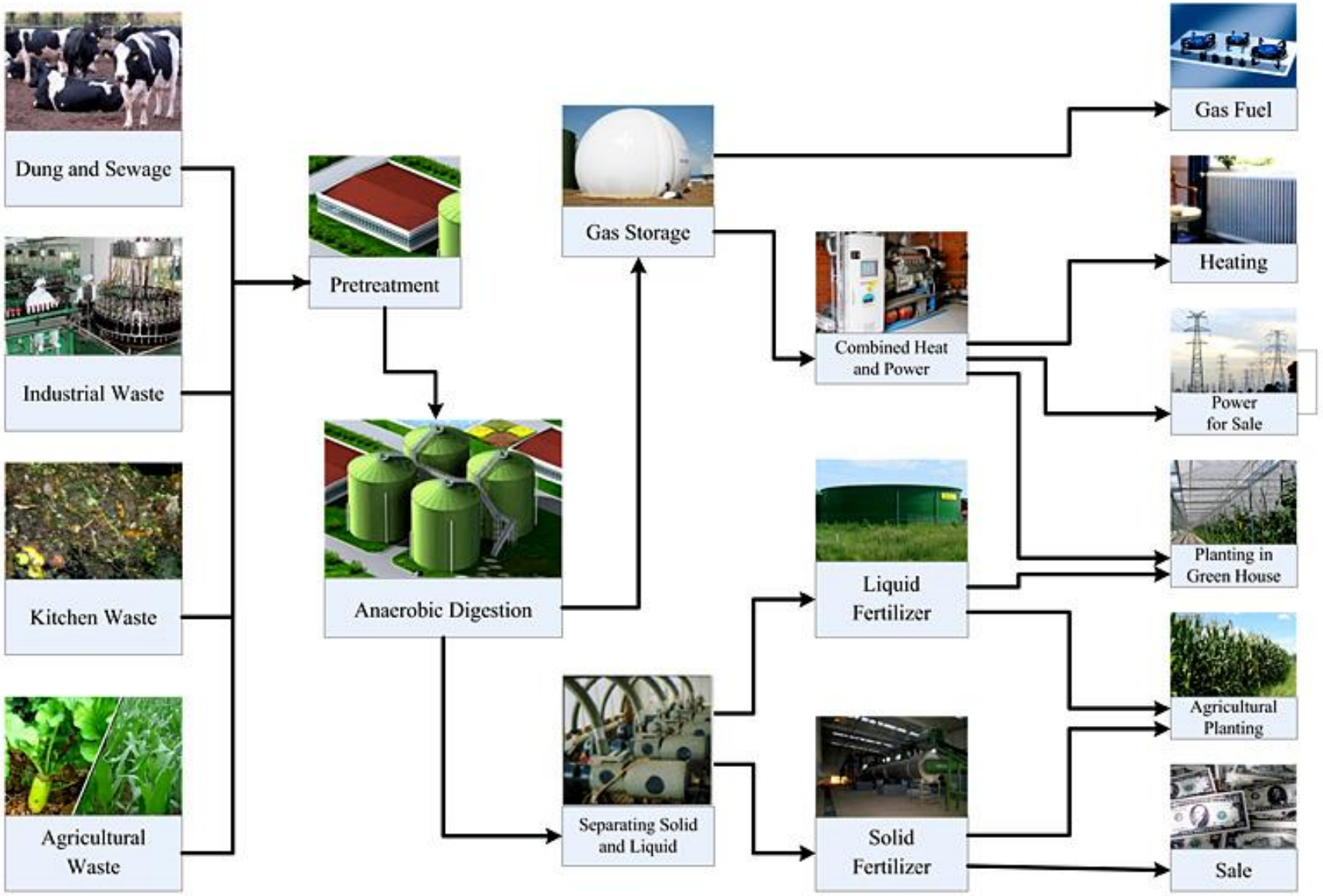
Biogas Production and Application



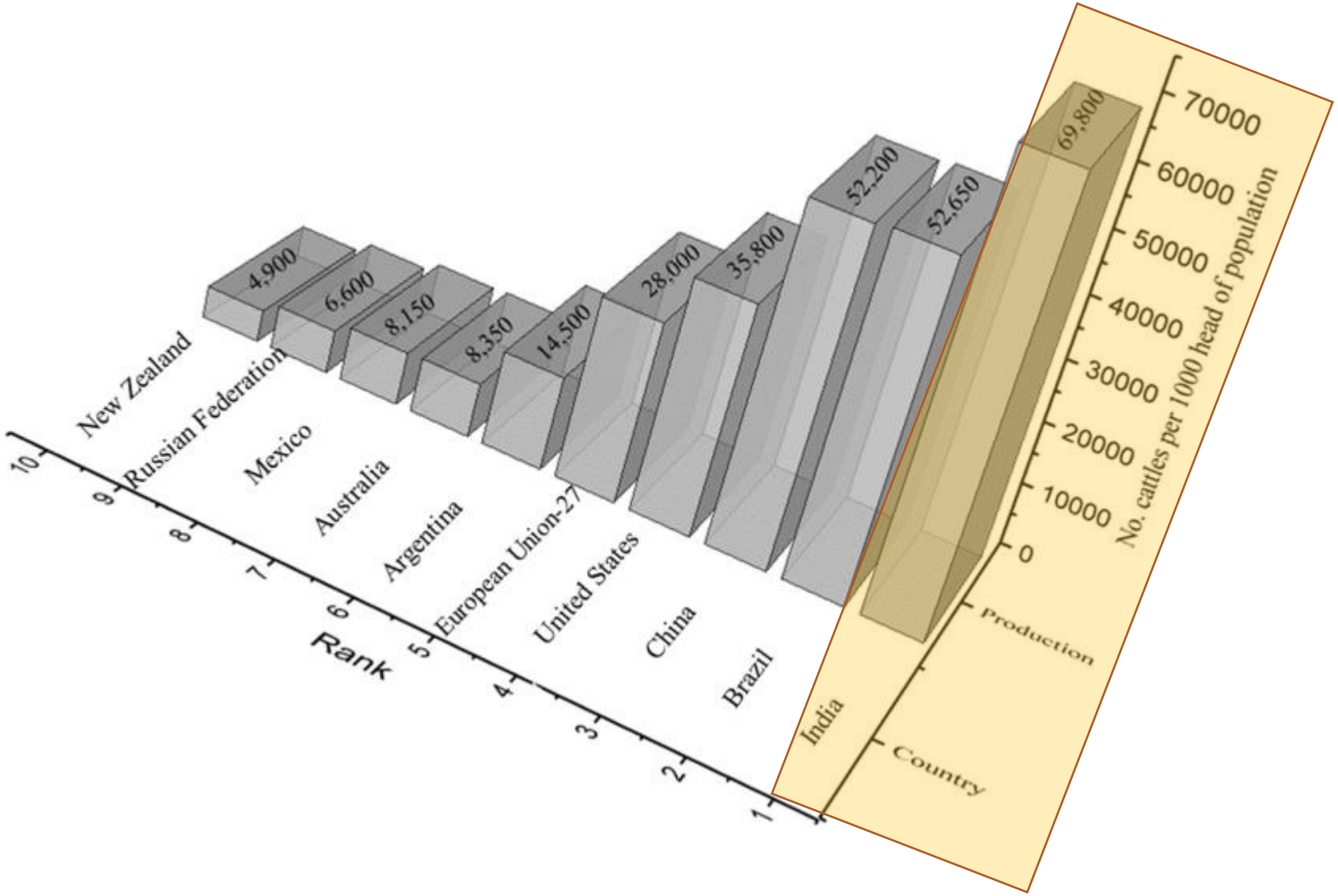
(source: http://www.erneu.com/en/P020203.htm)

Feedstock Availability-India

Agricultural biomass	Dry biomass (Million tonnes)	Surplus biomass (Million tonnes)	Heat value of biomass (MJ/kg)	Approximately energy available (PJ)
Rice straw	225.5	43.9	16.81	737.96
Wheat straw	145.5	25.1	18.07	453.56
Maize straw	27.9	6	18.57	111.42
Sugarcane bagasse	119.2	41.6	18.89	785.82
Cotton stalk	66.6	29.7	16.01	475.5
Gram stalk	26.5	8.7	16.8	146.16
Pegan pea stalk	9.2	1.8	14.81	26.66
Groundnut shell	12.9	3.9	18.1	70.59
Mustard waste	17.1	5.2	17.57	91.36
Soyabean waste	27.8	10.0	16.4	164

(Data source: Glob. Methane Initiatiative, 2020)

