

Evidence against Indicator 17.4.3-17.4.4

17.4.3	Education for SDGs in the wider community Have dedicated outreach educational activities for the wider community, which could include alumni, local residents, displaced people		Yes		
	Alumni		Yes	Expert lecture by Dr Gayendra, Dept of CE, Dec 2023	
	Local community		Yes	Biogas, Solar panel, UBA, Skill-Vigyan Project activities	
	Displaced people and refugees		No		
17.4.4	Sustainable Literacy This question explores how you evaluate your students' ability to learn and retain key concepts of sustainability. For 2025 we will not score this question but will use it to inform our decisions for 2026. Measure the sustainability literacy of students.		Yes	Evaluation of ongoing SDG courses	

**An Expert Lecture
On
“Innovation, Entrepreneurship & Sustainability”**

It is the immense pleasure to inform you that an expert lecture titled as “Innovation, Entrepreneurship & Sustainability” was delivered by Dr. Gyanendra Kumar, Founder Director & CEO of SustianAble Solutions Noida, India on Decemebtr 9, 2023 in the Department of Civil Engineering. A total of 40 no. of students and the faculty members of the Department of Civil Engineering joined this expert lecture. The main aim of the lecture was to explore the new sustainable materials for the construction process which may help us out to preserve the natural resources as well as in reducing the carbon footprinting. Dr. Gyanendra Kumar also discussed the possible number of alternatives of cement and the fuels used in the same process. He was also very interested to do work with the Department of Civil Engineering of JUIT Wajnaghat in the field of sustainable construction. Besides this, a Q&A session was also organized to address the query of the students related to innovation and how to become an entrepreneur.






17.4.3: Education for SDGs in the wider community


Local community

<p>Centre of Sustainable Technologies for Rural development</p>	<p>https://www.juit.ac.in/biotechnology-bioinformatics-cestrd</p>
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Research & Innovation JUIT Exclusive Campus/ Facilities Library Student Activities Downloads Academic Calendar Grievances Redressal

ACADEMIC BANK OF CREDITS DigLocker in f X @ v


 **JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY**
Established under H.P. Legislative Assembly Act No. 14 of 2002 and Approved by UGC under section 2(f)

 **JAYPEE** EDUSPHERE IGNITED MINDS INSPIRED SOULS

HOME ABOUT JUIT ACADEMIC DEPARTMENTS PROGRAMS ADMISSIONS TRAINING PLACEMENT ALUMNI CAREERS CONTACT US Q

Home Biotechnology & Bioinformatics CESTRD

CENTRE OF SUSTAINABLE TECHNOLOGIES FOR RURAL DEVELOPMENT

 RELATED LINKS

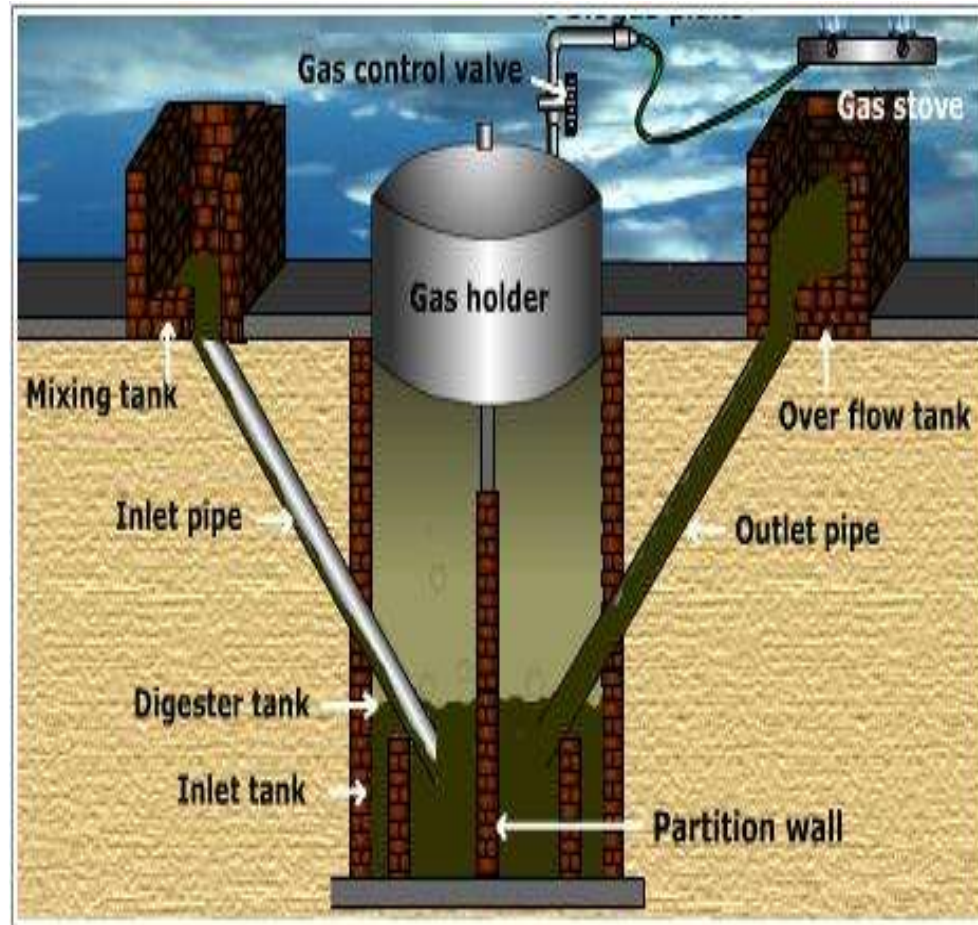
- About The Department
- Notification

FOOD WASTE TO BIOENERGY

CONTENTS

- About Biogas and Deenbandu Biogas Reactor
- Our Aim
- Biogas Sectors in Himachal Pradesh
- Installed Biogas Reactors by our Research Group
- Working and Efficiency of Biogas Reactors
- Microbial Profiling of Biogas Reactors
- Biogas stove and Vapour Filter - Innovation related work
- Dissemination of our Technology
- Biogas Reactor for Lab. work – video
- Biogas and stoves in use for cooking – videos
- Our Current and Future Road map for Biogas work
- News Coverage and Recognitions
- Our Publications and Research Group

DEENBANDHU DESIGN IS COMMON, BUT LOW UTILITY ?



Why Should I Go For Biogas?

