Sustainable Mulch MANAGEMENT

Plastic Mulches in Horticulture Production

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Improved End-Of-Life of Plastic Mulches

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In This Issue...

Project Director's Note

Lisa Wasko DeVetter, Project Director, Professor, Washington State University

Momentum for our project remains strong. Although we are now well past the halfway point, substantial work continues as major milestones are reached. Our planned soil-biodegradable plastic mulch field trials in California, Washington, Nebraska, and Florida have wrapped up, with final results currently being generated in the lab. Soil health analyses from these sites will soon be completed and ready for dissemination alongside microplastic quantification results. These results will provide critical insights on the fate, residency time, and soil health impacts of soil-biodegradable plastic mulches relative to traditional, non-biodegradable plastic mulch made from polyethylene.

Our Recycling Working Group also continues to advance critical efforts characterizing mulch-film contamination, refining optimal cleaning approaches, and sharing findings with the life-cycle analysis Working Group to support robust comparisons of mechanical and chemical/advanced recycling pathways. Cost-benefit analysis is also integrated to ensure economic considerations are factored in.

Woven through all of this progress is the work of our Extension Working Group, which is actively gathering and sharing information across the many dimensions of the project. Our recent seven-part webinar series titled *"Improving End-of-Life Outcomes for Plastic Mulch"* is the latest outreach effort. We encourage you to explore these sessions to deepen your understanding of project activities and outcomes to date.

Despite the significant progress, we are pursuing a No-Cost Extension to complete ongoing laboratory experiments, finalize data analysis, and generate high-quality research papers that will be disseminated through our extension and outreach channels.

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Cover photo Farhad 'Hadi' Ghasemi leads a tour of research fields at the University of Florida's Gulf Coast Research and Education Center. Photo by Alice Akers, UF/IFAS.

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Why Biodegradable Mulches Matter for Our Soils and Our Future

Sean M. Schaeffer and Jacob Clements, University of Tennessee

Plastic mulch has become a staple in modern agriculture. It helps farmers conserve soil moisture, suppress weeds, and boost crop yields—sometimes by as much as 25–40% in a single season. But there is a hidden cost: conventional plastic mulch does not disappear when the season ends. Even when removed, fragments often remain in the soil, where they break down into microplastics and nanoplastics that will persist for decades. These tiny particles can interfere with soil structure, water movement, and even plant growth. They may also enter food webs, raising concerns for animal and human health (Jin et al., 2022).

Unlike traditional plastic, soil-biodegradable mulches (BDMs) are designed to break down in the soil after use, reducing the long-term accumulation of plastic waste. Farmers can till BDM into the soil at the end of the season, where microbes gradually convert them into carbon dioxide, water, and biomass. This approach aligns with the principles of a circular economy—keeping resources in use and minimizing waste—while addressing the growing problem of plastic pollution in agricultural soils (McKinney et al., 2026).

WHY IS THIS IMPORTANT?

Healthy soil is the foundation of sustainable agriculture. Soil is a living ecosystem that supports plants, animals, and humans. When plastics accumulate in soil, they can: 1) reduce water infiltration and retention, making crops more vulnerable to drought; 2) alter soil microbial communities, which are critical for nutrient cycling; and 3) introduce microplastics into food chains, with potential health risks for livestock and people.

BDMs offer a promising solution. Studies show they can improve soil health by adding organic matter and reducing erosion, while still providing the benefits of conventional mulch (Sintim et al., 2021). However, challenges remain for BDMs: their purchase price is greater than traditional polyethylene (PE) plastic mulch, their breakdown rates vary by climate and soil type, and fragments can persist for more than a year.

Ongoing research is focused on improving the performance of BDMs and understanding their long-term impacts. Previous and current work at the University of Tennessee, California Polytechnic University, and Washington State University has focused on assessing biodegradation of BDMs in both laboratory and field studies, by using a range of techniques to understand how BDMs break down in soil (Astner et al., 2023; Hayes et al., 2019; Sintim et al., 2021). For example, we have examined how BDMs perform when tilled into soil after the growing season (Figure 1). These studies aim to provide farmers with realistic expectations and inform BDM improvements. Field studies across the U.S. are showing that degradation rates vary widely depending on climate and soil conditions, making location-specific testing essential. BDMs are designed to degrade through microbial activity, but they do not break down completely within a year, leading to accumulation when BDMs are reapplied annually. Depending on location, it may take up to 4 years for BDM to completely biodegrade.

