I J R B A T, Issue (XI) Vol (I) Jan 2023: 111-126
A Double-Blind Peer Reviewed & Refereed Journal
OPEN ACCESS
e-ISSN 2347 – 517X
Original Article

INTERNATIONAL JOURNAL OF RESEARCHES IN BIOSCIENCES, AGRICULTURE AND TECHNOLOGY

 www.ijrbat.in

STATISTICS OF BIOGAS DEVELOPMENT IN INDIA: A REVIEW

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Communicated :10.12.2022 | Revision: 20.01.2023 & 24.01.2023 Accepted: 26.01.2023 | Published: 30.01.2023

ABSTRACT:
In India, like in many developing countries, demand of energy is continuously increasing but its supply is not increasing proportionally. Currently India is experiencing critical phase of population explosion and therefore more energy requirement. As per US Energy Information Administration electricity consumption in India will grow at the rate of 3.3% per year till the year 2035. In this context, biogas is one of the promising renewable technologies which having ability to convert animal, agricultural, municipal and industrial waste into and non-polluting form of energy and contribute about 9% of the global energy consumption. In India biogas technology was introduced in 1981 as an alternative option for non-renewable energy to combat energy crises. At the national level the estimated potential of biogas power generation up to 2020 by off-grid project was only 7.34 Mwe (Megawatt electrical). The highest potential of biogas generation is done by Tamil Nadu i.e., 1.97 Mwe followed by Karnataka i.e., 1.57 Mwe. Under the National Biogas and Manure Management Programme (NBMMP) total 50,56139 number of biogas plants were installed from 1981-82 to 2020-21 out of which Maharashtra state has the highest no. of biogas plants i.e., 9,24111 followed by Andhra Pradesh (5,58962), Karnataka (5,10916), Uttar Pradesh (4,40930) and Gujrat (4,35272). Total funds allocated under National Biogas and Manure Management Program (NBMMP) in India from 2018-19 to 2020-21 was Rs. 14, 39, 24,900.00. Being an agrarian country, India has plenty of raw materials available which can be a good source of biogas generation. Also, biogas technology is a vital solution for energy crisis, and is the best renewable source in the context of global warming and greenhouse effect potential and the fast depleting fossil fuels and pollution caused by the same.

Keywords: - statistics, biogas, energy crisis, India.

INTRODUCTION :

Per capita consumption of energy is an important indicator of the socio-economic development of any country (Sayin et al., 2005 and Omer 2017). Actually, energy affects all spheres of development such as social, economic and environmental also (Amigun et al., 2008). Thus, economic prosperity and quality of life are closely linked to the per capita consumption of energy (Singh and Sooch, 2004). As per the census of India (2011), it has 17.30% of world's population density i.e., 371 people/km^2. The US Energy Information Administration stated that the electricity consumption in India till the year 2035 will grow at the rate of 3.3% per year. India is the second largest country w.r.t. population and contributes about 17.30% of the total world population and has 2.4 % of the world's land out of which 69% Indian population lives in villages (Census of India, 2011). Owing to huge population India is suffering from both economical and energy poverty (Mehta and Shah, 2003; Bhattacharya, 2006). This growing population require additional resources such as land, food, power etc. that is too difficult creating energy crisis hence there should be continuous energy supply for rising population by developing renewable resources. Thus, to meet the consumption rate India will have to increase its current power generation. Hence, to fulfill energy demand of Indian population, the planning should be focused on efficiency maximization, cost minimization, employment generation, and maximum use of the local available resources and reduction of greenhouse emitting gases.

Biofuels can minimize the oil import and the related pollution and is the best alternative in fulfilling the energy needs of India (Kumar and Mohan, 2005). However, these biofuels which

http://doi.org/10.29369/ijrbat.2023.010.1.0020

are conventionally used i.e. cow dung cake, wood etc. are responsible for health problems, pollution, operational issues, energy gain etc. Researcher K.S. Smith (1993) reported that in rural India, adverse health impacts on women are observed due to burning of these biofules. Other problems are less efficiency during cooking and therefore there is a requirement of such form of energy in India, which can satisfy the huge energy demand of the country and is environmental friendly.

In this context biogas is one of the promising renewable technologies which can have ability to convert animal, agriculture, municipal and industrial waste into a non-polluting form of energy (Rajendran et al., 2012; Mittal et al., 2018). As compared to the traditional fossil fuels and untreated solid biomass, biogas is a clean fuel which having other benefits like reducing greenhouse gases emission, reducing indoor air pollution which ultimately related to good health and livelihood of people also (Pathak et al., 2009). The biogas production currently in India is about 2.07 billion m^3/year (Mittal et al., 2018).

