

Assessment of Tomato Peels Suitable for Producing Biomethane Within the Context of Circular Economy: A GIS-Based Model Analysis

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Abstract

There is a general consensus that global warming is due to the anthropogenic emission of greenhouse gases. Renewable resources will play a crucial role in the current CO₂-mitigation policy. The biomass is seen as one of the most dominant future renewable energy sources. In detail, agro-industrial by-products represent a cheap, renewable, and abundant feedstock useful for several new products, including biochemical, biomaterials, and above all biogas that in Italy is taking on an ever-increasing role. In this context, the tomato chain was analysed, by detailing the transformation process with the aim to estimate the amount of processed tomato and the related waste production (tomato peels) as new suitable resource for producing biofuel (biomethane) as new frontier within the context of circular economy. Due both the importance of tomato industry in Sicily and given the uncertainty of data relating to waste quantities, this research aims at filling the gap in the knowledge of the production and yield of these by-products useful as biomasses for energy uses. This aim is relevant to plan the sustainable development of biomethane sector by reducing both soil consumption for dedicated energy crops and GHG emissions derived from biomasses logistic supply. Furthermore, if considered as waste, tomato peels produce a negative impact on the sustainability of all the food-chain industry, since their disposal represents one main issue in terms of environmental and economic impact. A GIS-based model was developed through QGIS software. Firstly, all the Sicilian tomato processing industries (eight) were localised in a GIS map then, detailed interviews were recorded, in order to quantify the amount of tomato processed and the related waste produced. Detailed GIS analyses were performed by showing three Sicilian areas highly characterised by this kind of biomass. Yearly about 1 million of Nm³ of biomethane could be produced if all tomato peels were used for anaerobic digestion. This strategy implies a shift from "cradle to grave" to "cradle to cradle" waste management with an increasing decrease in waste generation through the use of new business models. Therefore, it would be desirable that future policies of development of biomethane sector will take into account both the availability and distribution of these suitable biomasses within the territory.

Keywords: tomato peels, biomethane, GIS, circular economy, bioresource policy.

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