Further, the fate of these biodegradable materials within a field soil environment is not completely known. For example, are BDM fragments that are buried in soil to the bottom tillage depth biodegrading at the same rate as those closer to the soil surface where there tends to be more oxygen, which drives microbial activity? And how do the rates of biodegradation at the different tillage depths compare with the laboratory standards for biodegradability. International standards for plastic biodegradability include a soil-based

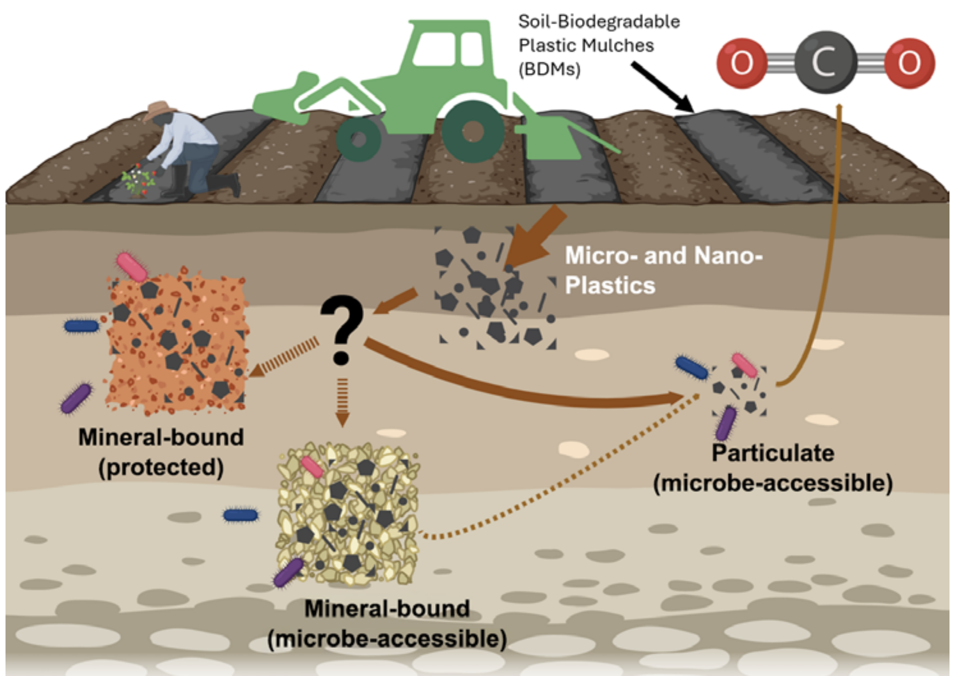

Figure 1. For most materials, it is not known: 1) whether BDM residues become physically or chemically protected in ways that extend residence time, 2) what fraction of BDM carbon becomes CO_2 versus being retained in soil, and whether retained carbon is in mineral-bound, or in particulate form, or 3) which microbial taxa directly assimilate and transform BDM-derived carbon. Figure courtesy of Jacob Clements, made with Biorender.

standard and a composting standard, and both assume high microbial activity and optimal moisture and temperature—conditions that do not occur year-round in most agricultural soils. As a result, certification does not generally reflect actual performance in the field.

Researchers at the University of Tennessee are working to determine the entire range of fates of BDM in soil. While some of the material is converted to microbial biomass and carbon dioxide, the remaining particles interact with other elements of the soil: organic matter and minerals. In contrast to non-biodegradable plastics, biodegradable materials have the potential to chemically interact with soil organic matter and minerals and potentially increase the amount of carbon stored in soils, thereby positively impacting soil health. We are currently exploring the use of advanced methods such as tracer studies and microbial community analyses to better understand how soil organisms interact with BDM micro-plastics, and how these microplastics interact with soil organic matter and minerals. These approaches aim to expand our knowledge regarding BDM breakdown and ecological impacts, such as changes in soil health and nutrient cycling.

THE BOTTOM LINE

The key take-aways from our work are:

1. Biodegradation of BDM is influenced by environmental variability, making standardized predictions difficult and site specific.
2. Current analyses methods range from high-precision chemical analysis to practical field observations, but each has limitations.
3. Long-term studies are essential to determine how much BDM may remain in soil over time and placement in the soil profile.

Switching to BDMs is not just about cleaner fields—it's about protecting the soil that sustains us. As farmers, researchers, and consumers, we all have a stake in reducing plastic pollution and supporting practices that keep our soil healthy for generations to come.

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Cover Crop Windbreaks Can Slow Deterioration of Soil-Biodegradable Mulch Film and Increase Pepper Yield

Caleb Wehrbein and Sam Wortman, University of Nebraska

PROJECT BACKGROUND

Reduced durability of soil-biodegradable mulch films (BDM) compared to polyethylene mulch films (PE) is a frequently cited barrier to adoption among specialty crop growers. By design, BDMs should deteriorate faster than PE mulch, but it can be problematic for growers when BDMs degrade too early or before the end of a crop production cycle. There are efforts to improve BDM durability through polymer chemistry and new product development, but there may also be opportunities to slow BDM deterioration through management. One example of this can be found in **recommendations for mechanical application of BDM** – growers are advised to reduce tension on BDM during application to avoid small rips and tears that can occur due to its lower mechanical and tensile strength. Once successfully installed, the greatest threat to the durability of a BDM (excluding wildlife!) is weather. In Nebraska and throughout the Great Plains region, early summer thunderstorms can bring intense wind and rain events that can compromise the integrity of any mulch, but especially BDM.

