



Photo: Salla Selonen, Finnish Environment Institute (Syke)

Highlights

- Fields with different use of plastics were studied
- Agricultural plastics are a source of microplastics
- The highest concentrations of microplastics were found at sites with OXO-PE films, now prohibited to be placed on EU market
- At sites with conventional PE mulching films, microplastic concentration was rather high, but number of large plastic fragments low. The farmers remove large plastic fragments from soil
- Biodegradable plastics, especially for multi-year use, produced a lot of fragments into soil. The degradation in soil seems slow in northern climatic conditions



Macro- and microplastics in agricultural soils after use of conventional and biodegradable plastics

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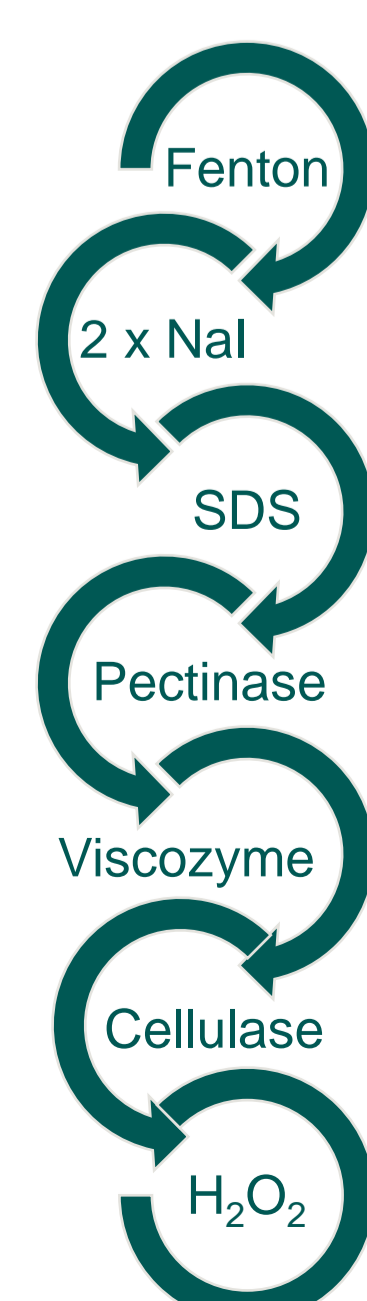
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Field study

- To study the **release of plastic particles from agricultural plastics** into soil, agricultural fields with different plastic use were studied in Southern Finland (Table 1)
- Five subsamples (5 cm depth) from each field were combined into one soil sample and analysed for plastics (Fig 1)

Table 1. The study sites representing different use of plastics and the number of sites analysed for meso- and macroplastics (> 2 mm) and microplastics (< 5 mm) in soil. NA = not analysed

	> 2 mm	< 5 mm
Control sites (no use of plastics)	n = 4	n = 3
PE mulching films (polyethylene)	n = 4	n = 3
OXO-PE-films (oxo-degradable PE)	n = 6	n = 3
PP weed controlling fabrics (polypropylene)	n = 4	n = 3
PP frost covers (polypropylene)	n = 4	NA
Biodegradable mulching films for single year use	n = 7	NA
Biodegradable mulching films for multi-year use	n = 2	NA



Sample analysis

- Plastics > 2 mm were analysed with μ FTIR (Spotlight 200i, Perkin Elmer)
- Plastics 20 μ m – 5 mm were extracted stepwise as described on left. 20 μ m stainless steel filter was used after each step. In the end the samples were filtered on Anodisc filter and analysed with μ FTIR imaging system (Bruker Lumos II FPA)

Results

- The most common microplastic (MP) types corresponded to the agricultural plastics that were used at the sites (Fig 2)
 - Suggests that agricultural plastics are a source of microplastics in soil
- For the sites studied for MPs, the highest MP concentrations were found at the sites with OXO-PE film (Fig 2)
 - Placing of oxo-degradable plastics on market is now prohibited in EU (EU 2019/904)
- MP concentrations were high also at the sites with PE mulching films (Fig 2), but the number of larger PE plastic particles (> 2 mm) was low (Fig 3)
 - Farmers actively removed larger pieces of plastic from the fields
 - Different mechanism behind the generation of the macro and microplastics?
- The highest concentrations of plastics with size > 2 mm were found at sites with biodegradable mulching films for multi-year use (Fig 3)
 - The degradation of biodegradable plastics in soil seems slow in northern climatic conditions

