Life cycle assessment of orange peel waste management

The management of orange peel waste constitutes an economic and environmental problem in regions in which there are important citrus processing industries, as is the case of southern Italy. Traditional handling techniques are either not economically attractive (e.g. composting and animal feeding) or discouraged by European policy (landfilling). As an alternative to these technologies, others aimed at recovering energy and resources are currently receiving increasing attention. The consequential life cycle assessment adopted in this work compares the environmental performance of ten orange peel waste management scenarios. These include mono-treatment scenarios (pyrolysis, incineration, and anaerobic mono-digestion) and co-treatment (four anaerobic co-digestion strategies with animal manure and seaweed) ones aimed at energy/resource recovery, which were compared with three "traditional non-energy focused handling techniques (landfilling, composting and animal feeding). Overall, the co-digestion scenarios appear to be the best, in terms of global warming and resource depletion mitigation. However, they also suffer from a drawback, that is, a potential eutrophication impact, due to nitrate leaching following on-land digestate use. Orange peel waste use for animal feeding, while appearing interesting from an environmental perspective (for example to reduce meal imports), presents practical challenges as far as the nutritional aspects and costs are concerned, and these eventually hinder its market potential. A preliminary cost flow analysis has concluded that anaerobic digestion strategies are economically preferable to the other alternatives.

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