THE ROLE OF ARTIFICIAL INTELLIGENCE TECHNOLOGY IN THE FULFILMENT OF SUSTAINABLE DEVELOPMENT GOALS IN BIOGAS PRODUCTION

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Abstract – Artificial intelligence (AI) can significantly improve the efficiency of the process, as well as optimize resources and the sustainability of the biogas production process. As part of the United Nations' Sustainable Development Goals (SDGs), this comprehensive review investigates the role of artificial intelligence-driven technologies in enhancing biogas yield, process monitoring, and waste management. This study aims to analyse the literature on AI's functions in assessing feedstock availability and quality for achieving Sustainable Development Goals, forecasting biogas yield, and overseeing biogas production processes. This systematic review leverages the Preferred Reporting Items for Systematic Literature Review and Meta-Analysis, PRISMA, to painstakingly review research papers published between 2016 and 2023 using Pubmed, Scopus and Web of Science to understand how AI can assist farmers and biogas plant operators in making informed decisions, identifying anomalies, and forecast biogas yield, ultimately contributing to sustainable development. We analysed the papers to identify research gaps and different artificial intelligence like Artificial Neural Networks (ANN), Genetic Algorithms (GA), Tree-based Pipeline Optimization Tools (TPOT), Random Tree (RT), Random Forest (RF), Adaptive-Network-based Fuzzy Inference System (ANFIS) etc., which have been used in previous research relevant to this study. The result from our study emphasizes recent progress, obstacles, and prospective research avenues for integrating AI into biogas production. It can be concluded that AI-augmented biogas systems, such as machine learning, predictive analytics, and process automation, enhance anaerobic digestion, mitigate greenhouse gas emissions, and facilitate the adoption of renewable energy (SDG 7), facilitate waste-to-energy projects, promoting sustainable consumption and production (SDG 12) while alleviating environmental pollution (SDG 13). Hence, AI can substantially aid in sustainable energy transitions and circular bioeconomy frameworks, bolstering global initiatives to attain various SDGs.

Keywords – AI; Biogas production; optimize resources; sustainable development; PRISMA
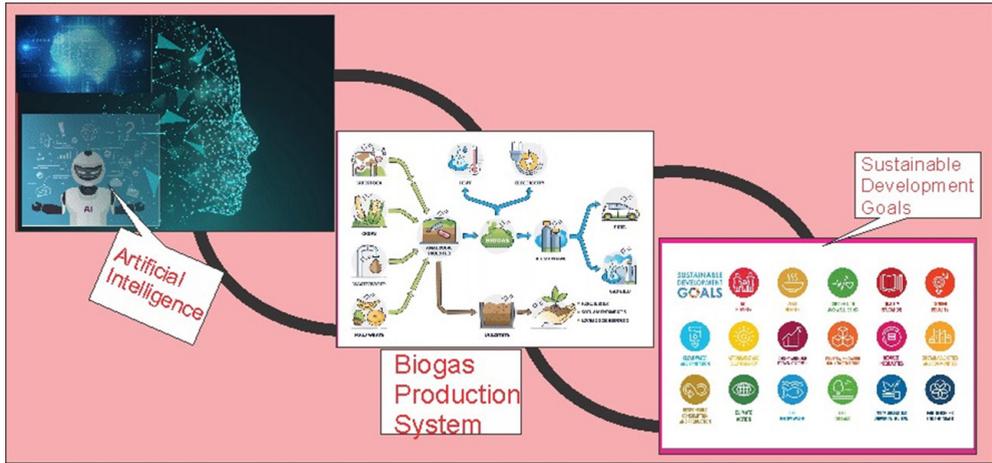
Artificial Intelligence in Biogas Production for SDG fulfilments

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