Presented By:-

Prachet Sokhiya 13112066

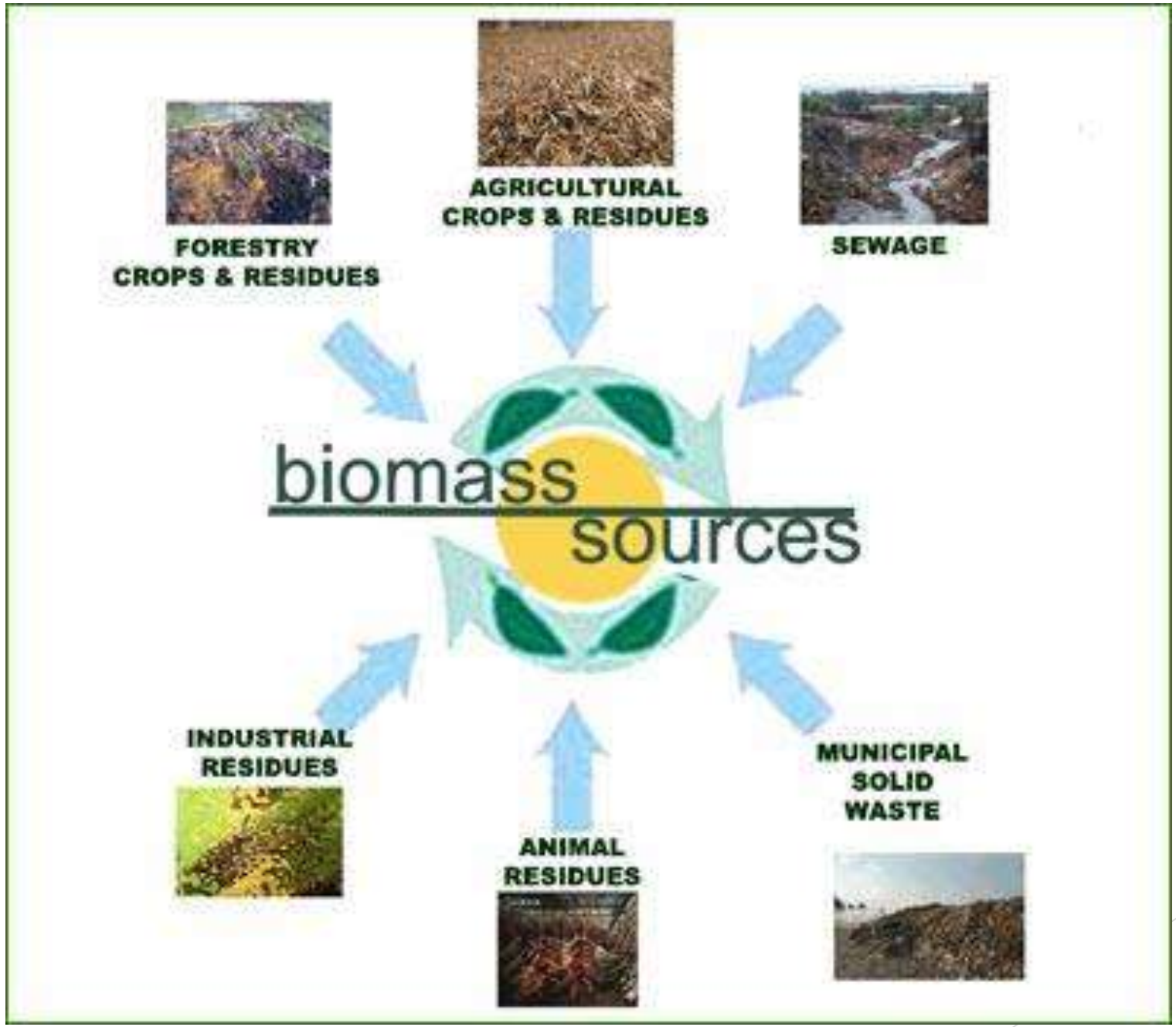
Prateek Agrawal 13112067

Overview

- Introduction + composition
- Production technique
- Production equipment
- Processing of biogas
- Benefits and limitations
- Application
- Indian scenario
- Global scenario
- Conclusion

Introduction

- Biogas typically refers to a mixture of different gases produced by the breakdown of organic matter in the absence of oxygen.
- Microbially controlled production of biogas is an important part of the global carbon cycle.
- It is a renewable energy source.
- The main source of raw material for production of biogas is Plant and Animal biomass .


