



# BEYOND PESTICIDES

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## Re. CS: Biodegradable Biobased Mulch Film

These comments to the National Organic Standards Board (NOSB) on its Spring 2017 agenda are submitted on behalf of Beyond Pesticides. Founded in 1981 as a national, grassroots, membership organization that represents community-based organizations and a range of people seeking to bridge the interests of consumers, farmers and farmworkers, Beyond Pesticides advances improved protections from pesticides and alternative pest management strategies that reduce or eliminate a reliance on pesticides. Our membership and network span the 50 states and the world.

The 2015 report<sup>1</sup> from the Organic Materials Review Institute (OMRI) and the 2016 supplemental technical review by OMRI<sup>2</sup> confirm what many critics said when biodegradable biobased bioplastic mulch (BBBM) was first proposed for the National List –BBBM is “not ready for prime time.”

The 2015 report states that BBBM as specified in the NOSB recommendation and NOP regulations does not exist. The recommendations, regulations, and NOP Policy Memo 15-1 (2015) make it clear that the BBBM must be 100% biobased. According to OMRI’s report, based on consultation with manufacturers, “In summary, the biobased content for commercially available BBMFs at the time of this report ranges from ~10-20%, with the remaining portion being derived from fossil fuels or other inorganic materials such as minerals and dyes.”<sup>3</sup>

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<sup>1</sup> OMRI, 2015. Report on Biodegradable Biobased Mulch Films.

<https://www.ams.usda.gov/sites/default/files/media/Biobased%20mulches%20report.pdf>.

<sup>2</sup> OMRI, 2016. Supplemental Technical Evaluation Report: Biodegradable Biobased Mulch Films.

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

<sup>3</sup> OMRI, 2015. Report on Biodegradable Biobased Mulch Films.

<https://www.ams.usda.gov/sites/default/files/media/Biobased%20mulches%20report.pdf>.

Faced with such information, the NOSB must be in a quandary. Should the board revise the listing (and definition) in the regulations to match the available products? Or should the NOSB vote to relist BBBM in the hope that the market will respond?

We suggest that the appropriate action is to base the sunset decision on the material as listed. BBBM was approved through a hasty consideration of the facts, under pressure from growers anxious to use the products. However, some elements of the NOSB's decision were a result of pressure from those who were concerned about environmental impacts of the material. Safeguards placed in the definition and listing should not be discarded.

However, the review in the 2016 Supplemental TR (STR) shows that many questions are still open. In fact, in considering the questions posed by the Crops Subcommittee (CS), the STR says, "Although these mulches, referred to herein as biodegradable mulch films (BMFs), do not meet the requirement for 100% biobased polymer content specified in NOP Policy Memo 15-1, they are discussed in this technical report since they have undergone field research related to the focus questions requested by the subcommittee, whereas very little field research on 100% biobased biodegradable mulch film is reported in the literature."<sup>4</sup>

## **Environmental and Health Effects**

Two research projects funded by USDA's National Institute of Food and Agriculture Specialty Crop Research Initiative –the first carried out between 2010 and 2013 (SCRI 1) and the second funded for four years beginning 2014 (SCRI 2) provide much of the data used in the STR.

- Current research reports a lack of reliable methods for measuring biomass carbon or carbon residues from the degradation of BMFs, but "one of the current SCRI 2 project goals is to determine how BMFs contribute to the carbon cycle, including the fractions that are bioassimilated, lost to the atmosphere as CO<sub>2</sub> via respiration, or converted into stable soil organic carbon: humus."<sup>5</sup>
- Researchers observed conflicting results concerning soil organic matter mineralization under BMF.<sup>6</sup>
- Studies conducted under SCRI 1 concluded that factors other than the use of BMF were most important in determining soil quality, and many more factors are being evaluated in the SCRI 2.<sup>7</sup>
- The scant evidence on ecotoxicity of the degrading BMFs, and what exists is equivocal. More research is underway as part of SCRI 2.<sup>8</sup>
  - Cumulative impacts of continued use of BMFs is also uncertain. The STR reports on research by Brodhagen et al, who looked at the potential for long-term accumulation of fragments with continued use of BMFs that pass the ISO 17088 (2012) and ASTM D6400-

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<sup>4</sup> OMRI, 2016. Supplemental Technical Evaluation Report: Biodegradable Biobased Mulch Films. Lines 17-21.

