

Practice Abstract n°10: MPs Contamination of European Agricultural soils: Results from the European Spatial Survey Monitoring



Pollution with microplastics (MPs) is one of the most pressing environmental issues we face today. These MPs, which can be harmful to both nature and human health, are released into our environment in large quantities—between 10 and 40 million tonnes each year. A significant portion of this pollution ends up on land, especially in farmland soils. This can happen through common farming practices, such as the use of mulch films, treated sewage, compost, or other practices to improve soil productivity and crop yield. MPs can also reach soils indirectly through litter, road runoff, flooding, or even from the air (atmospheric deposition). Despite the scale of the challenge, how much each of these sources contributes to the pollution remains unclear.

1. Aim of the Study

Taking this aspect into account, the PAPILLONS consortium published a study whose aim is to provide for the first time a comprehensive, comparable and reliable database of MPs and associated additive pollution in European agricultural soils.

2. Methodology

In order to investigate how much MP pollution is present in different types of farmland across Europe, PAPILLONS researchers used a single specialised laboratory to analyse soils collected from 71 agricultural fields in **seven European countries**, from Northern (Finland, Norway), via Central (Germany, Czech Republic) to Southern Europe (Spain, Italy, Greece). **This included fields where agricultural plastics, sewage sludge, or compost products had been used, as well as reference sites without known plastic inputs in the past 10 years, thus covering a wide range of field management practices and different climatic conditions.** The partners in each of the seven European Countries were

responsible for scoping farmers for participation, selecting fields to be included into the survey, and undertaking the complete field sampling. The farmers of the selected fields were asked to fill a questionnaire about field's size, slope, aspect, major crops cultivated in the last 10 years, field and crop management details, details on plastics application(s), application method, information about removal and disposal of plastics, source/origin of material, information about other possible sources of microplastics contamination (especially for control fields). For the samples, soil was taken from the top 10 cm layer, where microplastic contamination is expected to be highest due to surface exposure. By comparing samples from different locations and using statistical analyses, **the study revealed how land use and farming practices influence the presence of MPs in soil.**

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Strict contamination controls were followed throughout the process to ensure reliable results.

3. Main Results

The study's results revealed several important findings:

- **MPs were found in all European agricultural fields** investigated – including reference fields – and independently of the agricultural practices applied. The amount of MPs varied greatly, ranging from 2,080 to 414,520 MPs per kilogram of dry soil. Some fields had much higher MP levels than others.
- The researchers looked at different types of farming practices. They examined fields using plastic materials in farming, fields treated with sewage sludge or compost, and fields that hadn't used these for at least ten years (reference fields). Interestingly, **the amount of MPs was similar across all field types**. However, there was a trend of increasing MP concentration from northern to southern Europe.
- **The weight of the plastic particles** in the soil was also estimated. **The highest values were found in fields using APs and compost**. Most of the MPs found were tiny fragments. 21 different types of plastics were identified, with polypropylene being the most common.

- Out of 16 plastic additives studied, only one, tributyl-O-acetylcitrate (ATBC), was frequently detected. It was even found in reference fields, suggesting it comes from sources other than agricultural practices that involve plastic.

4. Conclusion

This study is the first to create a detailed and reliable database of MP pollution in European farm soils. By collecting soil samples across several countries and using advanced testing methods, the researchers were able to compare MP contamination in different agricultural fields. The study found that MP levels in the soil vary greatly, with concentrations being higher in Southern Europe than in the North. Some areas had MP concentrations 10 to 100 times higher than previously reported. The total amount of MPs in the top 10 cm of agricultural soil across the EU could be as high as 84 million tons, which is more than the total plastic waste produced annually in Europe. The findings highlight the growing environmental issue of plastic pollution in farm soils and suggest that addressing it will require a broad, integrated approach, not just individual solutions.



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