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EDITORIAL

Part B: Global Assessment for Organic Resources and Waste Management ORBIT2012

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During the last century, population growth and global economic and technological developments have led to increased use of resources, both in terms of materials and energy. Meanwhile the amount of waste produced has increased steadily. This rapid evolution contributed to a critical environmental situation for the planet: global warming strongly related to emissions generated by human activities, water and soil pollution associated with uncontrolled releases of pollutants and nutrients, as well as soil organic matter depletion. Natural resources are being consumed at a rapid pace, but are not infinite and we are confronted with such questions as: "What energy resources for tomorrow? What resources in terms of organic matter and nutrients to the soil?".

As a consequence, during the last years, emphasis has been on organic resources recovery in order to achieve our aspiration towards a "Recycling Society" and climate stabilisation. Energy, nutrients and organic matter needs have driven sustainable management of resources and waste and promoted new technological developments. In this context, biological processing of organic waste to recover valuable nutrients such as nitrogen and phosphorus, to produce soil amendments and to supply energy is of great interest. However rules on the management of organic waste are fragmented and might not be sufficient to achieve the stated objectives of an effective management. Moreover, unsolved questions still exist concerning the management options for organic waste and resources among which:

- Which types of management systems should be promoted, from an environmental and economic point of view?
- How can we optimize the recovery of organic waste streams at all territory scales?
- What synergy can exist between management of urban and agricultural waste?
- Are the energy recovery and the organic matter and nutrients recovery really compatible and how can we obtain products that comply with agronomic needs?

All these key issues highlight a strong need for environmental and economic assessment to guide both the technological choices and public decision making. Moreover there is an open question on the tools that can be used to assess the efficiency of organic resources and waste management systems and lead to the selection of adequate processes. Especially the increasing use of Life Cycle Assessment tools has to be carefully addressed with a special focus on the indicators considered and the local applicability of the results.

These are all questions that were addressed throughout the conference ORBIT2012 held in June 2012 in Rennes, France, and co-organised by The European Compost Network and Irstea Rennes. During 3 days, 260 researchers, waste operators and representatives of public services, coming from 36 countries all over the world, dealt with all aspects of organic resources and waste management with a special focus on the assessment of technologies from an environmental, social and economic point of view. A large place was given to climate change, waste management assessment and decision tools. Traditional themes as energy recovery (biofuels, biogas, hydrogen production), biological treatments [composting and anaerobic digestion (AD)] and also mechanical biological treatment remained

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central issues that were discussed in order to improve technologies and product quality, especially for land application. More local management systems such as home and community composting were discussed as they may represent solutions that have to be considered in an integrated organic waste management plan. Special emphasis was also laid on EU policies and strategies for sustainable organic waste management.

Among the 192 communications (oral and posters) given during the ORBIT2012 conference, we chose, through this issue of Waste and Biomass Valorization, to focus on the last developments in research on the composting management of organic waste.

Composting is one of the biological treatments considered as a valorisation pathway for organic waste by the European waste hierarchy. Indeed composting enables a decrease in the volume and weight of treated organic waste while supplying favourable conditions for waste hygienisation. Moreover the produced compost is of great agronomic interest. Intensive agriculture tends to decrease the stock of organic matter on farmland and natural resources of mineral nutrients for fertilization could be limited in the near future. An increased use of composts could help agriculture to face these problems by returning stabilized organic matter in agricultural soils and by supplying nutrients recovered from organic waste or residues. Nevertheless, industrial operation of composting plants faces environmental limits such as GHG emissions, nitrogen losses, or odour emissions. The development of AD led to the production of new organic residues, the digestates, the valorization of which opens the question of the synergy between composting and AD. Throughout the eigth following papers, an overview is given on how researches on composting process and compost properties could provide answers to the previous issues.

Two papers focus on the understanding and optimisation of biological phenomena along the composting process. Wang et al. investigated the impact of inoculating four psychrophilic and two cellulose decomposing thermophilic bacterial strains to improve the biodegradation along composting. They showed that such inoculation in chicken manure and sawdust composting increased the rate of temperature rise and the maintenance of high temperatures. Zeng et al. studied the dynamics of nitrogen and ammonia oxidizers during aerobic treatment of digestates. Experimental results showed that mineralization of organic nitrogen arose during the intense biodegradation stage and contributed to ammonia emissions, while the ammonia oxidation flow decreased to around zero during this phase and re-established during the maturation phase. The numbers of ammonia-oxidizing bacteria were correlated to the ammonia oxidation flow and suggested that these bacteria were responsible for ammonia oxidation during aerobic treatment of the studied organic wastes. Considering the composting process management, Blazy et al. investigated the influence of the aeration rate, the particles sizes of the bulking agent, the incorporation ratio of bulking agent and finally the effect of composting duration on the composting efficiency (temperature rise during composting, stability of the compost, moisture and nitrogen contents). The studied process parameters proved to be interrelated and to largely influence temperature rise and water removal from the compost. The authors proposed ways to manage the process parameters. In the area of environmental impacts of composting, Gutierrez et al. addressed the key issue of odour emissions in composting. They compared three approaches to monitor odours (e-nose; chemical analysis by GC–MS; olfactometry) at different stages of the composting process and showed that these approaches are complementary. While the e-nose was capable of identifying the activities responsible for emissions on the composting site, the GC–MS identified which chemical compounds were emitted and dynamic olfactometry quantified the odour concentration in relationship with the emissions. Addressing the issue of the synergy between AD and composting, Bustamante et al. studied the feasibility of applying composting as a post-treatment for digestates. They assessed the evolution of the microbial community by qPCR and showed that archeal/bacterial and fungal bacterial ratios were linked to aerobic conditions (bulking agent ratio) and stability achievement. The quality of composts for agricultural use was correlated to the quality of digestates before composting and to the ratio of bulking agent used for composting. Vandecasteele et al. investigated the optimal composition of feedstock to be composted in order to produce compost with a high fertilising value, by studying chicken manure composting. They also assessed the influence of the composting process on the phosphorus availability in the end-product and showed that the compost stability had a major influence on this latter parameter. Finally, two papers focus on the characterization of composts regarding their use and on the environmental assessment of their application on soils. Costello and Sullivan have developed a method for determining the pH buffering capacity of composts, which is an important characteristic regarding the horticultural markets for composts. Laville et al. studied nitrous oxide emissions following composts application in soil. They compared these emissions to those obtained after application of non-composted organic residues and for different types of soils. They showed that 3 days after application emissions of N_2O for composts were negligible and depended mainly on the initial mineral nitrogen content of the products. They also demonstrated that the type of soil largely influenced the results.

The results presented in these papers highlight the positive development of research concerning composting issues and the constant efforts to optimise the composting

treatment and the compost quality in order to improve valorization of organic waste and residues. On behalf of the scientific committee of the ORBIT2012 Conference, we wish that this special issue of Waste and Biomass Valorization will contribute to bring informative content and encourage further research and innovation.