# Modelling anaerobic digestion and compost of organic residues: towards organic matter fate prediction in soils during land spreading

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# MODELLING ANAEROBIC DIGESTION AND COMPOST OF ORGANIC RESIDUES: TOWARDS ORGANIC MATTER FATE PREDICTION IN SOILS DURING LAND SPREADING

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**Abstract**

In a context of environmental biorefinery, organic residues are no more considered as wastes but as potential resources for some targeted services. These services could be the energy production through the methane provided by anaerobic digestion, the agronomical valorisation of residues for cropped soils fertiliser and amendment, and others value-added compounds (i.e. obtained during fermentation like organic acids, hydrogen...). There are currently only few studies focused on both optimization of energetic valorization and agronomical valorization of organic wastes. One way to optimize both objectives is the process modelling. However, input variables from all existing models are different and there is a need to find relevant and common input variables to model the organic residues treatments. Recently, a new promising methodology of organic matter characterization has been successfully used to predict anaerobic and aerobic biodegradability and bioaccessibility of a broad range of organic residues [1]. This methodology is based on the combination of chemical fractionation simulating organic matter accessibility and of a 3 dimensional fluorescence spectroscopy highlighting fraction's complexity. The fractionation is shown to be consistent to both anaerobic digestion and compost organic fate [1]. Consequently, the fractions obtained were used as anaerobic digestion and compost model input variables and as organic matter fate in soil. Existing models are modified to take into account these new variables [2, 3, 4]. In order to calibrate and validate the models, a lab scale reactor of anaerobic digestion was operated to treat wastewater treatment sludge. Biogas, methane proportion, pH and input and output digestate quality were monitored. After 60 days of steady state operation, the digestate was centrifuged to separate the liquid from the solid part. The solid part was then added with green waste into a lab scale compost reactor. Temperature, $CO_2$ production, moisture and compost quality were monitored. Finally, the final compost was used as substrate for cropped soil incubation. Until now, the new anaerobic digestion model was successfully able to predict biogas and digestate quality. Both compost and soil model are under calibration. But, all the results will be available for the conference.

**References**

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