AGRICULTURAL
CROPS & RESIDUES
FORESTRY
CROPS & RESIDUES
SEWAGE
biomass
sources
INDUSTRIAL
RESIDUES
ANIMAL
RESIDUES
MUNICIPAL
SOLID
WASTE

Biogas is primarily methane (CH4) and carbon dioxide (CO_2) and may have small amounts of hydrogen sulfide (H2S), moisture and siloxanes.

Typical Composition of Biogas		
COMPOUND	MOLECULAR FORMULA	PERCENTAGE
Methane	CH_4	50–75
Carbon Dioxide	CO_2	25–50
Nitrogen	N_2	0–10
Hydrogen	H_2	0–1
Hydrogen Sulphide	H_2S	0–3
Oxygen	O_2	0–0.5

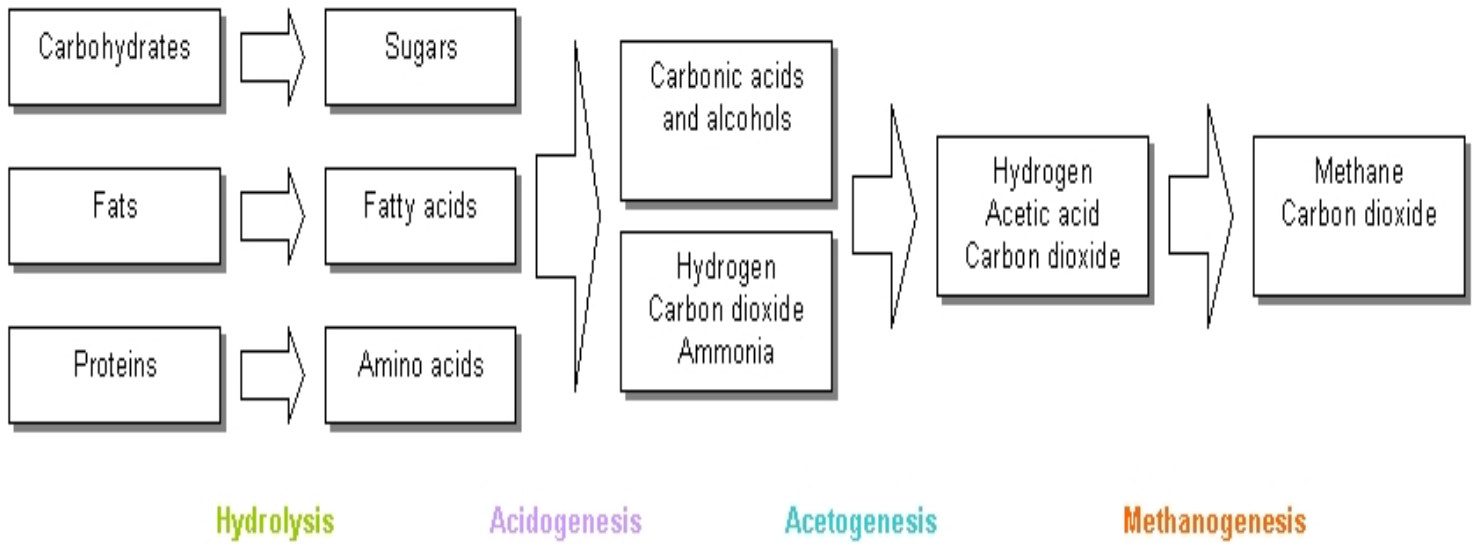
TYPICAL GAS PRODUCTION FROM DIFFERENT FEEDSTOCK

