting data on the differences between “compostability” and “biodegradability.” One source indicates that compostable products are biodegradable, but not all biodegradable products are compostable.¹⁰ Another source appears to contradict this by indicating that compostability does not equal in-field biodegradation.¹¹
- 5) The current annotation for BBMF on the National List requires that it be produced without organisms or feedstock derived from excluded methods. However, most of the biobased components of commercially available BBMF products may be produced using excluded methods.⁹

The National Organic Program’s Request to the National Organic Standards Board

Given the challenges identified above, the NOP requests that the NOSB continue work on this topic. The Board’s consideration is the logical next step in this process and will help us find the best path forward through engagement with stakeholders, discussion in subcommittees, solicitation of comments, and discussion at public meetings. This recommendation should identify ways to overcome the challenges we have identified, reflect BBMF products or other alternatives that could be commercially available now or in the near future, meet the goal of reducing plastic waste, and be consistent with the [Organic Foods Production Act](#) (OFPA).

As the Board deliberates this issue, please reference past NOSB work ([Appendix A](#)) and the challenges identified in this memorandum. We also look forward to responses to the following questions:

- 1) As biobased content does not impact biodegradability, is it necessary to require biobased content? If so, why?
- 2) If the Board determines that biobased content requirements are necessary, how should the biobased content be revised, given that current commercially available products are less than 50% biobased?
- 3) If biodegrading to 90% within two-years is unrealistic, what is a realistic requirement? Are the third-party testing standards currently in the USDA organic regulations appropriate? If not, what other testing standards could be used?

- 4) Given the conflicts between compostability and biodegradability, are both needed? If so, why? If only one is needed, which one is necessary and why?
- 5) What is the need for BMMF as an alternative to plastic mulch outside of reducing plastic waste? What types of organic operations are expected to use BMMF if compliant products were available now? Please be as specific as possible (number of operations, crop types, production systems, size/scale, geographic regions, etc.).
- 6) What specific uses of plastic mulch can be replaced by BMMF? How much plastic mulch would organic farmers no longer use if BMMF products were available? How many organic farms would switch from plastic mulch to BMMF? Would the use of plastic mulch be eliminated on these farms?
- 7) Are there other materials that could meet the functional goals of BMMF, but without the continued use of plastic-like materials?

The Board must review all substances on the [National List of Allowed and Prohibited Substances](#) portion of the USDA organic regulations every five years for renewal or removal (called a “sunset review”). The next sunset date for BMMF is October 30, 2029, and the NOSB is scheduled to conduct their next sunset review in 2027. We ask the Board to provide a revised recommendation before the next sunset review, at or before the Spring 2025 meeting.

We acknowledge and appreciate the Board’s previous work on this complex topic. The NOP thanks the NOSB in advance for continuing your work, and we look forward to your discussion and guidance.

References

¹ Ghimire, S., and C. Miles. 2020. "Soil-Biodegradable Mulches: Course Lecture." Soil-biodegradable Mulches in Agriculture. Washington State University Extension. September.

https://s3.wp.wsu.edu/uploads/sites/2181/2021/11/2.-long-lecture_presenter-notes.pdf.

² Excluded methods is defined at [7 CFR 205.2](#) and refers to a variety of methods used to genetically modify organisms or influence their growth and development in ways that are not possible under natural conditions.

³ DeVetter, L., B. Madrid, C. Miles, M. Flury, D. Griffin-LaHue, J. DeBruyn, S. Schaeffer, D. Hayes, and S. Ghimire. 2021. "Public Submissions to the NOSB." Washington State University; University of Tennessee-Knoxville; University of Connecticut. September 28. <https://www.regulations.gov/comment/AMS-NOP-21-0038-0239>.

⁴ DeVetter, L., S. Shrestha, and D. Hayes. 2021. "What is a Soil-Biodegradable Plastic mulch Composted Of?" *Washington State University Extension*. July. Accessed July 13, 2023.

<https://s3.wp.wsu.edu/uploads/sites/2181/2021/07/What-is-in-a-BDM.pdf>.

