



Biogas as a preferred choice for cooking fuel

An analysis based on some case studies in Rural Assam (India)

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Introduction

Biogas is a versatile source of energy which has the capacity to meet the growing energy demand, particularly cooking energy demand of rural areas in developing countries.

It is also a promising means to achieve sustainable energy development goals in many developing countries including in India

The National Biogas Program
(India)

SDG 1
SDG 6
SDG 7

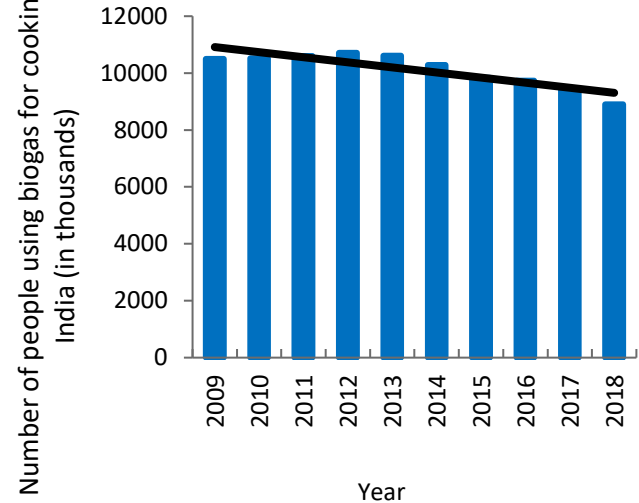
Cumulative number of Biogas plants installations up to 2019-20:

India: 5.06 millions

Assam: 0.14 millions

Source: ENERGY STATISTICS India 2021, National Statistical Office, Ministry of Statistics and Program, Implementation, Government of India

Trend of usage of biogas as a cooking fuel in India (2009-2018)

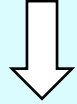


Source: IRENA (2020), Off-grid Renewable Energy Statistics 2020, International Renewable Energy Agency, Abu Dha

Introduction (contd.)

Potential of Biogas

To promote clean cooking, the Government of India subsidized the provision of LPG (Liquefied Petroleum Gas)

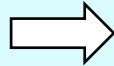


Impact

Sharp increase in LPG consumption from hitting 80 million connections in 2019

Source: India 2020, Energy Policy Review, International Energy Agency

Issues



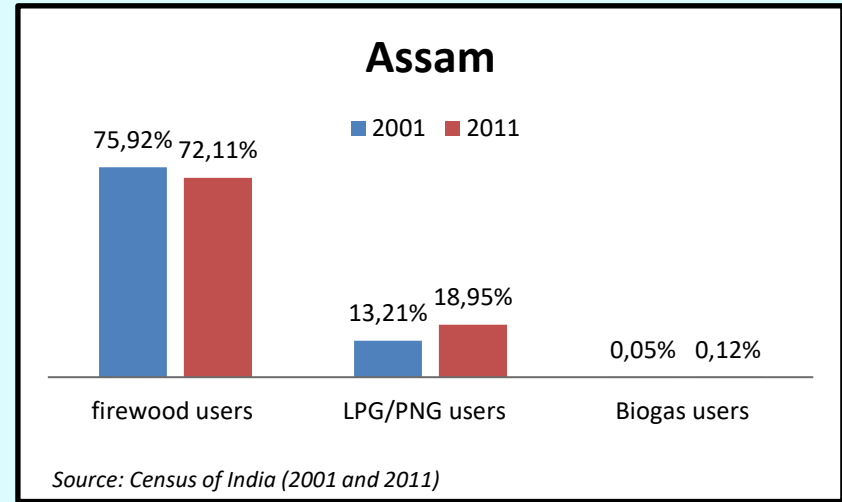
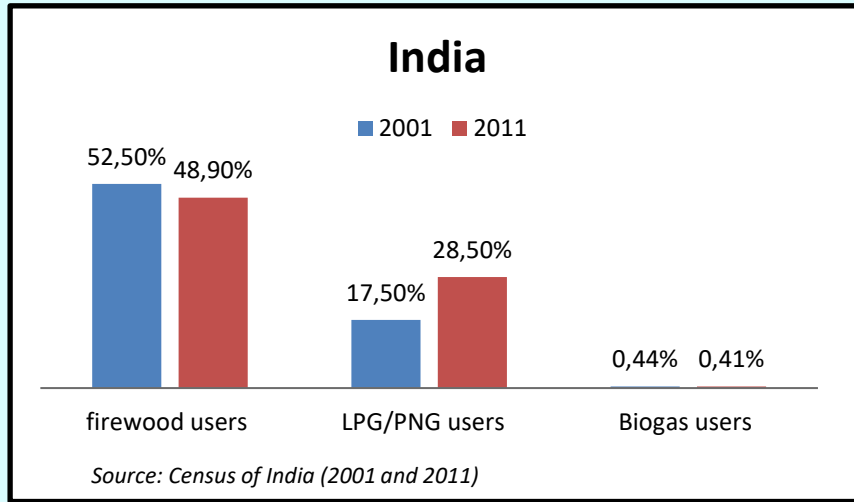
- Substantial fiscal burden
- An estimated 680 million people still do not have access to clean cooking solutions and primarily rely on biomass for cooking
- Traditional cooking still imposes a substantial burden on women
- An average of nearly 1.5 hours per day is spent collecting fuel wood.
- 85% of the energy supply for cooking and heating still comes from traditional biomass

