ABSTRACT

Hydrogen produces no waste and is suitable for both power generation and transportation; it is regarded as a potential game changer for global energy systems and a solution to climate change problems. Despite its many benefits, establishing a stable hydrogen economy poses various technological challenges, such as reducing production costs, preserving cost-effective transmission and distribution, increasing process efficiency, and taking advantage of cheap and sustainable feedstocks. This study sought to evaluate the economically feasible biomass feedstocks for hydrogen energy production and their export capabilities. The Product Space Model was the primary tool employed to attain the goal by fulfilling specific objectives. Two indicators of Product Space Model were used for this study including PRODY and EXPY. The study's findings indicated that Pakistan possesses substantial biomass resources for electricity generation. Sugarcane bagasse exhibited the largest energy potential compared to other evaluated bio-wastes. The minimum energy generating capacity was identified for waste cooking oil. Legume straw, wood waste and potato peels have high PRODY values of 51198, 46220, and 31202, respectively. They possess significant economic potential and are appropriate for export following the fulfillment of local energy requirements. The tea waste, waste cooking oil and rice straw exhibit low income potential, with values of 15433, 15067 and 9094, respectively. Bio-wastes with low-income potential are more advantageous when utilized in domestic energy producing facilities. In this study, the EXPY values of the seven countries are computed which denote the degree of sophistication of a country's total exports. This study has practical implications in social, environmental and economic domains, concentrating on efficient, adequate, and clean energy. Additionally, it recognized exportable biomass feedstocks to enhance Pakistan's economy. Additional research is necessary to assess other indicators of the Product Space Model, as they would elucidate the potential for bioenergy and biomass exports.