

Biogas production from goat and sheep manure grown in the Negev Desert



By – Mazen Zoabi
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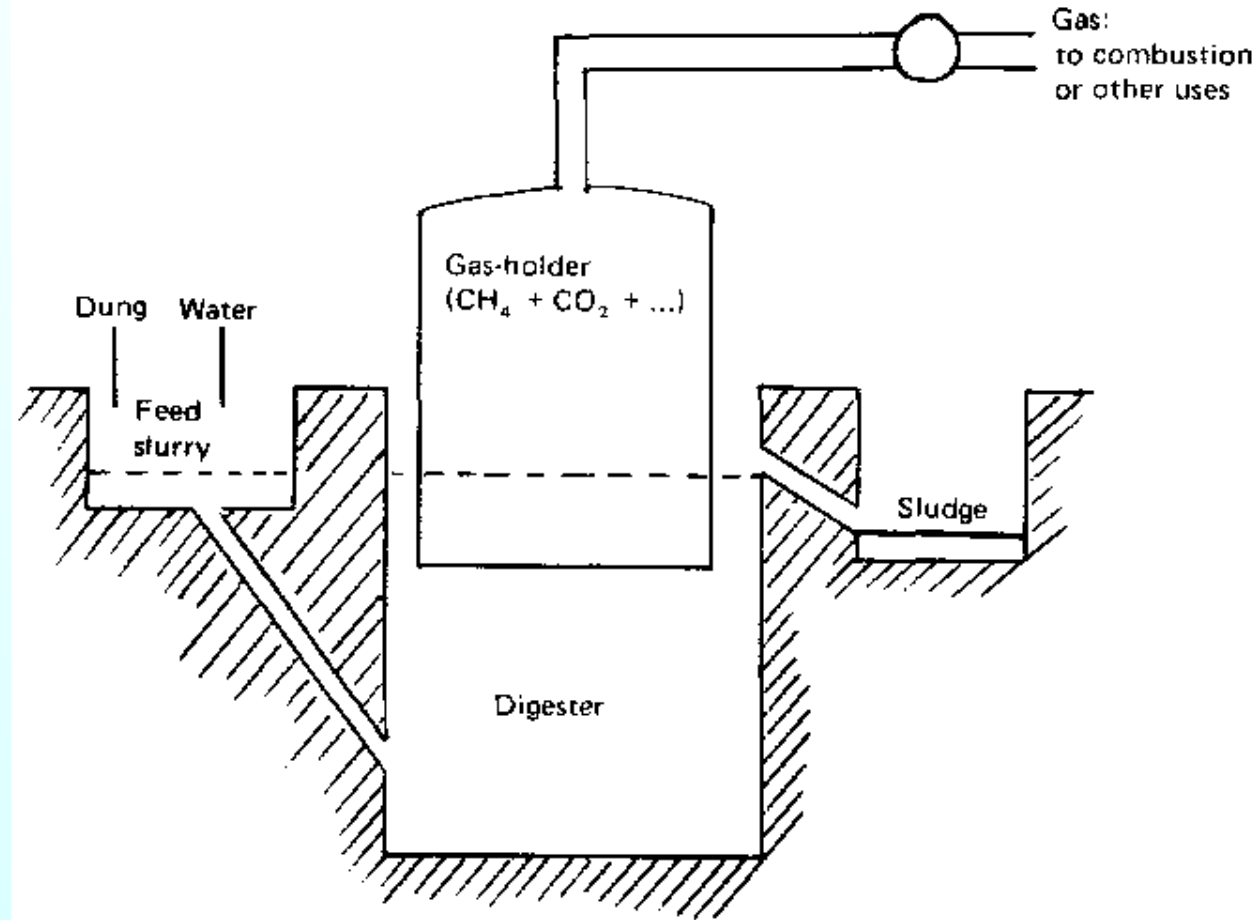
Supervisor

Dr. Amit Gross

Interdisciplinary Faculties and NGOs Work to Find a Sustainable Solution:

1. Ben-Gurion University of the Negev
 - Center for Women's Health and Promotion (Prof. Julie Cwikel),
 - Microbiology (Dr. Amit Gross, Mazen Zoabi),
 - Solar Energy (Suliman Hallasah).
2. The Arava Institute for Environmental Studies
 - Research Centre and the Centre for Renewable Energy (Dr. Tareq Abu Hamed, Ilana Mealem).
3. Eng. and Management (Dr. Shlomo Kimchie)
4. Bustan L'Shalom NGO

40 years of study



- China – over 22 Million Biogas reactors in rural areas (500 US\$/Unit)
- Israel – few industrial reactors

