



CENTER FOR FOOD SAFETY

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Toni Strother, Agricultural Marketing Specialist
USDA National Organic Program
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1400 Independence Ave. SW
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Comments on Biodegradable Bioplastic Mulch Film Draft Rule

The Center for Food Safety (CFS) is a non-profit membership organization that works to protect human health and the environment by curbing the proliferation of harmful food production technologies and by promoting organic and sustainable agriculture. Our membership has rapidly grown to include over three hundred and fifty thousand people across the country that support organic food and farming, grow organic food, and regularly purchase organic products.

Our comments address the proposed addition to the National List (NL) of biodegradable bioplastic mulch (BBM) film. While, theoretically, biodegradable bioplastic mulch is preferable to petrochemical-based mulch because it would substantially reduce landfill waste from organic farms, research has *not* conclusively demonstrated its biodegradation in the field.¹ Even BBMs that conform to the proposed ASTM standards have yet to be proven to completely biodegrade in the field. And, those currently on the market also have not undergone any long-term soil testing to ensure the absence of negative impacts on agroecosystems. Moreover, the definition and standards contained in the proposed rule are limited in scope and do not provide sufficient details about the specific components biodegradable bioplastic mulches would need to ensure full degradability.

Given the issues of questionable biodegradability and the unknown environmental effects of the breakdown products of BBM in the soil, CFS believes that BBM is not ready for use on organic farms. More research is needed to determine how best to fully degrade the mulch in organic systems across a wide range of conditions. Further product development is also needed to create BBM that is truly biodegradable and that does not detrimentally impact the agroecosystem as it breaks down. Only those mulches that have been proven to fully degrade

¹ Miles, C., Wallace, R., Wszelaki, A., Martin, J., Cowan, J., Walters, T. and Inglis, D. 2012. Deterioration of Potentially Biodegradable Alternatives to Black Plastic Mulch in Three Tomato Production Regions. *HortScience* 47(9): 1270-1277

in soil should be allowed in organic systems of production. Since no such products currently exist in the marketplace, adding BBM to the NL at this time is premature.

ASTM Standards are Not Applied Appropriately

Composting standards (ASTM D6400 and D6868) that form the backbone of the proposed regulation are standardized laboratory protocols. They are specifically designed to evaluate biodegradation in controlled, industrial composting facilities, not to simulate farm field conditions.² A managed, industrial compost environment is not comparable to the soil environment on farms because such facilities strictly control the temperature, moisture, and composition of the compost to promote optimal biodegradation. These protocols do not replicate, nor are they intended to replicate, the environmental conditions present on organic farms.

The biodegradation standard (ASTM D5988) contained in the draft rule also does not address the wide variety of conditions found on organic farms because it is a laboratory test that uses specific temperatures and parameters in a controlled environment.³ It relies on specified conditions that would not be found during the fallow season on farms, including warm ambient temperatures and inoculation with microbes from several different soil types. While this standard is more comparable to field conditions (because it attempts to replicate a soil environment) than the compostability specifications in ASTM D6400 and D6868, it still does not assure the performance of materials on organic farms.

Biodegradation of mulch proceeds at different rates in different climates and soils which means that BBM may be less suitable for use and/or may require more active management to ensure degradation in certain regions. Climate and weather variations will impact the rate of biodegradation and may impact the ability of mulches to degrade completely. Incomplete degradation of mulches on organic farms could cause serious problems for growers, including potentially difficult and costly removal of partially-degraded mulch films.

AMS has requested comments on whether it would be sufficient to define mulches approved for use in organic systems based upon biodegradation (ASTM D5988) and biobased (ASTM D6866) parameters only. CFS believes that this is insufficient because ASTM D5988 does not require the complete degradation of mulch.⁴ Instead, the standard only requires demonstrating 90% biodegradation in testing, which does not address residual components of mulch that could build up in soils over time. It is crucial that any standard for regulating BBM use in organic

² ASTM International. 2012. D6400-12: Standard Specification for Labeling of Plastics Designed to be Aerobically Composted in Municipal or Industrial Facilities.; ASTM International. 2012. D6868-11: Standard Specification for Labeling of End Items that Incorporate Plastics and Polymers as Coatings or Additives with Paper or Other Substrates Designed to be Aerobically Composted in Municipal or Industrial Facilities.