Following table shows State-wise Bio-energy Projects Installed by MNRE

In India various programs for disseminating biogas technology were started in early 1970s whose result was the first-biogas development program i.e., NPBD (National Biogas Development Programme). In the year 2006, NPBD was renamed as National Biogas and Manure Management Program (NBMMP) by the government by Ministry of New and Renewable Energy (MNRE) with NPBD's earlier objectives. NBMMP is a Central Government's scheme for setting up of family type biogas plants particularly for rural and semi-urban households of India. Thus, at the National level the estimated potential of biogas power generation up to 2020 by off-grid project was only 7.34 Mwe (Mega Watt Electrical). The highest potential of biogas generation is done by Tamil Nadu i.e., 1.97 Mwe followed by Karnataka i.e., 1.57 Mwe and states like Bihar, Chhattisgarh, Delhi has zero biogas power generation.

In India, the rate of biogas dissemination in rural households is insignificant. Only about 40% biogas plants have been installed under the biogas development programme against the total potential of 12 million domestic biogas plants as estimated by MNRE (CSO, 2014). In addition, along with family type biogas plants, 400 biogas (off-grid) power plants have been set up with a power generation capacity of about 505 Mw (MNRE,2015). Government of India has implemented National Biogas and Manure Management Program (NBMMP), which is an off-grid biogas power generation program along with waste to energy (Shukla, 2007; MNRE, 2015). But still the dissemination of biogas technology is not satisfactory, the reason might be lack of awareness, lack of technical and informational barriers and non-availability of natural resources (Shane et al., 2015). India's capacity of waste to energy is about 254.73 Mw and biogas power generation (off-grid) is about 7.34 Mwe only.

Under the National Biogas and Manure Management Programme (NBMMP), total 50,56159 number of biogas plants were installed from 1981-82 up to 2020 are shown in the following table out of which Maharashtra state have the highest number of biogas plants i.e., 924111 followed by Andhra Pradesh 5,58962, Karnataka 5,10916, Uttar Pradesh 4,40930 and Gujrat 4,35272.

Brief Overview of the Biogas Technology at Global Level

- At the global level, the traditional use of biomass, mainly for cooking and heating has increased and contribute to about 9% of the global final energy consumption. European Union countries like Denmark, Germany,

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Austria and Sweden are well-developed biogas industry followed by France, Netherland, Spain, Italy, the United Kingdom and Belgium. In these countries, agro-sector is strongly developed with well biogas production.

- The new East-European countries and other countries like Greece, Portugal and Ireland; the biogas sector is currently under development and identified the hidden potential of biomass (Horvath *et. al.*, 2016). Europe is the world's most leading producer of biogas (bio-methane) and use it as a vehicle fuel and natural gas grid establishing for 459 plants producing 1.2 billion m^3 and 340 plants feeding into the gas grid with a capacity of 1.5 million m^3 in 2015 (Horvath *et.al.,* 2016; Scarlet *et. al.,* 2018).
- In European Union (EU) biogas production has increased in the context of environmental, climate and economic benefits and reached 18 billion m^3 methane in 2015, which represent half of the global biogas production. EU is the world's leader in biogas electricity production, with more than 10 GW in 2015 with 71,400 biogas plants in comparison to the global biogas capacity of 15 GW in 2015 (Horvath *et. al.*, 2016). The European Union energy production from biogas has increased in the last decade from 2.5 billion m^3 in 2000 to 18 billion m^3 methane in 2015, representing half of the global biogas production (WBA, 2017 and Eurostat European Statistics, 2017).
- Most of the biogas production occurs in the United States and Europe; other regions are developing or increasing in this technology. Global biogas production has increased from the year 2000 to 2014 with global volume of 59 billion-m3 biogas (Global Bioenergy, Statistics, 2017).
- In Asia the modern use of biomass in increasing rapidly. The bio energy share in the total global primary energy consumption was about 10% before the year 2000 (Global Status Report, 2016). The impacts of climate change are widespread, but its consequences will fall disproportionately on developing countries, and typically will hit the poorest communities within them (Smith *et al.*, 2003).
- In the EU-countries, the biogas sectors are usually linked with agriculture. The agricultural biogas plants are most developed in Germany, Denmark, Austria and Sweden (Holm-Nielsen *et al.*, 2009).
- In addition, the technology is also developed at a certain level in Netherlands, France, Spain, Italy, United Kingdom and Belgium (Holm-Nielsen *et al.*, 2009). But in countries like Portugal, Greece and some Eastern European countries, the biogas technology is currently under development (Holm-Nielsen *et al.*, 2009).
- It is estimated that over 3500 farm-based digesters are running in Europe and North America today (Persson *et al.*, 2007). However, there are the different requirements of using anaerobic digestion process to produce energy among European countries, because of the differences in the agricultural organizations, in the energy distribution systems (gas, electricity or heat) and in the environmental and energy policies (Batzias *et al.*, 2005).
- The biogas technology has been developed much more sophisticatedly in developed counties than developing countries, in terms of biogas production as well as biogas utilization. For example, the biogas plants in Europe have higher efficiency, whose biogas output per m^3 digester volume could be double of ones in developing countries (Plochl and Heiermann, 2006).
- Compared to developing countries, there are more efficient ways of biogas utilization in developed countries where biogas is upgraded and then used as car fuel or injected into natural gas grid.