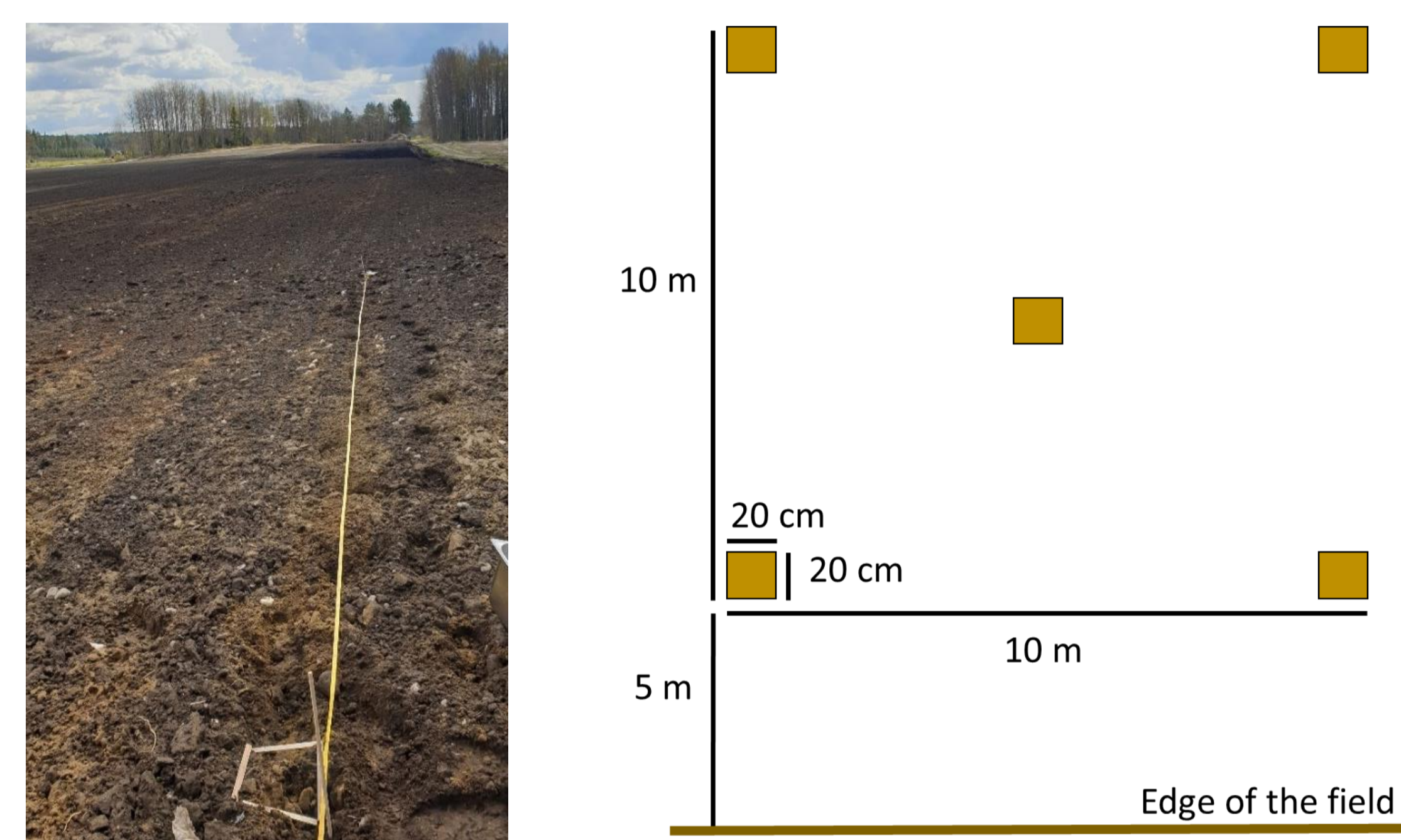


Figure 1. Sampling scheme at one field. Each square represent a subsample that were combined into one sample. Photo: Salla Selonen, Finnish Environment Institute (Syke)