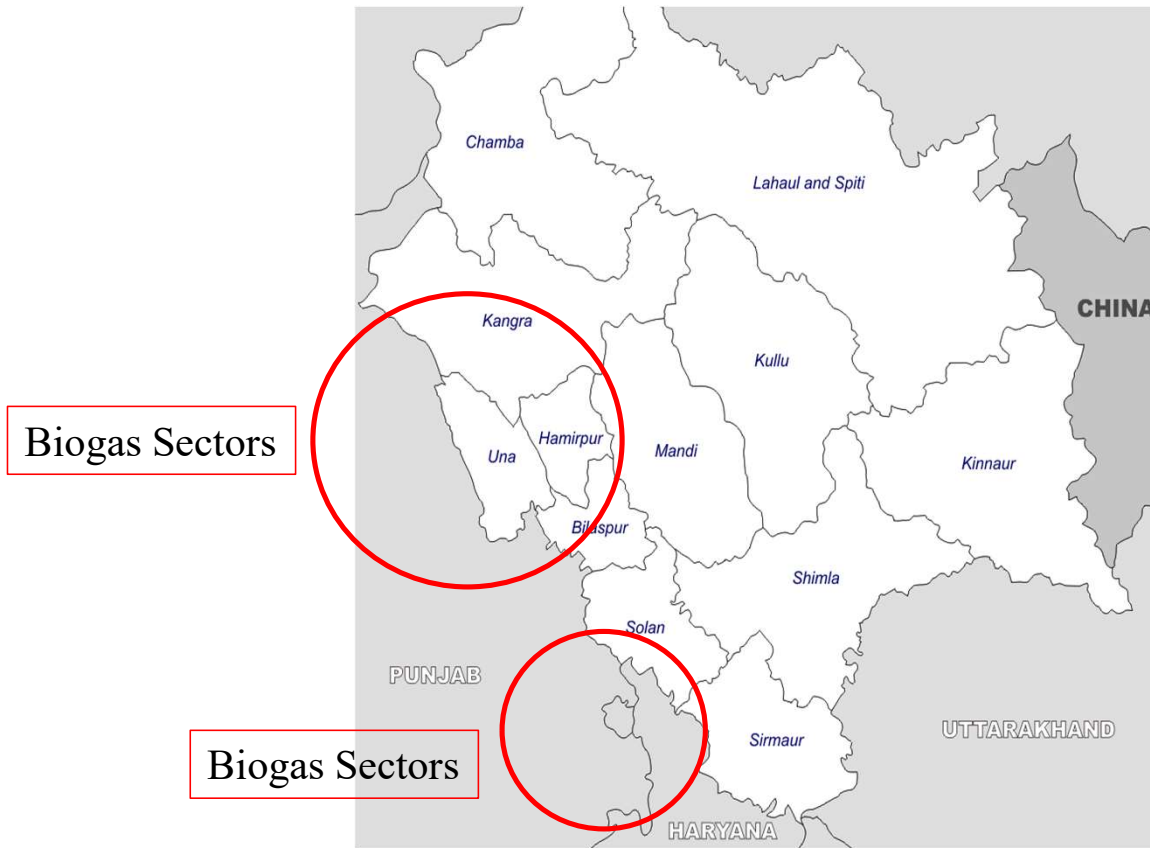
Biogas Vs LPG



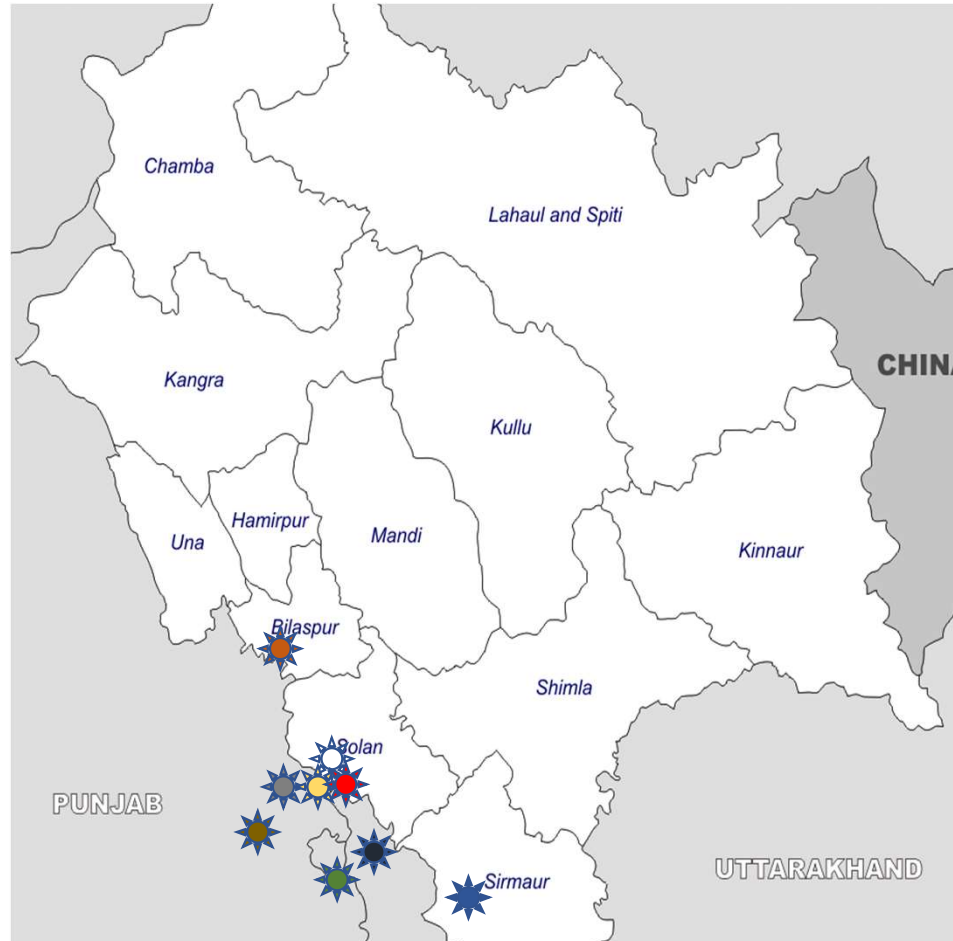
OUR AIM

- ✓ To improve design of biogas reactor and biogas stove.
- ✓ To reduce the cost of operation.
- ✓ To establish bioenergy nodal centers of Panchayats.