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Overview of the Biogas Technology at National Level

- In India, the biogas development programme was started in 1981 and was one of the approaches to reduce the energy crisis in rural areas (Shukla, 2007). This was augmented with the concern for climate change and solid waste management.
- As per report of Ministry of Non-Conventional Energy Resources (MNES), 1999, over three million biogas plants have been built against the estimated potential of between 12 and 17 million based on bovine dung availability. In the dissemination of biogas technology, there observed a wide variation in performance level in different region in India. Following table shows the efforts taken by the government to increase biogas development in rural as well as in urban areas in India.
- National Biogas and Manure Management Program is a Central Sector Scheme, which provides funds for setting up of family type biogas plants mainly for rural and semi-urban/households of India. A family type biogas plant generates biogas from organic substances such as cattle-dung, and other biodegradable materials such as biomass from farms, gardens, kitchens and night soil wastes etc. The main objectives of NBMMP are

-To provide clean biogas fuel mainly for cooking purposes and also for other applications for reducing use of LPG and other conventional fuels.

-To meet lifetime energy needs for cooking as given in 'Integrated Energy Policy'.

-To provide bio-fertilizers/ organic manure to reduce use of chemical fertilizers.

-To mitigate hard work of rural women, reduce forest destruction and highlight social benefits.

-To improve sanitation in villages by linking sanitary toilet with biogas plant.

-To mitigate climate change by preventing black carbon and methane emissions.

- Ministry of New and Renewable Energy is implementing the National Biogas and Manure Management Program (NBMMP) in all the states and Union Territories of India. About 47.5 Lakh biogas plants have already been installed in the country up to March 2014 and a target of setting up 1, 10,000 biogas plants was set during the year 2014-15. The biogas plant is the best option for households having feed material, to become self-dependent for cooking gas and highly organic enriched bio-manure. It provides the solution to protect the households from the problems of indoor air pollution saving on cost of refilling of LPG cylinders.

Following tables shows the state-wise estimated potential, cumulative achievements and funds allocated for family type biogas plants under National Biogas and Manure Management Programme (NBMMP) in India

Economics of family sized biogas plants in India

- A family size biogas plant can save about 316 L of kerosene 5,535 kg of firewood and 4,400 kg cattle dung cake as a fuel which can be used in reducing NOx, SO_2, CO and volatile organic compounds to the atmosphere bye 16.4, 11.3 987.0 and 69.7 kg per year respectively (Pathak *et al.*, 2009).
- If all the collectible cattle dung (225 Mt) produced in the country is used 51.2 million family size biogas plant can be supported which will have global warming mitigation potential of 496 Mt of CO_2 equiv/year and can on US $ 4.968 million carbon credit.
- The reduction in global warming should encourage policymakers to promote biogas technology to combat climate change and integration of carbon revenues will help the farmers to develop biogas as a profitable activity.
- Sharma and Neema reported during a case study of Bhopal- Sehore region that the average fuel wood consumption for a family of four members is 240 kg/month. Thus, installation of

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one biogas plant can save fuel wood consumption of 2,880 kg/family/year.