³ ASTM International. 2012. D5988-12: Standard Test Method for Determining Aerobic Biodegradation of Plastic Materials in Soil.

⁴ ASTM International. 2012. D5988-12.

systems must require complete biodegradability or risk compromising soil and plant health with unknown effects. There may be more appropriate standards in development, including an ASTM standard that seeks to evaluate biodegradation of plastics in the soil environment.⁵ Until an applicable standard is identified and products are developed that meet biodegradability requirements, AMS should not approve BBM.

Current Studies Show Inadequate Degradation

The draft regulation states that biodegradable mulch is intended to be incorporated into organic fields at the end of the growing season and left to compost in that unmanaged environment over the fallow season. However, field research has yet to confirm that the mulch can actually be biodegraded in the field. Research has shown that even those products on the market that meet the ASTM composting standards do not fully biodegrade in the field.⁶ Thus, compliance with these composting standards is not indicative of a mulch's performance in the field. More research is needed to determine an appropriate standard that could be replicated in a range of organic farming field conditions across the country.

Research from agricultural field experiments in Lubbock, TX, Knoxville, TN, and Mount Vernon, WA, which tested several biodegradable plastic mulches complying with ASTM standards, showed variable levels of decomposition during the growing season.⁷ The research evaluated commercially available BBM and found the greatest deterioration on the soil surface by the end of the growing season was at sites with the highest humidity.⁸ These results suggest that the field performance of the mulches varies based on climate and weather conditions.

In field tests at those same sites, mulch samples were buried in mesh bags at the end of the growing season and only the samples from the Texas site showed "significant degradation."⁹ Surface area degradation of the biodegradable mulches ranged from 0% at the Washington site to almost 90% at the Texas site after 18 months in the soil.¹⁰ These preliminary results are extremely concerning because they suggest that products meeting the proposed ASTM biodegradability definition may only partially biodegrade, or not at all, under certain field conditions. This experiment is ongoing and complete results from this as well as other field studies should be considered before biodegradable mulches are approved for use in organic systems.

⁵ Corbin, A., Miles, C., Cowan, J., Hayes, D., Inglis, D., and Dorgan, J. 2013. Using biodegradable plastics as agricultural mulches. Washington State University Extension Fact Sheet: FS103E. Available at: <http://cru.cahe.wsu.edu/CEPublications/FS103E/FS103E.pdf>.

⁶ Corbin, A., et al. 2013.

⁷ Miles, C. et al. 2012.

⁸ Miles, C. et al. 2012.

⁹ Inglis, D., Miles, C., Corbin, A., Belasco, E., Brodhagen, M., Hayes, D., Lee, J., Leonas, K., Marsh, T., Moore-Kucera, J., Wadsworth, L., Wallace, R., Walters, T., and Wszelaki, A. 2011. SCRI-SREP Project CRIS Report: Biodegradable Mulches for Specialty Crops Produced Under Protective Covers, Year 2. Available at: <http://mtvernon.wsu.edu/hightunnels/Content/SCRI-CRIS-2011.pdf>

¹⁰ Corbin, A., et al. 2013.

Potential Adverse Impacts of Mulch Additives are Not Addressed

It is important to ensure that all materials that will be added to organic fields and left to compost are entirely biobased because remnants of the materials could remain in the fields until they fully degrade. Yet, as currently proposed, the regulations do not clearly stipulate that the entire mulch product must be biobased and derived from renewable resources. CFS is concerned about the lack of studies that evaluate residual materials from biodegradation, especially ingredients that may not be biobased such as colorants, plasticizers and other minor ingredients. The Technical Evaluation Report (TER) submitted to the NOSB identifies incomplete degradation of bioplastics as an important “data gap” in the literature about biodegradable mulches.¹¹ None of the proposed ASTM standards require proof of total biodegradation due to the error margins provided for in each testing protocol. This could allow minor components of the mulch to remain undetected or partially degraded and to accumulate in soils when mulches are used on the same field for successive seasons.