BIOGAS SECTORS IN HIMACHAL PRADESH



GEOGRAPHICAL PRESENCE OF INSTALLED BIOGAS REACTORS BY OUR RESEARCH GROUP



 **Location 1:**
Altitude : 426 m

 **Location 2:**
Altitude: 673m

 **Location 3:**
altitude: 1483m

 **Location 4:**
altitude: 1483m

 **Location 5:**
Altitude: 1586m

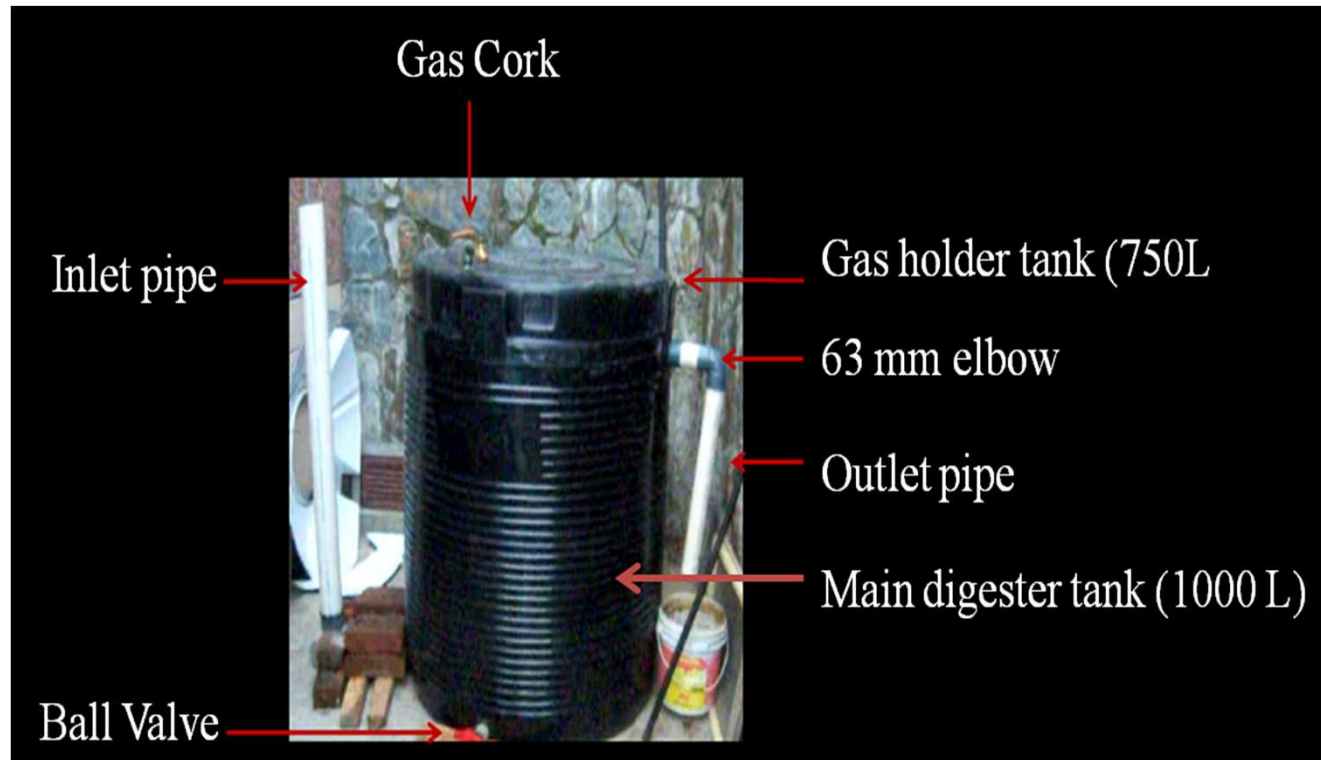
 **Location 6:**
Altitude: 1586m

 **Location 7:**
Altitude: 1586m

 **Location 8:**
Altitude: 1546m

 **Location 9:**
Altitude 1900m

Biogas Research: Biogas Reactor Design in JUIT Industry (Ayurved Ltd., Baddi) - 2008



Feedstock: Left over food waste (design adapted from ARTI, Pune)

Max. achievable potential: 0.37, 1.0, 0.58 m³ methane/kg ODW with carbohydrates, proteins and fats, respectively.

https://www.youtube.com/watch?v=g_jEaYP2g-Q

EFFICIENCY OF BIOGAS REACTORS

Biogas Unit	Available biogas	Cooking Time (app.)
500 litres reactor and 400 litres gas holder	250 litres	1 hour
1000 litres reactor and 750 litres gas holder	700 litres	2 hour
2500 litres reactor and 2000 litres gas holder	1750 litres	5 hour

Feedstock	Dry matter (DM %)	Organic dry matter (ODM% of DM)	Biogas yield (m ³ /ton ODM)	Biogas yield (m ³ /wet ton)
Cow dung	7-15	65-85	200-400	25
Vegetable waste	10-20	65-85	400-700	75
Fat slurry	8-50	70-90	600-1300	310

Adapted from Planning and Installing Bioenergy Systemes, 2005

C/N Ratio, Substrate nature, pH, Temperature – influence the biogas production

(Installed under HIMCOSTE PROJECT)

Reactor 1



Govt. Middle School, Matal Bakog, Gyancoat, Sirmour (Installation Date – 30 March, 2018)

Reactor 2



Govt. Primary School, Dhar Anji, Solan (Installation Date – 06 July 2017)

Reactor 3



Govt. Primary School, Poohat – Bani, Wagnaghat, Solan (Installation Date – 28 December, 2016)



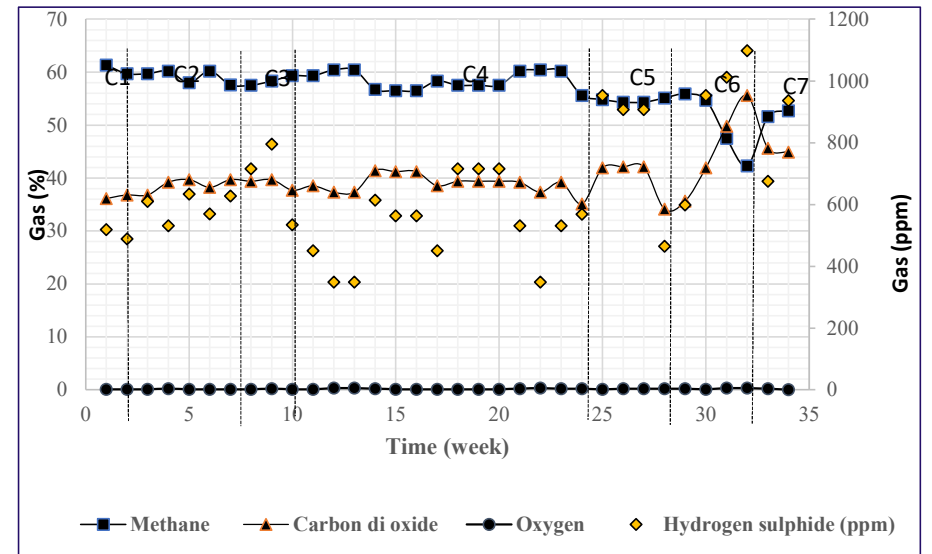
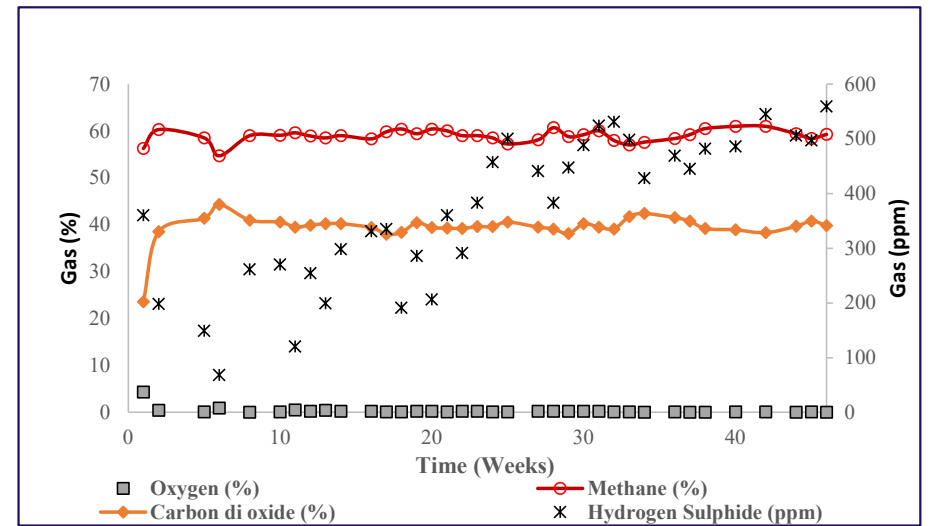
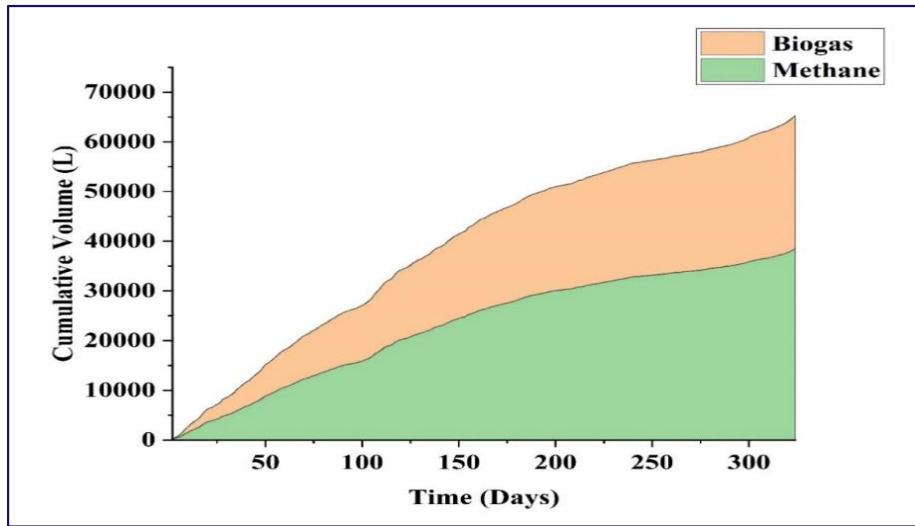
POTENTIAL WORK OUT PUT

