The Potential of Using Reclaimed Bio-Slurry as a Fertilizer

- Case Study for a Rural Area in the Kathmandu Valley, Nepal

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Biogas Technology in Nepal

- More than 260.000 installed biogas plants all over the country
- Fixed dome model *GGC 2047* (4 to 20 $m^{3)}$

Figure 1: Toilet Attached GGC 2047 Biogas Plant

Biogas Project in Changunarayan

- In cooperation with NGO *Beyond*

- 25 toilet attached biogas plants in the village
- Problems:
  - Biogas plants did not run properly
  - Bio-slurry was underutilized
- Task:

Assess the site-specific bio-slurry's potential to meet nutrient requirements in crop cultivation

Material Flow Analysis

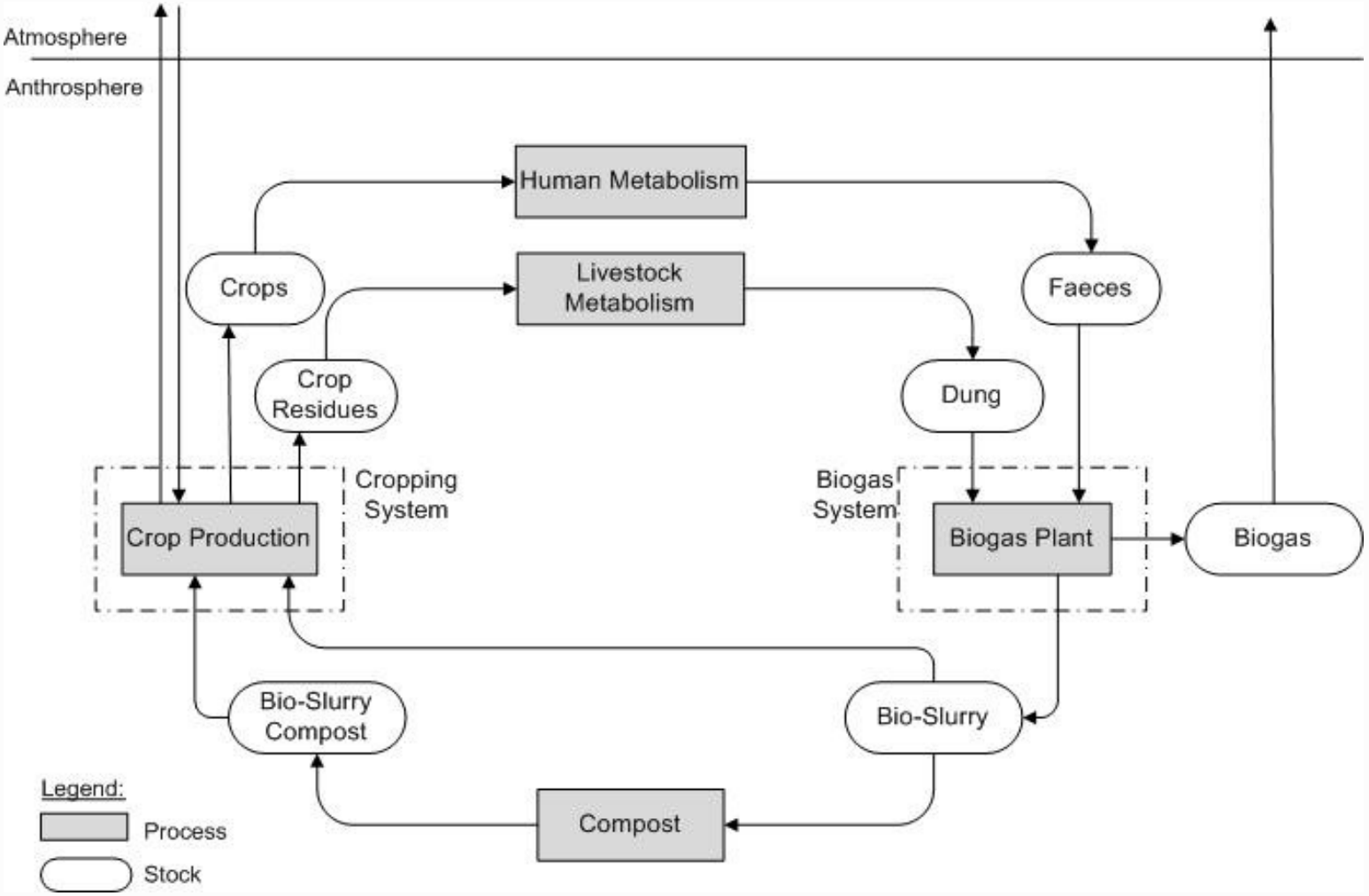

Figure 2: Carbon and Nutrient Cycle due to Bio-Slurry Usage

Biogas System

	Excreta [kg/day]	No.	Excreta [kg/household/ year]	Specific Gas Production [m^3/kg][b]	Gas Production [m^3/household/year]
Human	1.5[a]	6	3285	0.020	65.70
Cattle	10[c]	1	3650	0.023	83.95
Buffalo	12[c]	0.5	2190	0.023	50.37
a Berger (2008) b Sasse (1987); Neupane (2010) c Gurung (1997)				Total	200.02

Table 1: Biogas Production in an Average Household in Changunarayan

	C [kg]	N [kg]	P [kg]	K [kg]
Input Substrate	583.20	43.11	23.14	22.56
Output Biogas	126.56	5.34	0	0
Bio-Slurry	**456.54**	**37.76**	**23.14**	**22.56**

Table 2: Constitution of Input Substrate, Biogas and Bio-slurry

- Input:
  - Human faeces and urine
  - Cattle/ buffalo faeces
- $T_{Retention}$ 90 days
- $T_{Digestion}$ 15-20 °C

Cropping System

- Farmers cultivate 0.33 ha in rotation
- Staple crops included in calculations
- Neglection of other in- and output flows

Crop	Cultivated Land [ha/a]	Nutrient Uptake [kg/a]		
		N	P	K
Potato	0.14	9.49	10.17	15.37
Rice	0.12	17.88	2.57	19.84
Maize	0.12	14.51	2.60	9.59
Wheat	0.10	12.10	2.17	12.74
Millet	0.05	11.37	1.18	0.13
Total		65.36	18.67	60.67

Table 3: Total Annual Nutrient Uptake by Staple Crops in an Average Household in Changunarayan

Results and Discussion

	N [kg/a]	P [kg/a]	K [kg/a]
Nutrient Demand	65.36	18.67	60.67
Nutrient Supply	37.76	23.14	22.56
Coverage [%]	**57.78**	**123.92**	**37.18**

Table 4: Coverage of Nutrient Demand

- Relevant amount of nutrients can be recycled
- Behaviour in soil needs to be regarded more detailed
- Composting bio-slurry with harvest residues could increase fertilising potential

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