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Docket ID # AMS-NOP-20-0041

Re. Biodegradable Biobased Bioplastic Mulch

These comments to the National Organic Standards Board (NOSB) on its Fall 2020 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.

Background

Many things have changed since the passage of the Organic Foods Production Act (OFPA). Organic production has grown, and the size of many organic growing operations has grown. The way materials on the National List are used has changed—and many growers have become more dependent on those added synthetics. In addition, the materials themselves have changed. All of these changes are manifest in two materials on the National List—newspaper and other recycled paper and plastic mulch and covers.

Natural organic mulches should be the norm in organic production. The use of natural organic materials in compost and mulch is foundational to organic. In 2001, the National Organic Standards Board (NOSB)¹ gave this definition:

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

¹ NOSB Principles of Organic Production and Handling. NOSB Recommendation Adopted October 17, 2001.

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 NOSB went on to say that, among other things, an organic production system is designed to: “optimize soil biological activity;” “utilize production methods and breeds or varieties that are well adapted to the region;” “recycle materials of plant and animal origin in order to return nutrients to the land, thus minimizing the use of non-renewable resources;” and “minimize pollution of soil, water, and air.” The use of natural mulches—including cover crops—contributes to all of these values.

Organic production systems are also intended to mimic natural ecosystems. In natural systems, plants are fed by the action of soil organisms breaking down plant residues and excreting substances that are plant nutrients. Natural mulches provide a steady diet of organic matter for those soil organisms. This function is one way that we can judge the compatibility of synthetic mulches with organic values.

Plastic Mulch

As stated above, the use of natural organic mulches is foundational to organic production. The 1973 edition of the *Encyclopedia of Organic Gardening* does not mention plastic in its entry on mulches. By the time OFPA was passed and the first National List was promulgated, plastic mulch was so routinely used that it was approved unanimously by the NOSB. Nevertheless, some misgivings are reflected in the language of OFPA, prohibiting the use of plastic mulches “unless such mulches are removed at the end of each growing or harvest season.” The regulations also prohibit PVC plastic as mulch. Testimony at NOSB meetings indicates that this language is understood by many, but not all, certifiers to allow the continuous use of plastic mulch in perennial crops, such as fruit trees because the “growing season” is continuous.² Those using plastic mulch in annual crops report taking truckloads of mulch to the landfill at the end of the growing season.

Does plastic mulch meet OFPA criteria?

OFPA requires that a synthetic material on the National List meet three criteria:

1. It is not harmful to human health or the environment;
2. It is necessary to the production or handling of the agricultural product because of the unavailability of wholly natural substitute products; and
3. It is consistent with organic farming and handling.

The NOSB’s 2015 sunset review of plastic mulch looked at these criteria in greater depth than before. With regard to impacts on human health and the environment, the NOSB said:

² NOSB meeting materials, Fall 2018. Plastic mulch and covers.

- Polyethylene is usually derived from either modifying natural gas (a methane, ethane, propane mix) or from the catalytic cracking of crude oil into gasoline, though it may be made from biological sources.³
- Use of plastic mulch leads to environmental contamination because used plastic gets taken to landfills, and pieces are left behind on fields.

With regard to the need for plastic mulch “because of the unavailability of wholly natural substitute products,” the NOSB and technical reviews have pointed out alternatives. Natural alternatives are organic mulches and living mulches. Alternative practices that could be used include: for weed control, tillage and other mulches; for soil warming, planting adapted plants.

The NOSB and technical reviews have also pointed out reasons that plastic mulch is not compatible with organic farming:

- Solarization kills microorganisms.
- Loss of water: In one season, the loss of water was 2-4 times higher and the loss of soil sediment was three times higher in plots where PE mulch was used compared to those where hairy vetch residues were used.
- The substitution of plastic for natural mulches reduces inputs of organic matter.

Microplastics

Scientists are increasingly concerned about the impacts of microplastics—plastic fragments less than 5 mm in size—in size—on a wide range of organisms. Although concerns were first raised about microplastics in the marine environment, impacts on terrestrial organisms are increasingly documented.

A major source of microplastics in surface water is wastewater treatment plants. Although microplastics in soil have been less studied, presumably, microplastics in soil make their way in runoff to surface water. Agricultural soils may receive microplastics from sludge/compost fertilization, plastic mulches, and wastewater irrigation.⁴

Microplastics can cause harmful effects to humans and other organisms through physical entanglement and physical impacts of ingestion. They also act as carriers of toxic chemicals that are adsorbed to their surface. Some studies on fish have shown that microplastics and their associated toxic chemicals bioaccumulate, resulting in intestinal damage and changes in metabolism.⁵ Soil organisms and edible plants have been shown to ingest microplastic particles.⁶ Earthworms can move microplastics through the soil, and microplastics

³ Priscilla Lepoutre, The Manufacture of Polyethylene. <http://nzic.org.nz/ChemProcesses/polymers/10J.pdf>.

⁴ Zhu, F., Zhu, C., Wang, C. and Gu, C., 2019. Occurrence and ecological impacts of microplastics in soil systems: a review. *Bulletin of environmental contamination and toxicology*, 102(6), pp.741-749.

⁵ Li, J., Liu, H. and Chen, J.P., 2018. Microplastics in freshwater systems: A review on occurrence, environmental effects, and methods for microplastics detection. *Water Research*, 137, pp.362-374.

