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Investigating a sustainable operational method for a micro-scale biodigester in South Africa

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ABSTRACT

The adoption of micro-scale biogas digesters can play a significant role in reducing indoor pollution and promoting socio-economic development. This research aims to investigate a sustainable operational method for a South African micro-scale biodigester. The factors affecting a sustainable operation of a digester, the economic and market model analysis and an assessment of the current South African policy is discussed with an objective to improve the biodigester legislative framework. To operate a sustainable micro-scale biodigester, a compact project management should be established and qualitative data collection that could not be collected during the digester needs analysis community meetings should be gathered from community groups. Gathering data through community groups strengthens project integration into communal structures. Community consultation highlights whether there is an interest or not from the rural communities. The findings indicated that a compulsory maintenance contract guarantees a constant digester feeding thus solidifying microorganism sustenance. A routine maintenance plan ensures that all digester mechanical failures are minimised. The economic and market model analysis showed that micro-scale biodigesters are generally government or donor-funded in South Africa. Lack of financial resources ring-fenced for digester maintenance was identified as the cause for digester failure. The reviewed analysis of an economic and market model recognised the lack of digester regulation, poverty levels in rural regions, and lower affordability rates as a limitation for micro-scale biodigester adoption. The existing South African energy policy analysis indicated gaps for a sustainable micro-scale biodigester operation. Overall, the supplementary environmental and socio-economic benefits associated with a sustainable biodigesters operation add value to the livelihoods of rural dwellers through reducing energy poverty and encouraging economic development in rural communities.