- In India, Central Financial Assistance Funds allocated for the development of Renewable energy scheme are as follows in table no. 12
- Category wise subsidy for setting up of household biogas plants (1-6 m^3/ day) NBMMP is as follow

For general category - Rs. 9,000/plant
For SC and ST - Rs. 11,000/plant
Latrine attached - Rs. 12,000/plant

CONCLUSIONS :

- The global warming mitigation potential of a family size biogas was found to be 9.7 t CO_2 equivalent/year with the current price of US $10 t^{-1} CO_2 equivalent, and carbon credit of US $ 97/year could be earned by reducing greenhouse gas emission under the clean development mechanism (Pathak *et al.*,2009).
- The potential of reduction in global warming should encourage policy makers to promote biogas technology to tackle climate change and earning of carbon revenues can help farmers to develop biogas as a profitable technology.
- Biogas is a smokeless fuel and offers a substitute for kerosene oil; cattle dung cake, firewood and agricultural residue which are used as fuel in most developing countries. But during burning these fuels emits air pollutants such as CO, NOx, SO_2,VOCs and particles and also emits greenhouse gases and N_2O adding global warming and causing human health problem such as asthma (Gadi *et al.*, 2003; Parashar *et al.*, 2005, Venkataramana *et al.*, 2005 and Pathak *et al.*, 2006).
- Biogas slurry which is a by-product of biogas plant is a good manure and can be substituted for chemical fertilizers. It has been estimated that 1 tonns of cattle dung would generate similar amount of biogas spent slurry having 1.4 % Nitrogen, 0.5% Phosphorus and 0.8% potassium (Subrian et al., 2000; Tandon and Roy, 2004).
- A family size biogas plant with 4 cattle produces 4,400 kg dung (dry weight) and produces 2,200 m^3 of biogas per annum. Thus the biogas produce substitute 316 L of kerosene and 5,535 kg of firewood, the global warming potential of which are 762 and 10,571kg CO_2 equivalent respectively.
- The biogas slurry generated is 1,275 kg C which substitute 62 kg Nitrogen, 28 kg Phosphorus and 85 kg Potassium. The global warming potential of NPK fertilizer is 32 kg CO_2 equivalent. Also application of 62 kg Nitrogen in soil 0.43 kg N_2O-N with global warming potential of 210 kg CO_2 equivalent (Bhatia *et al.*, 2004; Malla *et al.*, 2005).
- Maharashtra has the highest number of biogas plants followed by UP, Andhra Pradesh, Karnataka and Gujarat. Maharashtra has the maximum global warming potential i.e 6.97 Mt CO2 equivalent followed by UP. AP, Karnataka and Gujarat. The minimum GWP states are Chandigarh and Andaman and Nicobar Islands.
- Under the program of MNES, 2006, 3.83 million biogas plants were established in India with estimated GWP of 37 Mt CO_2 equivalent/year with carbon credit of US $ 372 million/year.
- In India 335 Mt dung is produced annually out of which 225 Mt is available for biogas production, which can support 51.2 million of family size biogas plants. These biogas plants have potential to reduce global warming potential by 496 Mt CO_2 equivalent years. Thus India can earn US $ 4,818.7 million per year carbon credits.
- A family size biogas plant substitute's 5,535 kg firewood, 4,400 kg cattle dung cake and 316 L kerosene per year. Substitution of cattle dung cake and firewood results in the reduction of 3.5-12.2 kg of NOx, 3.9-6.2 kg SO_2, 436.9-549.6 kg CO and 30.8-38.7 kg volatile organic compounds per year. Thus a family size biogas

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reduces 16.4 kg NOx, 11.3 kg SO_2, 987.0 kg CO and 69.7 kg volatile organic compound per year.

- Biogas technology is useful in global warming reduction; hence the policy makers can promote biogas technology to tackle with climate change along with carbon revenues which will help farmers to develop biogas as a profitable activity.
- India has a global opportunity to combat energy crisis and create revenue under new root of carbon marketing. The mechanism of carbon market should be used to promote installation of biogas plants by making this financially viable.
- In Assam India, as per National Biogas and Manure Management (NBMMP) more than 85,000 number of family type biogas plants have been installed and farmers i.e. biogas plant owners are involved in organic farming which is a positive step towards sustainability. Organic farming has emerged as a major thrust area in agriculture over the years in Assam and the North East are mostly organic by default and out of 85,346 hectare under organic cultivation in the North-East, has an area of 2,828 hectare (Hazarika *et. al.,* 2015).

Thus from the above discussion, it is observed that government has implemented various policies for disseminating biogas technology in the rural area. As discussed above biogas technology has numerous benefits in terms of environmental, ecological and health also. In this present era of energy crisis, biogas technology is the best renewable resource in the context of global warming and greenhouse effect potential, fast depleting fossil fuels and pollution caused by the same. Scientists already predicted that these fossil fuels would be available only for the next 60-70 years. Taking into consideration the whole scenario there is need of sustainable ways of generating energy. Biogas is the best solution, particularly in the rural region since the easy availability of raw material in regard.

