

Avoidable plastic pollution to soil in the UK

Briefing Note

Introduction

Plastic pollution to soil is an issue that has come to the attention of researchers only recently as most focus has been on plastics entering our water systems. As researchers develop their knowledge of sources of plastic pollution, they are finding that soils are as contaminated, if not more so, as water courses with plastic fragments. This short paper lays out the issues and proposes solutions using already existing alternatives and systems that can largely avoid much of this contamination.

Further, in 2021 the United Nations FAO delivered a long-awaited report on the pollution caused by agricultural plastics¹ to which we will refer in this document.

There are avoidable and currently unavoidable sources of plastic pollution to soils

Currently difficult to avoid

From various studies^{2,3}, we already know that microplastics from the wear and tear of tyres are likely a dominant source of plastics debris entering the environment. A 2022 report from Suez⁴ shows that some 63,000 tons of microplastics are estimated to leak into the environment from tyres, and a significant amount of this is likely to be deposited on soil, near roads³.

To avoid such pollution, a redesign of tyres or management of road runoff may be required. In many EU countries, national EPR systems for tyres operate to avoid dumping in the environment. Such a policy would be intelligent here too.

Avoidable

A 2017 research article from the UKCEH⁵ illustrates that plastic and microplastic contamination received by soils is likely to be as great, if not greater, in volumes than plastics entering water courses. A BBC report published in 2023⁶ illustrates this again and lays down how microplastics can enter our food systems. Given the loadings of microplastics in sludges, it is reasonable to assume that some uptake is possible as a result of sewage sludge application. As sewage sludge contains notable

¹ <https://www.fao.org/3/cb7856en/cb7856en.pdf>

² <https://www.gov.uk/government/news/tyre-particles-are-contaminating-our-rivers-and-ocean-study-says>

³ https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4265609

⁴ <https://www.mrw.co.uk/news/suez-warns-tyre-wear-contributing-to-microplastic-pollution-06-04-2021/>

⁵ https://www.researchgate.net/publication/313358945_Microplastics_in_freshwater_and_terrestrial_environments_Evaluating_the_current_understanding_to_identify_the_knowledge_gaps_and_future_research_priorities

⁶ <https://www.bbc.com/future/article/20230103-how-plastic-is-getting-into-our-food>

quantities of microplastics (from for example, waste-water from washing machines), concerns now arise among the scientific community that these are no longer simply “contaminants” but are “pollutants” i.e., with impacts upon human health.

The sources of plastics to soil are multiple but some result from the direct use in farm applications of plastics that (after use) leave fragments. These include soil mulch films; tree guards; clips on fruit trees/bushes; bale wraps. Whilst soil mulch and bale wraps are generally collected after use, when stripped out of soil or when unwrapping bales, they leave fragments that accumulate year after year in the same fields. Tree guards and clips are generally left to nature. They may take years or decades before oxidising and degrading and may leave microplastics residues for long periods. The UNFAO report specifically concentrated upon these and it is highly important the committee takes this report into consideration among its evidence and echoes its recommendations.

The BBC reported⁷ in February 2021, on how soil is polluted with fragments of plastic left after the use and removal of some 45,000 tonnes/annum of plastic soil mulch films used by farmers to protect crops. Confidential industry sources report that around 3000 tonnes of plastic tree guards are used across the UK annually and remain *in situ*, breaking down into microplastics over time.

A second source is derived from spreading to land compost, digestate and as mentioned above, sewage sludge, all used as a substitute for chemical fertilisers and containing considerable nutrient value.

However, the collection of wastes entering compost and biogas plants generally contains large volumes of plastics which, when shredded, leave fragments in the final output, compost or digestate.

The EA estimate that the equivalent of 150 plastic⁸ carrier bags per tonne of compost/digestate is spread to soil in the UK. Around 3-4 million tons of compost and digestate is currently spread to soil. The EA has proposed new quality protocols to dramatically reduce this contamination which should enter into force shortly and which should be supported by the committee⁹.

Any intervention to reduce plastic emissions into the environment needs to be underpinned by data, which will require robust and targeted monitoring. There are 5 ISO standards currently under development relating to the sampling and analysis of microplastics in waters, however additional standards will be needed for monitoring plastics in soils.