Cover crops like winter cereal rye are often planted in strips between crop beds throughout the field by watermelon growers in Nebraska to protect young seedlings from wind erosion and “sandblasting” that can occur when airborne sand and soil particles abrade tender seedling stems and leaves. Because cover crops are already being used to protect specialty crops from wind, we sought to explore whether this same system could be useful for protecting the BDMs used to grow specialty crops. Results from our 2-year study in bell pepper (*Capsicum annuum*) (Figure 1) suggest that cover crops were helpful for reducing wind speeds (Figure 2) and slowing BDM deterioration, which likely contributed in part to greater pepper yield. The experiment overview and results are summarized here, and more details are available in our full **article in HortScience** (Wehrbein and Wortman, 2025).

Figure 1. Experimental design that included a comparison of bell peppers grown with polyethylene mulch film (PE), soil-biodegradable mulch film (BDM), or paper mulch with and without the protection of a cereal rye cover crop windbreak on the southern side of the crop row. Instruments in the image include a tensiometer for measuring soil moisture (in the center of each bed) and a cup anemometer (to the right of the brown paper mulch) for measuring wind speed.

EXPERIMENT METHODS

We tested the effect of a cereal rye (*Secale cereale*) annual windbreak on BDM durability and plant productivity in a bell pepper crop across 2 years in Lincoln, NE, USA. One BDM (0.6 mils thickness, Bio 360; Johnny’s Selected Seeds, Winslow, ME) and one PE mulch (1.5 mils thickness, Rain-Flo Irrigation, East Earl, PA) were tested in both years, and a paper mulch (WeedGuardPlus®; Sunshine Paper Co., Aurora, CO) was included in Year 2. Four windbreak strips (each 6 ft wide by 54 ft long and separated north to south by 35 ft to prevent effects between windbreaks) were oriented perpendicular to the southern prevailing wind direction with a single mulched bed located north of cereal rye windbreak strips. Adjacent to each windbreak was a bare soil control for comparison. Data collected in both years included windspeed and gust speed, soil temperature, soil moisture, mulch deterioration, stomatal conductance, leaf greenness, and total fruit yield (kg.ha-1).

RESULTS

Annual wind trends in 2024 were characterized by stronger and more frequent southern winds than those in 2023; as a result, windbreaks were more effective for reducing windspeeds in 2024. Within 3 weeks of planting, small and large holes in mulch were greatest in BDMs both years. In 2024, BDMs that were protected by the windbreak had 42% fewer large holes than non-protected BDMs. BDMs and PE mulch increased soil temperatures by 1.9 °C relative to paper mulch, and windbreaks increased soil temperatures by 0.9 °C in 2024 relative to no windbreak. Stomatal conductance was 27% to 29% greater in pepper protected by the windbreak relative to non-protected pepper both years. Total yield per plant of protected pepper plants was 24% greater than non-protected plants in 2024, but there were no yield differences in 2023. Increased soil temperature in 2024 likely contributed to crop earliness and greater total yield.

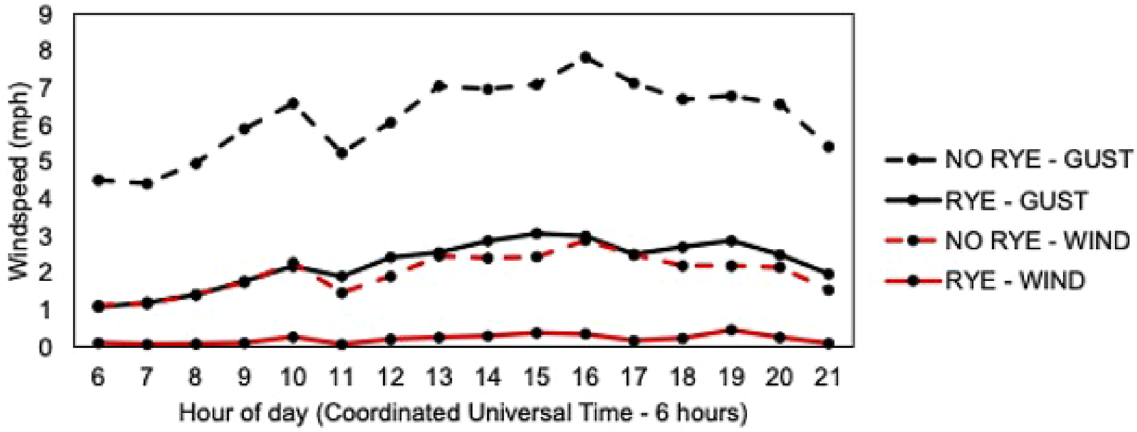

Figure 2. In year two of the study, the cereal rye windbreak (solid lines) reduced top wind gusts from the south direction (black lines) by 64% and average wind speeds from the south direction (red lines) by 89% in the mulched crop row compared to the bare, no cover crop control (dashed lines). The prevailing wind direction during the summer months in Nebraska is from the south or south-southwest.

