International Workshop “Renewable Energies for Community – A view from Japan and Asia”

Application of household scale biogas system in rural-mountainous areas of Vietnam

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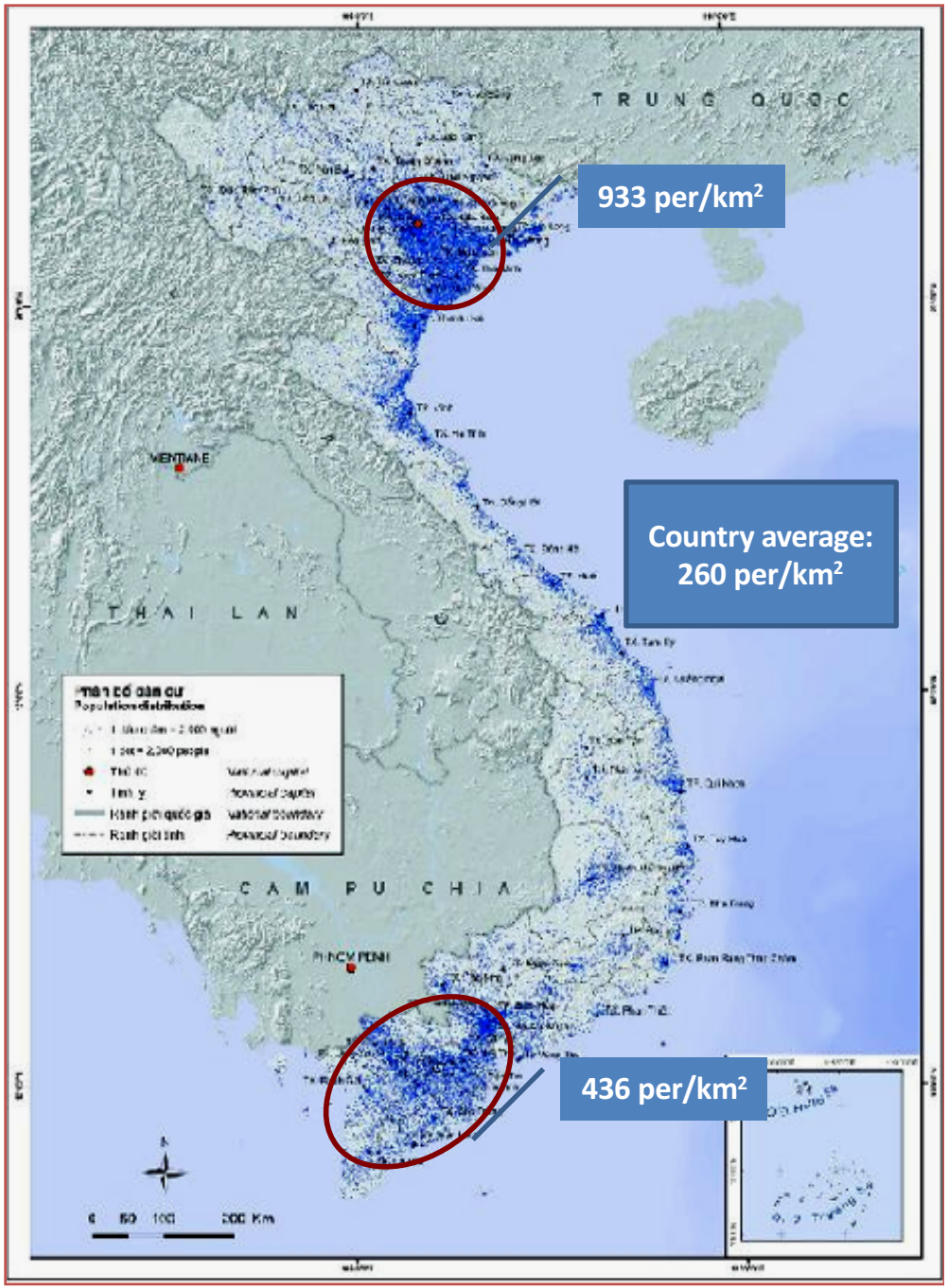
General overview

