Application of GBEP bioenergy sustainability indicators in developing countries –

LCA indicators for Biogas in Vietnam

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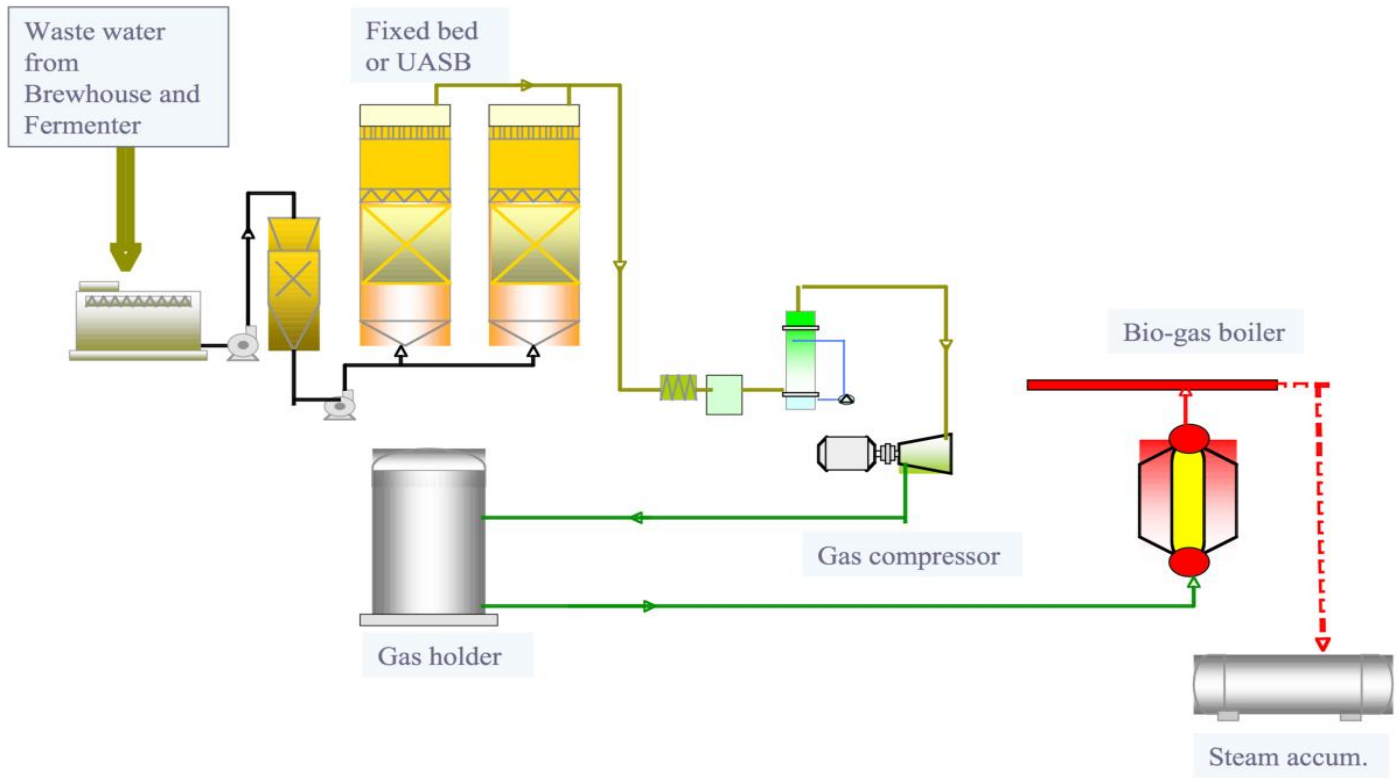
Biogas to reduce GHG emissions

- Vietnam commits to reduce GHG emissions by 8% by 2030 compared to the BAU scenario
  - The target can be reached over 25% if there is international support in terms of finance and technology and capacity
- Ways have been defined to help reducing GHG emissions:
  - Anaerobic wastewater treatment & biogas boiler
  - Bagasse for power generation (CHP)
  - Installing biogas plants:
    - Changing manure management practices
    - Replace fossil fuels and generate RE biogas for cooking *(a small part is used for lighting)*
    - Replace chemical fertilizers with the use of biogas by-products