These results suggest that cover crop windbreaks can contribute to greater crop yield, particularly in windy years, by extending the functional lifespan of BDMs and increasing crop stomatal conductance. Additional research is needed to evaluate additional BDMs and cover crop species as windbreaks as well as the relative effects of windbreak size and distance from the crop.

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BDMs in Strawberry-Cucurbit Relay Cropping Systems: Issues and Opportunities

Emily Witt and Nathan Boyd, University of Florida Institute of Food and Agricultural Sciences Gulf Coast Research and Education Center

Figure 1. Aerial photo of strawberry fields at the Gulf Coast Research and Education Center located in Wimauma, FL. Photo credit: Angelita Arrendondo.

Florida is one of the top strawberry producers in the nation and accounts for approximately 19% of the national market output. The Florida strawberry industry generates an estimated $540 million annually with over 16,000 acres planted. Much of the strawberry acreage is located within Hillsborough County, Florida. All strawberry growers in Florida rely on plastic mulch to maintain high yields, conserve soil moisture, and reduce weed pressure (USDA NASS 2024). Polyethylene (PE) mulch is an essential tool for effective soil fumigation and consistent crop performance. However, the widespread use of PE mulch also generates significant agricultural plastic waste, contributing to environmental concerns and can be costly to remove and dispose of.

In Florida, a portion of the strawberry growers relay-crop, which consists of planting a second crop late in the growing season on the same beds. Relay cropping allows growers to maximize land-use efficiency and capture additional value from the initial investment in materials and labor from bed preparation (Tanveer et al., 2017). While this practice offers economic and resource-use benefits, it also places additional demands on mulch longevity and performance, as the same mulch must remain functional across multiple crops and an extended growing season.

Soil-biodegradable mulch (BDM) has been developed to provide many of the same agronomic benefits as PE mulch with the added benefit that BDM can be incorporated into the soil at the end of the growing season, which lowers labor and disposal costs for growers. While BDMs have gained traction in certain regions and cropping systems, their integration into Florida's production system presents unique challenges that warrant careful consideration.

FIELD TRIALS IN FLORIDA

Field trials were conducted over two growing seasons at the UF/IFAS Gulf Coast Research and Education Center as part of the USDA Specialty Crops Research Initiative Strawberry Mulch project in collaboration with the University of Florida and Washington State University. Trials were established with five mulch treatments (Table 1). The experimental design was a randomized complete block design with 4 replications, and each plot was 75 feet long. In the first year of the trial, the field was fumigated in August and covered with totally impermeable film (TIF) to mitigate effects of uneven fumigation that may have occurred. The TIF was removed in September, mulch treatments were laid, and strawberries (cv. Brilliance) were transplanted in two rows on the top of each bed (Figure 1). Overhead irrigation was applied for 10-14 days to aid establishment, and the crop was managed under standard Florda strawberry production practices for the duration of the season (October-March; Whitaker et al., 2021). Cucumber (cv. Mongoose) was planted as a relay crop in February.

Under these conditions, BDMs performed well and remained mostly intact throughout strawberry production. Percent soil exposure (PSE) remained low during the season (Figure 2), with a noticeable increase occurring only after strawberries were terminated by hand (physically remove by hand), which is a common practice in the region. In the second year of the trial, the same practices were followed but Hurricane Milton made landfall in the area, causing significant damage to the field plots, requiring repairs and mulch replacement. Following installation of new mulch in the plots, higher PSE values were observed earlier in

Table 1. List of mulch treatments that were used in the 2023-2024 and 2024-2025 strawberry seasons.

Product Name	Feedstock Material*	Thickness	Color	Manufacturer
Totally Impermeable Film (TIF)	Black Polyethylene	1.25 mil	Black	Amcor
Bioguard 00	Mater-Bi (PBAT + starch)	0.9 mil	Black	PolyExpert
Bioguard 05	Ecovio (PBAT + PLA)	0.9 mil	Black	PolyExpert
Bioguard 50	Mater-Bi (PBAT + starch)	0.9 mil	White	PolyExpert
Bioguard 55	Ecovio (PBAT + PLA)	0.9 mil	White	PolyExpert

*Abbreviations: PBAT = polybutylene adipate terephthalate; PLA = polylactic acid.

the season across BDM treatments. Initial fragmentation was observed at the soil-mulch interface and along bed edges, where wind intrusion appeared to further accelerate tearing. However, despite these issues, there were no differences in strawberry or cucumber yield across the different mulches in either year (Figure 3). These field trials provide insights into how the BDMs perform compared to PE mulch and highlight areas for improvement.