Biogas Reactor at Kanpur Fertilizer Plant, Kanpur [VID-20190806-WA0012.mp4](#)

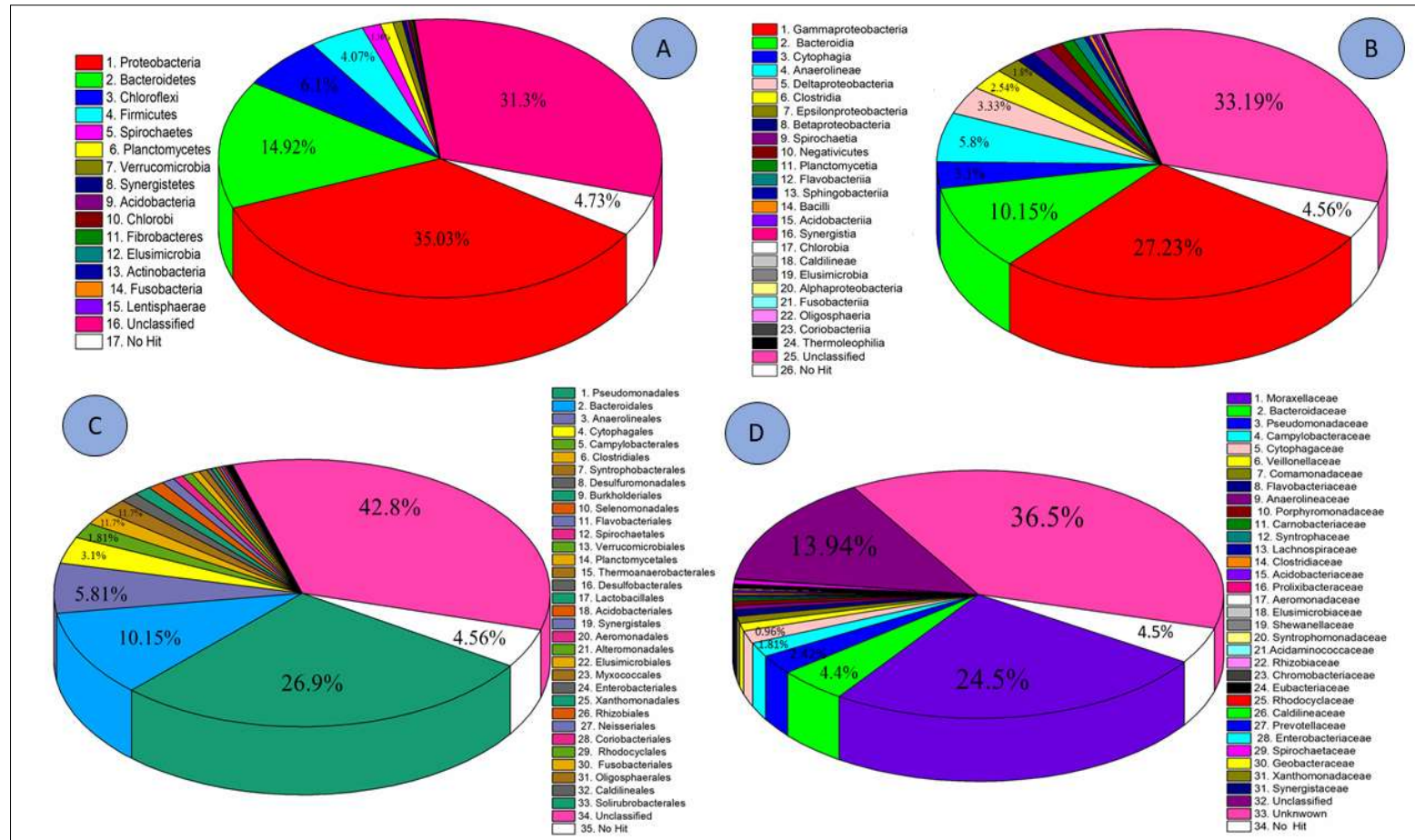


Biogas Reactor at Jaypee University, Solan [VID-20191128-WA0002.mp4](#)



