



Low-tech biogas digesters in Peru and Colombia

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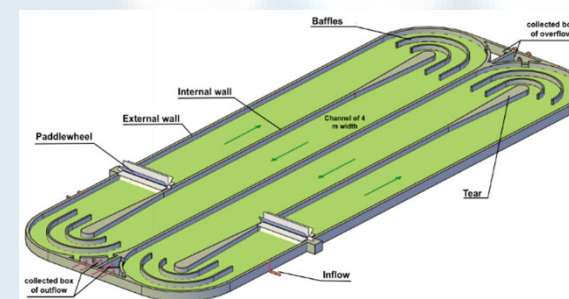
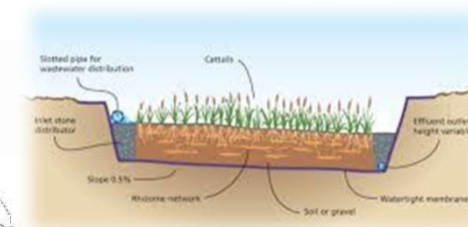
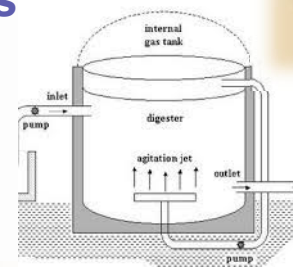


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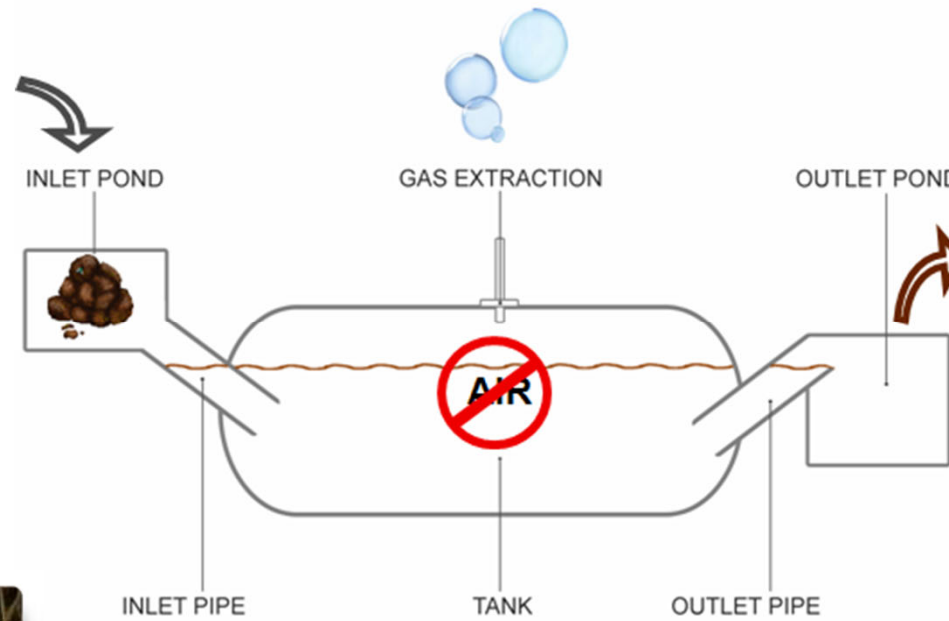


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- Nature-based solutions for the treatment of waste streams, bioelectrochemical systems
- **Biogas production** from residual biomass
- **Resource recovery** from waste streams using **microalgae biomass** to generate **BIOPRODUCTS** (natural pigments, bioplastics, biofertilisers) and **BIOENERGY** (biogas)
- Mathematical modelling of bioprocesses → **BIO_ALGAE MODEL**
- **Life Cycle Assessment (LCA)**