Most studies conducted on biodegradable mulches have relied upon visual assessments of biodegradation, which is insufficient to understand the composition of residues that may remain in the soil after partial degradation. The TER recognizes the need for adequate evaluation of biodegradation, noting that “testing is necessary to determine which polymer mixtures are degraded completely and what effects incomplete degradation may have on the agroecosystem.”¹² According to the TER, “ecotoxicology studies on biodegradable polymers following partial or complete decomposition in the soil are not common... a better understanding of bioplastic degradation and soil environmental effects is needed.”¹³ The variety of conditions under which these mulches are expected to perform amplifies the need for extensive field testing and evaluation of their biodegradation. This lack of ecotoxicological studies to test for potential residues or harmful compounds, alone, should preclude AMS from supporting the use of biodegradable mulches in organics, particularly since the environmental impacts remain largely unknown.

There are also unanswered questions concerning the bioavailability of partially degraded BBM to wildlife. The health of soil microbial communities that are directly exposed to the mulch during the biodegradation process is of particular concern, especially given the importance of soil quality to healthy organic farming systems. Introduction of BBM may favor certain species of microbes which are better suited to utilizing the mulch as a food source, thus altering the microbial community. It is also possible that intermediate or breakdown compounds in the biodegradation process or mulch residues could be harmful to some soil microbes. While the effects of biodegradation on microbial communities have not yet been analyzed, this is a critical

¹¹ USDA National Organic Program. 2012. Technical Evaluation Report: Biodegradable Mulch Film Made from Bioplastics. Compiled by ICF International. August 2. Lines 651-652.

¹² USDA NOP. 2012. TER: Biodegradable Mulch Film Made from Bioplastics. Lines 595-597.

¹³ USDA NOP. 2012. TER: Biodegradable Mulch Film Made from Bioplastics. Lines 443-444.

area of further research that must be conducted before the use of BBM is permitted in organic agriculture.¹⁴

Another concern about partially degraded mulch is the inadvertent spread of BBM pieces to adjacent ecosystems. As the degradation process begins and holes appear on the surface of the mulch, pieces may become loose and disperse throughout the environment. Depending on the size of the fragments, they may be bioavailable to different species in both the terrestrial and aquatic ecosystems that surround organic farms. Mulch fragments can enter aquatic ecosystems via runoff, wind or animals where they will not be able to be recovered. This could adversely impact aquatic species when ingested. If dispersal occurs, farmers will not be able to take appropriate actions to ensure complete degradation at the end of each growing season. Further research should be conducted to assess risks to wildlife, aquatic life, and adjacent ecosystems and to suggest best management practices that farmers can use to minimize dispersal of mulch fragments from their farms.

Regulations Must be Clear for Growers and Certifiers

AMS' proposed listing does not incorporate the NOSB's suggested language about grower responsibility for taking steps to ensure BBM is adequately composted. While best management practices will vary from region to region, depending upon factors such as soil type, microbial activity, and climate, it is still important for the regulations to be clear about how BBM should be used in organic systems. While other portions of the Organic Rule establish grower responsibility for building soil and avoiding practices that are detrimental to agroecosystems, we believe that strong regulations must be promulgated that detail best management practices for using and degrading BBM. This is especially relevant for certifiers who must ensure that mulch products are completely broken down in the field. AMS should not wait until problems arise with respect to the use and incomplete degradation of BBM before mandating best management practices. Instead, research must be conducted prior to finalizing rules to evaluate pitfalls, anticipate problems, and to develop a method for certifiers and growers to confirm that biodegradation is occurring and that it is complete. Considering whether to develop guidance after problems have arisen is too late and compromises organic integrity.