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Table 1: Selected State-wise Bio-energy Projects Installed for Power Generation under Various Schemes/Programmes of Ministry of New and Renewable Energy (MNRE) in India (As on 29.02.2020)

States/UT	Waste to Energy (In MW)	Biomass Power + Bagasse Cogeneration (In MW)	Biomass Cogeneration (Non-bagasse) (In MW)	Biogas Power Generation (off-grid) Projects (In MWe)
Andhra Pradesh	40.82	378.20	98.98	0.47
Bihar	0.00	113.00	8.20	0.00
Chhattisgarh	0.33	228.00	2.50	0.00
Delhi	52.00	0.00	0.00	0.00
Gujarat	11.28	65.30	12.00	0.02
Haryana	4.00	121.40	84.26	0.14
Himachal Pradesh	0.00	0.00	7.20	0.00
Jharkhand	0.00	0.00	4.30	0.00
Karnataka	**7.80**	**1866.60**	**15.20**	**1.57**
Kerala	0.00	0.00	0.72	0.12
Madhya Pradesh	15.40	93.00	12.35	0.10
Maharashtra	**28.71**	**2499.70**	**16.40**	**0.83**
Meghalaya	0.00	0.00	13.80	0.00
Odisha	0.00	50.40	8.82	0.01
Punjab	14.92	194.00	123.10	0.92
Rajasthan	3.00	119.30	2.00	0.01
Tamil Nadu	**10.45**	**969.00**	**28.55**	**1.97**
Telangana	19.50	158.10	1.00	0.21
Uttar Pradesh	44.63	1957.50	158.01	0.76
Uttarakhand	1.89	73.00	57.50	0.07
West Bengal	0.00	300.00	19.92	0.06
India	**254.73**	**9186.50**	**674.81**	**7.34**

http://doi.org/10.29369/ijrbat.2023.010.1.0020

Table 2: State-wise Cumulative Number of Biogas Plants under National Bio-gas and Manure Management Programme (NBMMP) in India (1981-1982 to 2020-2021 upto 30.06.2020)

States/UTs	No. of Biogas Plants
Andaman and Nicobar Islands	97
Andhra Pradesh	558962
Arunachal Pradesh	3609
Assam	138483
Bihar	129925
Chandigarh	169
Chhattisgarh	59850
Dadra and Nagar Haveli	681
Delhi	578
Goa	4226
Gujarat	435272
Haryana	63433
Himachal Pradesh	47706
Jammu and Kashmir	3200
Jharkhand	7823
Karnataka	510916
Kerala	153203
Madhya Pradesh	376558
Maharashtra	924111
Manipur	2128
Meghalaya	10659
Mizoram	5856
Nagaland	7953
Odisha	271809
Puducherry	17541
Punjab	185998
Rajasthan	72446
Sikkim	9044
Tamil Nadu	223894
Telangana	19702
Tripura	3710
Uttar Pradesh	440930
Uttarakhand	364582
West Bengal	1105
India	**5056159**

*Souce: Rajya Sabha Unstarred Question No. 1095, dated on 20.09.2020

http://doi.org/10.29369/ijrbat.2023.010.1.0020

Table 3: showing the efforts taken by the government to increase biogas development in rural as well as in urban areas

Year	Policies Implemented
1981	• Launching of first biogas development program i.e. NPBD • Under this program capital subsidy was given for installing small scale biogas plants • Ownership of 2-3 cattle was one of the criteria to get the capital subsidy under this NPBD
1995	• In this year to recover energy from municipal, agricultural and industrial wastes under National programme i.e. NPBD
2006	• In this year, NPBD was renamed as National Biogas and Manure Management programme (NBMMP) by the Govt. by Ministry of New and Renewable Energy (MNRE) with the same objective of NPBD. • During this, MNRE initiated an off grid biogas power generation programme to promote decentralized power as an option in rural areas (3kw to 250kw). • Financial help was given for setting a biogas powers as well as production of bio-CNG using bio-methanation technology.
2016	• In the year 2000, rules regarding management and handling of solid waste were implemented by the Ministry of Environment and Forest (MoEF) which were revised in 2016 extending its area of jurisdiction. • A new tariff policy was made by the central government and made it compulsory for the electricity distribution companies to generate 100% electricity from the waste. • Generic tariff for the electricity generated from waste to energy projects, which were announced by Ministry of Power.

