

Assessment of Agricultural Wastes within Circular Economy Concept: Towards Bioeconomy

Circular economy (CE) is a novel approach gaining attraction in the global economy to achieve sustainability and meet Sustainable Development Goals (SDGs). The replacement of wastes by resources seems to be a key factor in transition towards CE. The Circular Economy Action Plan of the European Commission addresses the biomass and biomaterials with priority. European policies support the transition towards bioeconomy that aims to reduce dependence on fossil-based resources, limit greenhouse gas emissions and environmental impacts, and to ensure sustainable economic growth. Therefore, focus on production of renewable fuels and chemicals from waste has gained momentum over time. At the same time, environmental pollution and waste generation are increasing rapidly in the agricultural sector. Turkey as an agricultural country has abundant potential sources originating from agricultural activities such as crop residues ideally used in bioenergy generation processes. Even though agriculture accounts for about 63% of the total biomass supply in the EU, in Turkey agricultural wastes have not been efficiently utilized as biomass resources to be converted to bioenergy and bio-based products. The aim of this study is to assess the potential for agricultural wastes to be replaced in biorefineries where innovative eco-efficient and cost-effective conversion processes are sequentially used. Three process schemes; two of them being environmentally friendly biorefinery systems and one being a conventional fossil fuel-based system as a reference technology for comparison will be analyzed in terms of environmental and economic impacts. For this comparison, their performance will be evaluated by applying life cycle assessment (LCA), in combination with the assessment of technical and economic feasibility via Techno-economic assessments (TEA). Finally, it will be demonstrated how to perform a combined environmental and economic analysis within the framework of a circular economy by introducing a methodology.

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