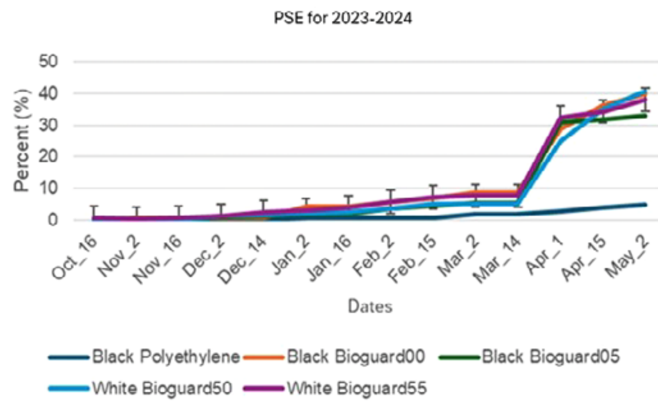

Figure 2. Percent soil exposure (PSE) was collected on the 1st and 15th of each month within a permanent, 3-ft long area of each plot. PSE represents an estimation of the area of soil no longer covered by mulch: 0% indicates a fully intact mulch whereas 100% indicates there is no mulch remaining. Strawberries were removed by hand in March. Bars represent standard error.

ISSUES AND OPPORTUNITIES

Despite comparable yield performance for the two crops, several critical challenges limit the immediate adoption of BDM in Florida strawberry systems. BDMs are currently restricted to conventional production, as they do not meet the standards set by the USDA National Organic Program for use in certified organic systems. This regulatory limitation reduces flexibility for growers operating diversified or organic-transitioning production systems.

The most significant barrier to adoption of BDM in Florida strawberry production is their incompatibility with fumigant retention requirements and their potential susceptibility to fumigation-induced degradation (Shcherbatyuk et al., 2025). Florida strawberry systems rely heavily on TIF to meet fumigant emission standards and ensure effective suppression of soilborne pests and diseases. Because BDM cannot replace in-row fumigation tarps, BDMs are limited to use in systems that use broadcast fumigation or alternative pest and disease management strategies. Additionally, early season fragmentation observed in the second year of the trial would be considered unacceptable by growers, as mulch integrity during the beginning of the season is essential.

Degradation timing under field conditions presents an additional challenge. While international standards require BDMs to reach 90% biodegradation within two years under controlled lab conditions, field studies demonstrate that degradation can take several years longer depending on environmental conditions (Griffin-LaHue et al., 2022). In that multi-site field evaluation, BDM fragments incorporated into soil in Quincy, FL were predicted to require approximately 2.4 years to reach 90% biodegradation, based on field observations and thermal time accumulation.

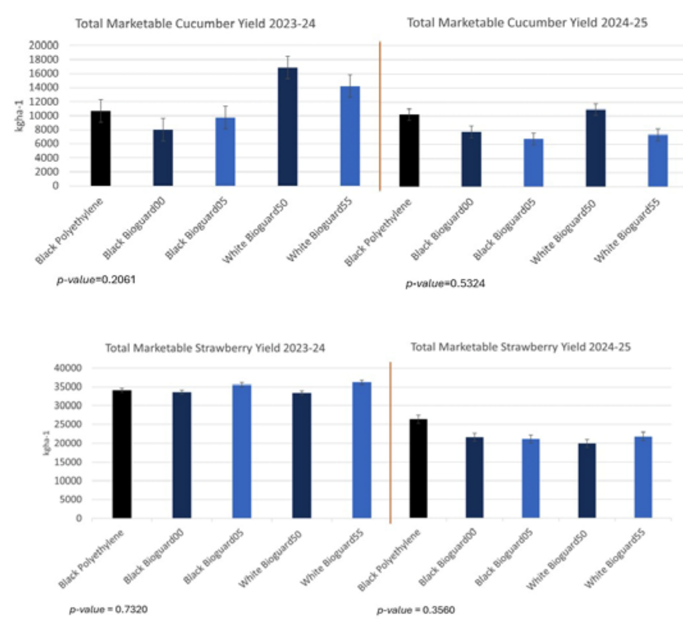

Figure 3. Strawberry and cucumber yield (kg/ha) in two production seasons at the Gulf Coast Research and Education Center located in Wimauma, FL. Bars represent standard error. Data are presented by year due to a year effect.

