ECN Position paper
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Position paper

Plastics, Microplastics in Compost and Digestate

About ECN

The European Compost Network (ECN) is a European non-profit membership organisation promoting sustainable recycling practices in composting, anaerobic digestion and other biological treatment processes of organic resources. ECN represents more than 4.500 organic recycling plants with a treatment capacity of more than 48 million tonnes of bio-waste in Europe.

ECN's vision is that of a Europe in which all organic resources are recycled and recovered in a sustainable way. From this vision, ECN's primary goal is to support the implementation of EU waste policies and thereby contributing to the development of a recycling society, of a sustainable agriculture and renewable energy recovery, to improve human health and to create overall added value within the European market. To achieve this, ECN believes that effective recycling in all Member States should be built on appropriate collection systems for organic waste to promote high quality products by means of biological treatments. ECN supports this development through implementation programmes for Member States, the development of EU quality assurance systems for compost and digestate, and guidelines for the monitoring of operational processes within compost and digestate facilities.

ECN supports the circular economy. The organisation and its members are committed to increase separate collection and recycling of bio-waste and are engaged in producing quality compost and digestate to be used in growing media, as organic fertiliser and soil improver.

Definitions

This document addresses the production of **quality compost and digestate** obtained from separately collected feedstock, and the presence of plastics in the final product.

Throughout the document we refer to:

- **Bio-based plastics,** are made out of polymers derived from non-petroleum, biological sources; they can be engineered to be either biodegradable or non-biodegradable.
- **Conventional plastics**, unless stated otherwise, are made of conventional polymers such as PET, PVC and others, that are non-compostable.
- **Compostable plastics** are made from polymers - obtained from either renewable or non-renewable resources - that comply with the EU harmonized standard EN-13432.
- **Microplastics** are fragments or particles smaller than 5 mm; those smaller than 1 µm are termed nanoplastics, larger particles will be described as macroplastics. ECN is aware that currently there is no internationally standardized definition for microplastics[1]. Microplastics can be further classified[2] into primary microplastics that are originally produced to be used as microplastics and secondary microplastics represented by fragments of plastic particles emitted as macroplastic into the environment.

[1] This definition is consistent with the one suggested by GESAMP (2019) and ECHA (2006). The term 'microplastic' is not consistency defined, but is typically considered to refer to small, usually microscopic, solid particles made of a synthetic polymer. They are associated with long-term persistence in the environment, if released, as they are very resistant to (bio)degradation. Referring to the European Chemicals Agency (ECHA) report on restrictions for intentional uses of microplastics, 'microplastic' means a material consisting of solid polymer containing particles, to which additives or other substances may have been added, and where ≥ 1% w/w of particles have (i) all dimensions 1nm ≤ x ≤ 5mm, or (ii), for fibres, a length of 3nm ≤ x ≤ 15mm and length to diameter ratio of >3.

[2] According to Bertling et al., Kunststoffe in der Umwelt: miKro- und maKroplastiK, Fraunhofer UMSICH, 2018

Maximising the quality of compost and digestate

ECN estimates that 11.7 million tonnes of compost and 4,1 million tonnes of digestate are produced annually in Europe (Reporting years 2016/2017). ECN and its member organisations are **committed to produce quality compost and digestate** starting form separately collected bio-waste by minimizing the presence of plastic (and other) impurities in the final product.

According to ECN the quality of compost and digestate cannot be achieved without **recognizing**:

- **the importance of the purity of the feedstock** (in terms of contamination with plastics) that is delivered at organic recycling facilities; bio-waste, the largest fraction of organic waste recycled in the EU, needs to be as clean as possible from conventional plastics such as plastic bags, food packaging and others, so to be treated effectively during the organic recycling process.
- The **better quality** – in terms of physical impurities – that is obtained by **collecting bio-waste with door-to-door collections schemes**, compared to solutions relying on bring-schemes; door-to-door collection schemes are proven to raise awareness in households and other waste producers, leading to higher and better bio-waste sorting.
- The **technical limits of current machineries and technologies** applied for pre-treating the feedstock to reduce physical contaminants or for refining the final product by sorting plastics; the organic recycling sector can reduce impurities, but technologies are unable to remove them entirely.

Key Priorities

Since the very beginning, national organic recycling organisations in EU member countries are being committed to recycle clean organic feedstock. ECN promotes the adoption of a Quality Assurance Scheme[i] for compost and digestate by its member organizations that include stringent limits for physical impurities.