Table 4 State-wise Estimated Potential and Cumulative Achievements of Family Type Biogas Plants under National Biogas and Manure Management Programme (NBMMP) in India (2015-2016 to 2017-2018)

(Plant in Number)

States/UTs	Estimated Potential	Cumulative Physical Achievements	2015-2016		2016-2017		2017-1018	
			Target	Achievement	Target	Achievement	Target	Achievement
Andaman and Nicobar Island	22000	137	-	-	-	-	-	-
Andhra Pradesh	1065000	532311	10200	10343	10200	6565	6030	4276
Arunachal Pradesh	7500	3475	50	0	100	5	100	0
Assam	307000	114119	7600	7600	9000	8638	9000	6365
Bihar	733000	129826	-	3	0	0	0	30
Chandigarh	1400	97	-	-	-	-		
Chhattisgarh	400000	51241	4150	2213	3050	1375	2000	1072
Dadra and Nagar Haveli	2000	169	-	-	-	-	-	-
Delhi	12900	681	-	-	-	-	-	-
Goa	8000	4109	100	78	100	43	0	0
Gujarat	554000	430025	3800	1560	2500	1504	1600	1080
Haryana	300000	60753	1650	790	1000	452	0	55
Himachal Pradesh	125000	47424	230	114	150	107	100	42
Jammu and Kashmir	128000	3072	100	84	100***	0	0	11
Jharkhand	100000	7326	100	142	200	21	350	198
Karnataka	680000	478958	16000	6392	10000	5263	8000	5623
Kerala	150000	144396	4000	2322	2850	2118	2300	1687

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Madhya Pradesh	1491000	353502	10700	6838	8000	5296	8500	5149
Maharashtra	**897000**	**871494**	**14660**	**14577**	**14500**	**12615**	**9200**	**9420**
Manipur	38000	2128	-	-	-	-	-	-
Meghalaya	24000	9996	250	0	200	0	800	0
Mizoram	5000	5020	500	150	500	190	300	190
Nagaland	6700	7903	300	0	300	0	400	0
Odisha	605000	265975	5100	2930	4000	1975	2400	725
Puducherry	4300	578	-	0	0	0	0	0
Punjab	411000	171765	10650	4000	5000	1419	3650	1780
Rajasthan	915000	70139	1050	436	1000	413	800	288
Sikkim	7300	8874	200	170	250	0	400	0
Tamil Nadu	615000	222283	450	308	300	73	250	74
Telangana	-	9900	9900	9054	12300	3792	4100	177
Tripura	28000	3368	350	165	400	87	200	33
Uttar Pradesh	1938000	438817	1750	931	1100	508	700	271
Uttarakhand	83000	18478	960	1284	1400	1297	1000	1445
West Bengal	695000	366595	-	185	0	0	0	132
KVIC	-	-	6200	*	8000 # #	*	3000	*
BDTC,IIT Guwahati	-	-	-	-	500	0	-	-
BDTC, IIT, Delhi	-	-	-	-	500	0	-	-
BDTC, UAS, Bangalore	-	-	-	-	1000	0	-	-
BDTC, UAS, Ludhiana	-	-	-	-	1500	0	-	-
India	**12339300**	**4834934**	**111000**	**72669**	**100000**	**53756**	**65180**	**40123**

Abbr. KVIC: Khadi and Village Industries Commissions.
BDTC: Bhopal and Biogas Development and Training Centre.

Note: *: KVIC achievements are included in the States achievements
#: For KVIC, Mumbai, National target 8000 { 6500 (5700 Gen. + 800 NEZ) and 1500 SCP target}.
***: Subject to settlement of outstanding amount of previous years lying with the state Govt.
: Figures are based on Monthly Progress Report and Final Claims.

Source: Ministry of New and Renewable Energy, Govt. of India. (16940).
: Lok Sabha Unstarred Questions No. 3575, dated on 23.03.2017.
: Lok Sabha Unstarred Questions No.410, dated on 19.07.2018.
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Table 5: Selected State-wise Installed Capacity and Funds Sanctioned for Electricity Generations Through Biomass/Biogas Power Plants in India (2016-2017 to 2019-2020)

Year	**States**	**Installed Capacity**	**Funds Sanctioned (Rs. In Crore)**
Grid Connected Biomass Cogeneration			
2016-2017	Andhra Pradesh	-	0.55
	Gujarat	-	0.58
	Bihar	9.00	-
	Karnataka	50.00	1.34
	Maharashtra	**98.00**	**7.53**
	Rajasthan	4.95	-
	Haryana	25.00	-

