Abstract

The current study's objective is to assess how well bioethanol produced from organic waste performs economically and environmentally in Lahore and it generates 6500 t of MSW annually. In the Gabi software, Life Cycle Assessment (LCA) was carried out utilizing the database and primary data collected from the field. Furthermore, there is not a proper bioethanol plant that exists in Lahore city, that particularly produces bioethanol. Hence, a small-scale bioethanol production plant was designed. Appropriately 15,300 t of bioethanol can be produced from 100 t of organic waste. Additionally, LCA was performed, and ReCiPe (H) LCIA was employed for modeling. Thus, modeling results presented that the production of bioethanol into OFMSW friendlier rather than the current landfilling with climate change methods of 3.05E-05 kg CO2eq, ozone depletion potential 0.0111 kg CFC-11 eq, eutrophication potential 10.9 kg P eq, acidification potential -5.39E-03, and photochemical ozone formation 132. Scenario modeling was also done to further mitigate the environmental effects, with the electrical source coming from photovoltaic solar cells, which decreases fine particulate matter formation from 67.8 to 0.766 kg PM2.5eq. Hotspot identification was done to draw attention to the effects of specific impact categories. However, the economic analysis represents the revenue generation of 1801.68 USD/day. Production of bioethanol from OFMSW and using as a substitute fuel that is economically as well as environmentally viable option for energy generation and also reduces the waste sent to landfills. Moreover, it also facilitates achieving a circular economy and the SDGs.