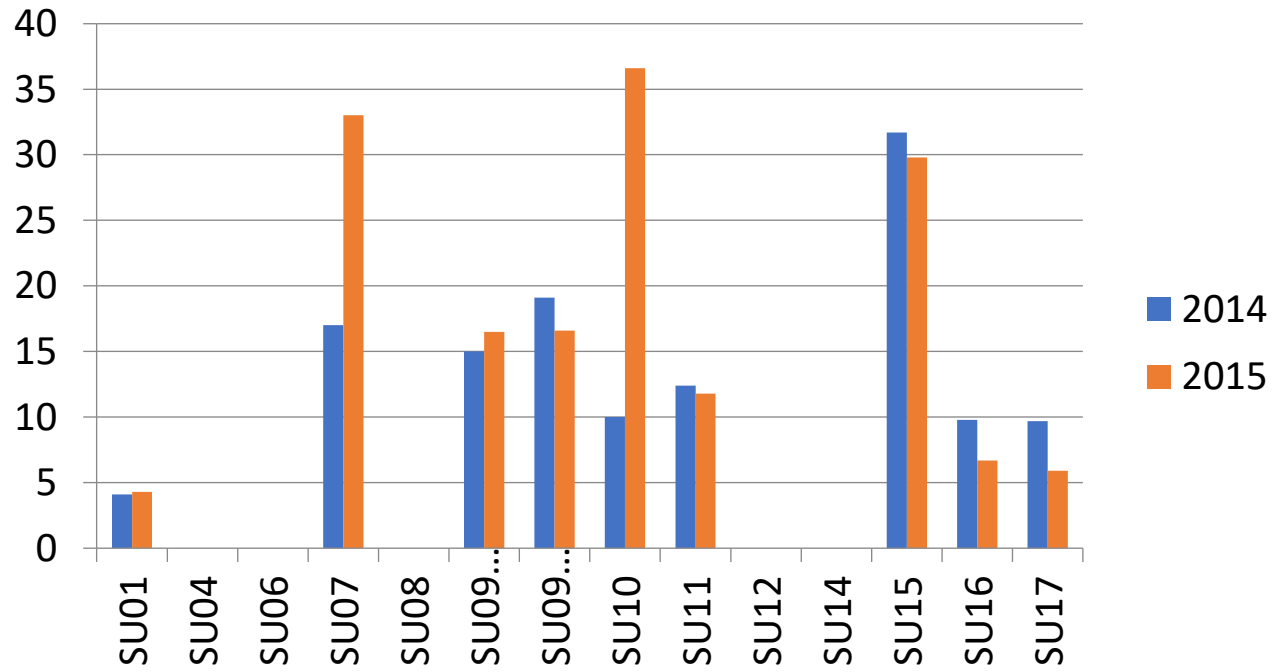
Anaerobic wastewater treatment & biogas boiler in TH Brewery

Wastewater were treated by aerobic treatment, implemented by TH Brewery in 2006 *(in the NEDO model project)*:

- High density wastewater from brewing and fermentation has been treated by anaerobic wastewater treatment
- Generated biogas has been used as fuel for boilers



Bagasse for power generation



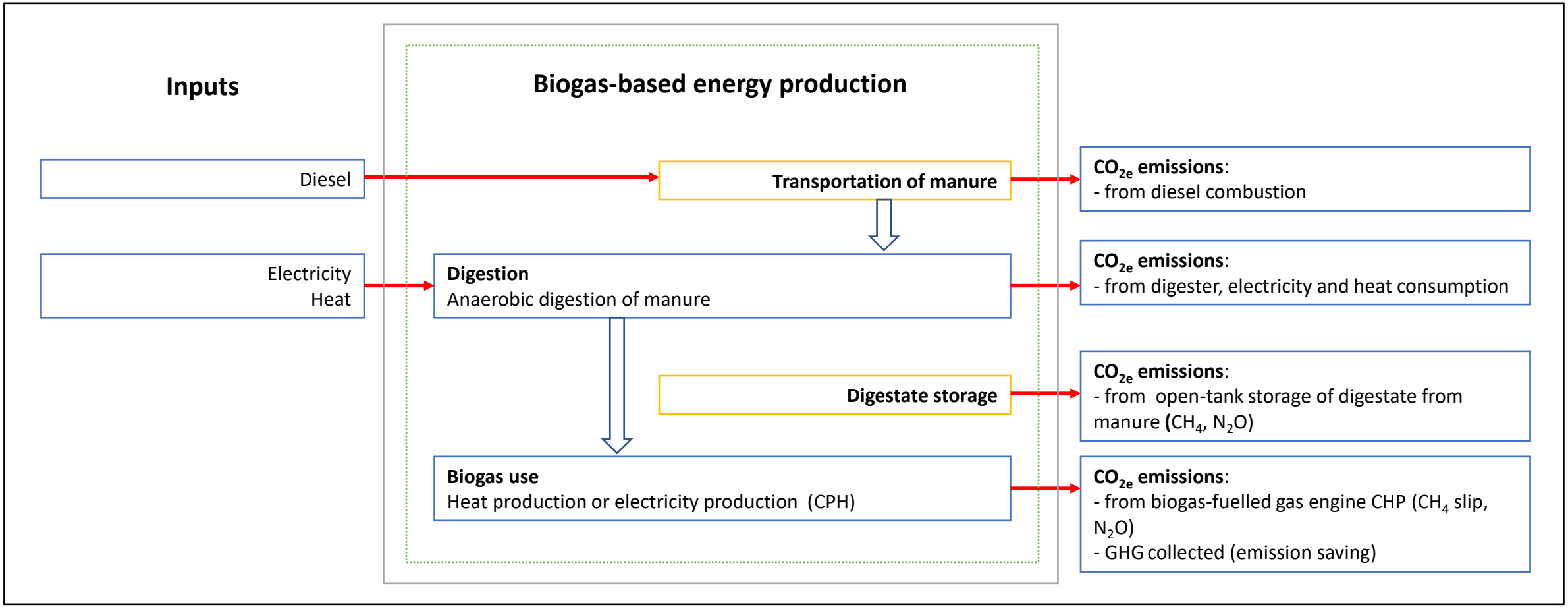
- CHP : Combined Heat and Power
- Power generation for production and sell to grid *(5.8 cent/kW, 2017)*
- 38 sugar plants