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2017-2018	Karnataka	301.60	0.33
	Maharashtra	**105.00**	**5.96**
	Chhattisgarh	-	1.50
	Punjab	15.00	-
	Tamil Nadu	48.00	-
	Uttar Pradesh	24.50	-
2018-2019	Karnataka	30.00	-
	Maharashtra	**329.70**	**6.83**
	Tamil Nadu	43.00	-
2019-2020	Karnataka	28.00	-
Off-Grid Biomass (Non-Bagasse) Cogeneration			
2016-2017	Andhra Pradesh	-	1.15
	West Bengal	-	0.94
	Punjab	-	0.44
	Uttar Pradesh	-	1.40
	Himachal Pradesh	-	0.36
	Telangana	-	0.15
	Karnataka	-	1.00
	Assam	-	0.40
	Haryana	1.20	-
	Punjab	1.00	-
2017-2018	Odisha	-	0.12+
	Andhra Pradesh	-	1.00+0.60+
	Punjab	5.00	-
	Tamil Nadu	4.50	0.90+
2018-2019	Gujarat	12.00	-

Source: Lok Sabha Unstarred Questions No.1835, dated on 28.11.2019

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Table 6: Number of Small Biogas Plants (1-25 M³ Per Day) Installed under New National Biogas Organic Manure Programme in Maharashtra (As on June, 2020)

State	Small Biogas Plants Established (up to June, 2020)
Maharashtra	924111
India	5056159

Source: Lok Sabha Unstarred Questions No. 1979, dated on 22.09.2020.
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Table 7 :Selected State-wise Installed Capacity and Number of Biogas Based Power Generation Plants (Off-Grid Projects Capacity Range of 3KW to 250 KW) Set up in India (2019-2020-upto 31.12.2019)

States	No. of Plants/Projects	Biogas Generation Per Day (In M3)	Power Generation (In KWE)
Andhra Pradesh	33	4145	466.0
Gujarat	1	200	20.0
Haryana	2	2370	135.0
Karnataka	66	15075	1570.5
Kerala	38	1060	124.0

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Madhya Pradesh	5	650	60.0
Maharashtra	**43**	**7520**	**825.5**
Odisha	1	30	6.0
Punjab	32	8510	922.5
Rajasthan	1	60	7.5
Tamil Nadu	38	20970	1971.0
Telangana	5	2040	208.0
Uttar Pradesh	40	5796	758.0
Uttarakhand	10	615	73.0
West Bengal	1	340	60.0
India	**316**	**69381**	**7207.0**

*Source: Rajya Sabha Unstarred Question No. 1092, dated on 11.02.2020
Downloaded from: http://www.indiastat.com/table/power-data/26/biomass-biogas/452705/1302512/data.aspx

Table 8 :Selected State-wise Funds Allocated under National Bio-gas and Manure Management Programme (NBMMP) in India
(2018-2019 to 2020-2021-upto 31.08.2020)

(Amount in Rs.)

State/City	2018-2019	2019-2020	2020-2021-upto 31.08.2020
Andhra Pradesh	36019890	37350338	27901400
Chhattisgarh	24473397	24917666	0
Gujarat (NDDB)	0	24000000	12000000
Haryana	6600000	0	0
Karnataka	106269050	36684000	42000000
Kerala	2393812	14631994	0
KVIC, Mumbai	60626136	30736748	0
Madhya Pradesh	46128729	39907500	39952500
Maharashtra	**42000000**	**54000000**	**0**
Meghalaya	1250000	0	0
Odisha	8267000	4800000	972000
Punjab	38159298	33487208	21099000
Rajasthan	14700000	0	0
Tripura	2203150	3365000	0
Uttar Pradesh	4740100	0	0
Uttarakhand	3600000	18260000	0
India	**397430562**	**322140454**	**143924900**

Source: Rajya Sabha Unstarred Questions No. 1095, dated on 20.09.2020.