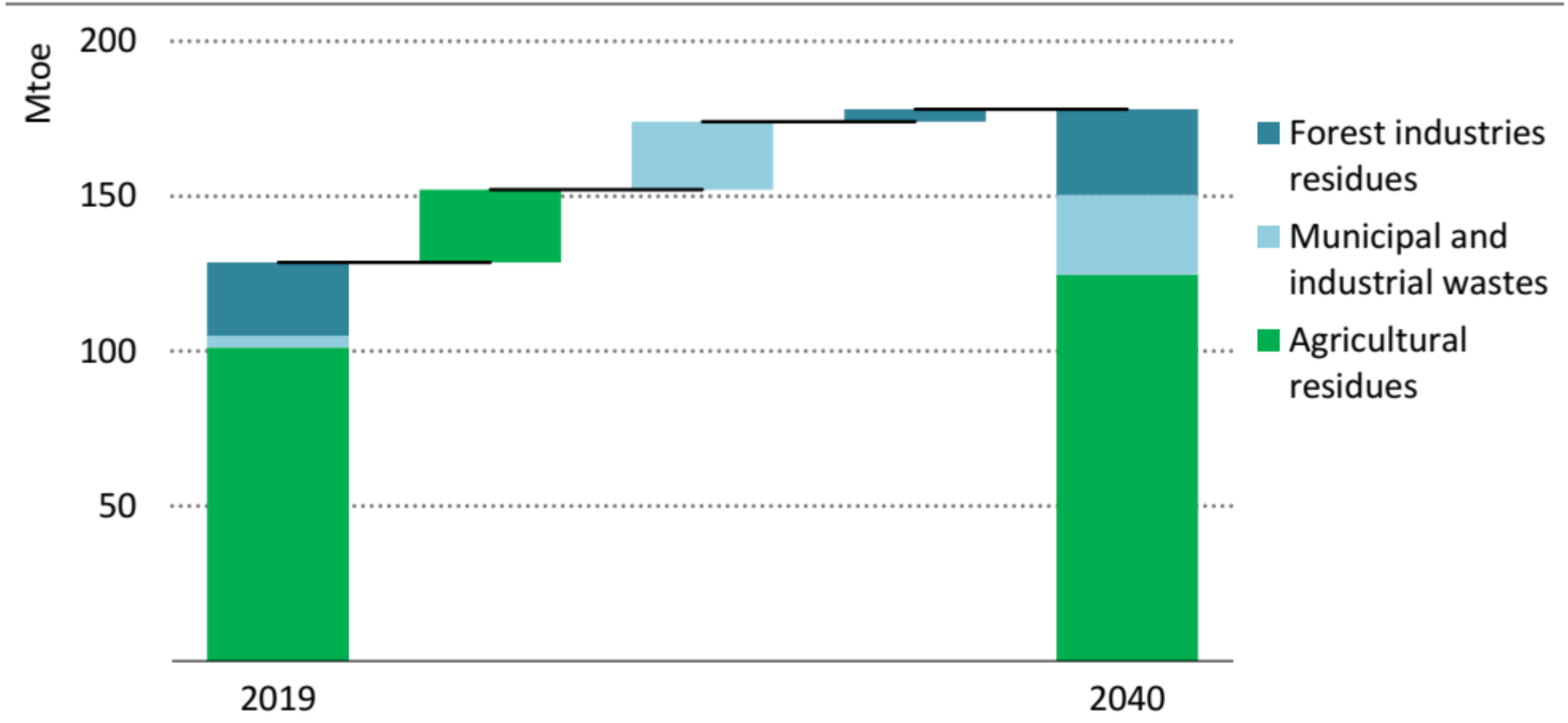
Feedstock Availability-India



Cattle production (animal numbers) by country in 1000 head population

Data source: (www.indexmundi.com)