Small scale reactor - China



Industry reactor



The Bedouin community in the Negev

- 45 unrecognized villages
- 90,000 residence
- 300,000 animals







Organic waste

- Dumping and burning
- Odor
- Mosquito and fly breeding
- Ground water pollution





Public health

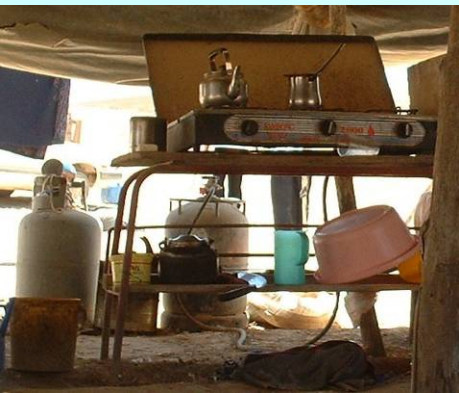
- Indoor air pollution
- Respiratory diseases
- Child burns





Energy – family consumption

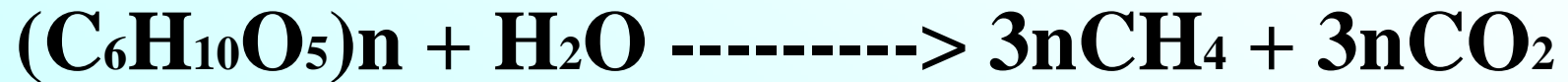
- **Diesel generators** - noisy, costly and emit a thick smoke (~ 750 USD/Month/families).
- **Cooking** over open fires
- **Gas** - cooking and heating. (~30 – 60 USD/Month/Family)
- **Wood** is used as fuel for cooking and heating





What is Biogas?

General fermentation formula



Advantages:

- Green energy
- Environmental protection
- Public health
- Compost
- Job market
- Global warming

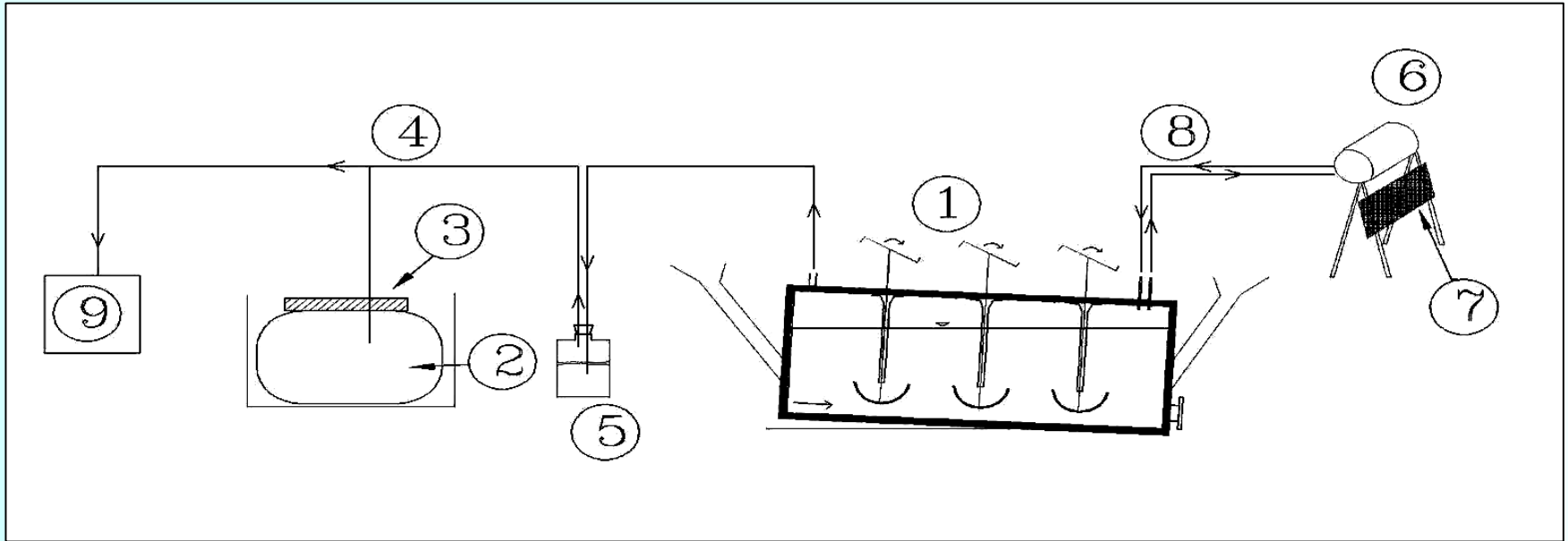
Why Not the Chinese design?



