

***Techno-Economic Analysis of Goat Manure Biogas Utilization in the
Productive Farm Livestock Group in Suco Village, Jember***

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ABSTRACT

techno-economic analysis aimed to evaluate the technical and economic feasibility of utilizing biogas produced from goat manure in Suco Village, Jember Regency. The technical analysis was conducted by evaluating the biogas production rate, methane (CH₄) and carbon dioxide (CO₂) contents, flame burning duration, and flame color. Meanwhile, the economic feasibility was assessed using the Cash Flow, Net Present Value (NPV), Internal Rate of Return (IRR), Benefit Cost Ratio (BCR), Payback Period (PBP), and Break Even Point (BEP) methods. The results showed that the biogas produced had an average production rate of 1.017 m³/day, a maximum methane content of 31.60%, and a flame burning duration ranging from 22.68 to 37.25 minutes, with the flame color varying from reddish-blue to predominantly blue. The economic analysis indicated that utilizing biogas as cooking fuel generated an NPV of IDR 11,466,151, an IRR of 18.45%, a BCR of 2.46, a PBP of 5.13 years, and a BEP of 4.63 years. Meanwhile, utilizing biogas as a source of electrical energy resulted in an NPV of IDR 9,626,259, an IRR of 17.03%, a BCR of 2.32, a PBP of 5.55 years, and a BEP of 5.01 years. Based on the technical and economic analyses, both utilization scenarios were considered feasible. However, the use of biogas as cooking fuel was identified as the more favorable alternative due to its higher economic return and shorter investment payback period compared with its utilization as a source of electrical energy.

Keywords: *biogas, renewable energy, goat manure, technoeconomics*