<sup>5</sup> OMRI, 2016. Supplemental Technical Evaluation Report: Biodegradable Biobased Mulch Films. Lines 97-102.

<sup>6</sup> OMRI, 2016. Supplemental Technical Evaluation Report: Biodegradable Biobased Mulch Films. Lines 118-134.

<sup>7</sup> OMRI, 2016. Supplemental Technical Evaluation Report: Biodegradable Biobased Mulch Films. Lines 180-197.

<sup>8</sup> OMRI, 2016. Supplemental Technical Evaluation Report: Biodegradable Biobased Mulch Films. Lines 200-219.

12 (2012) composting standards. They report that the biodegradability standards of these tests would permit the accumulation of small plastic fragments (< 2.0 mm), as well as up to 49% of the concentration of regulated metals allowed for sludges, fertilizers and composts. A new testing standard under consideration for aerobically biodegradable plastics in a soil environment, ASTM WK29802 (2014), would result in similar conditions: persistence of 10% of the plastic mass after 2 years for each constituent present in the material at a concentration of more than 1%. With their assumptions, the authors calculate that, if any portion of the remaining 10% represents recalcitrant polymers, metals or untested components, they will accumulate with repeated applications in the soil in a manner that can be estimated.<sup>9</sup>

- Similarly, the STR reports, “There is a lack of specific evidence in the current scientific literature to show that the breakdown of BMF polymers adversely affects soil and plant life or subsequently grazing livestock. . . Although these studies did not uncover significant impacts of BMF degradation products on soil or plant life, it is generally accepted that any such impacts are poorly understood and need further study. Regarding livestock that that would graze crop residues or forages grown subsequent to the use of BMFs, Brodhagen et al. (2015) report that it is unknown what effect the ingestion of plastics has on terrestrial organisms. It has been noted that plastics can absorb pesticides and other contaminants such as mycotoxins in the environment.”<sup>10</sup>
- The STR reports variation in decomposition of BMFs is affected by soil temperature, moisture, pH, nitrogen content, native microbial populations, and type of BMF.<sup>11</sup>
- The STR states, “It is currently unknown whether complete degradation of BMF is possible.” There are many intermediates produced in decomposition. “The effect of BMF additives, processing aids and their metabolites which are released into the environment during BMF degradation have not been extensively addressed in the scientific literature.” “Breakdown of a BMF polymer could potentially result in the release of nutrient elements such as nitrogen, with potential implications as a fertilizer or cause of toxicity, as in the case of ammonium, though such a scenario is more likely to occur in composted mulches.” “Research related to the risks and benefits of carbon emissions during microbial breakdown of biodegradable mulches has yet to be undertaken; however, increased mineralization of soil organic matter due to elevated temperature and moisture has been cited as a source of increased greenhouse gas emissions.”<sup>12</sup>

In summarizing the research on the impacts on soil health, the STR states, “These findings suggest that the effects of BMF degradation on soil quality will vary substantially based on a

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<sup>9</sup> OMRI, 2016. Supplemental Technical Evaluation Report: Biodegradable Biobased Mulch Films. Lines 245-253.

<sup>10</sup> OMRI, 2016. Supplemental Technical Evaluation Report: Biodegradable Biobased Mulch Films. Lines 271-295.

<sup>11</sup> OMRI, 2016. Supplemental Technical Evaluation Report: Biodegradable Biobased Mulch Films. Lines 313-377.

<sup>12</sup> OMRI, 2016. Supplemental Technical Evaluation Report: Biodegradable Biobased Mulch Films. Lines 383-436.

combination of factors, including the type of BMF used, location, cropping system and time since mulch incorporation.”<sup>13</sup>

The NOSB does not, therefore, have information to determine that BBBM meets the OFPA criterion of lack of negative effects on human health and the environment.

