Paying for Energy Services (Subsidizing Biogas in Kenya)

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Presentation Content

- Investment Cost of a Biogas Plant
- Cost Outlay and Subsidy Amounts
- Before Subsidy and Rationale for Subsidy
- Reasons for Subsidizing
- Affordability
- Conclusions

Biogas Plant Parameters

Digester Size M3	Maximum Number of zero-grazed cows (Ave. Live Weight 300 KG)	Max. Biogas Production M3 per day	Equivalent firewood in Kg @ Ksh 0.80 per kg	Equivalent Charcoal in Kg @ Ksh 17 per kg	Equivalent Fuel Oil in litres @Ksh 80 per ltr
12	**6**	**4.3**	**10.8**	**3.9**	**2.2**
16	**8**	**5.8**	**14.4**	**5.2**	**2.9**
32	**16**	**11.5**	**28.8**	**10.4**	**5.8**
48	**25**	**18.0**	**45.0**	**16.2**	**9.0**
70	**36**	**25.9**	**64.8**	**23.3**	**13.0**
91	**47**	**33.8**	**84.6**	**30.5**	**16.9**
124	**65**	**46.8**	**117.0**	**42.1**	**23.4**

Investment Costs

- Investment costs depend on the size of biogas plant
  - List of materials for a biogas plant
  - Cost of material and cost of labour approach

(labor not inclusive on these costs)

MATERIAL LIST FOR FIXED DOME DIGESTER

Total Volume 12 m³; Gas Storage Volume 2,8 m³

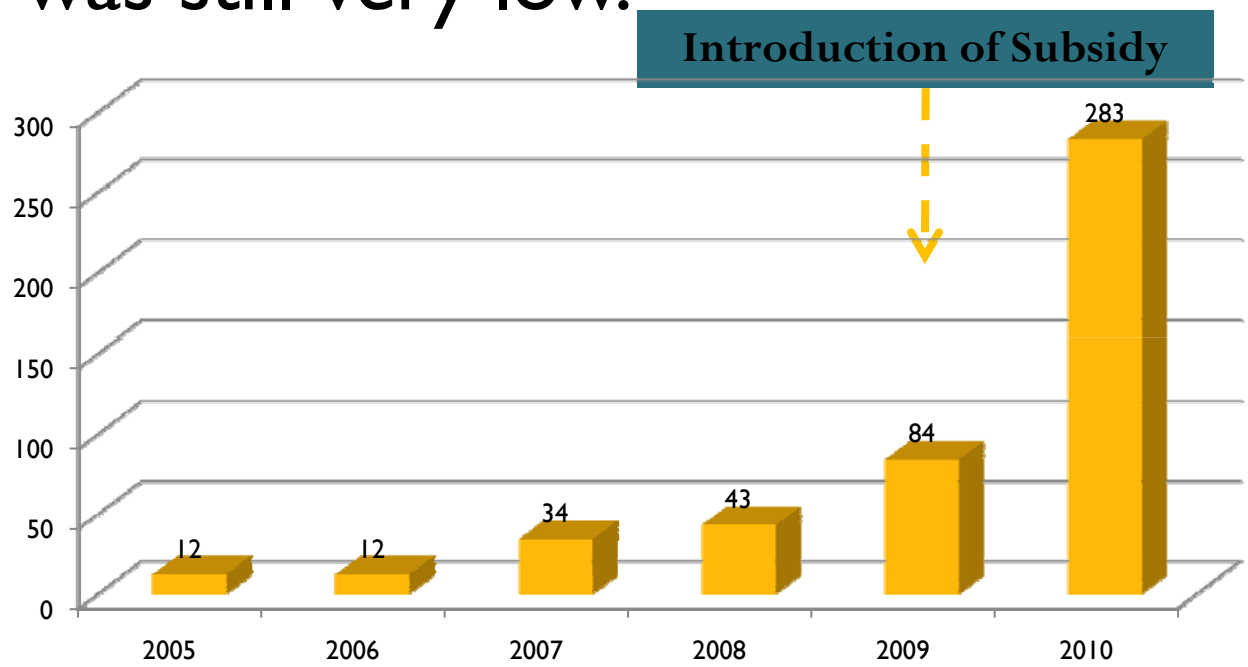
				PRICE PER UNIT	TOTAL PRICE
No.	MATERIALS	UNIT	QUANTITY	Ksh.	Ksh.
1	Excavation, aprox.	m³	30		
2	Backfill aprox.	m³	8		
3	Cement (amount incl brick making)	bags 50kg	40	900.00	36,000.00
4	River sand (WASHED)	T	8	1500.00	12,000.00
5	Ballast 25 mm	T	4	1800.00	7,200.00
6	Ballast 10 mm	T	1	1800.00	1,800.00
7	Lime	bags 25kg	3	150.00	450.00
8	Water proof additive	KG	8	200.00	1,600.00
9	Hollow blocks or quarry stones: 39x19x14 cm	U	300	50.00	15,000.00
10	Bricks, 24cmx11cmx9 cm; made on site	U	600	5.00	3,000.00
11	Round bars Y 8	Lenght	8	450.00	3,600.00
12	Round bars R 6	Lenght	9	300.00	2,700.00
13	Binding wire	KG	3	120.00	360.00
14	PVC pipe 4"	M	6	500.00	3,000.00
15	PVC elbow 4", 45°	U	1	450.00	450.00
16	Nails 3"	KG	2	150.00	300.00
17	Nails 2"	KG	3	150.00	450.00
18	Wire mesh	m2	1	200.00	200.00
19	Timber for scaffold approx.	M	6	150.00	900.00
20	Stilts for scaffold approx.	M	8	150.00	1,200.00
21	wooden bars 2"x2"	M	4	120.00	480.00
22	Plywood	pcs	2	550.00	1,100.00
23	Galvanized pipe , 3/4"	U	1	1800.00	1,800.00
24	Paint Brush 6"	U	1	150.00	150.00
25	Wire brush	U	1	50.00	50.00
26		U			
27	Subtotal	U			93,790.00
28	Contingencies	%	10.00		9,379.00
TOTAL					103,169.00

