

Certified soil biodegradable mulches

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- Plastic mulch is an environmental issue as there is no viable or sustainable option for disposal and it is usually highly contaminated with plant matter and soil
- Certified soil biodegradable mulches (CSBM) are a potential solution which break down naturally in the soil, leaving organic material and no microplastics, and no removal or disposal costs
- Instead of taking up valuable growing space through stockpiling or contaminating farmland, CSBM products enhance soil by adding carbon and do not lead to topsoil loss because they decompose in the field
- Strawberries are well suited to this alternative to single use plastic

It is estimated that around 12,400 tonnes of conventional mulch films enter the Australian horticulture industry each year. A very small proportion is managed using best practice.

Management costs for plastic mulch are significant including the labour, equipment and fuel use for removal at the end of each crop cycle, space for aggregation, transport for disposal and landfill fees.

The opportunity exists to move away from plastics to certified soil biodegradable mulch (CSBM). These products meet the international standard ISO 23517:2021 and will biodegrade into the soil leaving microbial mass and no microplastics.

These mulch films are distinct from conventional polyethylene films. This includes 'oxo-degradable' or 'oxo-biodegradable' mulch films, which are made from fossil fuels derived using non-biodegradable polyethylene and additives that enhance the product's physical disintegration into small plastic fragments which persist in the environment (i.e. microplastics).

The upfront cost of CSBM is significantly higher than conventional plastic mulches. However, there are future savings in terms of disposal as there is no need to collect, transport and landfill the material.

Table 1 presents a summary of the key benefits and risks of CSBM products

Table 1. A summary of the key benefits and risks of CSBM products

BENEFITS	RISKS
<p>Reduced plastic: Reduces the amount of field plastics that are stockpiled/buried/burnt or sent to landfill, with reduced microplastic pollution</p> <p>Reduced environmental impacts: Avoids the generation of microplastics that contaminate the environment (soil, vegetation and waterways)</p> <p>Production benefits: Increases soil carbon and reduces the loss of topsoil associated with the removal of conventional plastic film</p> <p>Mitigating future risk: Reduces the risk of soil and crop growth issues due to microplastics and increased prices of plastic mulch due to changing oil prices</p> <p>Reduced emissions and transport costs: As transport to landfill is not required, transport emissions and costs are avoided</p> <p>Significant labour/time savings for the grower: Installing and removing plastic mulch is estimated to take an additional 6 hours per hectare</p>	<p>Upfront cost of CSBM: The upfront cost for this product can range between 50% and 200% more than the cost of conventional plastic mulch</p> <p>Misaligned expectations on performance throughout the crop cycle: There can be unrealistic expectations on how long the CSBM product retains its full structural integrity, with the product potentially biodegrading before the end of the crop cycle. However, the timing of the biodegradation can be adjusted in manufacturing to meet grower requirements. Some certified soil biodegradable mulch suppliers have 'questionnaires' they provide to growers before a trial, so expectations are met from the beginning. The life of the product will depend on climate, crop, soil type and other management factors</p> <p>Less flexibility in timing: Timing of installation is an important consideration, as sometimes growers prefer to install all mulch before consecutive plantings. In this situation, CSBM may degrade slightly before the crop is planted and be more susceptible to tearing</p> <p>Adjusting to the product's structural integrity: CSBM requires slightly more care to avoid tearing when planting, using machinery or walking around the crop. This is particularly the case if planting occurs after laying the mulch. Growers need to slightly adjust how they treat and use the product to minimise these issues</p> <p>Fumigation limitations: Some fumigation products may accelerate the degradation of the CSBM and in these cases, the product will not work as required. Suitability of CSBM for fumigation will need to be checked before use</p>

Case Study

VegNET biodegradable mulch trials in Bowen, Queensland

With reef regulations coming into force in early 2024, growers in northern Queensland have a limited window to ensure solutions are in place to remove single use plastics from farms. To facilitate the move to alternatives, Bowen Gumlu Growers Association (BGGGA) and the VegNET Regional Development Officer have prioritised the removal of single use plastics from horticulture farms and the uptake of biodegradable mulch.

The horticultural area of Bowen in Queensland produces tomatoes, watermelons, zucchinis and other cucurbits which all use plastic mulch in production. The BGGGA conducted a trial of CSBM in September 2022 to assess its performance, particularly how quickly the mulch started to break down and if integrity was maintained throughout the crop cycle in the warmer months where day temperatures tend to exceed 30°C.

The black BioAgri CSBM product from Biobag was used with watermelon, rockmelons and zucchinis. The mulch suppressed weeds and the integrity of the mulch was still good after harvesting. The melons shading the mulch provided protection of the product from UV radiation. At the end of the crop cycle, some holes were evident where microbes had started breaking down the product.

The mulch was ploughed into the soil and by late October 2023 had completely broken down. The yield of the produce was in line with expectations and the performance of the mulch achieved the exact results desired.

It is important to note that the timing of the biodegradation can be adjusted in manufacturing to meet grower needs, making it a potential option for the shorter crop cycle typically found in single cycle winter strawberry production.



Figure 1. Plastic mulch trial at Bowen, Queensland

Photo credit: VegNET

What to look out for: Certified soil biodegradable mulch

- ✓ Products must be certified to ISO 23517. This certification means it will fully biodegrade and is beneficial for soil
- ✓ Many products claim to be biodegradable but are actually single use plastics which fragment easily into microplastics and not carbon, such as photodegradable (broken down by light) and oxodegradable (broken down by air) products. This false advertising is an example of 'greenwashing'
- ✓ Talk to your agronomist or product supplier and ensure that any alternative biodegradable mulch you purchase is certified to the standard ISO 23517
- ✓ Look for this certification label:



Further resources and references

- More information about the terms used can be found on the original Fact Sheet Soil Biodegradable Mulch Films available at <https://farmwaste.com.au/wp-content/uploads/2024/03/Soil-mulch-fact-sheet-V2.pdf>
- **AgriFutures 2023:** Pre-farm gate waste management – Baseline waste data for the agricultural, fisheries and forestry sector available from agrifutures.com.au/product/pre-farm-gate-waste-management-baseline-waste-data-for-the-agriculture-fisheries-and-forestry-sector
- Australian Standard 4454-2012: Composts, soil conditioners and mulches available from [store.standards.org.au/product/as-4454-2012](https://standards.org.au/product/as-4454-2012)
- Australasian Bioplastics Association (n.d.), Certification bioplastics.org.au/certification
- Australasian Bioplastics Association (n.d.), Per- and Polyfluoroalkyl Substances (PFAS) and Certified Compostable Bioplastics Fact Sheet available at bioplastics.org.au/wp-content/uploads/2022/11/ABA-Statement-PFAS-2022.pdf
- Soil Wealth ICP: Plastics recycling and alternatives to plastic mulch Fact Sheet available at berries.net.au/wp-content/uploads/2024/05/Plastic-mulch-factsheet-SWICP_20240212.pdf
- Landline video: Australia's first certified soil biodegradable plastic mulch available at youtu.be/f3iytVthDnU?si=zz_09j79Up_VHPat
- In-depth options analysis and costings for certified biodegradable plastic mulch available at agrifutures.com.au/wp-content/uploads/2023/04/23-009.pdf
- BioBag biobagworld.com/products/agriculture

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