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## Small- and Medium-Scale Biogas Plants in Sri Lanka: Case Study on Flue Gas Analysis

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### Abstract

Global warming, caused by increasing emissions of CO<sub>2</sub> and other greenhouse gases (GHG) as a result of human activities, is one of the major threats, which are now confronting the environment. CO<sub>2</sub> accounts for the largest share of GHG. For agricultural activities is estimated to account for about 13.5 % of the total GHG emissions and if emissions are allowed to increase without limits, the greenhouse effect can possibly destroy the environment for humans and other living creatures; even threatening the existence of humankind. Biogas production by anaerobic fermentation is a promising method of producing energy while achieving multiple environmental benefit e.g. fossil energy substitution, carbon emission reduction, pollution abatement, welfare improvement and it was evaluated as one of the most energy-efficient and environmentally friendly forms and technologies for renewable energy production.

The study was carried out in August 2014 in the different areas of Sri Lanka at the level of biogas plants (n=51) and local consultants (n=4). Methods of data collection included semi-structured personal interviews, questionnaire survey and flue gas analysis. Flue gas analysis was done through portable device TESTO 330-2, which is capable of capturing the gas concentration of CO, NO, consequently by recalculating CO<sub>2</sub> and NO<sub>2</sub>.

If considered almost 20 m<sup>3</sup> as average size of BGP, 600–700 m<sup>3</sup> of biogas generation per year can be expected. In our case reflecting average time when BGP is on use: 6.03 hours per day (+/- 3.98), with minimum 1 hour per day up to 12 hours per day.

Quite high COppm was detected (COppm=10089.24), which might be caused by insufficient burning, inappropriate biogas cookers and inappropriate maintenance. NOppm is under the value of 0.046, which is showing acceptable value. Flue gas temperature seem appropriate (TS=449.16°C) as well as efficiency (53.96 %) and excess air (3.99 %). Recalculated values are corresponding with values for such biogas systems.

Easy energy access is a trigger for development, especially in form of human, social and economic development and biogas plants represents a boon for farmers and rural people to meet their energy needs. However, further factors must be also examined and evaluated.

**Keywords:** Biogas technology, flue gas analysis, Sri Lanka