Although Florida's warm climate may promote faster BDM degradation relative to cooler regions, this anticipated timeframe remains problematic for Florida's intensive, fast-rotating production systems. Strawberry fields are often transitioned quickly into relay or rotational vegetable crops, leaving limited opportunity for BDM fragments to sufficiently degrade before replanting. In relay cropping systems, residual BDM fragments persisting in the upper soil profile could interfere with bed preparation, planting operations, fumigation dispersion, and early crop establishment, particularly in fresh-market vegetable production. Without relay cropping, the fallow period between strawberry productions cycles is typically only 3-4 months, also limiting time available for complete BDM degradation.

These findings highlight potential opportunities for targeted BDM use. Fields managed with extended intervals between crops, cover cropping, or rotations involving transplanted or taller vegetable crops may better accommodate the BDM degradation timeline observed under Florida conditions. Continued research is needed to better align BDM selection and management with fumigation practices and crop rotation schedules common to Florida strawberry production.

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From Plastic to Possibility: Rethinking Mulch, Cost, and Soil Health Through the Work of Dr. Shuresh Ghimire

Nataliya Shcherbatyuk, Washington State University in conversation with Dr. Shuresh Ghimire, Associate Extension Educator and Vegetable IPM Specialist at the University of Connecticut

Mulch has always been a quiet but powerful force in agriculture—controlling weeds, conserving moisture, regulating soil temperature, and directly influencing crop performance. Yet behind this seemingly simple layer of polyethylene (PE) plastic or alternative film material lies a complex and evolving story about sustainability, economics, and the future of land stewardship. Few people understand this better than Dr. Shuresh Ghimire, Associate Extension Educator and Vegetable IPM Specialist at the University of Connecticut, whose work bridges grower challenges, environmental considerations, and the need for practical solutions in the field. His recent conversation on the Mulch Matters podcast offers a nuanced look at the ongoing shift from conventional PE mulch toward soil-biodegradable alternative plastics and why that shift matters now more than ever.

For decades, PE mulch has been the standard in vegetable production. It is durable, effective, and relatively inexpensive upfront. Yet the true cost of PE only shows itself at the end of the growing season. Removing miles of torn, soil-covered plastic in the cold, wet days of late fall is consistently described by growers as their least favorite job of the year. More importantly, removal is rarely complete. With every planting hole punched into the film, countless small fragments are created that can never realistically be retrieved. Even with careful cleanup, at least 10% of PE mulch remains in the soil, where it accumulates year after year because it does not degrade. Its persistence stretches centuries into the future.

This is where soil-biodegradable plastic mulch (BDM) enters the story, not as a trendy alternative, but as a practical response to real-world limitations of PE mulch. In New England, the adoption of BDM has risen sharply. While national usage remains under 10%, Dr. Ghimire estimates that nearly half of all plastic mulch used by conventional vegetable growers in New England is now soil-biodegradable. The reason is simple: once labor and disposal are factored in, BDM often becomes more economical than PE. Even if the purchase price of BDM appears higher at first glance, growers have discovered that eliminating removal, hauling, and landfill fees transforms the cost equation. However, commercially available BDMs are not currently allowed for use in organic farming in the US because they don't meet the USDA's National Organic Program (NOP) standards, specifically the requirement that all polymer feedstocks must be biobased.

Beyond economics, BDM offers operational flexibility that PE cannot match. Instead of waiting for a window of dry weather to pull plastic off the field, growers can simply till BDM into the soil and immediately seed a fall cover crop. In regions like New England, where unpredictable weather and short seasonal transitions demand fast decision-making, this timing advantage is significant. A missed week in late October or early November can mean the difference between a healthy stand of rye and bare, exposed soil all winter.

Growers who have used both PE mulch and BDM also report something counterintuitive: BDM often leaves fewer fragments in the soil than PE mulch, even though BDM is intentionally incorporated. PE mulch tears as it ages. It splits under the equipment. It sheds pieces from every planting hole and every puncture. Those fragments stay in the soil indefinitely. BDM, by contrast, breaks down biologically, disappearing entirely within three to four years under Connecticut's climate conditions. The fragments are part of a natural decomposition process rather than a permanent pollutant.

Yet biodegradable mulch is not without challenges—most notably market confusion. Many products labeled "biodegradable" are not truly soil-biodegradable. Some degrade via oxidation or photodegradation, resulting in soil microplastics that behave more like PE than a biodegradable material. Without clear regulatory and labeling standards, growers are left to interpret marketing language rather than scientific evidence. To help growers identify truly soil-biodegradable mulch products that meet their needs, Dr. Ghimire recently led the writing of a factsheet on **Soil-Biodegradable Plastic Mulches (BDMs) Commercially Available in the U.S.**, which includes a list of mulches with relevant certifications and includes practical tips for growers.