⁶ Zhu, F., Zhu, C., Wang, C. and Gu, C., 2019. Occurrence and ecological impacts of microplastics in soil systems: a review. *Bulletin of environmental contamination and toxicology*, 102(6), pp.741-749.

can move through the food chain to human food.⁷ Microplastics can have a wide range of negative impacts on the soil, which are only beginning to be studied, but include reduction in growth and reproduction of soil microfauna.⁸ When looking at the impact of microplastics, it is important to include the impact of associated substances. As noted above, they can carry toxic chemicals. A review by Zhu et al. cites several studies showing, “[M]icroplastics can serve as hotspots of gene exchange between phylogenetically different microorganisms by introducing additional surface, thus having a potential to increase the spread of ARGs [antibiotic resistance genes] and antibiotic resistant pathogens in water and sediments.”⁹

Biodegradable Biobased Bioplastic Mulch

Biodegradable biobased mulch film (BBMF) was approved by the NOSB for use in organic production in October 2012, and the listing was finalized September 30, 2014 as:

(iii) Biodegradable biobased mulch film as defined in §205.2. Must be produced without organisms or feedstock derived from excluded methods.

The NOP also adopted a definition in §205.2 of the regulations:

Biodegradable biobased mulch film. A synthetic mulch film that meets the following criteria:

- (1) Meets the compostability specifications of one of the following standards: ASTM D6400, ASTM D6868, EN 13432, EN 14995, or ISO 17088 (all incorporated by reference; see §205.3);
- (2) Demonstrates at least 90% biodegradation absolute or relative to microcrystalline cellulose in less than two years, in soil, according to one of the following test methods: ISO 17556 or ASTM D5988 (both incorporated by reference; see §205.3); and
- (3) Must be biobased with content determined using ASTM D6866 (incorporated by reference; see §205.3).

While BBMF was supported enthusiastically by those who saw an opportunity to have the benefits of plastic mulch without the wasteful and labor-intensive practice of carting it off to the landfill at the end of every growing season, others (including Beyond Pesticides) warned that the available products were “not ready for prime time.” As predicted, the Organic Materials Research Institute (OMRI) soon announced that no products met the criteria in the National List—that is, 100% biobased and biodegradable. Before long, we were seeing declarations by OMRI, NOP, and the newer members of the NOSB that “there was confusion among Material Review Organizations (MROs) and certification agencies about how much of

⁷ He, D., Luo, Y., Lu, S., Liu, M., Song, Y. and Lei, L., 2018. Microplastics in soils: analytical methods, pollution characteristics and ecological risks. *TrAC Trends in Analytical Chemistry*, 109, pp.163-172.

⁸ He, D., Luo, Y., Lu, S., Liu, M., Song, Y. and Lei, L., 2018. Microplastics in soils: analytical methods, pollution characteristics and ecological risks. *TrAC Trends in Analytical Chemistry*, 109, pp.163-172.

⁹ Zhu, F., Zhu, C., Wang, C. and Gu, C., 2019. Occurrence and ecological impacts of microplastics in soil systems: a review. *Bulletin of environmental contamination and toxicology*, 102(6), pp.741-749.

the feedstocks must be biobased.” This so-called confusion existed in spite of clarity from the NOSB in deliberations and listing and despite clarity on the part of NOP in its clarifying memo¹⁰ that the BBMF approved by the NOSB is 100% biobased.

BBMFs are not removed from the field by the grower. Instead, they are tilled into the soil. The tillage process purposefully creates microplastics, with the intention that the action of soil organisms will degrade these small particles. However, as reported in OMRI’s 2016 Supplemental Technical Review (STR)¹¹, many growers report that fragments persist in the soil. OMRI reports that research on the eventual fate of biodegradable mulch films is ongoing. There is nevertheless, research reported by OMRI indicating that the BBMFs do not completely degrade and may degrade more slowly when tilled under the surface, that they contain components that may be hazardous, and particles may adsorb persistent toxins.

Beyond Pesticides reiterates what many said at the time that biodegradable biobased mulch film (BBMF) was first petitioned for use in organic production—the available products are not “ready for prime time.” It is disappointing that having discussed at length in 2012 what would make an acceptable BBMF product that there is now an effort to undo that work.

Synthetic mulches should not replace organic mulches.

Organic mulches have always been a central aspect of organic production. The Rodale *Encyclopedia of Organic Gardening*, for example, begins its long entry on “mulch” with this: “A layer of material, preferably organic material, that is placed on the soil surface to conserve moisture, hold down weeds, and ultimately improve soil structure and fertility. As with composting, mulching is a basic practice in the organic method; it is a practice which nature employs constantly, that of always covering a bare soil.”¹²

According to the NOSB Principles of Organic Production and Handling,¹³ 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.

Reliance on synthetic mulches for functions that can be performed by organic mulch is not compatible with organic production. Since soil warming cannot be achieved by organic

¹⁰ NOP, January 22, 2015. Policy Memo 15-1. Subject: Biodegradable Biobased Mulch Film. From Miles McEvoy, Deputy Director of NOP.

¹¹ OMRI, 2016. TR Biodegradable Biobased Mulch Films.

¹² Rodale, J.I. and the staff of Organic Farming and Gardening magazine, 1959. *The Encyclopedia of Organic Gardening*, Rodale Books, Inc., Emmaus, PA. P. 722.

¹³ NOSB Recommendation Adopted October 17, 2001.

materials like straw, both the listings for plastic mulch and BBMF should be annotated “for soil warming only.”

Synthetic materials must meet all of the OFPA criteria.

In order to be included on the National List, synthetic materials must not cause harm from manufacture through disposal, be necessary for organic production, and be consistent with organic production. Avoiding harm from cradle-to-grave impacts requires that BBMF be both biobased and biodegradable.

The original listing for BBMF clearly intended the BBMF to be 100% biobased.

The lack of a qualifier on “biobased” clearly expresses the intention that the BBMF be 100% biobased. If that isn’t clear, then reading the checklist attached to the recommendation should clarify the issue. If the BBMF was not intended to be 100% biobased, then the NOSB review as reflected in the checklist, would have addressed the manufacture of non-biobased components.

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