Community-Level Resource Development and Management, Part 2: A Transferable Approach to Feasibility Analysis for Biogas as an Alternative Cooking Fuel
Summary Paper

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1 TARGET AUDIENCE

Practitioners interested in developing biogas as an alternative cooking fuel in rural villages; school or other institutional administrators aiming to reduce their reliance on firewood; volunteers evaluating possible biogas plant applications.

2 BACKGROUND

Energy access for all is the seventh Sustainable Development Goal (SDG) put forth by the United Nations in 2015 and continues to be an initiative focused on by non-governmental organizations (NGOs), national governments and communities alike. Traditional approaches to cooking often rely on three-stone fires (or other open wood fires). The smoke from these open cooking fires is known to cause significant adverse health impacts, thus access to cleaner energy sources is especially important to improve cooking conditions. One alternative cooking fuel is biogas from human waste, which has the advantages of smoke reduction, decreased reliance on and impact of firewood collection, and reuse of resources that would otherwise be disposed of. However, all too often development project concepts, including those focusing on energy independence, are funded prematurely, before the realization that the implemented technology does not function properly or is unsustainable for specific applications.

3 PURPOSE

This article first presents a condensed method for evaluating the feasibility of biogas energy development at the community level through a cost-vs.-effectiveness analysis, and then applies the method to a case study in a rural Tanzanian secondary school setting.

4 METHOD

This article presents a highly-accessible method of feasibility analysis and its application to a case study for selecting, sizing and costing of a community-scale biogas plant. The method details the process of sizing a plant for a specific population of users and beneficiaries, and analyzes the sanitary and social barriers of using human waste to power the plant. The case study analysis aims to evaluate the effectiveness of using biogas as an alternative cooking fuel.

6 RESULTS

This method was successfully used to identify an appropriate digester type for our rural Tanzanian school application, and to size the biogas plant relative to the number of septic tanks integrated into the design. The chosen digester, a floating drum design, is expected to operate both safely for the operator and hygienically in the school environment. The costing analysis revealed that the two major material expenses were likely prohibitive relative to the yields expected from the plant. The scale of gas produced would not be sufficient to entirely replace cooking with firewood because of the daily cooking demand, so in this case study biogas is recommended only as a supplementary fuel source if implemented.

7 IMPLICATIONS FOR TARGET AUDIENCES

This article provides a clear and concise method of comparing the costs and effectiveness of biogas plants for specified applications. The method can be readily used by development practitioners, individuals, or community organizations for analysis and transparency in the initial stages of plant feasibility assessment and design. By evaluating the major components of plant cost, developers can ensure that required monetary investments are known and obtained prior to commencing projects. In addition, this method will ensure that operators and beneficiaries are clear regarding the maintenance of selected designs and the expected scale of gas yields from constructed biogas plants.