Thus, ECN considers the following issues as key priorities **to prevent and limit the presence of plastics in compost and digestate** produced starting from separate collected feedstock.

A responsible supply chain for separately collected bio-waste

The quality of a recycling process depends significantly from the physical impurities content of separately collected food-waste, garden-waste and other organic materials (from the agricultural sector, from food processing or from other sources). Any pre-treatment and

refinement process to sort plastics does cause an additional economic burden and a net loss of organic matter (sorted and lost together with the impurities) and consequently reduces the yield of the recycling process; this economic burden can become significant for feedstock affected by large amounts of plastic.

Thus, ECN urges local authorities and national decision makers to address the issue of the quality in the separate collection of bio-waste by promoting **communication and awareness initiatives.** Citizens and other waste producers need to become aware about their role in sorting bio-waste correctly and understand that a circular economy on bio-waste includes soil as the main acceptor of compost and digestate.

ECN recommends - as a basic provision to reduce plastic in compost and digestate - **not to use conventional plastic bags and liners** for the separate collection of bio-waste and garden-waste.[3] The utilizaton of compostable bags made of paper or bioplastics that comply with the standard EN 13432 are a proven tool to enhance convenience for households, thereby maximising quantity and quality of collected organics, avoiding at the same time the use of conventional plastic bags for the same purpose, and are compatible with most industrial composting sites.

- **The Quality Assurance for Compost and Digestate**

Organic fertilisers or soil improvers obtained from waste recycling cannot be free from any physical impurity. For compost and digestate[ii] the EU Fertilising Products Regulation[iii] 2019/1009 establishes specific upper limits of 5 g/kg D.M. (or 0,5% d.m.) for physical impurities made of glass, metals and plastics with a particle size above 2 mm, and a limit of 0,3% D.M. for each single type of impurity. For plastics in particular the regulation foresees a further reduction of this limit down to 0,25 g/kg D.M. as of July 2026.

Many national organic recycling organisations are engaged to promote the quality of compost and digestate. According to data of selected ECN member organisations[iv] - representing countries producing almost 65% of all compost generated in the EU - the average contamination of plastics in compost ranges between 0,01% and 0,2% D.M. (the amounts of plastics are generally assessed[v] by considering fragments larger than 2mm), in any case far lower than the most stringent limits set by the EU Fertilising Products Regulation 2019/1009.

[3] In 2020 there is a full or partial ban on the use of conventional plastics bags in Italy, France, Austria, Island, while others have a levy or partial ban (from statista.de accessed on 19.4.2021),

- **Microplastics in compost, in digestate and in soil**

The bio-waste recycling sector itself is already committed to limit the amounts of plastic particles above 2mm (or 1mm) inside the final product (e.g. compost, digestate); these limits are established by the relevant legislation that compost and/or digestate has to comply with in different EU member states.

Mechanical treatments performed on bio-waste at industrial biological waste treatment plants (composting and anaerobic digestion) tend to reduce the particle size of plastic fragments, making it more difficult to sort them out from the final product (e.g. compost, digestate). ECN underlines that clean bio-waste reduces the need for intensive sorting of the input materials, and for final refinement of the final product, hence limiting the fragmentation of plastics and other physical impurities.

ECN follows with concern the issue and **evidence of microplastic** (and plastic) pollution **in various environmental media** such as air[vi], oceans[vii], fresh water[viii] and soil[ix]. **According to ECN the comparison of literature data by different authors should be done carefully** due to differences in the methodologies for sample preparation, the size of particles monitored and the absence of EN or ISO standards for assessing/quantifying the presence of microplastics.

As a consequence, the food web, food itself and related discards, are contaminated, to some extent, by microplastics, drawing further attention to the need to curb the diffusion of plastics in the environment. This is something that cannot be addressed through our efforts, and requires consistent policies, which we fully support, to minimize dispersion of plastic/microplastics. There is rising evidence that food (and consequently food waste) is already contaminated by microplastics when it is collected for recycling: according to investigations of consumer associations in Europe[x], microplastics are found in 65% of seafood, such as shrimps or prawns, and in 68% of cooking salt. According to other authors[xi], the average intake of microplastics by an adult from food and beverages ranges from 39.000 to 52.000 particles per year. Another possible source of microplastics during composting could be the soil added to the input mixture of different organic feedstock; the microplastic concentration in agricultural soils investigated in Denmark[xii] range between 4.4 and 14.9 mg/kg soil, while data for Switzerland[xiii] show higher values, of about 32 mg/kg, in floodplains of natural reserves.