Biogas at household level and Industrial lever (2017)

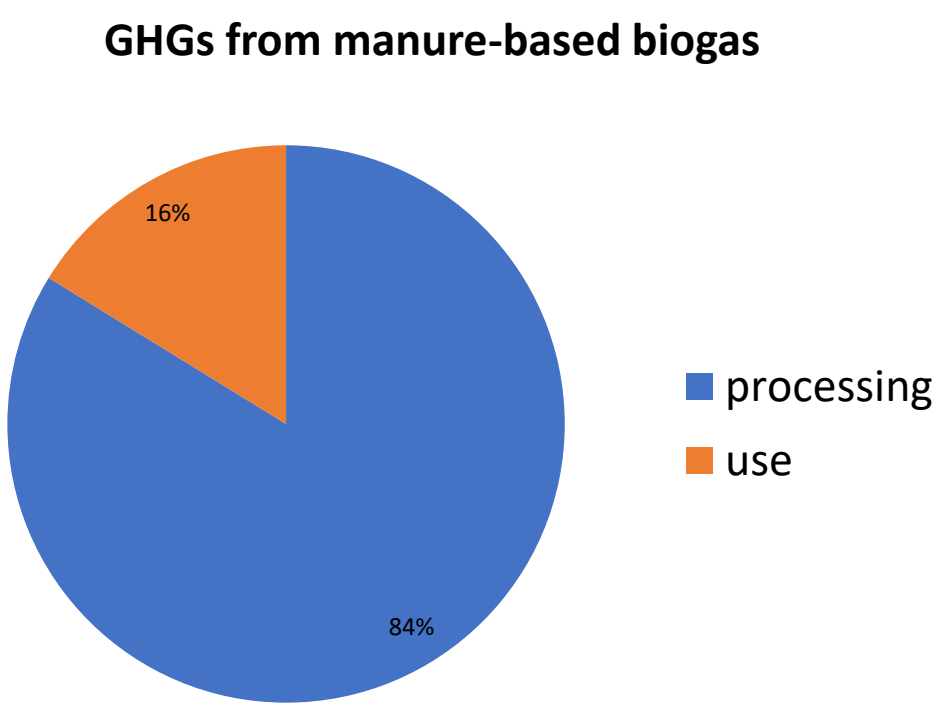
- For biogas utilization at farm scale:
  - Capacity ratio for utilization of biogas is almost zero
  - The flexible ratio for power generation: 145%
- For household level:
  - The capacity ratio approach approximately 1
  - The capacity ratio for biogas at national scale: ~ 5%