Sl. No.	Feedstock	Typical Gas Yield (liters/kg)	Typical Methane Content (%)
1.	Paper Waste	480	53
2.	Bagasse	330	57
3.	Spent Tea Waste	235	57
4.	Food Waste	160	62
5.	Bamboo Pulp	145	54
6.	Dry Leaves	118	60
7.	Green leaves & twigs	100	65
8.	Fruit waste	91	50
9.	Bamboo dust	53	72
10.	Distillery effluent	31	75
11.	Black liquor (Paper Mill)	22	69
12.	Animal Excreta		
	- Cow/Bullock	36	60-65%
	- Buffalo	36	“
	- Pig	78	“
	- Chicken	62	“
13.	Human Excreta	70	“

Biogas History

1776 : Marsh gas, By Volta
1808 : Humphry Davy, Methane
1859 : Leper colony, Mumbai, Digester
1895 : Gas lamp in Exeter, England
1907 : Patent, Germany
1930 : R&D

Production



Biogas is produced as landfill gas (LFG), which is produced by the breakdown of biodegradable waste inside a landfill due to chemical reactions and microbes, or as digested gas, produced inside an anaerobic digester.

Biogas is produced by four steps –

- Hydrolysis
- Acidogenesis
- Acetogenesis
- Methanogenesis


PDBP

Production Equipment

The Main parts of a typical biogas plant consist of the following components:-

- Inlet
- Digester
- Gas holder
- Outlet

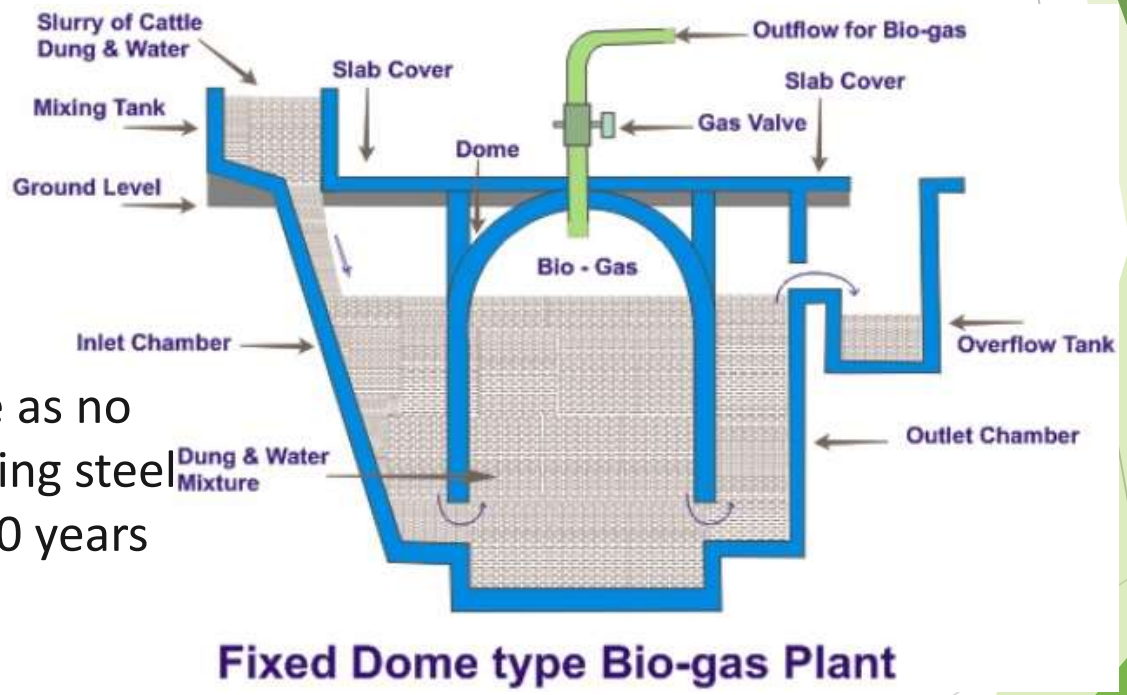
There are different types of biogas production plants . The main two types are as follows :-

- Fixed-dome Plant

- Floating-drum Plants

Fixed dome type

- A fixed-dome plant consists of a digester with a fixed, non-movable gas holder, which sits on top of the digester