⁵ Miles, C., S. Shrestha, and S. Ghimire. 2021. "Soil-Biodegradable Mulch for Organic Production." *Washington State University Extension*. May. Accessed July 13, 2023. https://s3.wp.wsu.edu/uploads/sites/2181/2021/06/4.-BDM-organic_presenter-notes.pdf.

⁶ Miles, C. 2023. "Reducing Plastics Along the Entire Organic Supply Chain." *The Organic Center Confluentes Organic Week 2023*. Washington, DC: <https://www.organic-center.org/organic-confluentes-during-organic-week-washington-dc>.

⁷ Michigan State University. 2019. "Biodegradable Biobased Mulch Films in Organic Crop Production." *National Organic Program*. September. Accessed July 13, 2023.

<https://www.ams.usda.gov/sites/default/files/media/2019MemoBiobasedMulchReport.pdf>.

⁸ Miles, C., B. Madrid, L. DeVetter, and B. Weiss. 2023. "Soil-Biodegradable Plastic Mulch for Organic Production Systems." *Washington State University Extension*. March. Accessed July 13, 2023. <https://smallfruits.wsu.edu/documents/2023/05/soil-biodegradable-plastic-mulch-for-organic-production-systems.pdf/>.

⁹ Ghimire, S., D. Hayes, J. Cowan, D. Inglis, L. DeVetter, and C. Miles. 2018. "Biodegradable Plastic Mulch and Suitability for Sustainable and Organic Agriculture." *Washington State University Extension*. Accessed July 13, 2023. <https://pubs.extension.wsu.edu/using-biodegradable-plastics-as-agricultural-mulches>.

¹⁰ Royer, S., F. Greco, M. Kogler, and D. Deheyn. 2023. "Not so biodegradable: Polylactic acid and cellulose/plastic blend textiles lack fast biodegradation in marine waters." *PLOS ONE*. <https://doi.org/10.1371/journal.pone.0284681>.

¹¹ United States Environmental Protection Agency (EPA). 2022. *Frequently Asked Questions about Plastic Recycling and Composting*. August 30. Accessed July 13, 2023. <https://www.epa.gov/trash-free-waters/frequently-asked-questions-about-plastic-recycling-and-composting#dif>.

APPENDIX A – History of NOSB Review & NOP Rulemaking Activity for BBMF

Website: [NOP Petitioned Substances Index entry for Biodegradable Biobased Mulch Films \(BBMF\)](#)

Timeline:

- 2012 [Petition](#) requesting addition of BBMF to the National List.
- 2012 [Technical Report](#).
- 2012 Fall [NOSB recommendation](#) to add BBMF to the National List.
- 2014 [NOP final rule](#) adding BBMF to the National List (79 FR 58655). The preamble explains that all BBMF feedstocks must be derived from renewable materials (biobased), not fossil-fuels.
- 2015 NOP Policy Memorandum 15-1 clarified that all feedstocks must be biobased, and non-biobased feedstock such as petrochemical resins are prohibited. The 2019 NOP Memorandum (see below) rescinded this memorandum as it did not present new information or impose additional requirements compared to the 2014 NOP final rule.
- 2015 [Report on Biodegradable Biobased Mulch Films](#).
- 2016 [Limited Scope Technical Report](#).
- 2017 Fall [NOSB recommendation](#) to renew BBMF (2019 Sunset).
- 2019 Spring NOSB meeting: [Expert panel on BBMF](#).
- 2019 [NOP Memorandum](#) to NOSB to rescind Policy Memorandum 15-1, transmit a BBMF study from Michigan State University, and request the Board’s review and recommendation for next steps.
- 2019 [NOP notice](#) renewing BBMF until 2024 (84 FR 53577).
- 2020 Spring [NOSB discussion document](#).
- 2020 Fall [NOSB discussion document](#).
- 2021 Fall [NOSB recommendation](#) to amend BBMF.
- 2022 Fall [NOSB recommendation](#) to renew BBMF (2024 Sunset).
- 2023 [NOP notice](#) renewing BBMF until October 30, 2029 (88 FR 22893).