- Economic achievements:
  - GDP growth rate : 6.2%/year *(2003 – 2013)*
  - Advance economic transition (*from agriculture-based to mainly based on industry and service sector)*
  - Over coming food shortage
  - Improve living conditions
- Population development:
  - Increase 3 times, from 30.2 ➔ 89.7 millions *(1960 – 2013)*
  - Growth rate: ~2.1%/year
- Rapid urbanization
- Population are un-equally distributed *(mainly concentrated in river deltas and coastal areas)*



Source: General Statistic Office

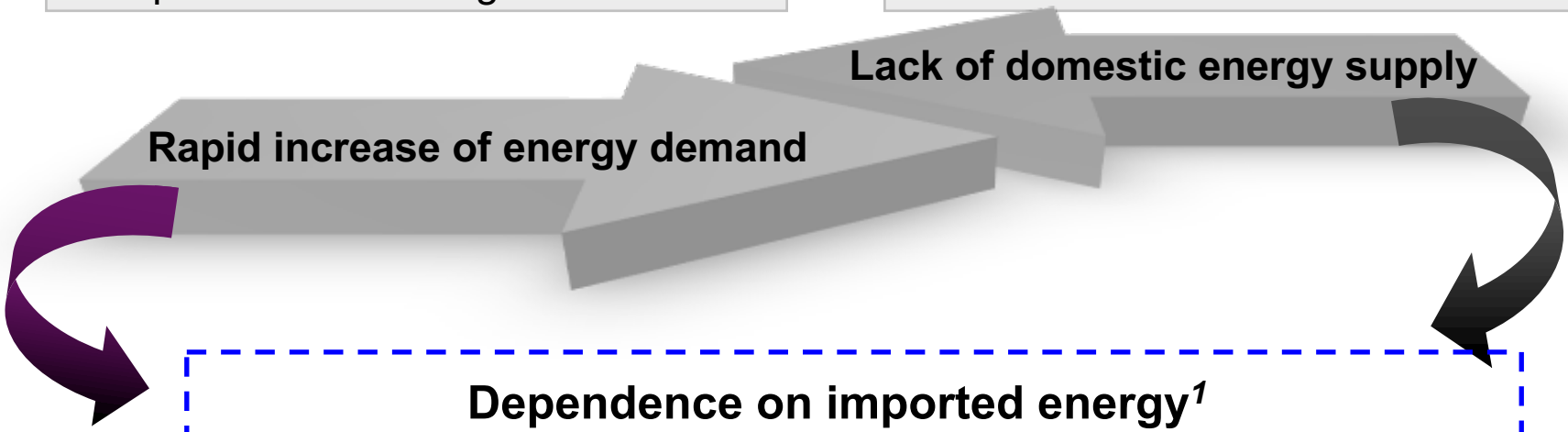
Challenges to energy sector in Vietnam

Driving forces[1]

- Economic development
- Population growth
- Urbanization and industrialization
- Improvement of living conditions

Limitations[1]

- Degradation of natural resources
- Limitation of refinery systems and technologies



Dependence on imported energy[1]

Current environmental impacts from energy sector[2]

Need to develop the alternative energy sources, especially for the rural and mountainous areas

Source: [1]APERC, 2006; ADB, 2009; Khanh, 2005; UNEP, 1999; UNESCAP, 2007; [2]HSV, 1999

Renewable Energy Development in Vietnam

Small Hydro

Potential: > 7.000 MW
Present: >1670 MW

Biomass

Potential: >2000 MW
Present: 150 MW
{ 6 projects selling E to grid}

Biogas

Potential: >100 MW
Present: >1.6 MW

Solar energy

Potential: 4-5kWh/m^2
Present: 4 MW
Grid-connected: 0.6MW

Wind energy

Potential: 8% total national areas (6-7 m/s)
Present: 52 MW
Many projects (F/S): ~ 3000MW