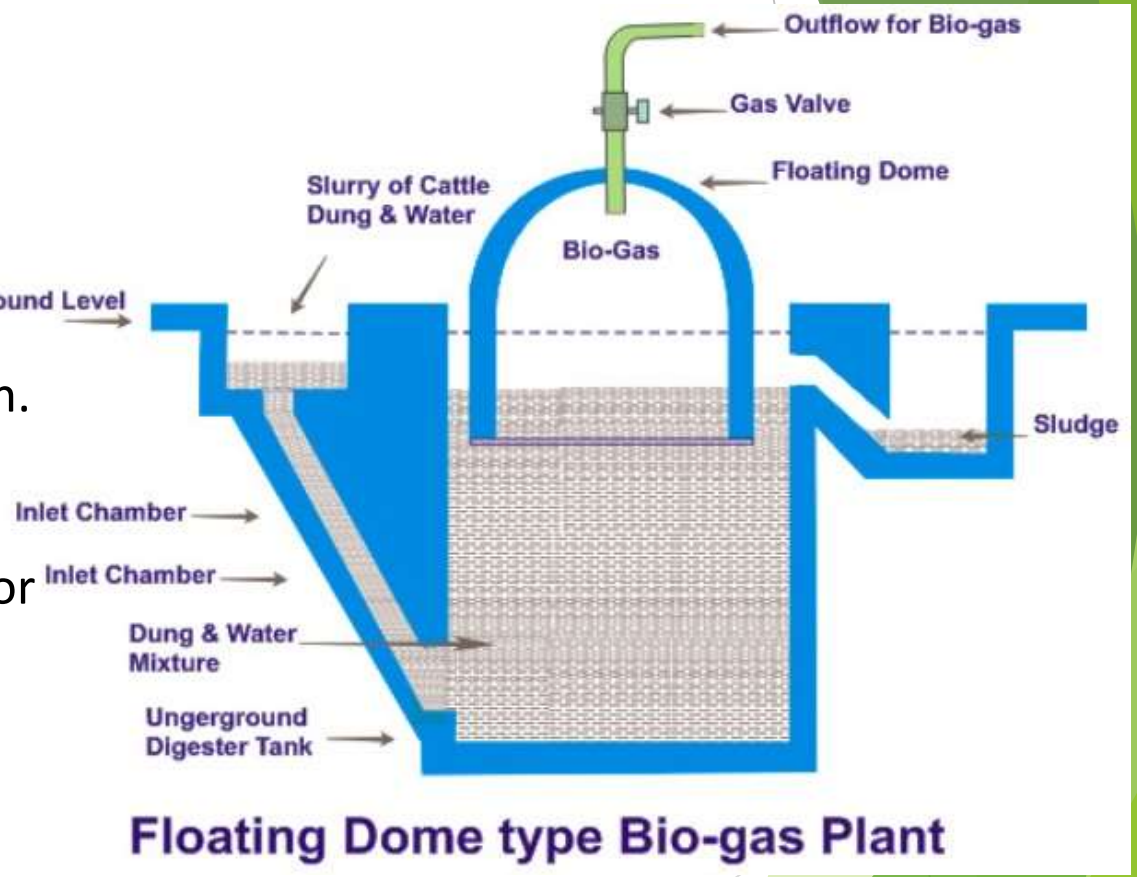


Fixed Dome type Bio-gas Plant

- Advantage - The costs of a fixed-dome biogas plant are relatively low. It is simple as no moving parts exist. There are also no rusting steel parts and hence a long life of the plant (20 years or more) can be expected.

Floating dome type

- Floating-drum plants consist of an underground digester and a moving gas-holder.
- The gas-holder floats either directly on the fermentation slurry or in a water jacket of its own.
- The gas is collected in the gas drum, which rises or moves down, according to the amount of gas stored
- Advantage- Floating-drum plants are easy to understand and operate. They provide gas at a constant pressure, and the stored gas-volume is immediately recognizable by the position of the drum



Floating Dome type Bio-gas Plant

Processing of Biogas

- The scrubbing of the biogas in order to remove impurities that are generated during the digestion process such as CO2 (Carbon Dioxide) and H2S (Hydrogen Sulfide)
- Biogas go through a cleaning process, and becomes biomethane.
- A simple method for Hydrogen Sulfide utilizing steel wool in a glass bottle
- For Carbon Dioxide removal, as well as additional Hydrogen Sulfide removal a method of water spray crossflow can be used . In this method the Biogas enters one end of a tube and experiences water streams flowing in the opposite direction .