A related issue is recycling. While recycling PE mulch would theoretically reduce disposal burdens, the reality is far more complicated. Even clean household plastics face recycling rates as low as 10%. Agricultural plastic, contaminated with soil and organic matter, presents an even steeper challenge. Technologies are emerging to shake soil from mulch films in the field, but Dr. Ghimire remains cautious about the feasibility of widespread PE mulch recycling, especially when factoring in transport distances, contamination, and the energy required to manage the recycling process. In this context, BDM represents not just convenience but an opportunity to reduce long-term waste accumulation at its source.

Looking ahead, Dr. Ghimire sees the future of mulch intertwined with technology. Advances in AI, sensors, and precision agriculture will likely expand the role of mulch in controlled production systems. Research into spray-on materials, organic coatings, and new formulations may soon improve the predictability and speed of BDM degradation, tailoring materials more precisely to regional climates and crop cycles. In densely populated states with limited farmland, innovations in mulching could support more resilient, resource-efficient systems that reduce soil disturbance, limit plastic waste, and strengthen soil health.

The shift from PE mulch to BDMs reflects a larger movement in agriculture to balance productivity and long-term soil stewardship. Dr. Ghimire is hopeful this signals a future in which research, collaboration, and thoughtful design can allow growers to select materials that move mulching systems "beyond persistent plastic"—serving the crop, supporting the farmer, and returning safely to the soil—addressing both economic practicality and environmental responsibility.

Listen to the full podcast from Mulch Matters.

Tilling Toward Tomorrow: Sustainable Solutions for Mulch Management with Jazmine Mejia-Muñoz

Nataliya Shcherbatyuk, Washington State University in conversation with Jazmine Mejia-Muñoz, Water Quality Program Manager, California Marine Sanctuary Foundation

Plastic mulch has long played a crucial role in agricultural production, offering benefits ranging from weed suppression and moisture retention to yield enhancement. But as concerns about plastic waste and environmental sustainability grow, so too does the need to reconsider the materials and methods used in today's farming practices. A new wave of research and collaboration is pushing soil-biodegradable mulch (BDM) to the forefront of agricultural innovation, particularly in California's high-value cropping systems.

CONSERVATION AND AGRICULTURE: A SHARED LANDSCAPE

California's Monterey Bay region is home to both world-renowned agriculture and sensitive coastal ecosystems. For decades, organizations like the California Marine Sanctuary Foundation have worked to protect water quality while supporting the farming community. These conservation efforts increasingly intersect with the issue of agricultural plastic waste.

Plasticulture, the use of plastic in crop production, originated in the 1950s and has since become widespread. Mulch films made of polyethylene (PE) are now standard in crops like strawberries and melons, and are starting to be used in orchards. However, PE mulch presents serious end-of-life challenges. It must be removed from the field, transported, and disposed of, which is often in landfills. These steps all involve cost, labor, and environmental impact.

THE PROMISE AND LIMITATIONS OF SOIL-BIODEGRADABLE MULCH

BDM offers an appealing alternative to PE mulch. Designed to break down in the soil through microbial activity, BDMs eliminate the need for post-season removal and landfill disposal. Field trials in commercial strawberry systems in Monterey County have shown both promise and limitations. One major challenge is biodegradation timing. In systems where rapid crop transitions are common, BDM sometimes persists too long, creating complications for the next crop. Another concern is the risk of surface residue that can impede or contaminate the next crop and can pose food safety concerns, particularly in leafy vegetable production.

Despite these challenges, successful use cases have emerged. In one instance, a grower transitioning from strawberries to Brussels sprouts found BDM to be a good fit due to minimal contact between the soil and the harvested crop, and the harvesting method. Such examples point to the potential for strategic, crop-specific adoption.

ECONOMICS AND PRACTICALITY

Cost is often cited as a barrier to adoption. BDM purchase cost can be nearly twice that of PE mulch. However, growers must consider the total cost of mulch usage. When factoring in labor and equipment for removal, transport costs, and landfill fees, BDM can present a cost-effective solution. For example, removing PE mulch often requires 15 to 16 hours of labor per acre, at an average wage of $17.20 per hour, plus landfill tipping fees that range from $58 to $250 per ton. In contrast, BDM requires no removal or disposal and can be incorporated into the soil using existing tillage practices. When all factors are considered, growers are likely to see a net gain in profitability.

Still, adoption is not without complexity. Smaller growers often overlook the opportunity cost of their own labor, and larger operations may need to assign workers to other tasks for worker retention. For example, one grower in the Northeast noted that the end of the season is an especially busy period, and tilling the mulch into the field allowed the farm crew to focus on other essential tasks. Thus, not removing the mulch was actually a benefit for the farm operation (personal communication).

RECYCLING: AN ADDITIONAL PATHWAY

While BDM represents one solution to the PE mulch dilemma, recycling of PE mulch is another avenue being explored. In regions with access to recycling facilities and mechanical removal technologies, recycling can reduce disposal costs. However, contamination and cleaning requirements remain challenges that could offset savings.