Geothermal

Potential: 340-400 MW
Present: 0 MW

M.Solid wastes

Potential: >320 MW
Present: 2.4 MW
One more 1.9MW under construction

Ocean energy

Potential of tidal power: 100-200 MW
Present: 0 MW

Source: Institute of Energy, 2014

Renewable Energy Development in Vietnam

Biogas

Solid waste from Vietnam Animal Husbandry

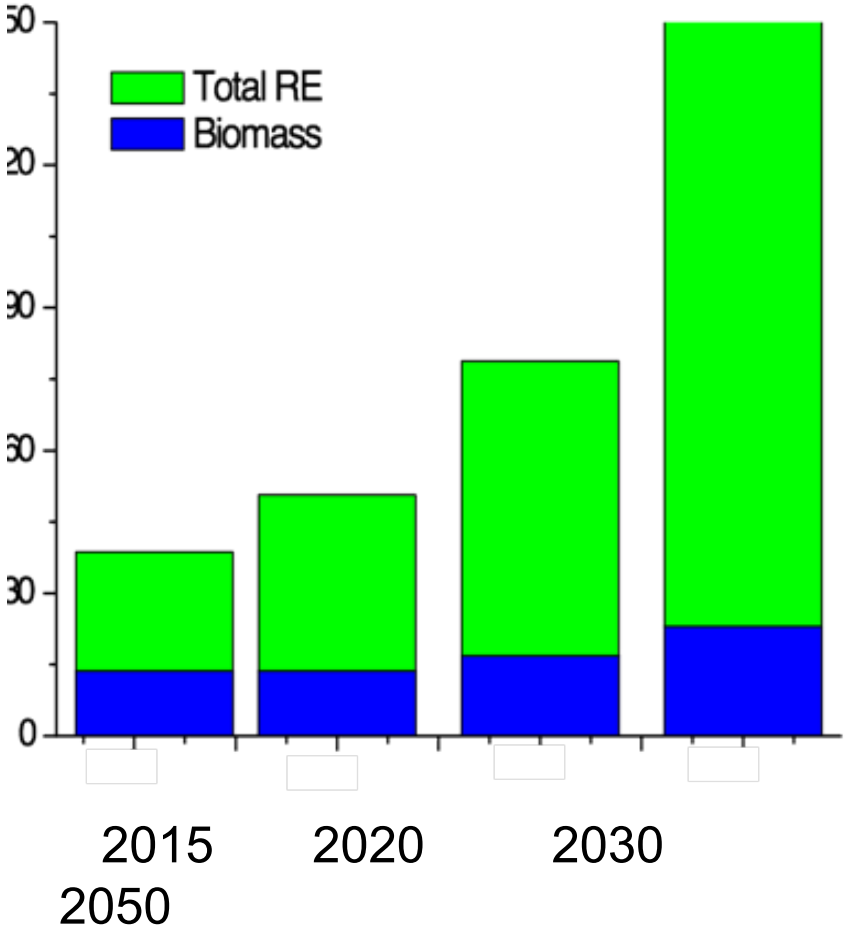
Animal	2009	2011	2013
Mil.Ton/year			
Cow	22,000	19,500	18,500
Buffalo	15,800	14,600	13,800
Pig	20,000	19,400	18,900
Poultry	20,400	23,000	22,600
Goat, Sheep	750	684	726
Horse	149	126	113