Benefits Of Biogas

- Alternate energy source
- Fertilizer
- Requires only locally and easily available material for construction
- Control pollution
- Little operational skills and maintenance required
- Rapid falls in disease

Advantage of biogas as a fuel

- High calorific value
- Renewable source of energy
- Non polluting
- Reduces landfills
- Economical Technology

Limitations of biogas

- Biogas can be explosive when mixed in the ratio of one part biogas to 8-20 parts air.
- Biogas leaks smell like rotten eggs (hydrogen sulfide)
- Not feasible
- Not Attractive on Large Scale
- Little technological advancement
- Contain Impurities
- Cannot be easily stored .

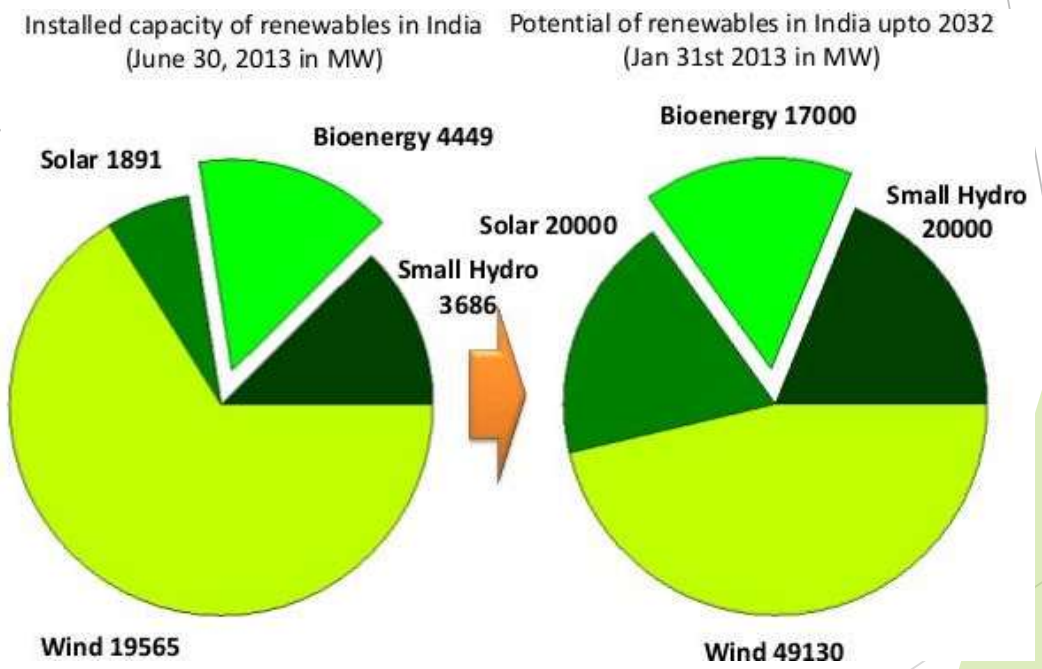
Applications

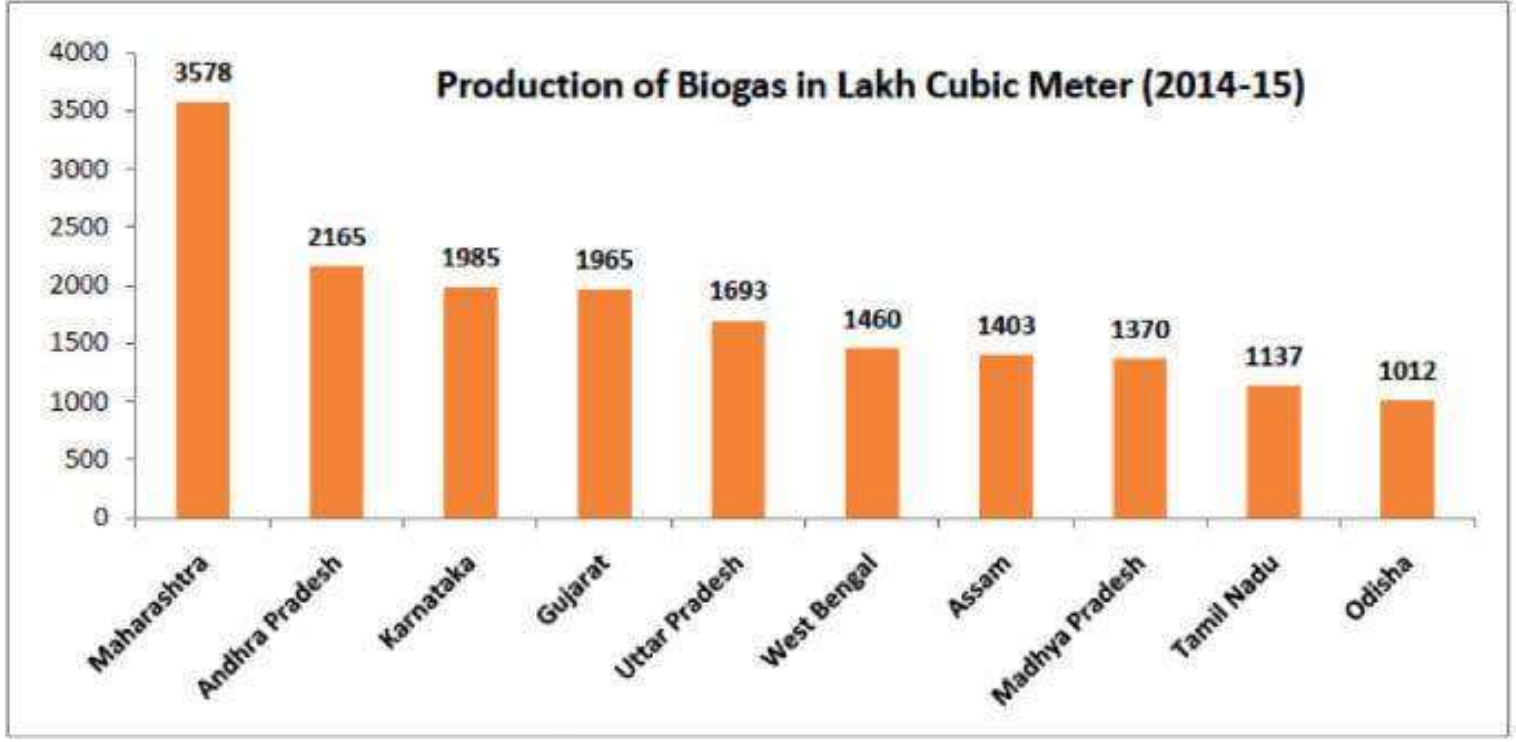
- Biogas gas-grid injection
- Biogas in transport
- Using of carbon dioxide and methane as chemical products

"Biogaståget Amanda" ("The Biogas Train Amanda") train near Linköping station, Sweden

Indian scenario

- India has installed 4.75 million small scale biogas plants.
- India has potential maximum number of biogas plants has been estimated to be 12-17 million .
- Mainly biogas is produced based on dairy manure as feed stock and these "gobar" gas plants .
- In the last 2-3 decades, research organisations with a focus on rural energy security have enhanced the design of the systems resulting in newer efficient low cost designs





- India have additionally commissioned 158 projects under its biogas based grid power generation programme, with a total installed capacity of 2 MW.

- National Biogas and manure management programme {NBMMB} is implemented in our country since 1981-82 for promotion of biogas plants based on cattle dung .

- To support above programme the governments providing 50% subsidy for installation of biogas plant .