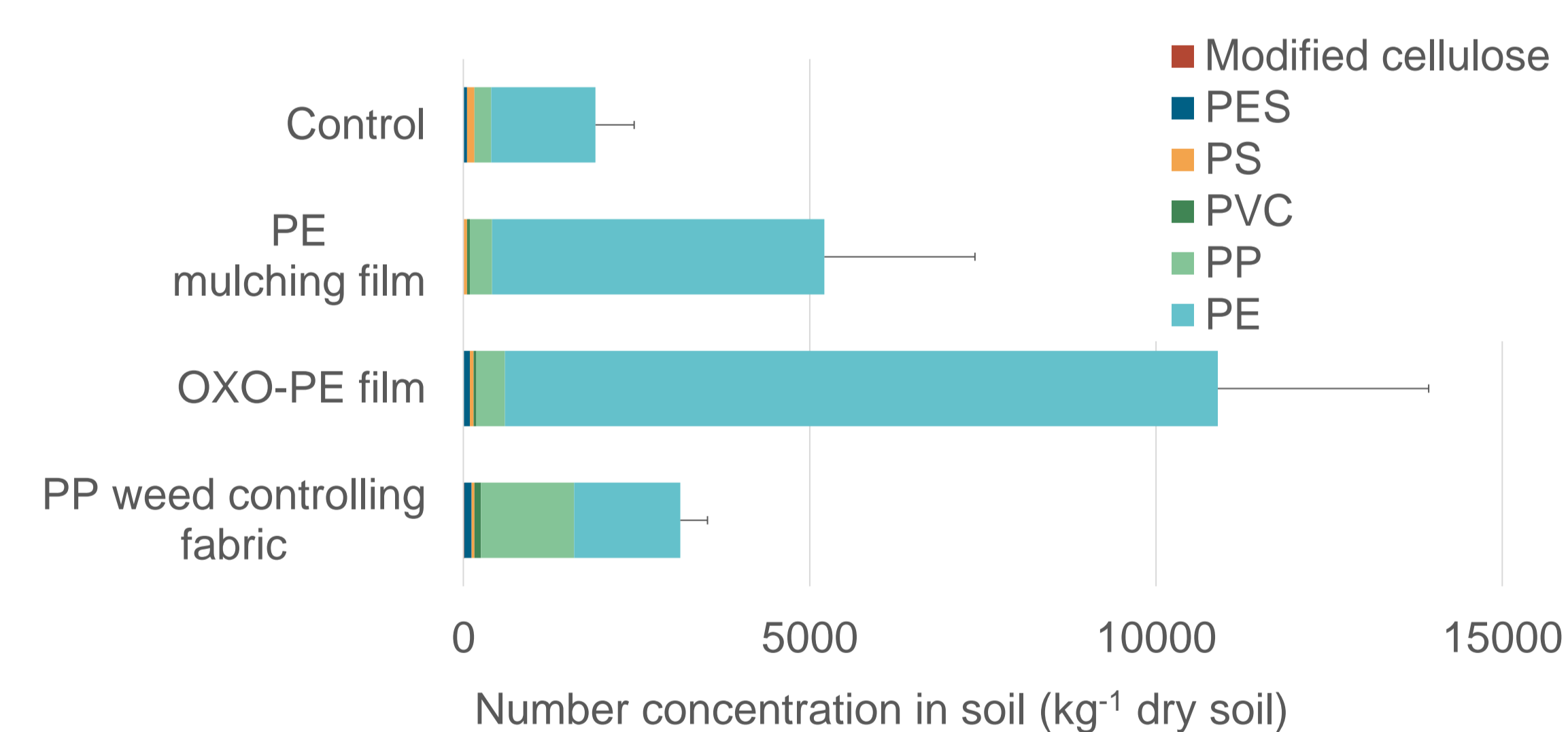


Figure 2. Number concentrations of microplastics (< 5 mm) in soil (5 cm depth) after use of agricultural plastics.