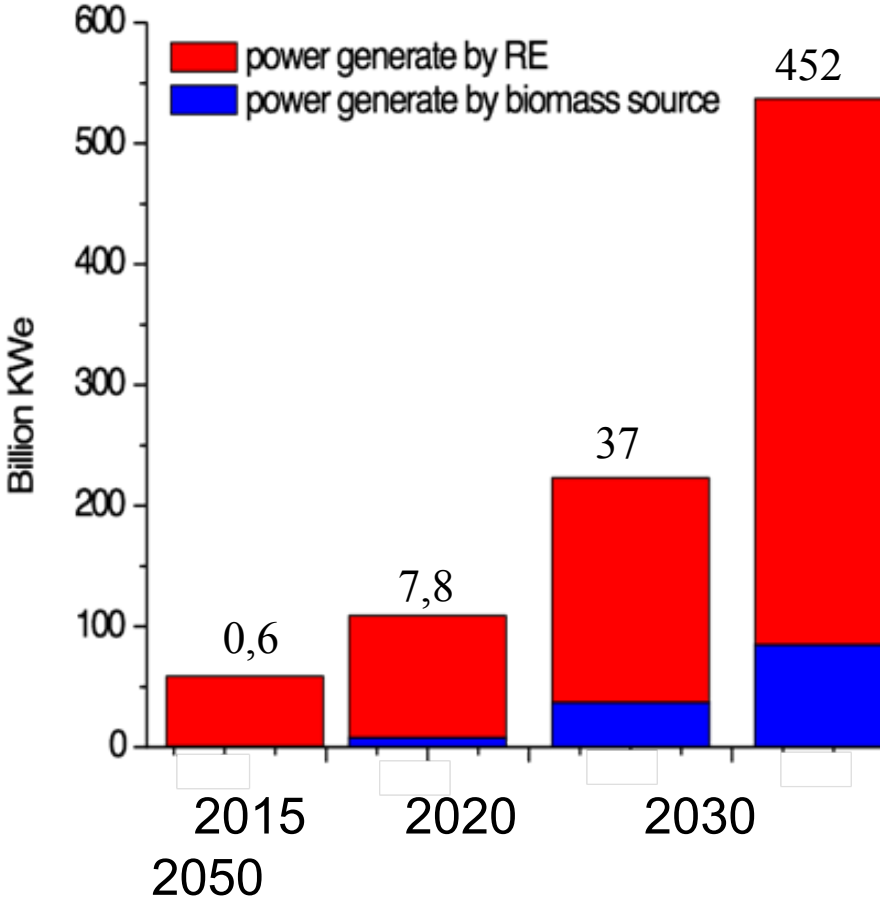
Source: Department Animal Husbandry , MARD, 2014

- Vietnam has 8,5 mil. breeding household
- 8,7% breeding household has built biogas ~ half million biogas constructions
- Most biogas project uses for cooking and locates in rural area; some uses for electricity producing.

Renewable Energy Development of Vietnam

The future contribution of Biomass to RE





Oriented by the VN's government
Decision 2068, date Sep. 25th, 2015

Research objectives and Methodologies

Objectives:

To identify current situation of household scale biogas system in rural – mountainous areas of Vietnam