Source: Draft National Energy Policy, NITI Aayog, Government of India, Version as on 27.06.2017

Prospect



Biogas is a viable alternative for supplying clean and sustainable energy especially as a cooking fuel



Issues against the household biogas dissemination in rural India:

- **Easy availability of alternative fuels (such as household woody biomass, crop residue, dung cake),**
- **Lack of support and services to address operation and maintenance of biogas system,**
- **Lack of awareness,**
- **Fuel stacking,**
- **Affordability**

(Source: Bhat et al. (2001) Biogas plant dissemination: success story of Sirsi, India, Raha et al. (2014) The implementation of decentralized biogas plants in Assam, NE India, Mittal et al. (2018) Barriers to biogas dissemination in India: A review, Gould et al. (2020) The role of education and attitudes in cooking fuel choice: Evidence from two states in India)

Objective of the study

Rationale:

- Limited study about the growth/barriers of biogas technology in many regions including North Eastern India
- There exists remarkable gaps between availability and demand for quality energy particularly for cooking
- Inherent benefits of biogas over traditional solid fuel are not realized
- Besides fulfilling the need for cooking fuel, biogas system has been identified to address waste management and source of crop nutrient
- Despite of obvious benefits and Government support, the adaptation, popularity and dissemination of biogas technology remains low in many regions including Assam (India)

Keeping in view of the above, this present study is undertaken in some typical rural areas in Assam to investigate the issues concerning the usage of household biogas system

Materials and methods

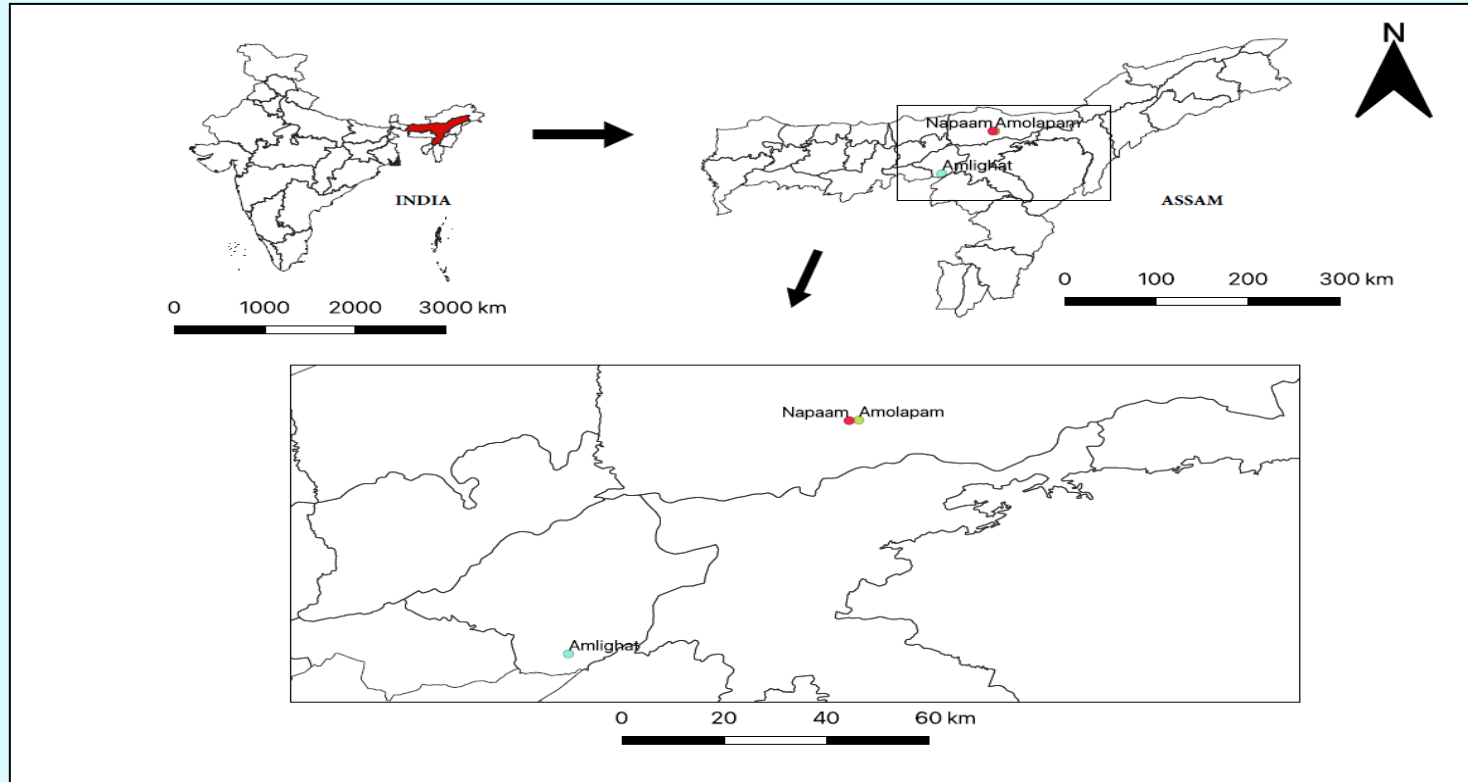
Study area and the procedure of study:

