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11. Local urban biowaste recycling as fertilisers: a safe-by-design approach

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Introduction The EU Green Deal strives for a 50% reduction of agrifood system nutrient losses by 2030, combined with a 20% reduced fertiliser use. Furthermore, the EU Waste Framework Directive specifies targets for waste recycling, with Member States having the binding obligation to recycle or prepare at least 60% of their municipal waste for reuse by 2030. The use of domestic and commercial biowaste (food waste) as fertilisers is a logical step combining both ambitions. However, closing this loop for nutrients will also introduce other biowaste components in the agrifood system. Useful ones such as organic matter, but also possible contaminants like pathogens, heavy metals and pesticides. The currently ongoing PPP project 'Circular Urban Food Production, safe by design' (see project website) is developing a safe-by-design approach to ensure food safety and regulatory compliance when reusing municipal (bio)waste as compost or other fertilisers.

Methodology The project is looking in detail at urban biowaste composition (focusing on food waste), different processes for fertiliser production and legal aspects. Samples of different biowaste inputs and process outputs are analysed, and the results will be integrated in a HACCP-like approach for evaluating the effects of using the outputs in the agrifood system on human health. In parallel the compliance of processes and products with the regulatory framework is evaluated, e.g. the fertiliser quality and application rules that are in place to protect environmental health. Biowaste conversion processes included in the project are worm hotels, commercial scale vermicomposting and anaerobic digestion to produce a nutrient solution for vertical farming. Kitchen waste grinders are evaluated as a novel collection system for the Netherlands. Centralised composting (sometimes preceded by anaerobic digestion) as currently performed in the Netherlands is used as the reference process. Samples are taken in different seasons and will be analysed for agronomic value, visual contamination (e.g. plastics, glass), heavy metals, pathogens, and organic pollutants (a.o. pesticides and PAHs). Critical control points will be identified for the different processing options. Analytical results will be complemented with available literature data if necessary.

Results and discussion At the current stage of the project, the regulatory framework has been mapped and legal limits for contaminant concentrations and nutrient content have been identified. A complex interaction of rules and regulations needs to be taken into account as different directives and regulations apply. The status of food waste as category 3 animal by-product (Regulation (EC) No 1069/2009) is important, requiring hygienisation. In addition, Dutch and EU fertiliser regulations have different characteristics. For example, digestate from biowaste can be used as input for CE certified fertilisers, whereas within Dutch law composting is the only viable option.

Processes have been mapped and prepared for identifying the critical control points. Literature data on constituents has been gathered and as soon as biowaste and product samples have been analysed, a thorough comparison and interpretation will take place. At the moment of writing this abstract, no publicly available data can be reported yet, but it is expected that most of the sampling results will be available at the time of the conference. Some contaminants are inevitably present in food waste (e.g. zinc and copper, as these are also micronutrients), whereas others are a direct result of human behaviour. The levels of contaminants in the biowaste are ultimately decisive in determining the fertiliser quality and related acceptable or unacceptable risks when using them in the agrifood chain.

Conclusion Various food safety hazards have been identified that potentially could be present in the incoming and outgoing biowaste materials. Based on the safe-by-design approach, conclusions are drawn on the impact of using fertilisers made from biowaste processing on food safety, which will be presented at the conference.

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