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Table 9 :State-wise Number of Biogas Plants (1-25M³ Per Day) Installed under New National Biogas and Organic Manure Programme in India
(As on June, 2020)

States/UTs	Small Biogas Plants Established (up to June, 2020)
Andaman and Nicobar Islands	97
Andhra Pradesh	558962
Arunachal Pradesh	3609
Assam	138483
Bihar	129925
Chandigarh	169
Chhattisgarh	59850

http://doi.org/10.29369/ijrbat.2023.010.1.0020

Dadra and Nagar Haveli	681
Delhi	578
Goa	4226
Gujarat	435272
Haryana	63433
Himachal Pradesh	47706
Jammu and Kashmir	3200
Jharkhand	7823
Karnataka	510916
Kerala	153203
Madhya Pradesh	376558
Maharashtra	**924111**
Manipur	2128
Meghalaya	10659
Mizoram	5856
Nagaland	7953
Odisha	271809
Puducherry	17541
Punjab	185998
Rajasthan	72446
Sikkim	9044
Tamil Nadu	223894
Telangana	19702
Tripura	3710
Uttar Pradesh	440930
Uttarakhand	364582
West Bengal	1105
India	**5056159**

*Sources: Lok Sabha Unstarred Question No. 1979, dated on 22.09.2020
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Table 10: State-wise Number of Biogas Plants Installed and Villages Covered under National Biogas and Manure Management Programme/New National Biogas and Organic Manure Programme (NBMMP/NNBOMP) in India
(2016-2017 to 2018-2019-upto 28.06.2019)

States/UTs	**No. of Bio-gas Plants #**	**No. of Villages Covered ##**
Andhra Pradesh	13045	2052
Arunachal Pradesh	119	16
Assam	15021	5140
Bihar	76	44
Chhattisgarh	5617	1418
Goa	43	9
Gujarat	3366	1155
Haryana	1142	147
Himachal Pradesh	142	132
Jammu and Kashmir	0	0
Jharkhand	336	150 (KVIC)
Karnataka	17876	1318
Kerala	4797	2582

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Madhya Pradesh	12841	6572
Maharashtra	**31739**	**11996**
Manipur	0	0
Meghalaya	370	113
Mizoram	668	311
Nagaland	0	0
Odisha	2751	1565
Punjab	7419	1081
Rajasthan	1082	380
Sikkim	0	0
Tamil Nadu	790	341
Telangana	1955	408
Tripura	164	45
Uttar Pradesh	1113	457
Uttarakhand	4050	1229
West Bengal	398	202
KVIC, Mumbai (All states)	*	*
India	**126920**	**38818**

*Sources: Lok Sabha starred Question No. 181, dated on 04.07.2019

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Table 11 :State-wise Estimated Potential and Cumulative Achievements of Family Type Biogas Plants under National Biogas and Manure Management Programme (NBMMP) in India (2017-2018)

(Plants in Nos.)

States/UTs	**Estimated Potential**	**Cumulative Physical Achievements**	**Target**	**Achievements**
Andaman and Nicobar Islands	2200	137	0	NA
Andhra Pradesh	1065000	549235	6030	2250
Arunachal Pradesh	7500	3555	100	0
Assam	307000	130375	9000	4200
Bihar	733000	129844	-	NA
Chandigarh	1400	97	0	NA
Chhattisgarh	400000	54825	2000	565
Dadra and Nagar Haveli	2000	169	0	NA
Delhi	12900	681	0	NA
Goa	8000	4230	0	NA
Gujarat	554000	433317	1600	641
Haryana	300000	62085	0	NA
Himachal Pradesh	125000	47650	100	25
Jammu and Kashmir	128000	3163	0	NA

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Jharkhand	100000	7579	350	43
Karnataka	680000	491764	8000	1987
Kerala	150000	149568	2300	962
Madhya Pradesh	1491000	365689	8500	1910
Maharashtra	**897000**	**899472**	**9200**	**3414**
Manipur	38000	2128	0	NA
Meghalaya	24000	10196	800	0
Mizoram	5000	5412	300	146
Nagaland	6700	7953	400	0
Odisha	605000	270880	2400	542
Puducherry	4300	578	0	0
Punjab	411000	177445	3650	1310
Rajasthan	915000	71231	800	41
Sikkim	7300	9044	400	0
Tamil Nadu	615000	222870	250	0
Telangana	-	22951	4100	0
Tripura	28000	3620	200	33
Uttar Pradesh	1938000	440713	700	0
Uttarakhand	83000	21558	1000	789
West Bengal	695000	366974	-	NA
KVIC	-	-	3000	1267
India	**12339300**	**496628**	**65180**	**20125**

*Sources: Ministry of new and Renewable Energy, Govt. of India. (ON1737)
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Table no. 12

Sr.No.	Year	funds sanctioned
1.	2016 -17	4307 crore
2.	2017-18	4080 crore
3.	2018 -19	5146.63 crore
4.	2019-20	3891.74 crore

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