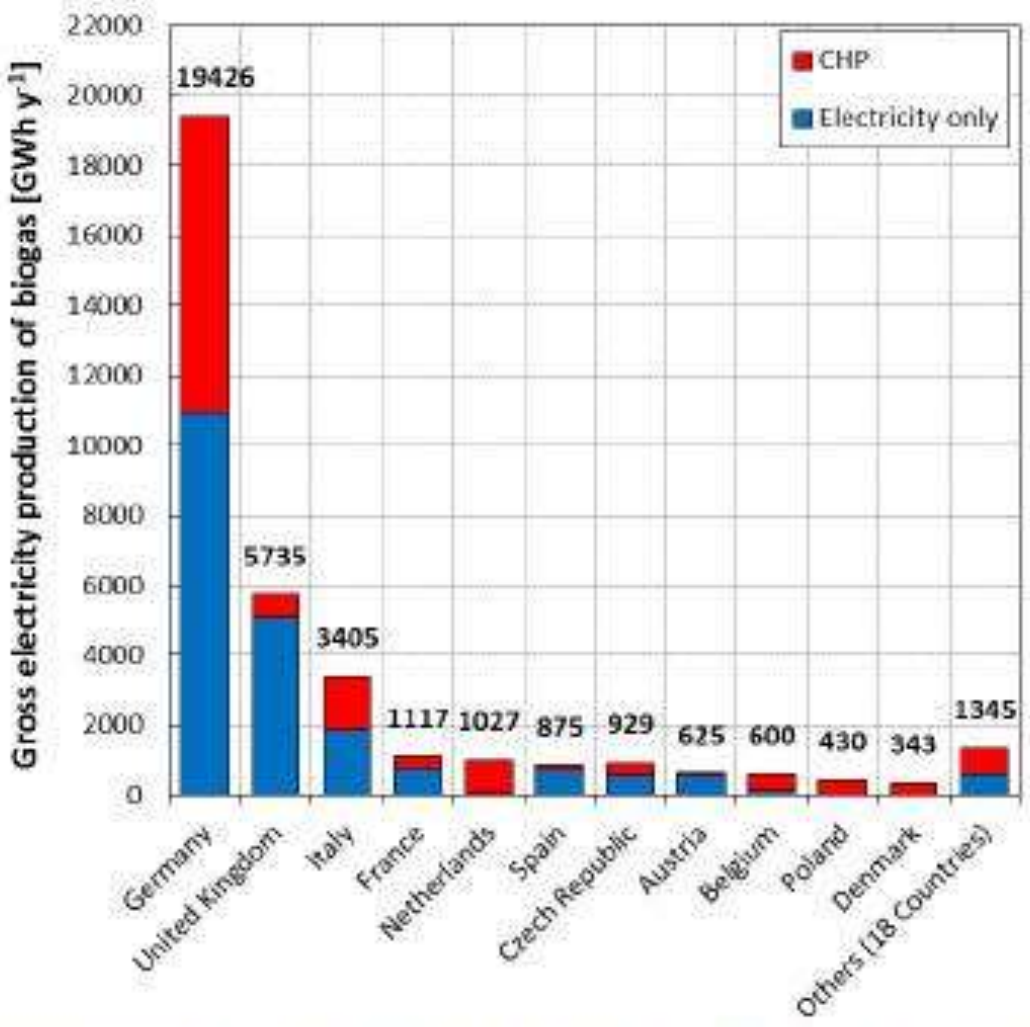
1.0 MW power project based on cattle dung at Haebowal Dairy Complex Ludhiana, Punjab