- Three villages, Napaam and Amolapam and Amlighat of the state of Assam were considered for the study based on some preliminary investigation.
- ✓ *There are beneficiaries of Government of India sponsored Schemes for promotion and implementation of household biogas plants in these three villages*
- ✓ *Needs of clean cooking fuels, fertilizer for crop and waste management are prevalent in these three villages*

- Structured questionnaire to interview 76 potential users of household biogas system to gather information related to
 - ✓ *background of users,*
 - ✓ *type of biogas plant,*
 - ✓ *duration of use,*
 - ✓ *status of uses (functional/non-functional),*
 - ✓ *issues concerning the operation (feedstock, collection, storage and feeding, output from the biogas plant) and training /servicing of the system*

Materials and methods

Location of study area



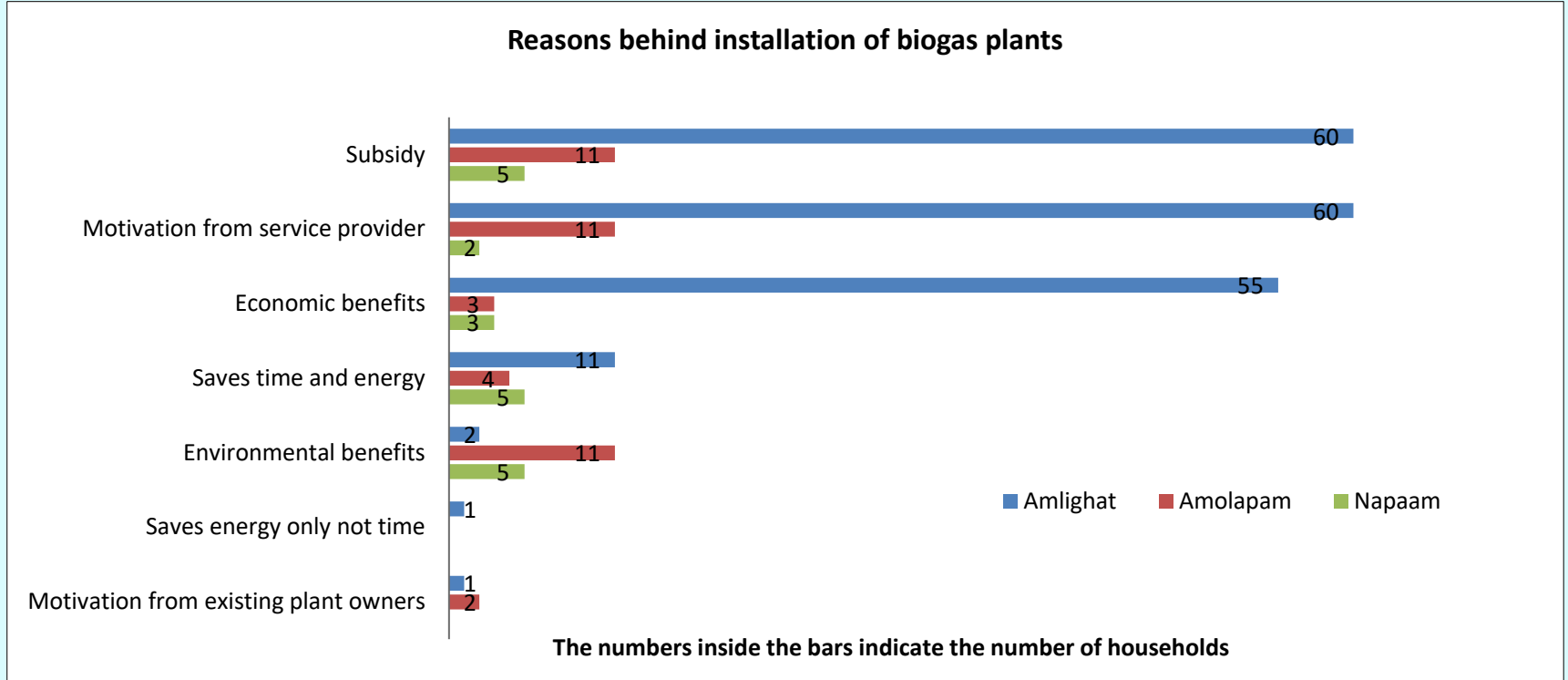
Results

Users feedback about the experiences are analyzed and presented under the following heads :

1. *Motivation*
2. *Period of construction of biogas plants and status*
3. *Post installation services*
4. *Operation and Maintenance*

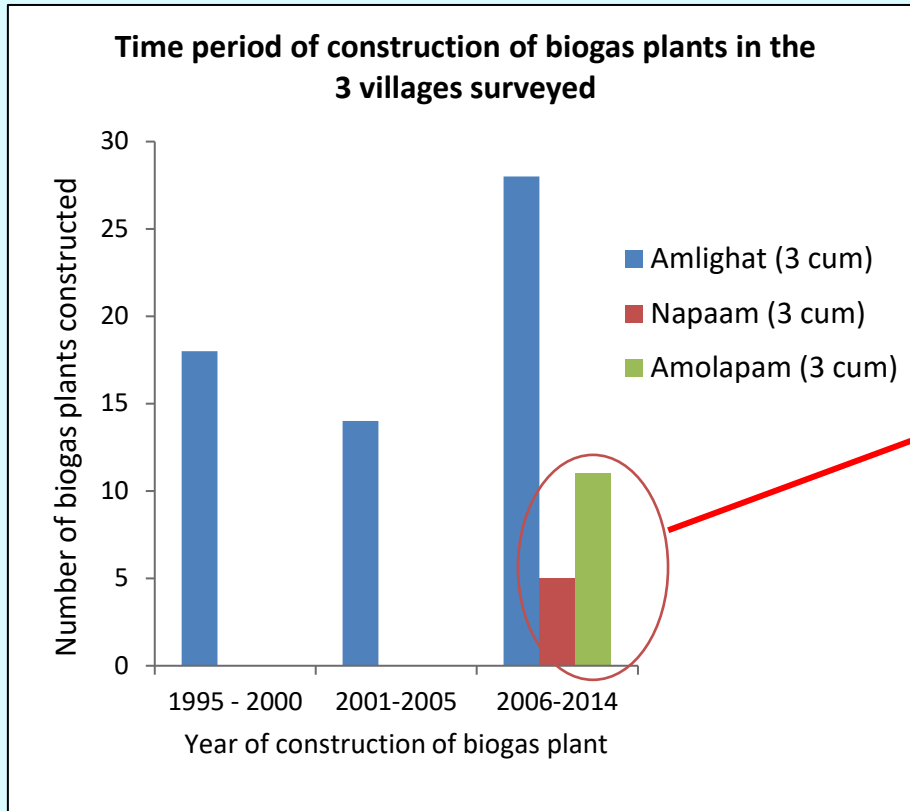
Results (contd.)

1. Motivating reasons: Information regarding beneficiaries' motive for installation of biogas plants



Results (contd.)

2. Period of construction of biogas plants and status



Defunct
biogas plants in Napaam
and Amolapam for a
period of 1 – 5 years

cum = cubic metres

Results (contd.)

