



WASHINGTON STATE
UNIVERSITY
EXTENSION



BIODEGRADABLE MULCH FOR VEGETABLE PRODUCTION

BY THE NUMBERS

- Approximately 17,000 acres in Washington are covered with plastic mulch (non-biodegradable) in Washington.
- Mulch use in North America was 60,000 tons in 2007.
- The global use of plastic mulch nearly tripled from 1.22 million tons in 1999 to 3.2 million tons in 2007, largely due to the increased use of plastic mulch in drought-prone regions of northwest China.
- Expected cost for nonbiodegradable mulch is \$400 per acre for purchase and installation, \$240 per acre for removal, and \$28 per acre for landfill disposal.
- Expected cost for biodegradable mulch is \$534 per acre for purchase and installation, and \$18 per acre for tillage into the soil.

2016

ISSUE

The use of plastic mulch has become a standard production practice for specialty crop growers in Washington and throughout the United States, as well as worldwide. Plastic mulch is a very thin film that is applied to soil for controlling weeds, conserving soil moisture, modifying soil temperature, preventing soil erosion, and increasing crop yield and quality. Increase in crop production is up to 50% with the use of plastic mulch. Drip irrigation used in combination with plastic mulch has a 90% water-use efficiency, and total water usage is generally half that of furrow irrigation or overhead sprinklers. The cost of using mulch is compensated by savings in weed removal and reduced irrigation.

Most plastic mulch is made from polyethylene, a non-renewable resource that is not biodegradable. After its use, plastic mulch often is stockpiled, buried on farms, or burned illegally due to limited recycling options. Plastic mulch often fragments during removal, and can be dispersed by wind into the environment where it becomes a hazard to microorganisms, insects, fish, and mammals.

There is increasing concern regarding plastic mulch residues in the soil and the overall cost of plastic mulch usage. These concerns have resulted in a search for biodegradable mulch alternatives. Biodegradable mulch can provide all the benefits of plastic mulch, but eliminate the need for removal and disposal, and potentially alleviate the negative environmental impacts.

RESPONSE

The adoption of biodegradable mulch relies on science-based information regarding the efficacy of the mulch for crop production and biodegradation as well as safety in the environment. Our 5-year study is testing 4 biodegradable mulches made from biological and synthetic feedstocks. We are measuring mulch biodegradation on the soil surface during crop production and in the soil after the mulch has been tilled-down at the end of the cropping season. This is unique in that these measurements will be done for 4 consecutive years of mulch usage and tillage into the soil.

We also are measuring the impact of biodegradable mulch on crop yield and quality in a pumpkin test crop, as well as impact on soil and water quality in the test field. Additionally, we are measuring costs for producing biodegradable mulch from different feedstocks, and assessing bridges and barriers for grower adoption of biodegradable mulch.



QUOTES

"Testing biodegradable mulches in a variety of soil and climatic conditions and environments, especially with interested farmers, both large and small can help iron out some of the challenges, and may help with earlier adoption. This project realistically can be on the cutting edge of technology. Having growers involved adds a real-world element to the process, brings the science to the field and, perhaps, offers other common sense approaches. As a small grower who sells at farmers markets, I can both test and serve as a liaison for field trial studies." - Columbia Basin grower

"As a mulch film manufacturer, working with the study allows us the rare opportunity to see our films tested under scientific, real-world conditions that include valuable input from most important person, the farmer." - Washington-based biodegradable plastic manufacturer



While the use of biobased plastics increases the sustainability of mulch use, it also increases the costs of the biodegradable mulch compared with polyethylene mulch.

Information from this study is posted on our website, <http://biodegradablemulch.org>, and will help all mulch stakeholders answer questions they may have. New information from our project may be especially useful to the organic standards board, inspectors, and growers who need to document biodegradation of mulches in certified organic systems.

This study has been funded by 2 USDA Specialty Crops Research Initiative grants: \$2 million from 2009-2012 (Award No. 2009-51181-05897) and \$5 million from 2014-2019 (Award No. 2014-51181-22382). The current project includes 19 scientists from 3 institutions (Washington State University, University of Tennessee-Knoxville, and Montana State University).

IMPACTS

Research results from our first project demonstrate that not all biodegradable mulches will biodegrade in the soil across diverse environments (Washington, Tennessee, and Texas were the test sites) within a crop cycle or reasonable timeframe thereafter. This finding has led to greater awareness on the part of manufacturers for the need of a new standard to test biodegradation of biodegradable plastics in soil. As a result of our project, ASTM International is creating a new standard to address this need (WK29802).

Mulch products that are currently on the market contain no more than 20% biobased content. Also, there is concern that biodegradable mulches will not reach manufacturers' goals of 90% biodegradation within 2 years of tillage into the soil. As a result of these and other findings, currently available biodegradable mulch films are not allowed in certified organic systems in the United States.

Results from our project are encouraging manufacturers to create new biobased formulas. Additionally, growers are gaining a better understanding of management practices needed to attain maximum biodegradation.

As demand for biodegradable mulch increases, costs of mulch production are expected to become more competitive with polyethylene mulch.