To identify the role of communities in biogas development

To propose solution toward sustainable biogas production and utilization

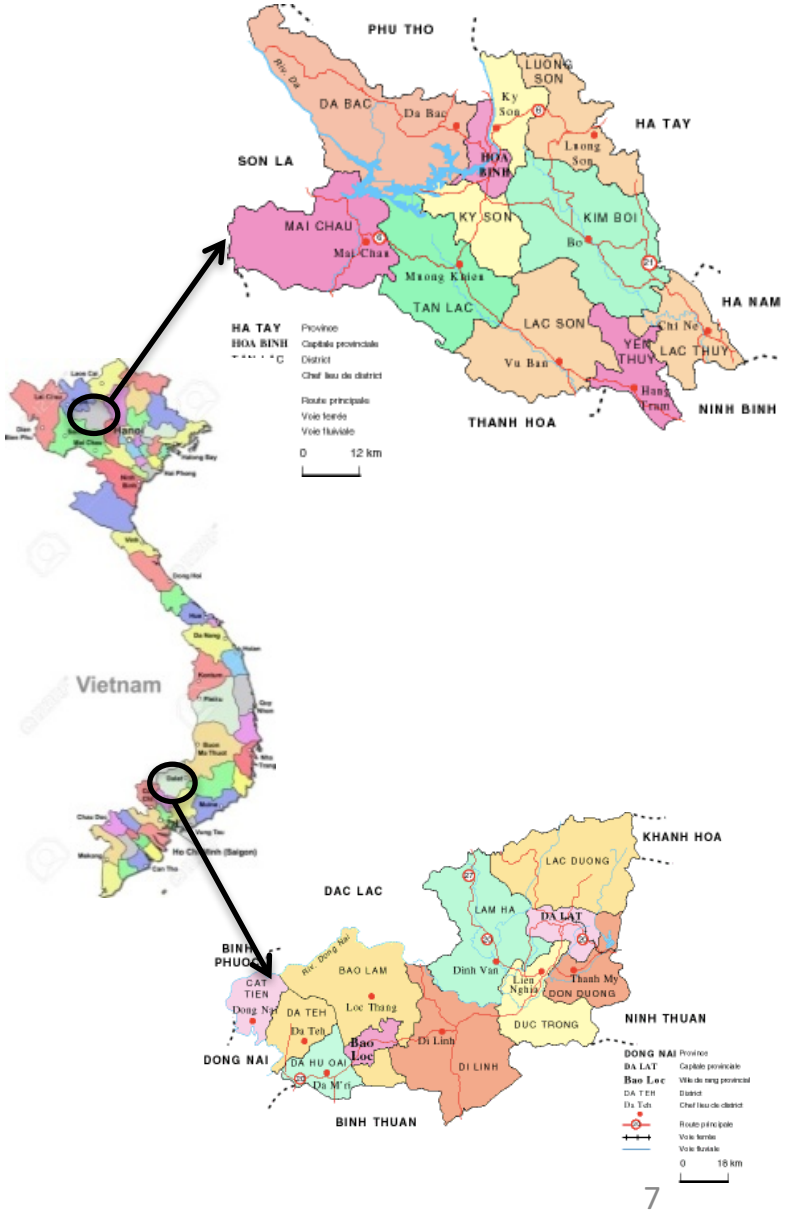
Targeted research group:

Households located in rural and mountainous areas of Vietnam, which have and/or do not have biogas system

Methodologies: Onsite survey using questionnaire

- Location of interviews: Lam Dong and Hoa Binh provinces

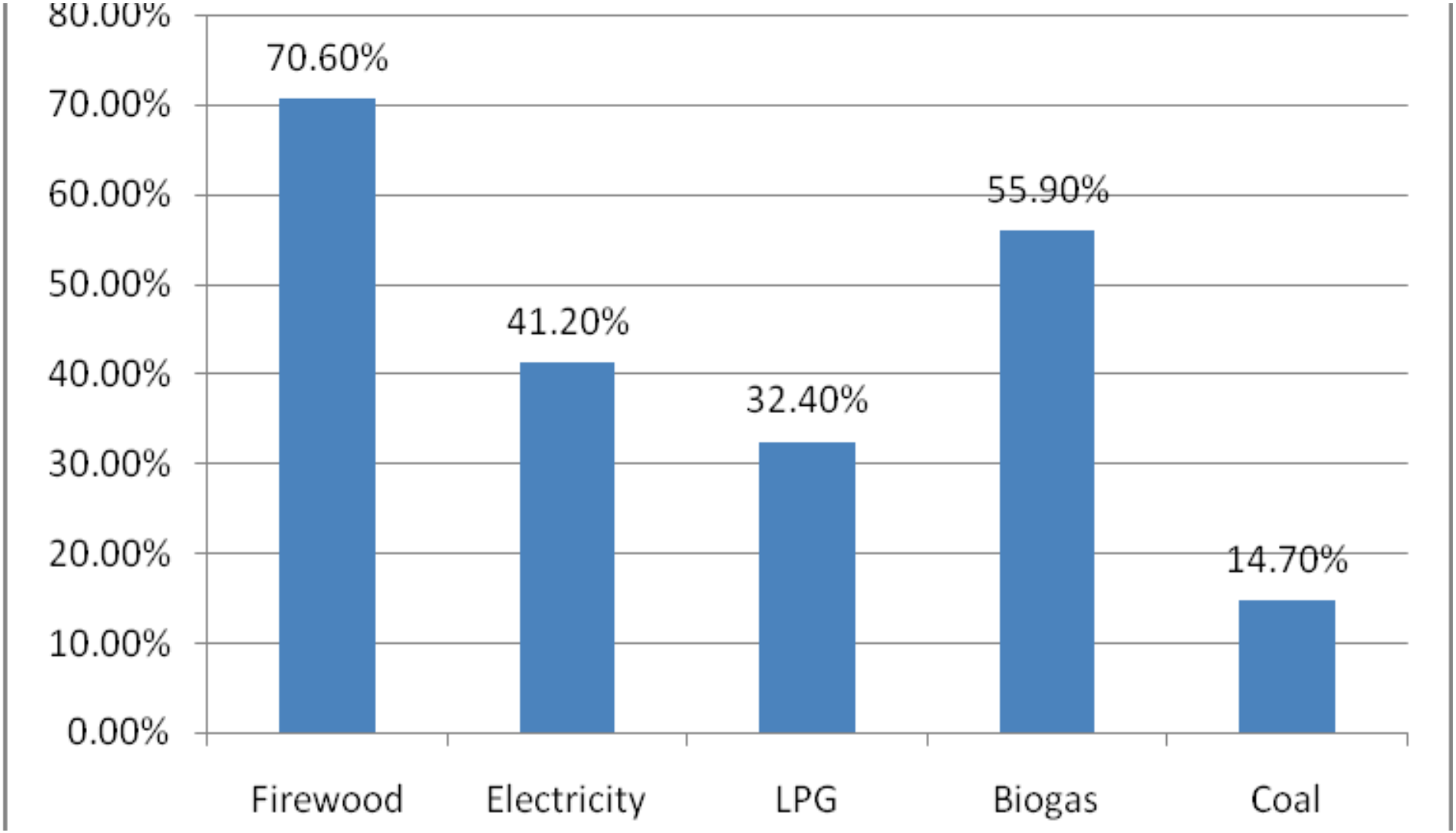
- Number of interviewed household: 34 (20 with biogas, and 14 without biogas)



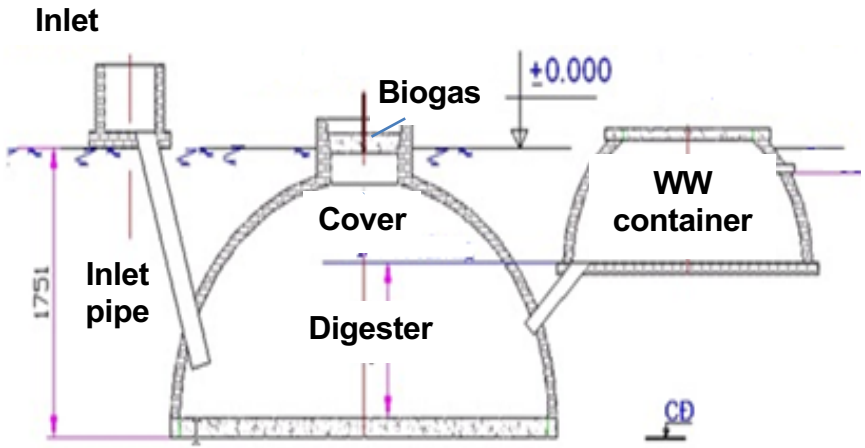
Information of interviewed HHs

- Mainly based on industrial and fruit tree cultivation
- Some HHs have ex-job: tofu making and wine cooking
- Some (but not many) HHs have husbandry activities
  - Main livestocks are pigs and sows (10 – 20 heads/term, 2 – 3 terms/year)
  - Some HHs have 2 – 3 cows or goats or several thousands of poultries
- Most of husbandry are spontaneous activities, based on HHs experiences

Current fuel use for cooking in HHs



Technology to apply – HH scale biogas digester



EXAMPLE OF POPULAR BRICK BIOGAS DIGESTER

Volume: 15 – 20m^3

Investment cost: ~1.0 million VND/m^3

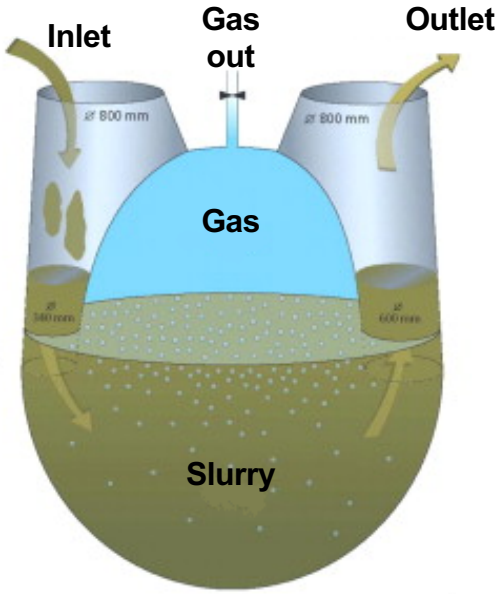
(~50 USD/m^3)

EXAMPLE OF POPULAR COMPOSITE BIOGAS DIGESTER

Volume: 9m^3

Investment cost: ~1.5 million VND/m^3

(~75 USD/m^3)



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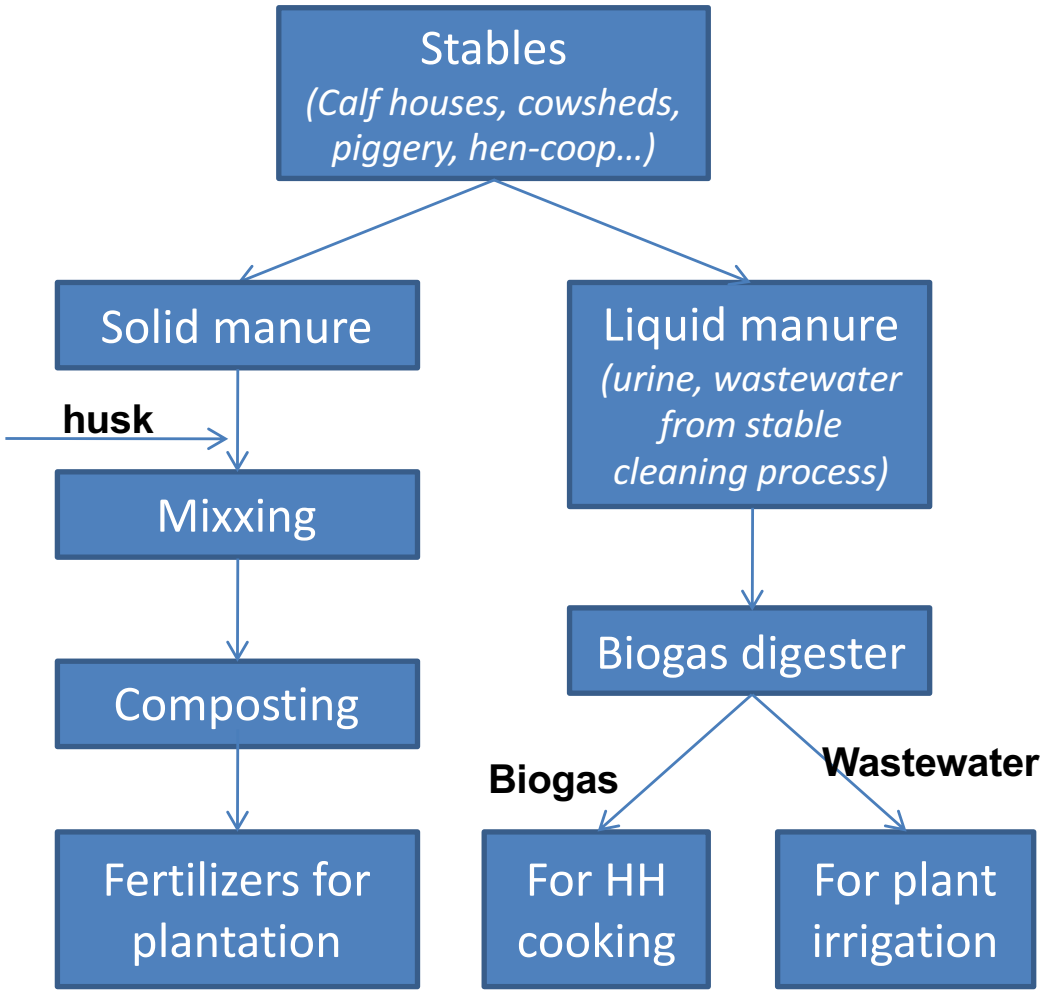

Benefits:

- Production of free of charge renewable and clean energy for HH consumption → reduction of HH daily expenses

- Reduction of environmental pollution appear during the process of husbandry

- Re-utilization of nutrient sources from biogas wastewater for HH plantation

Advantages:

- Simple construction and installation *(by experience sharing from neighboring HHs or technicians of the suppliers)*

- Easy to make investment decision (*scale, technologies, materials…)*

Lam Dong Province

Hoa Binh Province

Criteria for making decision of biogas application in HHs

Criteria	Percent	Criteria	Percent
Number of livestocks	100	Refer scale and equipment prototype from other households	35
The amount of livestock waste in household	100		
The financial capacity of household	5	Consultant of project staff	15

Main barriers of biogas development

Reasons	Rate (%)
- Budget limitation	85.7
- Lack of financial supports from donors	35.7
- Scale of husbandry activities in HH	92.9%

Lack of technical support to minimize the risks of HH scale biogas application

Risk on biogas operates, that limiting the sustainability of HH biogas development and utilization

- Most of the biogas system can produce more biogas than energy demand of the household ➔ released the residual gas by open burning ➔ risk of explosion
- The household commonly use plastic pipe for biogas ➔ risk of gas leakage and explosion
- Insufficient guiding on biogas safety operation:
  - ✓ After a period of use, the scum layer appear on the top of biogas tank ➔ reduce the efficiency of gas production ➔ Owner try to stir or get into the tank to remove scum ➔ Died or poisoned by toxic gas
  - ✓ Burn wild grass around the biogas plant ➔ fire impacted to the gas pipe ➔ explosion
  - ✓ …

Risk on biogas operation – Accidents recorded

• 4 persons dead on Feb. 08, 2006 in Ha Nam province was asphyxiated when trying to stir and remove scum of biogas system

• 3 persons dead on Apr. 18, 2011 in Chau Thanh District, Dong Thap Province due to toxic gas asphyxiation from household biogas system

• Another person in Tan An, Long An province was asphyxiated due to toxic gas on Jan 23, 2014

Community initiative to maintain sustainable development of HH scale biogas

Communicators and local authority staffs play important roles in development of biogas application (using local communicators for experience sharing and local authorities for expanding technical and financial supports)

THANK YOU VERY MUCH FOR YOUR ATTENTION!