Goals of the Program:

- 1. Environmental awareness.**
- 2. Integrated Waste Recycling Systems**
to generate cooking gas, light heat and electricity through the sustainable re-use of organic waste and potential safe treatment of human sewage.

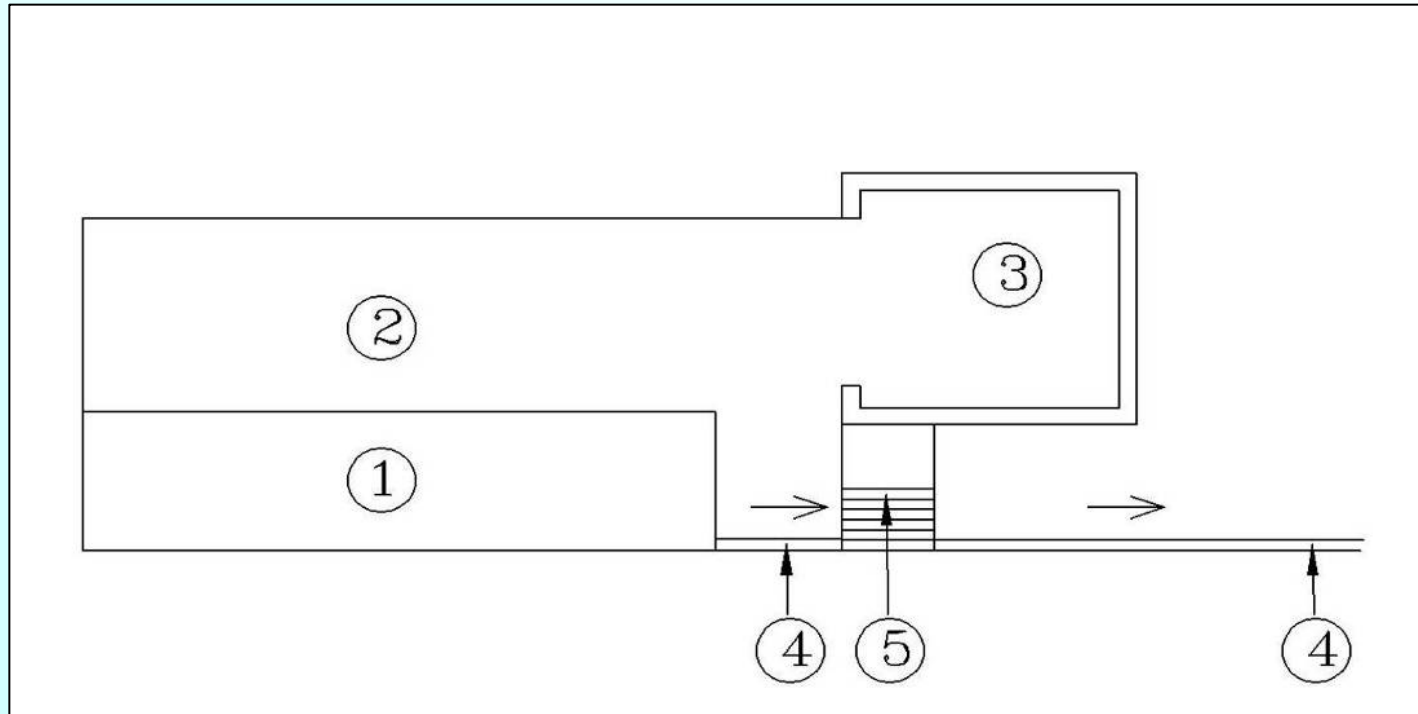
Fig 1. - Schematic Presentation of the Biogas Production, Storage and Utilization System:



Key:

- 1. Digester
- 2. Floating-bag plastic gas holder (gas storage)
- 3. Weight
- 4. Biogas line
- 5. Flame arrester
- 6. Solar water heater
- 7. Solar collector
- 8. Hot and cold water pipes from the solar water heater
- 9. Biogas to consumers (e.g. for cooking oven, gas boiler, heater, biogas generator, lamps)

Fig 2 – Top View of Compostation Area – Used to Treat the Process Bi-Product:



Legend

1. Compost pile area
2. Service area (for tractor or person to turn the piles, for sieving etc.)
3. Shade for end-product storage
4. Drainage tunnels (with the ground slope)
5. Drainage pit

Pilot site calculations:

50 people (gray water 465 lit/day)

50 goats (manure – 35 DM/day)

Plug flow reactor (10 m³) + solar heater

Retention time 15 days

Biogas/Electricity generator

and biogas household appliances

Compost

8200 USD saving of 8.45 USD/day

Assuming 330 operation days/year

3 years pay-back time

Time for questions?

