

Analysis of Problems with Family Biogas Plants in Central Vietnam

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Introduction

The resource limitations of fossil fuels and problems coming from their combustion have led to widespread renewable energy resources. Anaerobic digestion is considered as one of the most significant improving technology of environment, as it is solving waste management problems, producing biogas and at the same time digestate as fertilizer (Molino et al., 2012; Adu-Gyamfi et al., 2012). Production of biogas through the AD shows significant advantages against other forms of renewable energies (Lu Shu-Guang et al., 2006). It was evaluated as one of the most energy-efficient and environmentally friendly forms and technologies for renewable energy production (Raposo et al., 2011; Weiland, 2010). It can be expected that the higher amount of biogas plants (BGPs) in developing countries will also bring a significant number of problems and complications regarding their operation.

Methodology

The survey was carried out from July to August 2012 at the level of owners of BGP ($n=141$) and local authorities and facilitators ($n=9$) in the districts Huong Tra and Phong Dien, Thua Thien Hue province in central Vietnam. Methods of data collection for both target groups included focus group discussions, semi-structured personal interviews, questionnaire survey and observation. All farmers were interviewed within one hour semi-structured interview. Data were analyzed in Statistica 10. The formula to calculate Return on Investment (ROI) was used, where D is payback time, I cost of the investment, P_r average annual benefits and N_{pr} annual operating costs.

Figures



Fig. 1: Methane leakage



Fig. 2: BGP cooker comparison



Fig. 3: Biogas user



Fig. 4: Unclean BGP surface

Results & Discussion

The survey revealed that 29% BGP-owners have experienced problem with this technology. Problems were diverse in nature; the main problem is connected to leakages in reactor (35%), leading to undesired CH_4 emissions and even stopping the functionality of BGP. This was reported by 20% of respondents within the first year of use of BGP. Similar problem was identified in studies of authors Chang et al. (2011) and Lam et al. (2012). Further mentioned problems deal with a biogas cooker (15.3 %) and solid digestate floating in a main tank decreasing so production of biogas (14%).

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Results & Discussion

Similar conclusions with corrosion of biogas cookers can be found in the study by Pipatmanomai et al. (2009). In some cases also displacement of BGP and subsequently damage happened due to wet soil during the rainy season. Other problems can be non-technical; lack of finance for building and maintaining BGP, cultural and social obstacles and political restrictions (Chen et al., 2011; Zhou et al., 2008). Other observed problem lies in a possibility of proliferation of mosquitoes on the outer surface of BGP possibly leading to even threat to life by malaria transmission. The respondents ask for better skills of masons and local facilitators, who are often not able to solve occurred difficulties with BGP. The study also involves the calculation of return on investment (ROI). Our findings revealed linear relations between ROI and satisfaction with BGP technology, biogas and biogas program. Mean of D in years with subsidy was 2.25 (+/- 2.04) and mean for D without subsidy was 4.46 (+/- 3.22).

Conclusion

Constantly growing worldwide energy consumption and population expansion in developing countries increase stress and damage to the planet, insomuch biogas technology can potentially highly contribute to solving current issues about waste management, especially manure and human excreta in rural Vietnam areas. BGP can play a vital role in farming systems and add value to agricultural waste and livestock excreta. It is offering significant advantages; especially in the energetic, environmental and economical way. In conclusion, this study analyzed the current situation about problems with biogas plants in Thua Thien Hue province. It showed the need of further research on eradication of the problems with this technology. The final findings with appropriate recommendations will be provided to local authorities, especially facilitators of local level.

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