2 MW biogas power at Kanoria Chem, Ankleshwar

3000 Cum biomethanation project of solid waste at slaughterhouse in Andra Pradesh

Biomethanation of Tapioca Processing wastewater at Varalaxmi Starch, Salem

Global Scenario



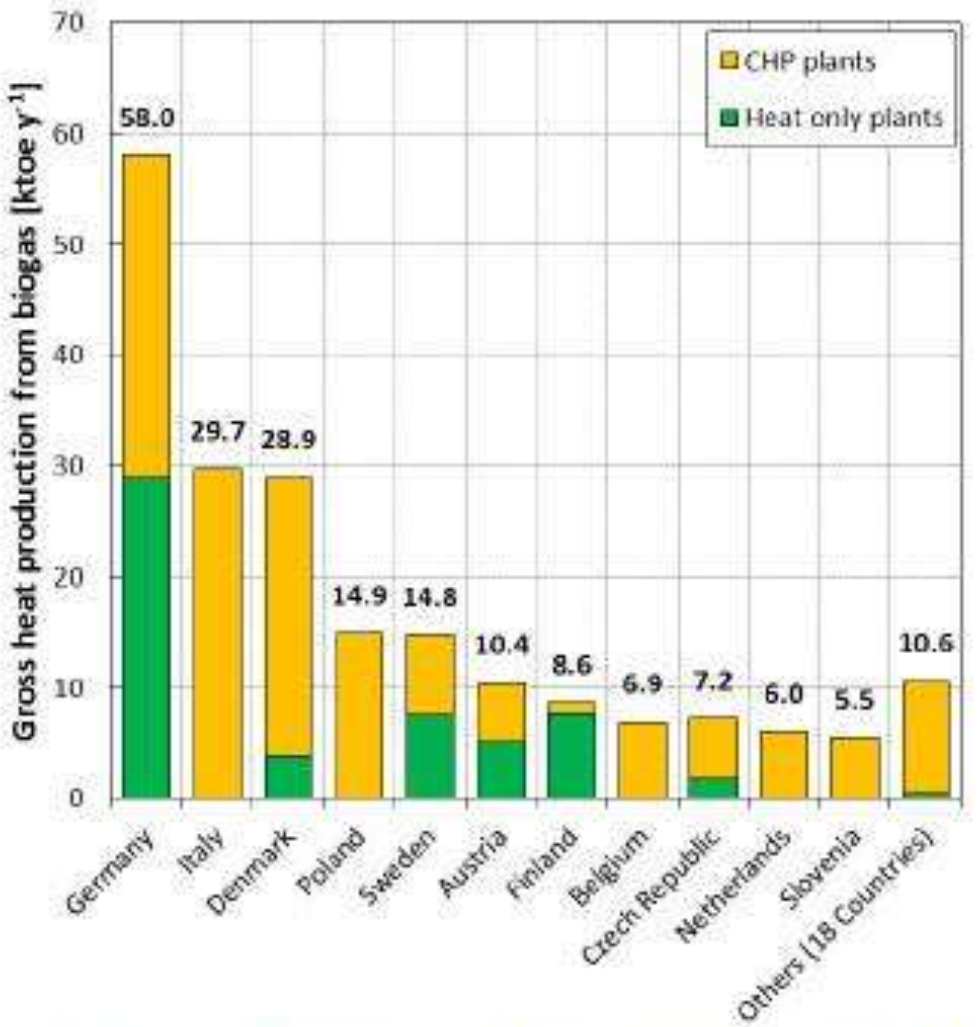


Figure 7. Gross electricity and heat generation from biogas in EU countries in 2011 (EurObserv'ER, 2012a, adapted by the Authors).

- In 2003, the United States consumed 147 trillion BTU of energy from "landfill gas“
- As of September 2013, there are about 130 non-sewage biogas plants in the UK. Most are on-farm, and some larger facilities exist off-farm, which are taking food and consumer wastes.
- Germany is Europe's biggest biogas producer and the market leader in biogas technology. In 2010 there were 5,905 biogas plants operating throughout the country; Lower Saxony, Bavaria and the eastern federal states are the main regions.
- Depending on size and location, a typical brick made fixed dome biogas plant can be installed at the yard of a rural household with the investment between US$300 to $500 in Asian countries and up to $1400 in the African context. A high quality biogas plant needs minimum maintenance costs and can produce gas for at least 15–20 years without major problems and re-investments

Conclusion

- Although renewable energy power generation is a genuine clean development success story, there are some problems that need to be addressed to make the industry sustainable and self-supporting
- Biogas offers a vast set of benefits.
- Except India and china , in other developing country the proportion of functioning biogas plants is less than 50% .

- Considerable government involvement is required for these support network to be continued over time

- It is challenge to develop a new technology for biogas generation which has low cost , high efficiency of production and proper functionality .

Thank You