Low-cost digesters



Plastic tubular digester

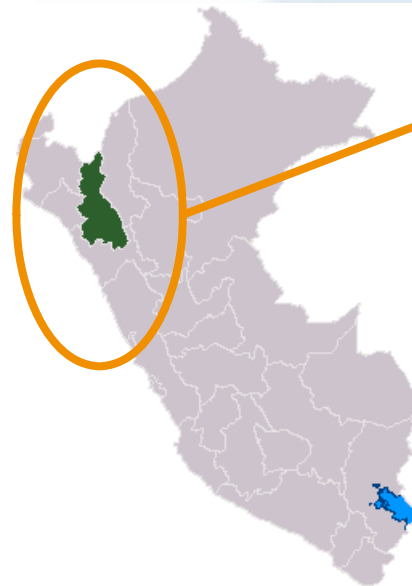




Context



Cajamarca, Peru



Pilot project

Rural households

2600-3800 m.a.s.l.

Context



- Subsistence agriculture
- Self-sufficient farming (cow, guinea pig)



Context

- Lack of water and electricity supply
- Lack of improved cookstoves (92% population)
- Traditional biomass: firewood and dried cattle dung



Goal



Crops, trees, shrubs



Livestock



Biogestor

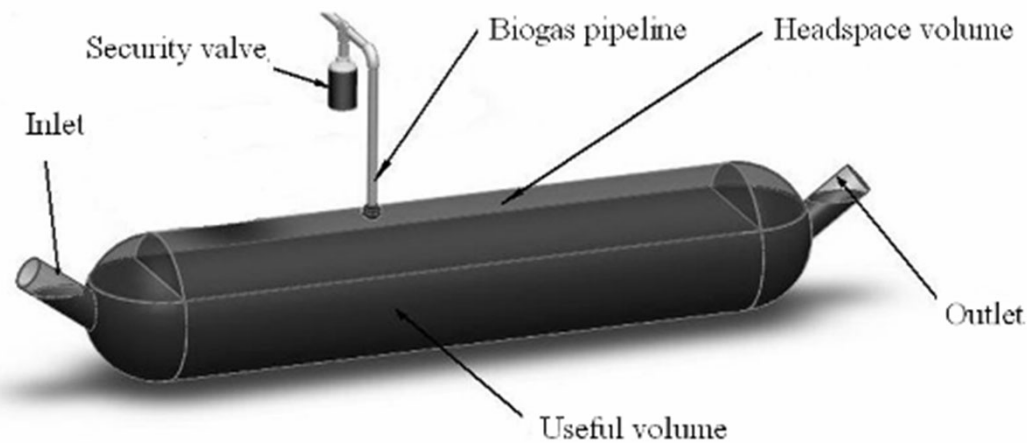
Low-cost digester

Plastic tubular digester

Taiwan, Vietnam, Colombia, Costa Rica (Preston, 1990; Botero, 2008)



Plastic tubular digesters

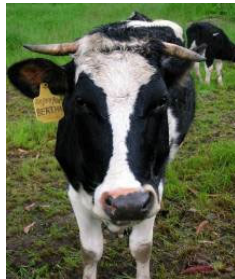


- ✓ No specialised manpower
- ✗ Prefabricated plastic bags require transport
- < Lifespan (5 years)

Bolivia, Peru

Performance at high altitude?

Biogas production



CEFOP, Cajamarca (2.658 m.a.s.l.) INIA, Baños del Inca (2.667 m.a.s.l.)

- 50% traditional biomass



Digestate reuse as biofertilizer

- Field trials



Environmental and socio-economic benefits

- Life Cycle Assessment
- Environmental and socio-economic benefits (income, time, health)

Digesters improve household standard of living!