3. Post installation services: Training offered after installation of the plant and follow up services

Training offered after installation of the plant

| S.No. | Training offered after installation of the plant | Options given | Users in Napaam | Users in Amolapam | Users in Amlight |
|-------|--------------------------------------------------------------------|---------------------------------------------|-----------------|-------------------|------------------|
| 1 | Provision of training to the users after installation of the plant | No training received | 5 | 9 | ---- |
| | | On the spot instructions | ---- | 2 | 18 |
| | | Short training provided by service provider | ---- | ---- | 42 |
| 2 | Provision of follow up services to the users from the agency | Yes | ---- | ---- | 46 |
| | | No | 5 | 11 | 14 |

Follow up services

| | |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Napaam and Amolapam | No service centres available in the villages |
| Amlight | A full time rural energy technician is available who is responsible for the installation and maintenance of the biogas plants of the whole village. |

Results (contd.)

4. Operation and Maintenance

Feedstock availability

| Village | Average cows/household |
|----------|------------------------|
| Napaam | 2 |
| Amolapam | 2 |
| Amlighat | 14 |



An animal shed in Amlighat

Maintenance issues: Reasons for which the of biogas plants in Napaam and Amolapam became defunct

- Defects in digester/gas holder/pipe/inlet/outlet (100 % of respondents)
- Maintenance costs no longer affordable (50 % of respondents)
- Not interested to operate because other sources of fuel are available (firewood, LPG) (44 % of respondents)
- Non uniform availability of feedstock (100 % of respondents)

Results (contd.)

4. Operation and Maintenance (contd.)

Motivating factors

Existence of cooperative milk processing rural industry (Sitajokhola Dugdha Upadak Samaway Samiti) dairy milk farms in Amlighat appeared to be the motivating factors among the biogas users to keep their biogas plants running in proper working conditions.

Something similar can be suggested in Napaam and Amolapam



Dairy milk farm business in Amlighat

Users' Interest

Household biogas plant owners can be grouped as below

1. Interested in continuing to uses biogas due to useful experience (Amlighat)
2. Interested in using biogas but faces difficulties (Amolapam & Napaam)



A functioning biogas plant (Amlighat)



Defunct biogas plant in Napaam

Recommendations

The primary objective of this survey was to determine **the issues related to the dissemination of biogas in certain regions of North East India**

Based on the observations of the study, following recommendations are suggested to address the issues against diminishing interests

The recommendations have also been suggested under four stages:

1. *Motivation*
2. *Installation*
3. *Post installation services and Business opportunities*
4. *Operation and Maintenance*

Recommendations

Motivation

The users should be sufficiently aware regarding the technology involved in the working of a their biogas plant. The existing provisions of awareness programs may be re-oriented to focus the target group

Success stories of identical uses and benefits derived from household biogas plants may be disseminated among potential users. Site visits may also be planned as a means to promotion

Installation

User's Involvement during construction phase is critical to avoid post-installation defects. Installation is not mere a job of hired mason.

Size of the biogas system should be based on users need and feedstock availability. Excessive deviation of the installed capacity from this two aspects is not desirable. The most successful design should be selected based on the experience of identical conditions.

Recommendations

Operation and maintenance of the plant

Knowledge on the methods of feeding, regular cleaning, periodical maintenance is key for successful operation. Govts subsidy may be linked with testing of such knowledge of the beneficiaries.

Dedicated turnkey workers having appropriate skill for the repairing of the plants should be available. Existing provisions appear lack sustainable business model

Economic benefits of digested slurry for its nutrient contents appears missed out due to improper handling. This is key for a successful business model.

Post installation services & Business opportunities

Online data collection of the household plant may be useful not only for understanding the health of the plant but also to address the non-operational issues immediately

Multiple enterprises helps to promote biogas system. Therefore, promotion of dairy enterprises may be considered to ensure sustainable supply of feedstock. Diversity of feedstock including crop residue may also be considered

Conclusion

- This present study was done to investigate the issues concerning the usage of household biogas system in some typical rural areas in Assam.
- Reliable supply of feedstock, proper training regarding the operation of the biogas plant, existence of after-installation support services, awareness programs were some key factors in influencing the users' preference for biogas as a cooking fuel.
- Information Technology intervention, entrepreneurial avenues for livelihood generation and more awareness regarding opportunities and schemes from Government will help biogas be a viable option for cooking fuel.



Thank you