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Public-Private Partnerships and the Dissemination of Biogas Digesters in the Global South

Dr Xavier LEMAIRE, Senior Research Associate; **Mr Daniel Kerr,** Research Assistant; **Ms Nandi Mbazima,** PhD student

University College London, Energy Institute

Contact: X.Lemaire@ucl.ac.uk

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STEPs
Sustainable Thermal Energy Service Partnerships

Contents

- Elements of context of the research
- Case studies of unsuccessful dissemination
- Case studies of successful dissemination
- Some lessons on dissemination of bio-digesters

Biogas as a thermal energy service

Biogas as a technology:

- Relatively mature technology
- Cost-competitive?
  - Capital costs can be reduced when a market is created
  - Compete with "free" sources of energy like wood (actually collection time,…)
- Energy with reduced environmental and health impact

The delivery of a thermal energy service

- Cooking and to a less extent lighting (electricity)
- Can provide better quality of services than cook stoves
  - No smoke – better air quality
  - Use of already on site waste – save time
- But unaffordable for the majority

Sustainable Thermal Energy Services Partnerships - STEPs

STEPs:

- 3 years research project
- Funded by Uk Aid/Dfid- DECC- ESPRC
- Thermal energy services
  - Heating, Cooking, (Cooling)
  - Technology neutral (biogas, LPG, solar water heater,…)
- Business models; Institutional and regulatory framework

Methodology

- Literature reviews, Case studies
- Workshop with solar companies in South Africa
- Project in Afghanistan

Biogas - STEPs

A dome-type biodigester under construction in Arusha, Tanzania. Image: Laramee & Davis (2013)

Prefabricated biogas digester by AGAMA Bioenergy in South Africa. Image: Agama Biogas PRO via Youtube.

Case of Rwanda (1)

Rwanda

- Rwandan National Domestic Biogas Program (NDBP) instituted in 2007
- SNV and Rwanda's Ministry of Infrastructure (MININFRA)
- Objective of installing 15,000 bio-digesters at a household scale by 2011

Approach

- Strong support of the government
- Fixed subsidy 300 USD (all plants size) + micro-finance (3 years loan)
- Investment in training & skills development (biogas new technology in Rwanda)
  - Creation of small business
  - Appliance manufacturers, banks, NGOs and government divisions

Case of Rwanda (2)

Outcomes

- As of 2011,
  - 303 masons and 121 supervisors receiving training.
  - 53 independent biogas companies and 3 appliance manufacturers
- BUT as of 2016, there have only been 5,833 digesters installed

Difficulties

- Cost bio-digester higher than planned
- Level of satisfaction low
  - Construction accelerated ➔ leakage
  - Lack of monitoring
- For households with large systems, the amount of feedstock was not adequate
- Decision-making undertaking placed on male household inhabitants,
  - Detrimental effect on women's attitudes toward biogas technology and use

Case of China (1)

- A long story
  - First institutions to promote biogas in the 30s
  - State support from beginning 70s with high priority to rural biogas digester for small farms
  - Opening of the country in the 80s with numerous environmental laws and regulations and standards to support bio-energy
  - National Rural Biogas construction Plan 2003-2010
    - ➔ Above 30 million bio-digesters {actually more than 40 million bio-digesters]

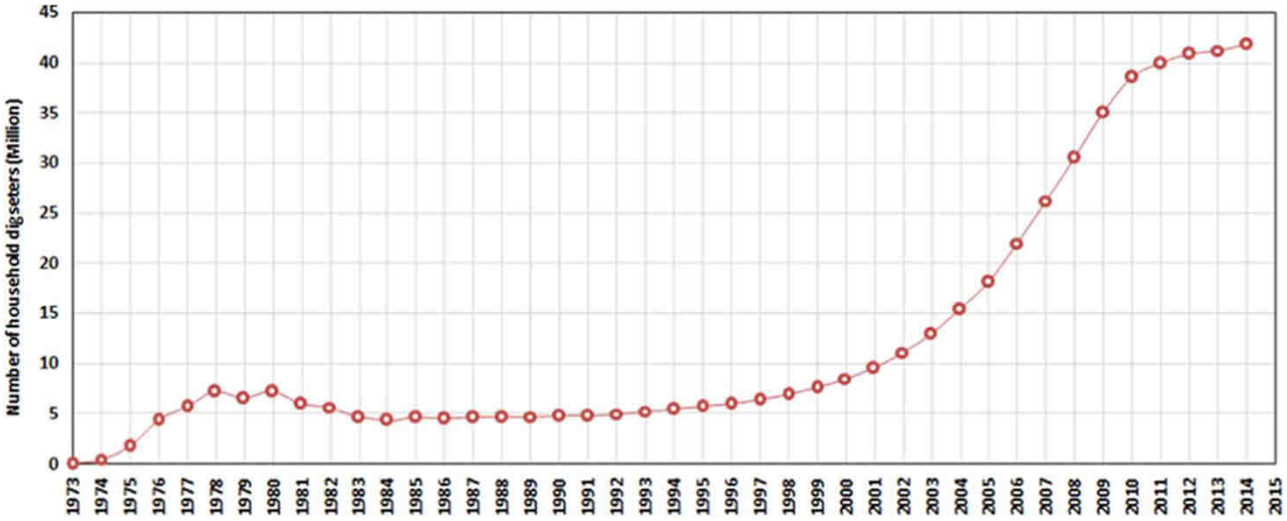
- Two types of bio-digesters (280-300+ US$ for 8m3)
  - Concrete: small/big maintenance every 2-3 years/every 4-5 years
  - Glass Fiber Reinforced Plastic from 2000 – no maintenance