## **Essentiality of BBBM**

Since the studies that have been begun to address the many unknowns associated with the effects of BBBM on soils and the ecosystem will still require years to complete, the time should also be used to further investigate other ways of meeting the needs served by plastic mulches. To the extent that plastic mulch is used for weed control, natural mulches and cover crops can accomplish the job in a way that is more compatible with organic production.<sup>14</sup>

## **Compatibility with Organic Production**

### **Routine use of synthetic materials**

The NOSB Principles of Organic Production and Handling<sup>15</sup> state:

Organic agriculture is an ecological production management system that promotes and enhances biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. These goals are met, where possible, through the use of cultural, biological, and mechanical methods, as opposed to using synthetic materials to fulfill specific functions within the system.

The routine use of synthetic inputs do not appear to be consistent with this principle. This applies to non-biodegradable plastic as well as BBBM.

### **Removal**

The biodegradable biobased mulch film, which was originally petitioned as “biodegradable plastic mulch made from bioplastics” is, regardless of all the qualifiers, a synthetic plastic. As such, it is subject to the OFPA restriction that prohibits the use of “plastic mulches, unless such mulches are removed at the end of each growing or harvest season.” (OFPA §6508(c)(2)) We agree with those who propose that complete degradation (not necessarily complete mineralization) would qualify as “removal.” Unfortunately, we do not believe that the biodegradability/compostability criteria in the regulation are adequate to ensure biodegradability within the timeframe of OFPA. We believe that further research is needed to determine the appropriate criteria for biodegradability –and hence, removal. This is particularly important since NOP’s regulation removed the NOSB requirement for producers to take the appropriate steps to ensure biodegradation in the timeframe allowed by OFPA.

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<sup>13</sup> OMRI, 2016. Supplemental Technical Evaluation Report: Biodegradable Biobased Mulch Films. Lines 58-60.

<sup>14</sup> See Jeff Moyer, 2011. *Organic No-Till Farming*. Acres USA, Austin, TX. 2012 TR on Biodegradable Mulch Film Made from Bioplastics. Lines 684-721.

<sup>15</sup> Adopted October 2001. See 2016 Policy and Procedures Manual, pp. 37-38.

The standard for biodegradation must be removal at the end of each growing or harvest season. Neither the standard put into regulation by NOP nor the standards proposed by the NOSB appear to be adequate to ensure complete removal. They do not address the wide range of conditions found on organic farms. A short review of the current state of affairs with respect to biodegradable biobased bioplastic mulches states,<sup>16</sup>

Many types of mulch claiming to be biodegradable are actually compostable, and fulfill the requirements of ASTM D6400, or related standards. Moreover, no standard currently exists for measuring the biodegradability of plastics buried in soil under field soil conditions. To meet this need for measuring biodegradability within the soil, ASTM is developing a standard through a specification (Work Item 29802) entitled "Aerobically Biodegradable Plastics in the Soil Environment" (Ramani Narayan, ASTM Fellow, personal communication). In this new standard, biodegradable mulches must break down into CO<sub>2</sub>, water and environmentally benign substances within one or two years, leaving no harmful residues. The ability of existing and emerging biodegradable plastic mulch products to meet these criteria in the soil environment is still being researched.

Therefore, and as discussed in the STR, we believe that it is not yet possible to establish adequate criteria that can be implemented by materials review organizations, certifiers, and growers that will ensure biodegradability to the extent required by OFPA.

### **Nanomaterials**

We are also concerned about the removal of the prohibition on engineered nanomaterials from the NOSB's motion. Miles McEvoy stated at the meeting that MROs can depend on NOSB recommendations:

Then if there were particular questions about, let's say, the clause and nanomaterials is removed, if there were questions that a manufacturer was using nanomaterials, they would go to the final recommendation from the NOSB on nanomaterials to say that those are synthetic substances and are not allowed in those substance -- those products that are being approved.

However, recent experience has taught us that NOP does not always stand by NOSB recommendations, so this assurance is inadequate, and we request that a prohibition on engineered nanomaterials be added as part of the annotation.

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<sup>16</sup> 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>

## Conclusion

Biodegradable bioplastic mulch film and the associated definition should be removed from the National List. Further research is needed before BBBM meeting OFPA criteria will be available. Furthermore, neither NOP nor the NOSB can weaken the requirement in OFPA that plastic mulch –bioplastic or other—be removed at the end of the growing season.

Thank you for your consideration of these comments.

Sincerely,

A handwritten signature in black ink, appearing to read "Terry Shistar".

Terry Shistar, Ph.D.  
Board of Directors

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