A More Robust Annotation is Required

We understand that the term "plastic" was removed from the "biodegradable, biobased mulch film" definition in the NOSB recommendations and draft rule because OFPA prohibits plastics from remaining in the field after the growing season.¹⁵ But, the removal of the term "plastic" serves to obfuscate what the rule is intended to regulate. What is being regulated is clearly a form of biobased plastic and the text of the proposal confirms this by stating that

¹⁴ Miles, C. et al. 2012.

¹⁵ 7 CFR § 205.206(C)(6).

biodegradable mulch film is “applied to agricultural fields as a thin plastic layer and is left in the field to biodegrade.”¹⁶ CFS believes that the full biodegradation of BBM constitutes its “removal,” in accordance with OFPA. If this standard cannot be met, then complete removal of the BBM has not occurred and its use cannot be allowed, by law. To be clear to all stakeholders, we urge the AMS to retain the word “plastic” in the term of what the rule is ultimately intended to regulate—biodegradable bioplastic mulch film.

In addition, while this draft rule specifically states that excluded methods must not be used in the production of BBM for organic production, it is silent on the issue of nanotechnology. To reinforce the understanding that products of engineered nanotechnology are prohibited in the production of BBM, we believe that it should be explicitly stated in the regulation. Given that specific nanotechnology regulations have not been forthcoming by the NOP, we believe it is essential to explicitly include the prohibition in BBM regulations to prevent any confusion or misinterpretation of the rule, now and in the future as nanotechnologies develop. Moreover, the NOSB and NOP have clearly stated that engineered nanomaterials are inconsistent with organic systems of production.¹⁷ Therefore, any rules promulgated to govern bioplastics must reflect that decision. We urge the AMS to include a prohibition on the use of engineered nanomaterials in the annotation of BBM once the regulations and the mulch are ready for approval.

Biodegradable Bioplastic Mulch is Not Ready for Prime Time

In the face of concrete evidence that products conforming to the proposed ASTM standards are not performing adequately in the field, due to their failure to completely biodegrade, CFS urges AMS to *not* list BBM at this time. We do not believe that the mulches currently on the market can be reliably composted in organic field conditions, even if they comply with the proposed ASTM standards. We urge the NOSB and NOP to encourage more innovation in the bioplastics industry and urge AMS to wait until a reliable source of BBM is developed and tested before adding it to the National List.

Many unanswered questions remain about the impacts of BBM on soil and the surrounding ecosystem. Research is ongoing to answer questions about what constitutes an acceptable biodegradable bioplastic mulch product and what steps need to be taken on the farm to facilitate biodegradation under a range of field conditions. Research is also needed to evaluate the long-term impacts of partially degraded residues on cropping systems, soils, biodiversity, and wildlife. This necessitates that AMS work with the NOSB and NOP to more substantively define

¹⁶ Federal Register. 2013. Proposed Rules: National Organic Program; Proposed Amendments to the National List of Allowed and Prohibited Substances. 78(163): 52101.

¹⁷ McEvoy, Miles. 2010. Memorandum for the Chairperson of the National Organic Standards Board, Subject: National Organic Standards Board Recommendations. 17 December. 9-10.; NOSB. 2010. Formal Recommendation by the NOSB to the NOP, Subject: Guidance Document—Engineered Nanomaterials in Organic Production, Processing and Packaging. 28 October. Available at: <http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5087795&acct=nosb>

the complete biodegradation of products and how it can be accomplished in organic production systems.

We urge you to withdraw the current proposal and support further research into resolving data gaps that would allow farmers and certifiers to confidently allow biodegradable bioplastic mulch as an alternative to petroleum-based mulch in organic agriculture systems.

Thank you for your consideration of our comments.

Sincerely,

Lisa J. Bunin, Ph.D.
Organic Policy Director

Sarah Stevens
Organic Program Assistant