Current project



Universidad
Industrial de
Santander

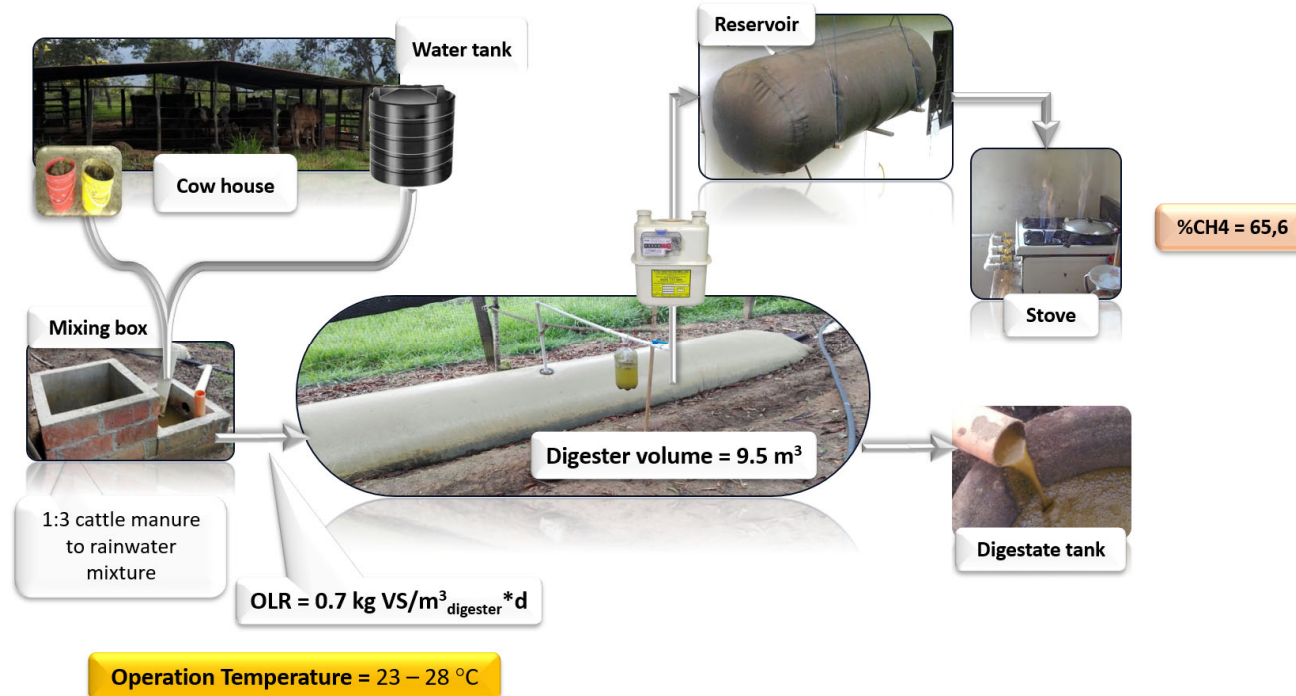


Bucaramanga, Colombia

Current project

- Life Cycle Assessment (panela)
- Digestate characteristics and post treatment

Anaerobic Digestion (AD) in Marcella farm



Lessons learned

- From 2007 more than **10 students**
- **TFM/TFG**
- Local partner **University** vs. **NGO**
- Min. **6 Months**
- Previous experience with **NGOs** (ESF Catalunya)
- Experience on a **personal and professional level**



Students' opinion

El participar en un proyecto así ha sido una de las mejores experiencias..... A su vez te hace reflexionar sobre la infinidad de cosas que tenemos y vemos tan corrientes y que en otra parte del mundo son lujos que no se pueden permitir. C.



Sento que aquesta experiència m'ha obert al món, m'ha permès sortir de la petita bombolla que és la universitat, donant-me conta de les infinites possibilitats de estils de vida, feines i vocacions.....ha estat un aprenentatge de gran ajuda. O.

.....A més, he fet grans amistats, que m'han aportat nous punts de vista sobre els meus estudis i sobre la vida mateixa. M.

..... Professionalment he gaudit molt amb la feina que feia i personalment ha sigut una experiència molt enriquidora. L.



Thanks for your attention !

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