Case of China (2)

- 60% of biogas digesters were operating in 2007

- Mainly the ones constructed before 1990 in China not operating
  - Poorly constructed – leakage
  - Technology ➔ temperature well above 10 Celsius
    - Level of biogas production acceptable low in cold regions
      - North China 5-8 months per year
      - Central China 7-9 months per year
      - Southern China 10-12 months per year
  - Lack of maintenance and technical support
    - In the past financial support only for construction
    - Not enough follow-up : most provinces have small rural energy offices with lack of staff

Case of China (3)



Source: Deng et al (2017)

Fiberglas reinforced plastic digesters

http://greeningchina.wordpress.com/

Case of China (4)

- Technology and policy changes in China
  - From 2003 to 2009, 3 billion US$ invested
    - 82% for households bio-digesters (subsidy around 150 US$ for 8m3 = above half of the price)
    - 10% medium & large scale bio-digesters
    - 8% to finance service system
      - Encourage creation of local consultancy and service providers
      - 2,000 biogas enterprises across the country employed more than 30,000 people in 2011
  - Modern biogas technologies
    - Scheme of Low-temperature Biogas Production and Commercialized Utilization Technology
  - Size of bio-digesters tend to increase
    - Linked to increase size of farms
      - Increase productivity to provide gas/heat, cooking
      - 10,000 pig farm = 100 kW electricity capacity
      - Adaptation centralised/decentralised systems to the density of the population
  - Standardization engineering equipment and materials used in construction
    31 standards for biogas construction

Case of Cambodia

- Cambodian National Bio-digester Program was initially conceived in 2004
- Barriers
  - lack of skilled masons/ technical staff for the construction of bio-digesters,
  - absence of facilities for credit or subsidies for bio-digesters,
  - commercial loans having high interest rates generally in the country (3–5% per month).
- Target: 20,000 biodigesters in 2012 [target reached]
- Approach
  - Development of technical and managerial capacity to maintain bio-digester installations
  - Flat rate subsidy of 150 USD + Micro-credit
- Context favorable
  - Rural farming communities with good feedstock regimes

Case of India

- National Biogas and Manure Management Program in 2005 to replace National Project on Biogas Development in 1981
  - Previous program too many agencies involved
- Variable subsidy from the central government according to the size
- Limitations
  - Lack of awareness and undertaking of maintenance procedures by the state implementing agencies and private contractors
  - Lack of awareness from biogas users of the benefits of biodigester systems, particularly the use of digestate as fertiliser
  - lack of training received by women for the maintenance and operation of the biogas systems
  - Insufficient performance or non-operation of biogas systems due to rapid construction of biodigesters

Some lessons

What is central to the success of bio-digester programs

- Awareness of all stakeholders
- Women central role as main end-users
- Always a subsidy but need to be completed by micro-finance
- Importance of a network of technicians & local manufacturing + correct sizing
- Duration & capitalisation of knowledge – avoid "stop and go"

External factors

- Cultural taboos exist but not main barrier
- Enough resources = enough waste = enough cattle = relatively wealthy farmers

THANK YOU!

More information: http://stepsproject.net/

Contact: Dr Xavier Lemaire, University College London - Energy Institute
x.lemaire@ucl.ac.uk

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STEPs Sustainable Thermal Energy Service Partnerships