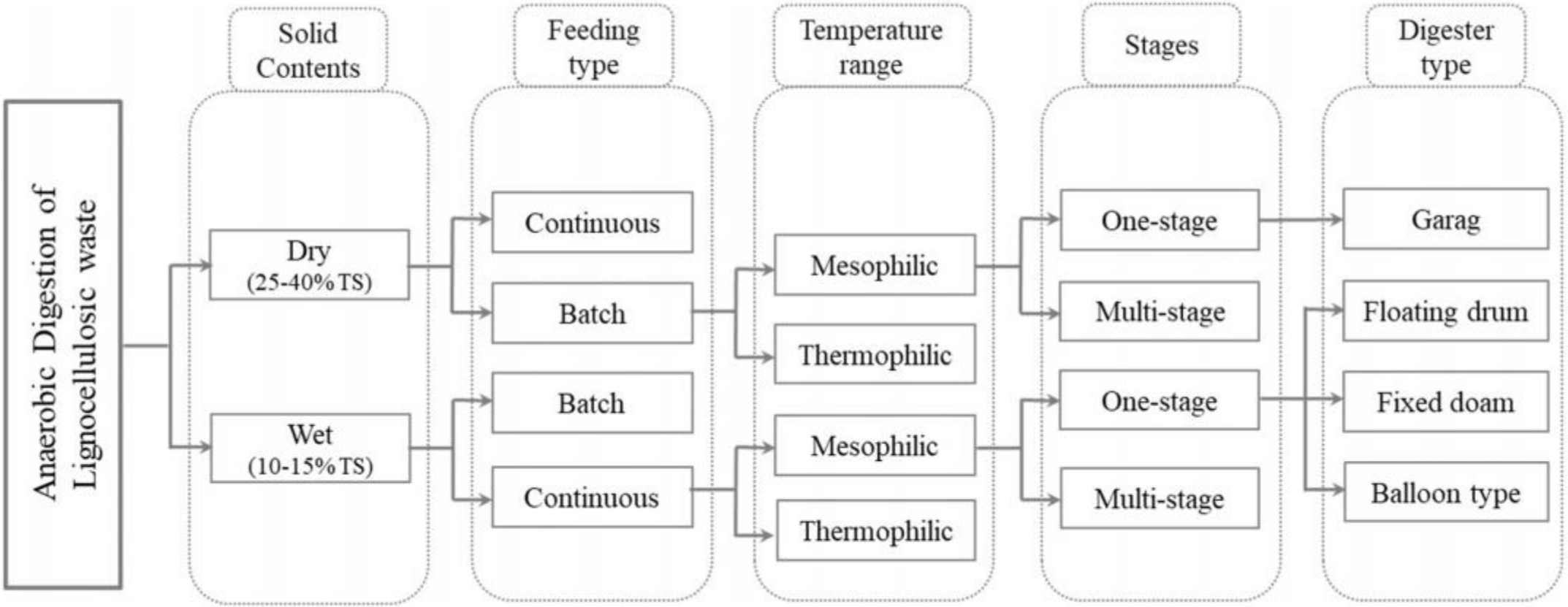
Bioenergy potential from organic waste in India, 2019-2040



Organic waste could produce 130 Mtoe of useful energy today, equivalent to 15% of India's total energy demand.

Source: India Energy Outlook 2021, IEA

Biogas generator – Technology Options



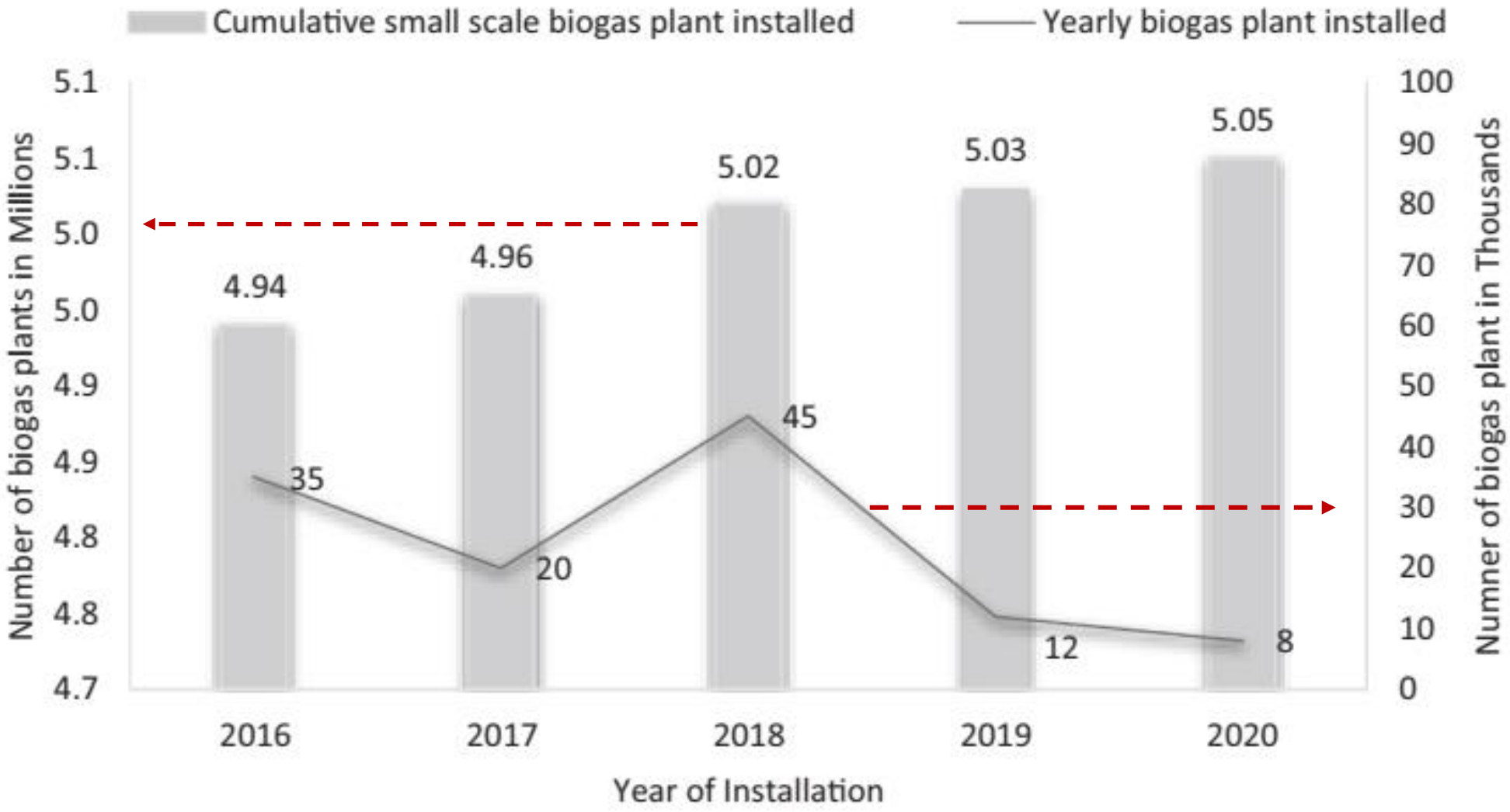
Source: Mahmudul et al., Sci. Total Environ. 2021