Cost Outlay and Subsidy

Size of plant (cbm)	Material Cost (KES)	Labour (KES)	Total costs (KES)	Farmers subsidy (KES)
8	94.622.00	35.000.00	129.622.00	30.000.00
12	108.669.00	40.000.00	148.669.00	35.000.00
16	125.933.50	45.000.00	170.933.50	40.000.00
24	141.394.00	53.000.00	194.394.00	45.000.00
31	176.275.00	65.000.00	241.275.00	55.000.00
48	209.638.00	75.000.00	284.638.00	
59	230.829.50	80.000.00	310.829.50	
70	264.379.50	90.000.00	354.379.50	
90	291.192.00	100.000.00	391.192.00	
124	342.430.00	120.000.00	462430.00	

Before Subsidy

- During awareness creation workshops a lot of interest was being generated.
- However. the real demand for biogas plant construction was still very low.



Reason for Subsidy

- Financing problems;
  - There were no specific loan schemes for biogas construction
  - Consumer loans of payback period of one year) didn't appear to add value
- Quality control. follow-up and reporting was difficult to secure (contractors and farmers did not see any reason to inform the project of ongoing constructions).
- Farmers adopting the technology were hesitant to allow others and the project to visit or use it for demonstration.
- Practical awareness of biogas technology remained low - farmers needed to see several working biogas units within their villages to appreciate the usefulness of the technology

Affordability of Biogas

- households that keep livestock with low levels of productivity find it challenging to invest in biogas (long-term perspective)
- many households in rural Kenya have cattle that will yield less than 6 liters per day. In such cases the pay back becomes a major problem
- For instance. if a household sells 5 liters of milk per day would fetch a maximum of Ksh 3.000 per month. Assuming a 30% allocation to repayment of a loan of about Ksh 100.000. repayment period would be 100 months (8-10 years)

Loan Analysis

REPAYMENT OPTIONS	I	II	III	IV
Amount of Loan	100.000	100.000	100.000	100.000
Yield per cow (litres/day)	**10**	**15**	**20**	**25**
Number of cows	**2**	**2**	**2**	**2**
Total production of milk	20	30	40	50
Price per litre	20	20	20	20
Income per day	400	600	800	1000
Number of days	30	30	30	30
Income per month	12000	18000	24000	30000
30% available for loan repayment	3600	5400	7200	9000
Number of months to repay loan	28	19	14	11
Number of years (repay)	2.31	1.54	1.16	0.93