Thus, considering the pollution of feedstock for the production of compost and digestate and the environmental source of microplastics in air, soil and water/rain, the organic recycling sector is not acting as a generator of microplastics, but can be considered as an unwilling carrier of microplastics into the environment.

Conclusions

According to ECN the organic recycling sector needs to look carefully at the issue of plastics and microplastics in the production of quality compost and digestate by pursuing the maximum quality management and assurance of the composting and anaerobic digestion process.

At the same time specific initiatives need to be put in place by local authorities responsible for municipal solid waste management, so as to prevent conventional plastics to be collected with bio-waste, since current treatment technologies are unable to sort 100% of these contaminants during the recycling process.

ECN would like to point out that according to the principles of circular economy, the quality of compost and digestate can be enhanced through a clear commitment of waste producers, of waste collectors and others not to collect impurities (such as plastics and other materials) with bio-waste; thus, the need for quality starts from waste producers and citizens , and continues with waste managers of cities and of municipalities, waste collection companies down to the composting and anaerobic digestion plants.

The foregoing may minimize the contribution of microplastics from separate collection and subsequent recycling of organic feedstock. Anyway, it must be clear that, despite collection schemes for bio-waste with a dedicated quality monitoring during collections allow to drop physical impurities below the 1-1,5% of fresh matter, there are significant amount of microplastics that come to the food web and the human body through air, water and soil, and subsequently contaminate our food and related discards; these small particles can neither be sorted out completely during the collection phase, nor during the recycling process. **According to ECN we must therefore frame the composting and anaerobic digestion sector** as one of the many **unintentional carriers of microplastics**. We would therefore highlight the following:

- the organic **recycling sector** has always been and is continuously committed to minimize microplastics in its products, through promotion of performing collection schemes and promotion of tools and systems that avert use of conventional plastics;
- the sector cannot afford, though, microplastics being disseminated in soils and in the food web through their main vectors, such as atmospheric fallout, waters, rainfall and the like.
- the sector therefore supports the adoption of consistent policies able to address sources of plastics and microplastics and minimise their dissemination into the environment, in soils, water, and food.

References

[i] European Compost Network 2018. European Quality Assurance Scheme for compost and Digestate. Quality Manual ECN QAS. Issue-No. 03_2018: https://www.compostnetwork.info/ecn-qas/ecn-qas-manual/

[ii] Compost and digestate are Component Material Categories (CMCs) according to the Regulation (EU) 2019/1009.

[iii] Regulation (EU) 2019/1009 of the European Parliament and of the Council of 5 June 2019 laying down rules on the making available on the market of EU fertilising products and amending Regulations (EC) No 1069/2009 and (EC) No 1107/2009 and repealing Regulation (EC) No 2003/2003, OJ L 170, 25.6.2019, p. 1–114

[iv] Including Austria, Belgium, Germany, Italy, the Netherlands and Spain (Catalonia only).

[v] In case of Germany the fragments are measured starting from 1mm.

[vi] Prata, J., 2018. Airborne microplastics: Consequences to human health? Environmental Pollution, 234, pp.115-126

[vii] Beaumont, N., Aanesen, M., Austen, M., Börger, T., Clark, J., Cole, M., Hooper, T., Lindeque, P., Pascoe, C. and Wyles, K., 2019. Global ecological, social and economic impacts of marine plastic. Marine Pollution Bulletin, 142, pp.189-195

[viii] Bellasi, A., Binda, G., Pozzi, A., Galafassi, S., Volta, P. and Bettinetti, R., 2020. Microplastic Contamination in Freshwater Environments: A Review, Focusing on Interactions with Sediments and Benthic Organisms. Environments, 7(4), p.30.

[ix] Guo, J., Huang, X., Xiang, L., Wang, Y., Li, Y., Li, H., Cai, Q., Mo, C. and Wong, M., 2020. Source, migration and toxicology of microplastics in soil. Environment International, 137, p.105263

[x] Test salute 2019 reporting a test managed by EU consumer associations of Austria, Belgium, Denmark, Spain and Italy.

[xi] Kieran Cox, 2019. Human Consumption of Microplastics.

[xii] Danish EPA, 2017. Microplastic in Danish wastewater Sources, occurrences and fate.

[xiii] Scheurer et al., 2018. Microplastics in Swiss Floodplain Soils. Environ. Sci. Technol. 2018, 52