Nutrient-rich Organic Fertilizer: An economically feasible Solution Promoting a sustainable circular economy







INTRODUCTI

- **Old infrastructure**
- Lack in basic amenities Π
- Unhygienic and untreated waste disposal

- 40-45% edible products
- 40-45% by-products
- 15-20 % waste generation

- Public health and environmental hazards. Π
- Potential reservoir of pathogenic growth
- **Environmental pollution** Π
- Impermissible limits of effluent discharge

Resource loss

generation

Economic loss

Potential revenue

Number of slaughterhouses:



<u>Illegal·~35 00</u>

Rural Slaughterhouse Dumping



Insight of slaughterhouse generated

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	was	ТР		
 Size of a Small-scale Slaughterhouses: Less than 30 Big animals slaying 	PARAMETERS	PERMISSIBLE VALUES (AS OF EPA, 1986)	WASTE BLOOD	RUMEN DIGESTA
20 Buffaloes slaughtered daily.	рН	5.5–9.0	8.1	8.0
400 liters Cattle Blood 400kg of Rumen Material	TS (mg L ⁻¹)	-	821,517	57,220
raw meat industry is 1 million ton	TSS (mg L ^{−1})	100	409,737	44,072
Violating EPA, permissible limit leads to closure of Small slaughterhouse	$BOD_5 (mg l^{-1})$	30	66,011	140
Organic rich resource loss	COD (mg L ⁻¹)	250	270,403	35,997
Loss of revenue generating opportunity	Oil and grease (mg L ⁻¹)	10–20	25	76,992
		Roy et al. Interr	ational Journal	Of Recycling of Or

Agriculture 2013



Comparison among existed recycling

Recycling alternative s	Used feedstock	technolo conditions	giess outcome	Pathoge n survival	References	Challenges
Incineration	Hazardous animal waste	850 °C for at least 2 sec	Inorganic ash	×	Anon (2002)	Heavy and Complicate
Rendering	Poultry waste	133 °C for 20 min (at 300 kPa)	Animal feed	+++	Salminen and Rintala (2002)	machinery
Composting	Cattle rumen	Unknown	Organic fertilizer	+++	Nunes et al. (2015)	Time
Anaerobic digestion	Dead livestock	37 °C for 15-30 days/ 55 °C for 12-14 days	Biogas	+	Cantrell et al. (2008)	consuming
Alkaline hydrolysis	Sheep wool	120 °C for 20 min (at 200 kPa)	Protein/fat recovery	+	Gousterova et al. (2003)	High capital and
Enzymatic Management	Sheep entrails	50 °C for 135 min (at pH 7.1)	Protein/fat recovery	++	Bhaskar et al. (2007)	operating cost
Drying treatment	Blood and rumen digesta	90-110 °C for 3-4 hrs	Organic fertilizer	+	Our work	++ · Vory high +++ · High ++ · Low + · Vory low



DISPOSAL AND RECYCLING OF ORGANIC WASTES PRODUCED IN RURAL SLAUGHTERHOUSES (PREVIOUSLY REVIEWED BY SALMINEN AND RINTALA 2002; WHITTLE AND INSAM 2013)

Helical ribbon mixer dryer



Helical-ribbon mixer dryer fabricated based on calculations and currently installed in one of the rural abattoirs of Magrahat, South 24 Parganas, West Bengal (India).

Grantec

Waste-to-Wealth

Non-recurring costs (INR)Equipment fabrication cost2,50,000Annual recurring costs (INR)Operation and maintenance costs5,000Fuel and electricity charges15,000One labour @ 10,000 per month.1,20,000Sub-total1,40,000Total cost (INR)3.90,000	Year	Non- recurring Cost	Recurrin g Cost	Labor Cost	Total Cost (per Year)	Annual Producti on (in kg)	Price (INR. per kg)
	Year 1	2,50,000	20,000	1,20,000	3,90,000	20,000	39
Assuming 20 days in a year are non-productive	Year 2	-	20,000	1,20,000	1,40,000	20,000	39

- □ Total production days = 345 days.
- □ Production per day is 60–70 kg.
- □ The calculation is made at the lower end taking 60 kg per day.
- □ The price of the recycled product is calculated considering 5% profit over production cost per year.



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