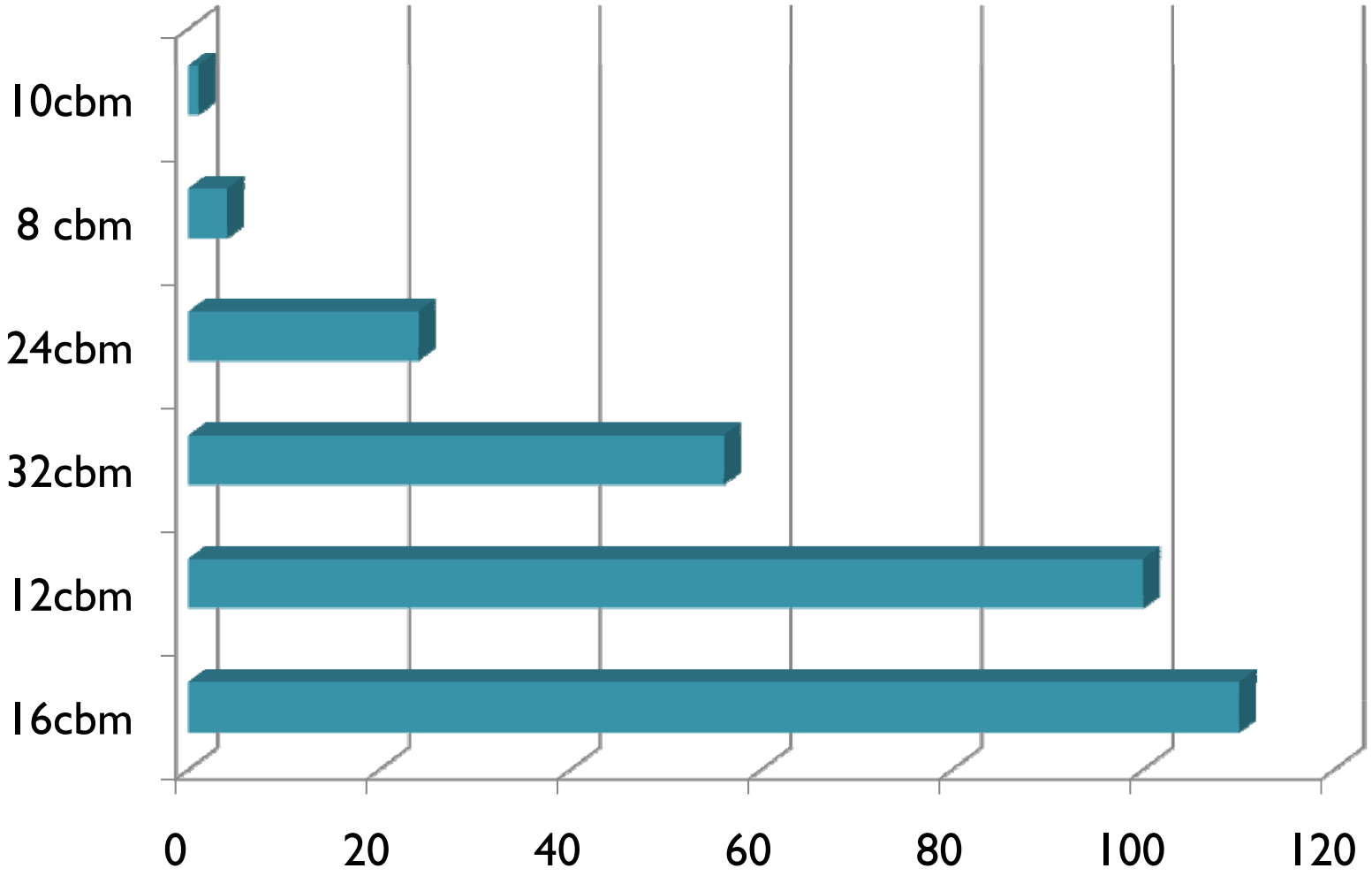
Cost: Benefit Analysis (2009)

Revenue	Quantity	@	Total
• Replaced Firewood	12 Pack	800	9,600
• Replaced Charcoal	12 Sack	850	10,200
• Replaced LPG Gas	72 Kg	160	11,520
• Replaced Paraffin/kero. 60 L	60	3,600	
• Replaced chem. fertilizer	10 Bags	2,500	25,000
• **Total Indirect Revenue**			**59,920**
Cost			
• Investment Costs	16cubic meter		204,000
• Operation cost (2 – 9yr)	@ 3,580 p.a.		32,220
• Rehabilitation (10th yr)	@ 14,580 p.a		13,580
• Operation (11 – 20yr)	@ 3,580 p.a		32,220
• Total			283,020
• Average cost per year in 20 year			**14,151**
• **NET REVENUE**			**45,869**

Subsidy Disbursements (Dec 10)

- **Total Investment (farmers & subsidy)**
  - **KES 82 million (750.000€).**
- **Subsidy Disbursed**
  - **KES 12 million (117.096 €)**
- **Number of functional biogas plants subsidized**
  - **309 biogas plants**

Subsidized Biogas Plants (by sizes)



Subsidy Process

- Application by potential client (in consultation with contractor/farmer mobilizer
- Appraisal by technical team
- Preparation of agreement (client and project)
- Release of 1st Installment (90%)
- Construction supervision and surrender of expenditure receipts (equiv to subsidy amount)
- Release of 2nd installment
- Plant registration and commissioning

Conclusion

- Based on the cost : benefit and payback analysis, biogas technology is financially viable, however awareness and financing options should be explored.
- Pro-poor biogas calls for concerted efforts by both the public sector and private sector working together
  - **Public sector** include the government. development agencies and NGOs working to:
    - Develop financing mechanisms i.e. Innovative subsidies to help overcome the high initial cost of biogas installations
    - Develop innovative cost effective community biogas installations through mobilization of community organizations as one option of reaching the poor with biogas technology e.g. Youth and women groups
    - Explore financing opportunities in carbon finance and other international financing mechanisms
  - **private sector**. especially the financing institutions. MFIs and cooperatives located in rural areas should still be encouraged to help in the provision of loans and subsidies

Thank You