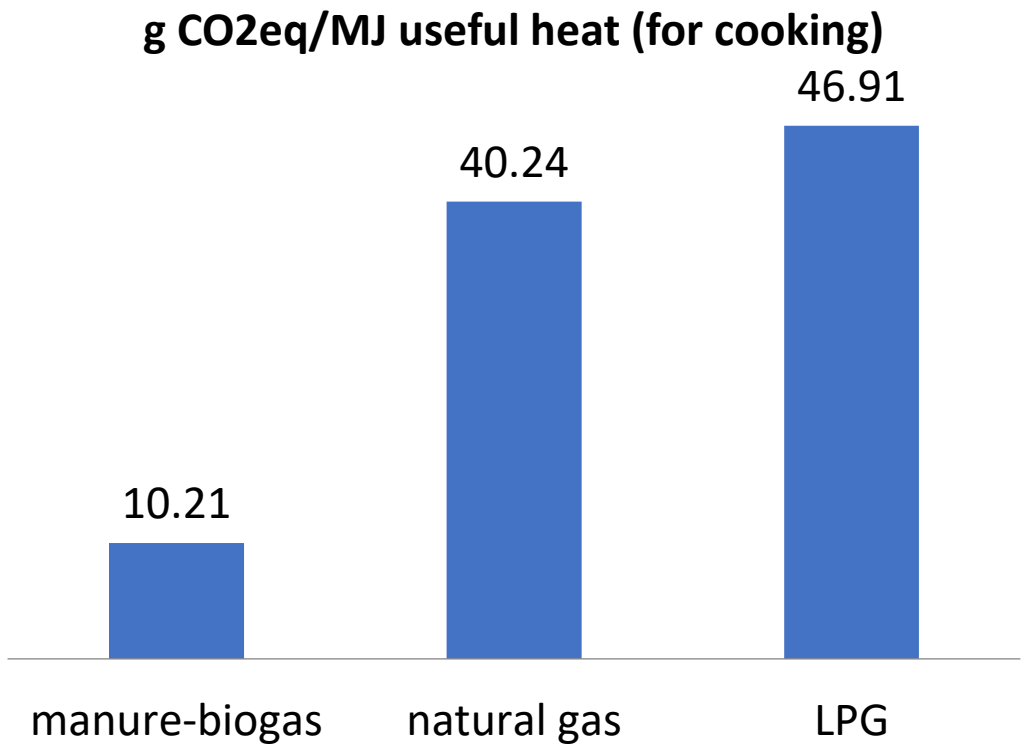
Size the plant m3	Biogas Produced in m3/plant/yr	Number of Plants (90% in use)	Total biogas production in m3/yr
SBP 10 m3	1,095	405,000	443,475,000
MBP 500 m3	52,500	12,933	678,982,500
LBP 2,000 m3	210,000	900	189,000,000

GHG emissions: LCA for Biogas production and usage



GHG emissions: comparison with the BAU case





*Using biogas is achieved GHG emission saving **~ 75%** and **78%** in comparison to the BAU in which cooking is done by commercial natural gas or LPG cook-stove, respectively*

- The potential demand for renewable energy from biogas in Vietnam in the livestock sector will be an integrated biogas system, including waste collection, gas production facilities and generators or production equipment. fertilizer export.
- Potential customers are large livestock farms, agricultural processing factories and municipal waste management companies.
- However, practice shows that there is ***no biogas power plant connected to the national grid and the use of biogas generators on farms is not effective***.

The application of biogas technology to treat livestock (pig) waste at household and farm scale currently faces problems/difficulties:

- The number of biogas tunnels being built currently accounts for a small percentage compared to the amount of industrial waste generated at household scale due to the limitations of biogas construction cost is too high, the technical process of tunnel operation is complicated
- MBP:
  - many biogas digesters put into use have not been designed and installed to suit the livestock needs of households and have not been operated according to technical requirements
- SPB:
  - the types of generators on the market are not popular and have not met the needs of consumers.
  - H_2S (concentration > 2,000 ppm) is an important topic: H_2S not only wear out appliances (stoves) but its smell puts some households off from using the stove for cooking.
- The utilization of sewage sludge and treated wastewater from biogas digesters for fertilizer and animal feed purposes has not been guided for effective use.

References:

1. Pirelli et al. (2018). Sustainability of biogas and cassava-based ethanol value chains in Vietnam. Results and recommendations from the implementation of the Global Bioenergy Partnership indicators. Rome: FAO (Environment and natural resources management working paper, 69
2. Thoa, Le Thi (2020). Lack of overall strategy on the expansion of biogas production. In Biogas Journal (Autumn 2020), pp. 37-39
3. Technische Universität Berlin (2021). Final report: UKAVitaProject. Environment-and climate sound adaptation of biogas plants in Vietnam
4. Nguyen Thi Quynh Huong and Pham Thi Tra (2020). Effectively enhancing the benefits of biogas technology in livestock waste treatment in Vietnam. In Environment Journal (December 2020), in Vietnamese.