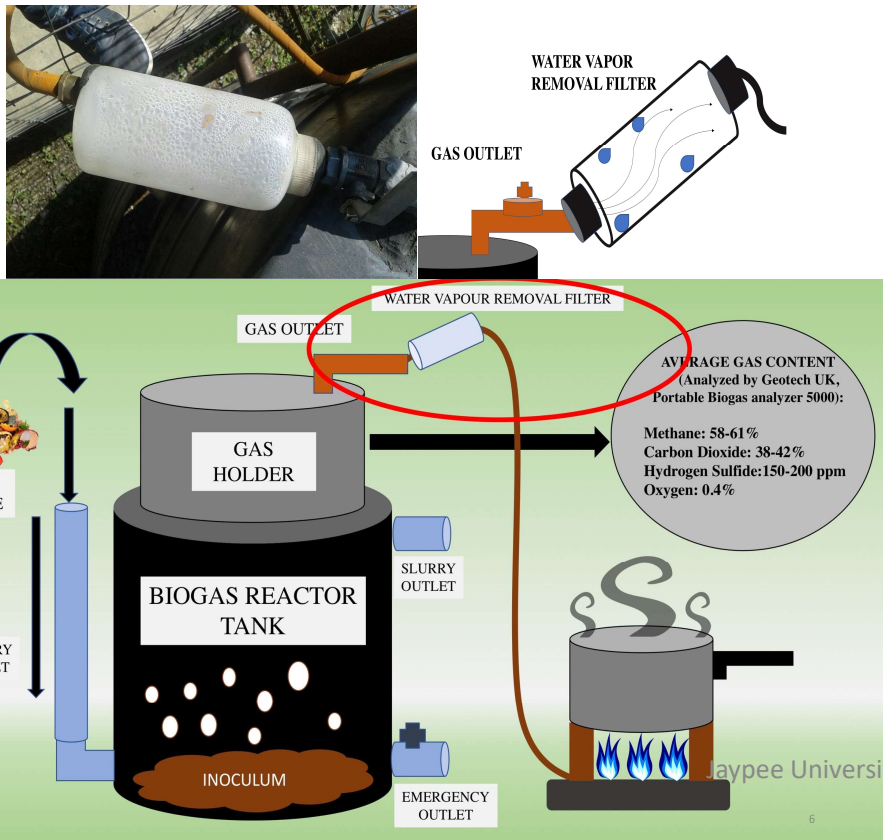


MICROBIAL PROFILING OF BIOGAS REACTOR



STOVE AND VAPOUR FILTER - INNOVATION RELATED WORK

LOW COST WATER VAPOR REMOVAL FILTER

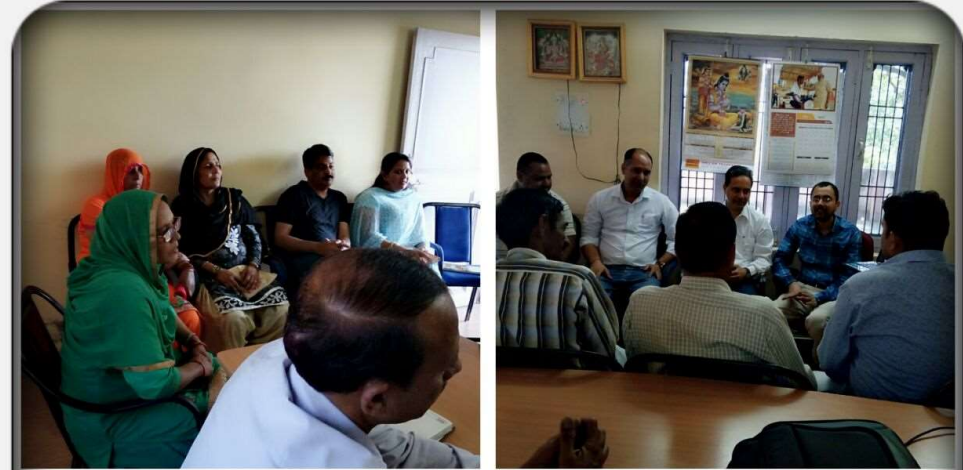


LOW COST SINGLE PHASE BIOGAS STOVE



Jaypee University of Information & Technology, Wazirpur, Solan, HP- India

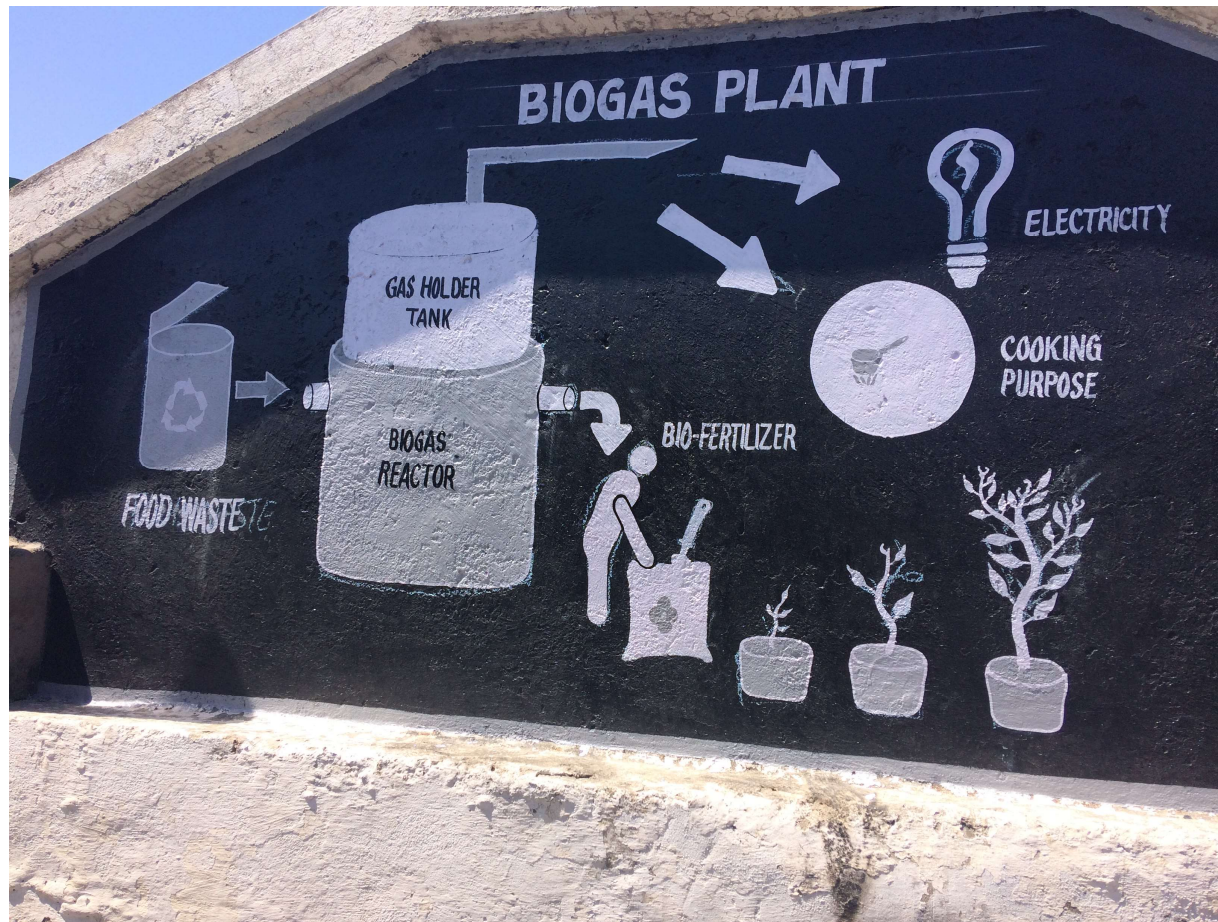
Biogas Reactor Training Una and Nalagarh, Himachal Pradesh (24-25 April, 2018)





Dhar Ki Anji Govt. Primary School Biogas Reactor

Glimpse Of Work



Our Biogas Reactors in use....