Approved Biogas generator Models in India

Types of anaerobic digester designs (approved in India)	Anaerobic digester models
Fixed dome	❑ Deendbandu fixed dome model constructed with Ferro-cement and brick masonry model ❑ Solid-state Deenbandhu model ❑ RCC prefabricated fixed dome model ❑ KVIC model having floating type steel material gasholder and digester with brick masonry ❑ KVIC model having floating steel metal gasholder and Ferro-cement digester
Floating drum	❑ KVIC model having Fibre Glass Reinforced Plastic (FRP) gasholder and digester ❑ KVIC model made up of HDPE/PVC/FRP/RCC etc. material digester with gasholder ❑ Pragarti model biogas plant
Prefabricated Models	RCC prefabricated digester with KVIC floating drum/gasholder
Bag types AD model	Flexi model

Source: Panjab Energy Development Agency (PEDA, 2021)

Status of Small-Scale Biogas Plants in India



Source: Bioresource Technology Reports 16 (2021) 100830

Potential Effect of Adoption of Biogas Generation in India

Parameter	value
Overall population	1.32 billion
Total homes (@ 4.8 persons per homes)	275 million
Rural homes (53% of the total homes)	159.5 million
Number of rural homes depending on livestock (22%)	35.1 million
Biogas plant installation capacity (50% of livestock dependent families)	17.5 million
Expected monthly savings on firewood and chips @ 5.78 kg per home	101.4 thousand tons
monthly estimated value of the firewood and chips saved (Rs.)	257.6 million
Monthly kerosene savings expected (litres) @ 0.78 L per home	13.7 million
Estimated monthly value of kerosene saved (Rs.)	389.5 million

Source: Mottaleb and Rahut, Biomass Bioenergy 123, 166–174, 2019

Biogas – Push from Government

- **New National Biogas and Organic Manure Programme (NNBOMP)**
  - aims to set-up about **2.5 lakhs unit of biogas plants in 1-25 m^3/day capacity**
  - Supports household in rural and semi-urban regions to develop organic manure systems based on bio-waste (generally cattle dung)
  - 8 Training Centres of BDTCs assisting State Rural Development Departments/ State Nodal Agencies with biogas development and knowledge through technical and training, field inspections, and information and publicity

- **Biogas power generation (Off-Grid) and thermal energy application programme (BPGTP)**
  - to support biogas-oriented regulated sustainable sources of energy to generate electric power (off-grid) in the range of power of **3 kW to 250 kW**
  - to support energy required for heating/cooling purposes from biogas production derived from AD plants ranging in size from **30 to 2500 m^3**
  - Currently India has
    - a total of **325 biogas-oriented projects** with a total generation of **electric power capacity of 7.587 MW** and a **total generation of biogas capacity of 72,351 m^3/day**