TOWARD TAILORED ADOPTION

The success of BDM adoption hinges on context. Soil type, crop rotation and timing, labor availability, and environmental goals all play a role in determining suitability for a farm operation. Collaborative field trials and grower-led experiments continue to yield insights that help refine best practices. Educational outreach, such as field days and conferences, is also proving invaluable. These events serve as two-way learning platforms where researchers share data and growers provide critical feedback from real-world conditions.

MOVING FORWARD

BDMs hold significant potential to reduce agricultural plastic waste and promote more sustainable farming practices. While they are not a one-size-fits-all solution, ongoing research and collaborative implementation can pave the way for broader, more effective adoption. Growers interested in exploring BDMs are encouraged to start with small trials in the fields and consult available resources, including university extension services, production guides and online decision tools. As technologies advance and the cost of labor continues to rise, the economic and environmental case for BDM will only grow stronger. By rethinking how we use plastic mulch, we can take meaningful steps toward a more sustainable agricultural future, one that supports both productive farming and environmental stewardship.

Listen to the full podcast from Mulch Matters.

Celebrating Hadi Ghasemi's Outstanding Achievements in Research and Professional Development

Nataliya Shcherbatyuk, Washington State University

We are proud to highlight the exceptional accomplishments of Farhad 'Hadi' Ghasemi, a PhD candidate at the University of Florida (UF) Gulf Coast Research and Education Center and a dedicated member of the Horticultural Crop Physiology Lab. Hadi's research focuses on plant physiological responses and environmental adaptation, with the goal of developing more sustainable and efficient crop production systems. His passion for integrating modeling, innovative technologies, and long term concepts such as space farming reflects his forward thinking approach to agricultural science.

Beyond his research, Hadi is actively involved in student leadership at UF, demonstrating his belief that strong leadership is essential for advancing scientific collaboration and progress.

Over the past year, Hadi's hard work and commitment have earned him several prestigious awards and recognitions. Hadi's achievements reflect not only his talent and dedication but also the strength of our program and the impact of student driven research in specialty crop production. We are excited to see where his curiosity, leadership, and innovative mindset take him next. Please join us in congratulating Hadi on an outstanding year of growth and accomplishment.

Farhad 'Hadi' Ghasemi, PhD candidate, University of Florida.

ASHS STUDENT TRAVEL AWARD ($500)

This award supported his participation in the 2025 ASHS Annual Conference in New Orleans, where he delivered an oral presentation titled "Two-Year Evaluation of Biodegradable Plastic Mulches for Winter Strawberry Production in Florida: Mulch Deterioration, Plant Growth, Yield, and Fruit Quality." Presenting at a national conference is a major milestone, and Hadi represented our program with excellence.

GCREC TRAVEL AWARD ($500)

This award enabled him to attend both the North American Strawberry Growers Association Conference and the Southeast Regional Fruit and Vegetable Conference in Savannah, GA, held January 7–10, 2026. These events provided valuable opportunities to engage with growers, researchers, and industry leaders while deepening his understanding of real world production challenges.

UF/IFAS SCHOLARSHIPS

Bobby F. McKown Scholarship ($1,500) and James Davidson Graduate Travel Scholarship ($300). These competitive scholarships recognize academic excellence, leadership potential, and meaningful contributions to agricultural research—qualities Hadi consistently demonstrates.

Recent Publications

RESEARCH

Weiss, B., G. Gramig, and L.W. DeVetter. 2026. **Hydromulch History, Trials, and Challenges—a Review**. *Weed Science*. 74(1): e12. doi:10.1017/wsc.2026.10088.

Ghimire, S., G. Puerto, L.W. DeVetter, and C. Miles. 2025. **Soil-biodegradable plastic mulches (BDMs) commercially available in the U.S.** Washington State University Extension Factsheet, 6 pp.

Miles, C., Hayes D. and P. Sarazin. 2025. **Oxo-degradable plastics risk environmental pollution**. SCRI Mulch Project factsheet.

Upcoming Events

Mark your calendars for the following agricultural plastic recycling and waste conversion technology conferences and trade shows:

WEBINAR SERIES

IMPROVING END-OF LIFE OUTCOMES FOR PLASTIC MULCH

- **March 24.** Biodegradable Mulch *(Shuresh Ghimire, University of Connecticut)*
- **April 7.** Economic Considerations *(Suzette Galinato, Washington State University)*
- **May 5.** Circularity and Extended Producer Responsibility *(Pierre Sarazin, PolyExpert)*

If you know of an event you think would be of interest to the agricultural plastics and recycling community, please contact Lisa DeVetter (**lisa.devetter@wsu.edu**) or Nataliya Shcherbatyuk (**n.shcherbatyuk@wsu.edu**).

Connect and Tune In!

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