❖ **PROTOTYPE FOR LAB. WORK** [PROTOTYPE FOR LABS..mp4](#)

❖ **JAYPEE UNIVERSITY SOLAN BIOGAS REACTOR** [VID-20191128-WA0002.mp4](#)

❖ **JAYPEE KANPUR FERTILIZER FACTORY REACTOR** [VID-20190806-WA0012.mp4](#)

Our Current and Future Road map for Biogas work



News coverage

Converting waste into cooking fuel

TRIBUNE NEWS SERVICE

SOLAN, MAY 6

Dr Sudhir Syal and Dr Ashish Kumar from Jaypee University of Information Technology, Wagnaghat in the district, fabricated a unique biogas digester that uses waste food, vegetable refuse and agricultural residue. It can be used as a substitute for LPG.

Dr Syal said the design was originally developed at the Appropriate Rural Technology Institute in Maharashtra and first of its kind digester for schools had been designed by them. One such device had been installed at Government Primary School at Pooghat-Bani in the district. It would provide them about 30 to 40 minutes of fuel on a daily basis to cook mid-day meal and it would sub-



Biogas digester developed by JP University of IT, Wagnaghat.

stantially bring down the LPG usage, he said.

The research was funded by the HP Council for Science Technology and Environment, Shimla. Dr Aparna

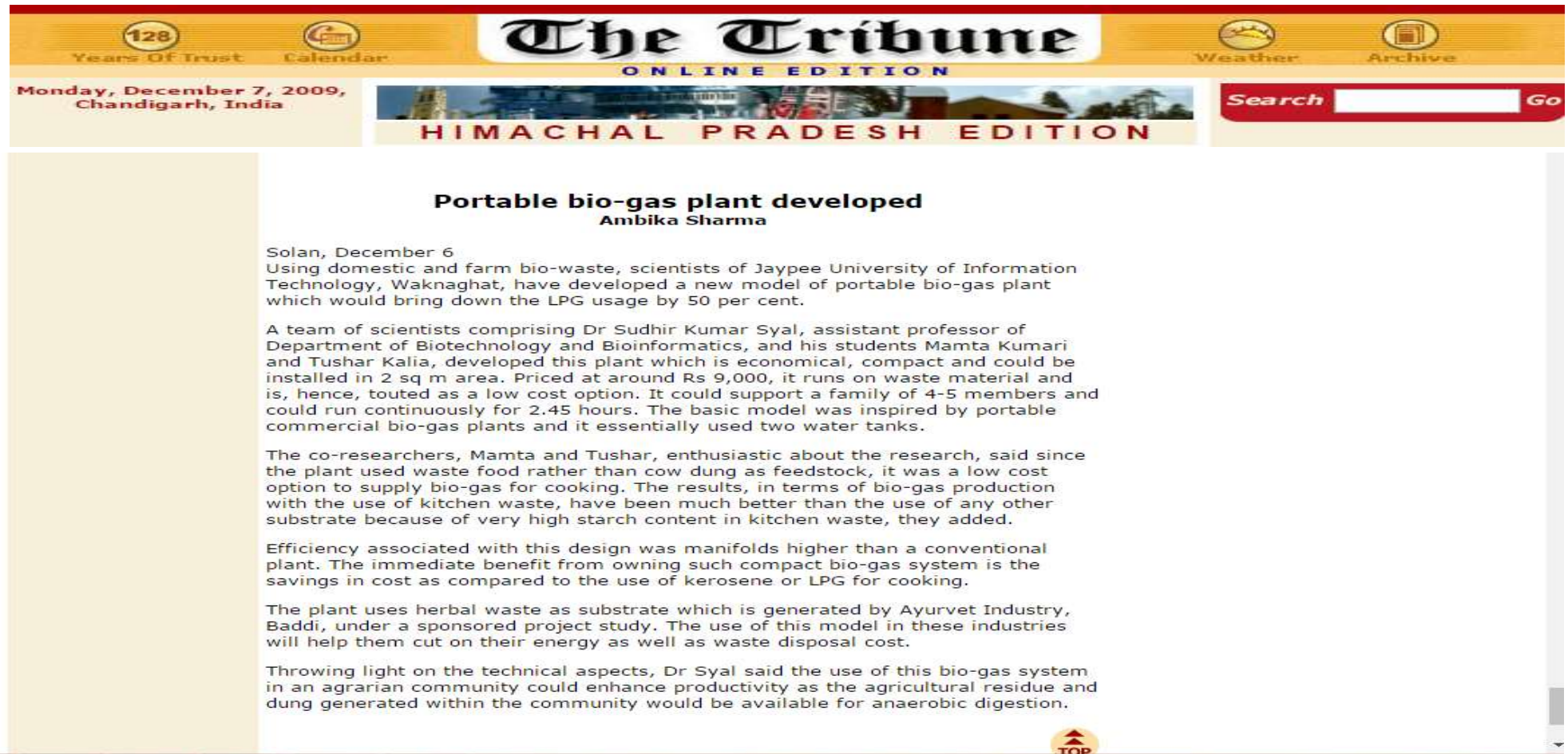
Sharma and Manoj Kaul from the council kick-started its operations at the Pooghat-Bani school yesterday.

The equipment is slated to bring down the LPG usage of the school. Priced at Rs 15,000, it can be easily transported as per the needs.

“This is the most appropriate system for people living without livestock and in build-up area. As on now, system produces 30-40 minutes of cooking gas per day,” they said.


The scientists are now trying to improve its efficiency using crushed pine needles. This system is an ideal way to manage household waste and to produce decentralised power generation. The usage of this technology will also save women from smoky kitchen and time lost in searching for firewood.

News coverage





The screenshot shows the top section of The Tribune newspaper's website. The header includes the newspaper's name "The Tribune" in a large, stylized font, with "ONLINE EDITION" underneath. To the left, it says "128 Years Of Trust" and "Calendar". To the right, there are icons for "Weather" and "Archive". Below the header, the date "Monday, December 7, 2009, Chandigarh, India" is displayed. A search bar with a "Go" button is on the right. The main content area features a headline "Portable bio-gas plant developed" by "Ambika Sharma". The article text follows, detailing the development of a portable bio-gas plant by scientists at Jaypee University of Information Technology.

128
Years Of Trust

 Calendar

The Tribune
ONLINE EDITION

 Weather

 Archive

Monday, December 7, 2009,
Chandigarh, India

Search Go

HIMACHAL PRADESH EDITION

Portable bio-gas plant developed

Ambika Sharma

Solan, December 6

Using domestic and farm bio-waste, scientists of Jaypee University of Information Technology, Wahnaghat, have developed a new model of portable bio-gas plant which would bring down the LPG usage by 50 per cent.


A team of scientists comprising Dr Sudhir Kumar Syal, assistant professor of Department of Biotechnology and Bioinformatics, and his students Mamta Kumari and Tushar Kalia, developed this plant which is economical, compact and could be installed in 2 sq m area. Priced at around Rs 9,000, it runs on waste material and is, hence, touted as a low cost option. It could support a family of 4-5 members and could run continuously for 2.45 hours. The basic model was inspired by portable commercial bio-gas plants and it essentially used two water tanks.

The co-researchers, Mamta and Tushar, enthusiastic about the research, said since the plant used waste food rather than cow dung as feedstock, it was a low cost option to supply bio-gas for cooking. The results, in terms of bio-gas production with the use of kitchen waste, have been much better than the use of any other substrate because of very high starch content in kitchen waste, they added.

Efficiency associated with this design was manifolds higher than a conventional plant. The immediate benefit from owning such compact bio-gas system is the savings in cost as compared to the use of kerosene or LPG for cooking.

The plant uses herbal waste as substrate which is generated by Ayurved Industry, Baddi, under a sponsored project study. The use of this model in these industries will help them cut on their energy as well as waste disposal cost.

Throwing light on the technical aspects, Dr Syal said the use of this bio-gas system in an agrarian community could enhance productivity as the agricultural residue and dung generated within the community would be available for anaerobic digestion.

 TOP

News coverage

Riding on innovation, teacher installs bio-fuel plant in government school at Jabowal

NEHA SAINI
TRIBUNE NEWS SERVICE

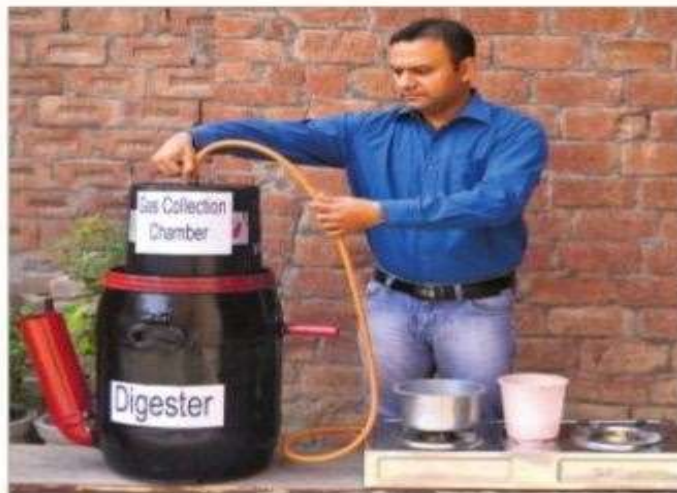
AMRITSAR, AUGUST 22

Leading the way for his students towards an eco-friendly lifestyle, Sanjiv Sayal, a teacher at Government Senior Secondary School, Jabowal, has installed a bio-fuel plant at his school.

Working on the project for more than a year, designing and implementing ideas and concepts towards sustainable clean energy, Sanjiv also put up a show on the functioning of the bio-fuel chamber.

Designed to convert kitchen and organic waste into fuel for cooking purposes, the chamber consists of a self-designed charring drum, with a chimney and a gas collecting chamber.

Sanjiv explains, "Most of us, especially the rural population, depend on wood for cooking purposes. It results in heavy deforestation and pollution. Biogas plants use various types of biodegrad-



Sanjiv Sayal displays the functioning of a bio-fuel plant at a school near Amritsar. PHOTO: VISHAL KUMAR

able solid waste to produce bio-fuel through anaerobic digestion. It has the advantages of producing energy, decreasing pollution, producing high quality fertiliser (spent slurry) and also preventing the transmission of diseases. Biogas

system improves sanitation and conserves alternative fuels."

He said, "This biogas plant is based upon the plant initially developed by Appropriate Rural Technology Institute (ARTI), Pune. But this

particular plant is different from the prior ones in the way that it runs on kitchen waste and other starchy or sugary waste, the digestion of which compared to the cow dung used in the conventional designs."

The plant is a two-chambered cylinder with one acting as a digester and the other as a collector. "The digester is connected with an inlet to feed in kitchen waste and the collecting chamber has an outlet for gas," he said.

With a master's degree in horticulture, the banker-turned-teacher has been teaching his students about healthy and clean energy practices.

He has travelled to promote and educate people of nearby villages about turning paddy or agricultural waste into bricklets of bio-fuel through simple pyrolysis.

"The bricklets when sun-

dried, can be used as fuel at home or industrial use," he explains.

Of course, the process involves a lot of details, but it has its advantages. "Partial burning allows us to reuse the waste as fuel and less smoke is emitted during the process. Also, since it converts agricultural waste into energy efficient fuel, it provides a healthy alternative," he said.

Initial help came from his brother, who is a researcher and works in the field of bio-fuel. Sanjiv informed that this type of biogas plant with tank sizes of 1,000 lt and 750 lt, saves approximately 100 kg of LPG, which is equivalent to 0.23 tonne of carbon dioxide per year and in a rural household it may save 3 tonne of wood per year.

"Methane gas has a high calorific value. Approximately 2 kg of kitchen waste is enough to serve a nuclear family per day," he says.

AWARDS/RECOGNITION

स्वच्छ भारत मिशन (ग्रामीण)
पेयजल एवं स्वच्छता विभाग, झारखण्ड, राँची

झारखा बाजार पानी टाकी परिसर, प्रथम तल, झारखा बाजार, राँची-834002 फोन नं.-0651-2482876 Email-sbmg.jhar@gmail.com

संख्या: SBM(G)/Gobardhan Scheme - 221/13,14/18 दिनांक: 22.10.18.

क:

दिनेश कुमार सिंह
संयुक्त सचिव-सह-संयुक्त निदेशक,
SBM(G), पेयजल एवं स्वच्छता विभाग
झारखण्ड, राँची।

ग में.

1. Jaypee University of Information Technology
Email - sudhir.syal@juit.ac.in, syalsudhir@gmail.com
2. Excellent Renewale Pvt. Ltd.
Email - info@bioenergyindia.co, hemant.patel@bioenergyindia.co
viral.patel@bioenergyindia.co
3. Sakh Foundation
Email - sakh332@gmail.com, mssengar03@gmail.com
manu_manojisingh@yahoo.co.in
4. Synod Bio Science Pvt. Ltd.
Email - gardencity@synod.in, zeeshan@synod.in
5. Gram Vikas Training Centre
Email - gvtcranchi@gmail.com
6. Price Water House Coppers Pvt. Ltd.
Email - shivanshu.chauhan@pwc.com, shyamal.mukherjee@in.pwc.com
7. Savitry Mega Venture Pvt. Ltd.
Email - savitrymegaventure@gmail.com
8. ECO Save Systems Private Ltd.
Email - ccsp1@choiceindia.com
9. Dustara Solutations Pvt. Ltd.
Email - vinod@dustara.com




विषय: गोबरधन योजना से संबंधित Technical Agencies का MIS में Registration कराने के संबंध में।

व्याशय.

उपरोक्त विषय के संबंध में कहना है कि गोबरधन योजना से संबंधित कार्य को गारंम करने हेतु भारत सरकार की ओर से सभी Technical Agencies का SBM के MIS में Registration कराने हेतु आदेश प्राप्त हुआ है। विशेष जानकारी हेतु इस पत्र के साथ MIS का Print Screen उपलब्ध करायी जा रही है।

अतः आग्रह है कि आप निम्न लिंक <http://sbm.gov.in/gobardhan/Registration.aspx> पर जाकर अपने Agency का Registration करा कर निदेशालय, स्वच्छ भारत मिशन (ग्रामीण) के ईमेल sbmg.jhar@gmail.com पर अवगत कराना सुनिश्चित किया जाय।

विश्वासभाजन,
दिनेश कुमार सिंह
(दिनेश कुमार सिंह)
संयुक्त सचिव -सह-संयुक्त निदेशक,



Government of Himachal Pradesh
Rural Development Department

No. SMG-1/2015 - RDD- (SBM-G) - Budget - Dated Shimla - 171009 30th May, 2018.

NOTIFICATION

In pursuance to the instructions issued by the Ministry of Drinking Water and Sanitation, Govt. of India, vide DO No. S-15014/1/2018 -SBM-III dated 2nd May, 2018, the State Technical Advisory Committee (STAC) for implementation of GOBAR -DHAN scheme under the Swachh Bharat Mission- Gramin is hereby constituted as under :

1. Mission Director - Swachh Bharat Mission- Gramin - Chairperson
2. Member Secretary, The State Council for Science, Technology & Environment - Member
3. Head, Department of Agriculture - Bio Technology, CSK.H.P. Agriculture University, Palampur - Member
4. HoD, Department of Bio-Technology, JPUIT, Wagnaghat, Solan - Member
5. Joint Director, Rural Development Department - Member Secretary

By order
(Rakesh Kanwar)
Director cum Special Secretary (RD)
to the Govt. of Himachal Pradesh

Endst. No SMG-1/2015 - RDD- (SBM-G) - Budget - Dated Shimla - 171009 30th May, 2018.

Copy forwarded for information and necessary action to :

1. Joint Secretary, Ministry of Drinking Water and Sanitation, 4th Floor, Pt. Deendayal Antodaya, Bhawan, CGO Complex, New Delhi - 110003
2. The Member Secretary, State Council for Science, Technology & Environment for information
3. The Mission Director - Swachh Bharat Mission- Gramin, Rural Development Department, Shimla-171009
4. Head, Department of Agriculture - Bio Technology, CSK.H.P. Agriculture University, Palampur for information
5. HoD, Department of Bio-Technology, Jay Pee University of Information Technology, Wagnaghat Solan for information
6. The Joint Director (RD), Shimla-171009

(Gian Sagar Negi)
Joint Secretary (RD)
to the Govt. of Himachal Pradesh
sbhmhimachal@gmail.com

Feedback...

उत्तर प्रदेश शासक (संस्कृत) द्वारा जारी की गई
 दिनांक 10/12/2018

उपरोक्त योजना के अंतर्गत स्थापित
 20 फुट घाट पार क्षेत्रों में हीम डिब्बा बना
 (कचरे को जलाने से) से बचने
 को उद्योग व उद्योगों के उत्तराखण्ड
 (जानकारी) प्रकल्प को जल संचयन प्रकल्प, महानगर
 विकास प्रकल्प आदि सहित संस्थाओं के प्रकल्प
 व भी संचयन प्रकल्प का अन्तर्गत किया।
 (कचरे को जलाने से) से बचने के लिए
 इस योजना के अंतर्गत 20 फुट घाट पार क्षेत्रों
 में हीम डिब्बा बना (कचरे को जलाने से) से बचने
 को उद्योग व उद्योगों के उत्तराखण्ड
 (जानकारी) प्रकल्प को जल संचयन प्रकल्प, महानगर
 विकास प्रकल्प आदि सहित संस्थाओं के प्रकल्प
 व भी संचयन प्रकल्प का अन्तर्गत किया।

To Whom It May Concern

Certified that a biogas plant had been set up
 in the premises of G. P.S. Deiyoda Edu Block.
 Kandaghat, Distt Solan (H.P) on dt 28/12/16 by
 Jaypee University of Information Technology, Waknaghat.
 The biogas plant has been working since then
 and helpful to minimize the consumption of LPG
 cylinder to some extent for cooking food to the
 students of the school under the Mid-day-Meal
 scheme.

Rajesh Chakraborty
 Govt. Elementary School,
 Deiyoda, Distt. Solan (H.P)

Feedback of Rajgarh

श्रीमती नीलम शर्मा ग्राम कौस्त का क्षेत्र

आज दिनांक 10 मई 2018 को जे.पी. यूनिवर्सिटी
 द्वारा स्थापित की गई थी। इस योजना के अंतर्गत
 इस क्षेत्र में बायो गैस से संचयित जलाने का
 को गैस बनाने में मदद हुआ है। इससे
 सड़क जलाने में गैस का उपयोग हो रहा है।
 इससे हमारे घरों में गैस का उपयोग हो रहा है।
 इससे हमारे घरों में गैस का उपयोग हो रहा है।
 हम हीम डिब्बा का भी उपयोग करते हैं।

Neelam Sharma

प्रमाणित किया जाता है कि हिमकार्ट संस्थान से
 डा० सुधीर कुमार व डा० आशीष कुमार के नेतृत्व में
 दिनांक 30 मार्च 2018 को राजकीय माध्यमिक विद्यालय
 लानकोट में बायोगैस प्लांट स्थापित किया गया है।
 यह विद्यालय के प्रभारी की देखरेख में सुचारु रूप से
 कार्यशील है। विद्यालय में इसका शीत निकास भी शब्दा
 जा रहा है। विद्यालय के सध्याई प्रभोजन में क्या हुआ
 प्रभोजन आदि नियमित सही मात्रा में डाला जा रहा है।
 एवं ग्रैस को विद्यालय के सध्याई प्रभोजन प्रकल्प
 के तहत हीम डिब्बा के रूप में प्रयोग किया जा रहा है।

Manish
 Headmaster
 Govt. Middle School Gainkot
 Education Block Rajgarh
 Distt. Sirmour H.P.-171226

Govt. Middle School Gainkot, Sirmour, Distt. Sirmour, H.P.

Subject: 20/10/2018 (Date)

Page No: 1

Waste Sponsered Biogas Plant
 Installation of Biogas Plant (Capacity)
 Digesters and 1000 Liters gas holder

Biogas Plant was installed at Govt Middle
 School, Gainkot, District Sirmour, H.P. on
 28/12/16. The plant is working since then
 and helpful to minimize the consumption of
 school kitchen.
 Mr. Neelam Sharma and Mr. Rajesh Chakraborty
 (Project Officer) were present and
 the plant is working since then and helpful
 to minimize the consumption of LPG
 cylinder to some extent for cooking food to
 the students of the school under the Mid-day
 Meal scheme.

School teachers -
 1) Mr. Neelam Sharma - Headmaster
 2) