From (bio)mass to (bio)gas– or: how to best utilize urban slaughter waste

Kristina Roesel & Vianney Tumwesige

Inception meeting of Wambizzi abattoir biogas study
ILRI-Uganda, 24 September, 2014

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Irish Aid Department of Foreign Affairs An Roinn Gnóthaí Eachtracha

A pilot intervention study under the

IrishAid-funded Smallholder Pig Value Chain Development project
(CRP Livestock & Fish): http://livestockfish.cgiar.org/focus/uganda/

and the

GIZ-funded Safe Food, Fair Food project
(CRP Agriculture for Nutrition & Health): http://safefoodfairfood.ilri.org/

Meeting objectives

- Introduction of partners and roles in the pilot study
- Rationale of the study (Kristina)
- Intro concept of waste management and energy generation through biogas (Vianney + Gabriel)
- Discussion on workplan and timeline of the intervention, clarify questions and list expectations

Partners in the pilot

- Vianney Tumwesige, consultant: lead of the assessment of slaughter waste and energy needs as well as the construction of the biogas digester (with support from Gabriel Okello)
- Simon Lubega, Manager of Wambizzi abattoir: facilitation of the study at the abattoir (endorsed by Wambizzi board and with support from treasurer Thomas Kasule)
- Jonathan Mukoopa, staff at Wambizzi: will be trained on operation and maintenance of the digester on the job during the implementation for sustainability beyond the study
- Edward Wampande, manager of the Central Diagnostic Lab at COVAB/Makerere University: will oversee the biological monitoring of the intervention
- Kristina Roesel, ILRI-Uganda and coordinator of the Safe Food, Fair Food project (with support from Hung Nguyen, ILRI-Vietnam)

Rationale

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How does biogas work?

An introduction by

Vianney Tumwesige and Gabriel Okello

(Green Heat Uganda)

Technical Training on Biogas Digesters

By

Vianney Tumwesige (PhD fellow)

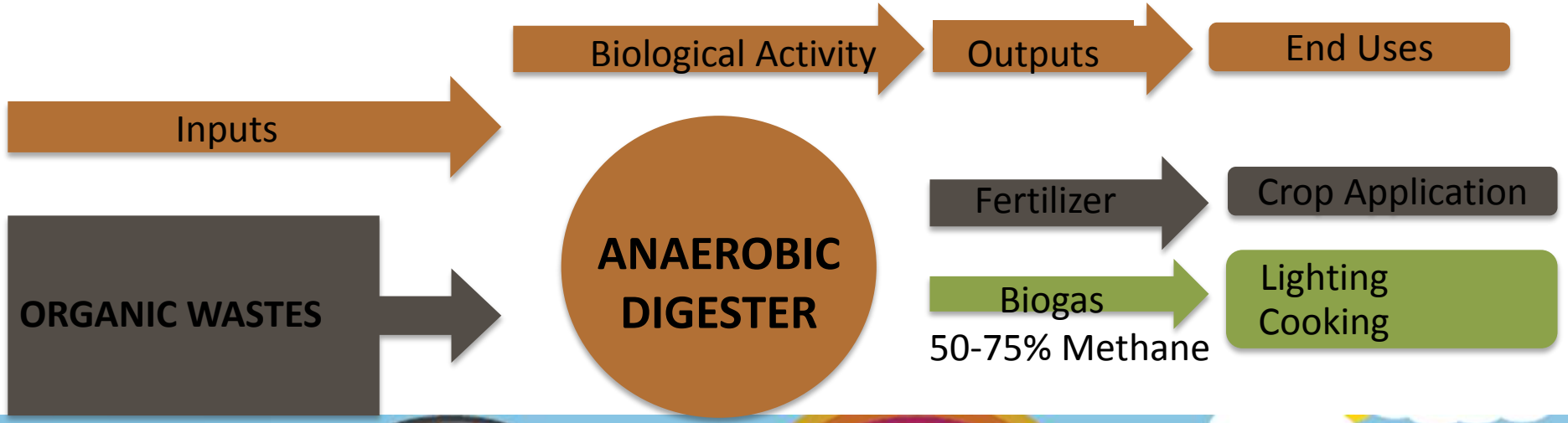
Gabriel Okello (Msc. Chem)

24th September 2014

Outline

1) **What is a biogas system?**
2) Biogas benefits
3) Challenges to implementation
4) Way Forward for Uganda

A biogas system…..



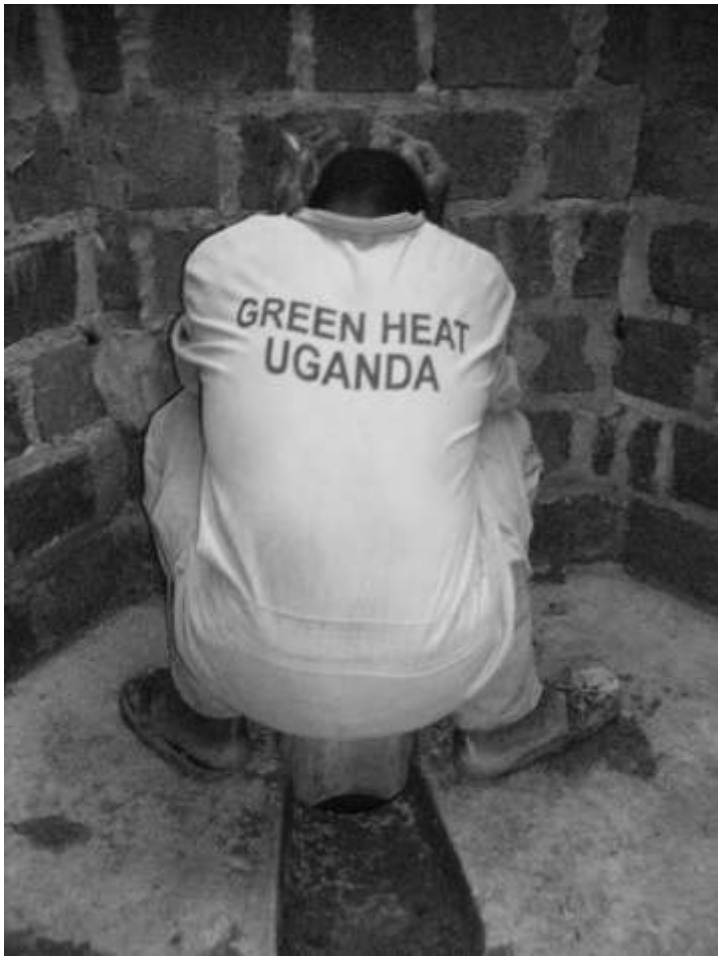
Inputs: Animal Manure

Manure is mixed with water /urine before its fed into the digester

Inputs: Food Waste

Inputs: Market waste

Inputs: Poo



Digester can be hooked to special latrines in public places like markets, schools e.t.c.

Digester types

- Fixed dome connected to a latrine
- Fixed dome
- Floating drum
- Flexible balloon

Digester: Fixed Dome

Digester: Fixed Dome

✓ **Built on a circular concrete base**

ADVANTAGES

- **Digesters have no moving parts**
- **Low maintenance costs**
- **Relatively maintains temperatures inside digesters**

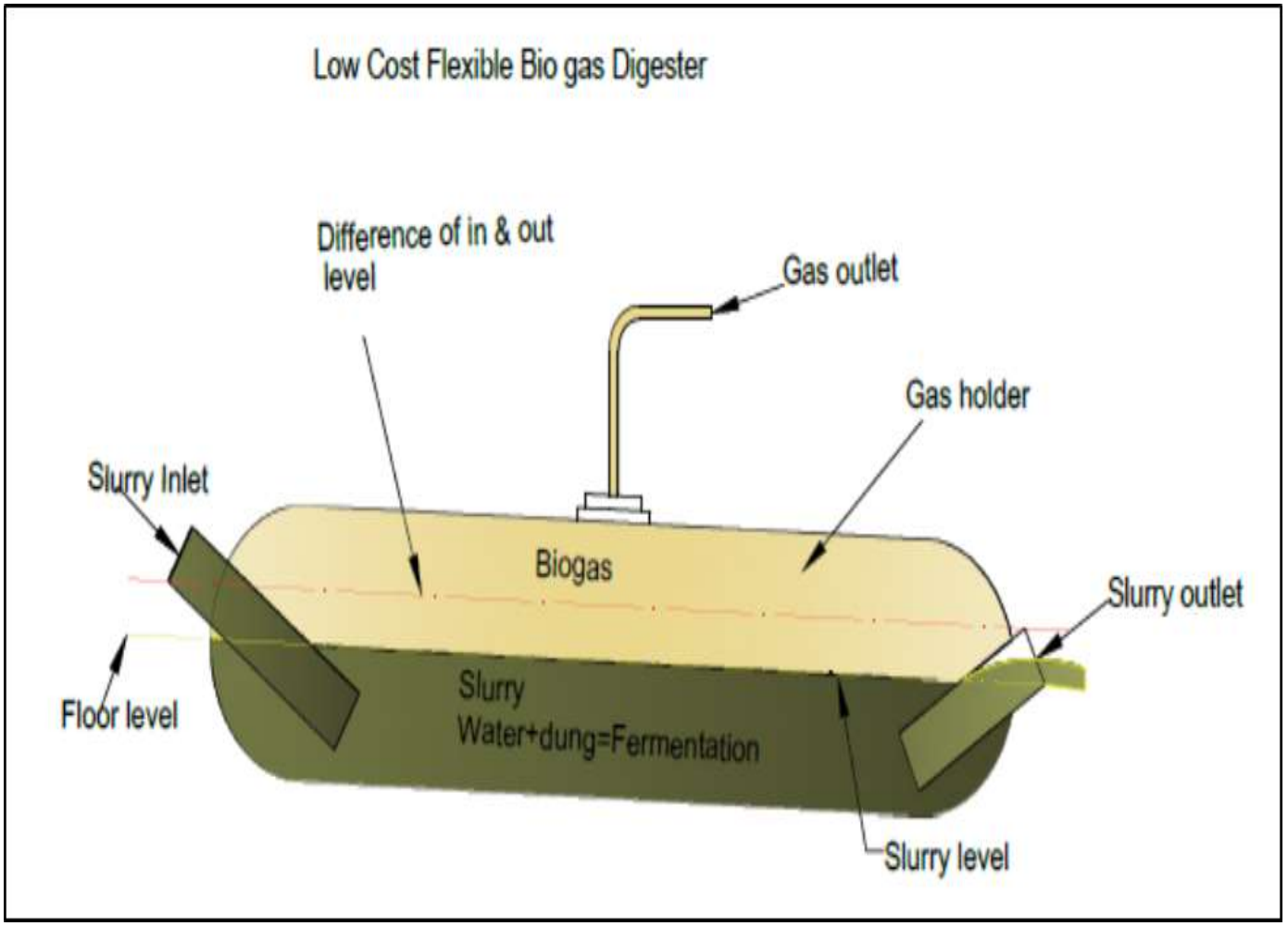
DISADVANTAGES

- **Construction costs are relatively high**
- **high technical skills are required for construction**
- **gas pressures fluctuate**

Floating Drum

- utilizes two standard high density polyethylene (HDPE) water storage tanks and standard `plumber piping.
- Tops of the tanks are cut off.
- Smaller one is inverted and placed inside the larger one.
- As the gas is formed it is stored in the inverted tank, which then “floats” on top of the water and feedstock slurry.
- Digester tanks can be constructed on top of cement and brinks.

Flexible balloon



Biogas uses

Outputs

Burned as a fuel for Cooking

Biogas
(50-75% Methane)

Outputs - Fertilizer

Outline

1) What is a biogas system?
2) **Biogas system benefits**
3) Challenges to implementation
4) Way Forward for Uganda

Improve water quality

Improves indoor air quality

Summary: Biogas Benefits

Improve public hygiene

Improve water quality

Improve indoor air quality

Improve energy security

BIOGAS BENEFITS

Save people money

Save women time

Improve food security

Mitigate climate change

Outline

1) What is a biogas system?
2) Biogas system benefits
3) **Challenges to implementation**
4) Way Forward for Uganda

High upfront capital costs

Lack of awareness

Outline

1) What is a biogas system?
2) Biogas system benefits
3) Challenges to implementation
4) **Way Forward for AFRICA**

Outline

Insufficient resources to collect all waste

Separation of waste is not implemented

Blocked drainage systems

Thank you

Q&A's

1. What are the costs of the various digesters (8m^3 capacity)?

   flexible ballon: 2.5 million UGX (950 US$)

   floating drum: 3.9 million UGX (1,500 US$)

   fixed dome: 4.5 million UGX (1,700 US$)

2. Could the grass used during transport be fed into the digester?

   yes, it can be used if it is fresh

Q&A's

3. Are there any risks associated with the biogas digester at the abattoir premises, i.e. explosion?

   no risk for explosion because the pressure is too low; moreover, the balloon will be protected from leaks with an iron sheet from UV-light (that could damage the PVC) and with meshed wire from bird picking

4. What is the life span of a the flexible balloon?

   approximately 20 years, and it can be moved in case Wambizzi finds another piece of land from where it may operate in the future

Q&A's

5. Residents from an outside slum are currently dumping there household waste at the abattoir's dumpsite – could this waste be fed into the digester, too?

   yes, it can; could be a way to involve the community

6. Can we sell the gas to outside customers?

   technically it is possible but it is difficult and expensive to compress the gas (into cylinders) – at least for the relatively small scale production that we will have at Wambizzi

Q&A’s

7. Do you have experience with blocked pipes?

   No, we have never experienced it

Expectations

"We are all dancing to the same tune"

- $ More customers at Wambizzi because of improved hygiene
- $ Less operational costs (i.e. electricity, firewood)
- $ Reduced environmental pollution
- $ More fertilizer for the farm
- $ Safe fertilizer that can be offered for sale and provide additional income
- Wambizzi as a model for students coming from the university for practicals
- Scientific evidence for the economic feasibility of such a system in Uganda
- Scientific evidence on the reduction of pathogens in a digester (i.e. determined retention time)
- Compare efficiency of cow dung with pig manure
- Build partnerships and capacity

Additional remarks

- Use local manpower to build the pit - to avoid misunderstandings, jealousy and boycott and nurture acceptance
- Keep presence of *wazungu* to a minimum during the study
- If human feces will be fed into the digester, there may be a problem with acceptance as this is a taboo in some places. Suggestion: Set up a demonstration bed where some specimen of maize and cassava etc. could be planted and grown with the new fertilizer – in a media event, the manager should eat the vegetables!

Additional remarks

- Once the pilot is successfully finished, we should think labeling the fertilizer as “safe from certain pathogens” and maybe add teaching material on the back of the bag (need to assess willingness to pay)
- Ascarid eggs may sediment to the bottom – the digester output could be free from the roundworm eggs but this would not prove if the digester fermentation efficiently destroys the eggs. This could be simulated in the lab.
- Do quality testing for pathogens beyond the study (e.g. once a month) to prove the high standard
- Any potential nutrient losses in the digester output should be monitored if we promote it as fertilizer

Additional remarks

- Different forms of fertilizer (liquid vs dried solid) and potential marketability/perceptions/uptake. e.g ease of transport and packaging, perceptions of certain animal waste fertilizers as good substrates for other pathogens (chicken poo and common banana virus)?
- Depending on results of testing for pathogen load of output slurry, option of adding treatment to further reduce pathogen vs experimenting with longer fermentation times.

Acknowledgements

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THANK YOU!

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https://safefoodfairfood.wordpress.com/

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