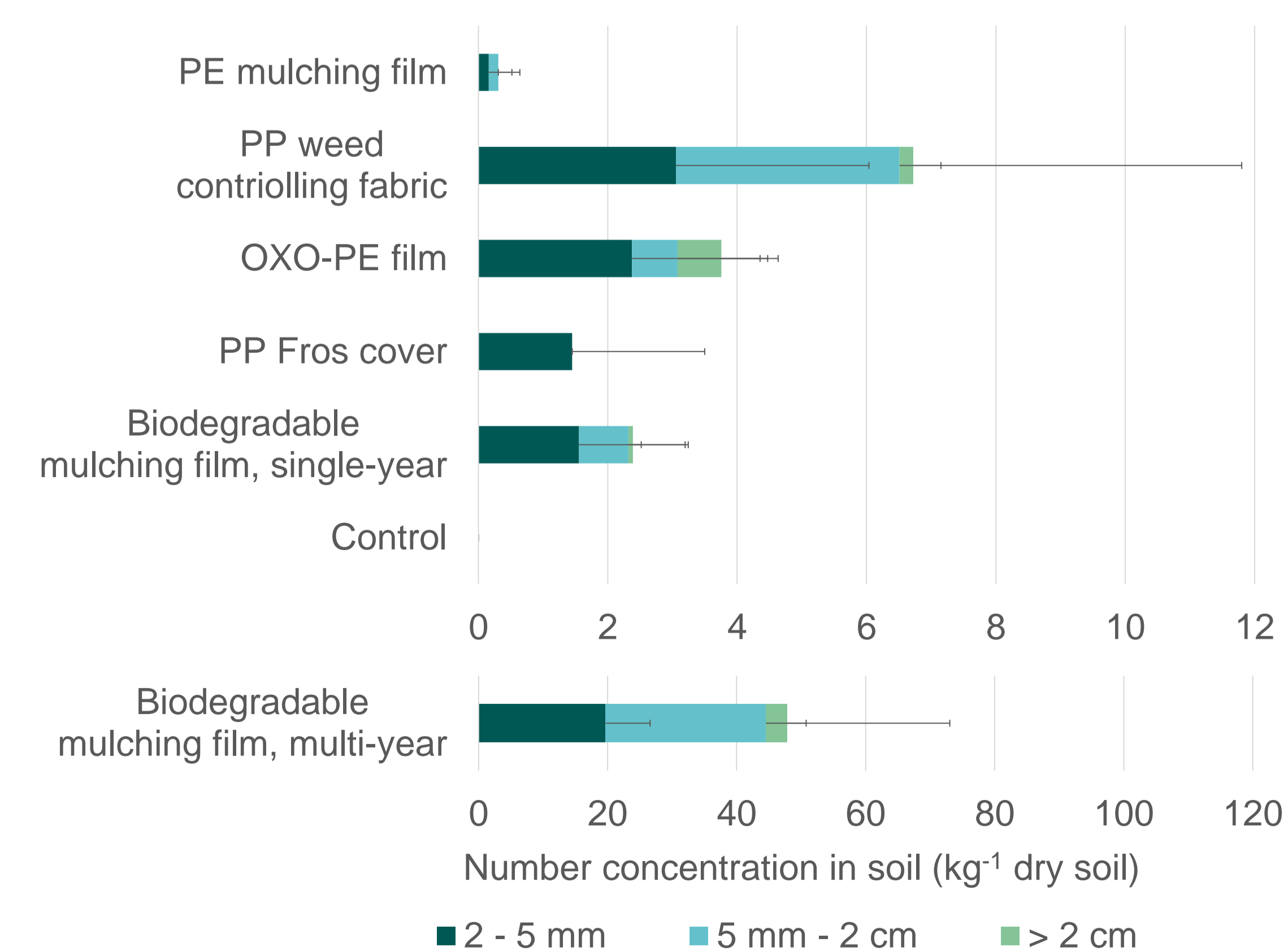


Figure 3. Number concentrations of meso- and macroplastic particles (> 2mm) in soil (5 cm depth) after use of agricultural plastics.



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