Health impacts

We now know for certain that plastics entering our soils break down into micro and nanoplastics and through root systems and animal grazing, enter our food chain¹⁰. We also know that plastics accumulating in soils have a negative effect on soil health, fertility, microbial activity and plant growth¹¹. We know further that accumulation is increasing and without changes to business as usual, will continue to grow. The consequences of microplastics entering our food chain are yet to be fully

⁷ <https://www.bbc.co.uk/future/bespoke/follow-the-food/why-foods-plastic-problem-is-bigger-than-we-realise.html>

⁸ [https://www.gov.uk/government/publications/waste-quality-protocols-review/waste-quality-protocols-review?ct=t\(EMAIL_CAMPAIGN_4_2_2020_12_15_QP\)](https://www.gov.uk/government/publications/waste-quality-protocols-review/waste-quality-protocols-review?ct=t(EMAIL_CAMPAIGN_4_2_2020_12_15_QP))

⁹ <https://www.gov.uk/guidance/biological-waste-treatment-appropriate-measures-for-permitted-facilities/3-bespoke-wastes-suitable-for-biological-treatment>

¹⁰ <https://www.sciencedirect.com/science/article/pii/S0013935120305703>

¹¹ <https://www.mdpi.com/2076-3298/7/5/38/pdf>.

understood but disruptive impacts on human endocrine systems have been found.¹² A precautionary principle should be applied in case of doubt.

Solutions to avoidable plastic pollution of soil

Contamination of soils from avoidable sources can be solved by making upstream changes that require virtually zero Government spending on infrastructure.

1. Soil mulch and bale wraps, tree guards and clips in farming can be produced (as the BBC pointed out) from materials that are certified to biodegrade in soil. The UK has an international standard of reference, the BS EN 17033 approved in 2018 for exactly this purpose. Soil biodegradable materials cost more than traditional plastics due to small scale use and production. By mandating the introduction of soil biodegradable materials (over a period of say five years) production would rise and prices fall.

Action: for Government to verify the feasibility of mandating the use of soil biodegradable film mulch and bale wraps using the standard BS EN 17033 as point of reference.

2. Compost, digestate spread to soil. The EA is imposing upon waste operators new, stringent limits to plastics entering their treatment facilities and thus also in the outputs. This is to be supported. We recommend that (when this mandate enters into force in 2024) all household food and garden waste is collected using only compostable bags certified to the standard BS EN 13432 which was recognised into law in the UK in 2000. Such a mandate is law in Spain and Italy now with other countries expected to follow suit, as have various states in the USA. This would lead to a dramatic decontamination of food and garden waste entering treatment and therefore going into outputs. Such a mandate requires Government legislation with the framework on the Resource and Waste Strategy and is a solution which Defra are studying.

Action: Defra to include the obligation for the collection of food and garden waste for treatment in composting and anaerobic digestion to be with certified compostable bags according to the standard BS EN 13432.

3. Sewage sludge. This is more difficult to resolve. In some EU countries sewage sludge cannot be spread to soil (e.g. Switzerland and the Netherlands) but must be incinerated because of the contaminants it contains (the Netherlands in fact export much of theirs to the UK). One solution is to mandate the use of microplastic filters on all washing machines¹³, which would give a positive outcome not just for soils but also for water courses, though would require responsible management of waste from filters. Another is to stop the spreading of sewage sludge to soil until contamination levels fall. This will place a financial burden on water companies and should be balanced against the important role sludge has in our agricultural system currently.

Action: Government to investigate the feasibility of mandating the installation of microplastic filters on all washing machines sold in the UK post (for example) 2023.

¹² <https://www.ciel.org/plasticandhealth/>

¹³ <https://www.sciencefocus.com/news/microplastics-laundry-filters-dramatically-reduce-fibres/>

Farmers, our supposed custodians of soil health, can contribute by moving away from the use of traditional plastics, as the UNFAO report recommends; retailers can mandate that products derived from UK farms must not use traditional plastic soil mulch to grow them and pay farmers the extra this will cost them; farmers can also contribute to this by growing the feedstocks needed to produce innovative materials that can then be used back in their planting. Lastly, we wish to the committee to be aware of terminologies. When we talk about “biodegradability” we mean materials that have recognised international standards certified by international bodies.

For packaging materials this means certified to EN13432¹⁴ on compostability; for soil biodegradability this means the EN17033¹⁵.

Sadly, too many generic claims are made around “biodegradability” by companies selling traditional plastics that have additives in them, for which no international standards exist, no field trials have ever proven biodegradability, and which are banned in many jurisdictions because they are accused of making “false consumer claims”. It is therefore of the utmost importance that rigorous application of international standards (to which the UK adheres) are made in determining material choices.

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¹⁴ <https://www.en-standard.eu/bs-en-13432-2000-packaging.-requirements-for-packaging-recoverable-through-composting-and-biodegradation.-test-scheme-and-evaluation-criteria-for-the-final-acceptance-of-packaging/>

¹⁵ <https://www.en-standard.eu/csn-en-17033-plastics-biodegradable-mulch-films-for-use-in-agriculture-and-horticulture-requirements-and-test-methods/>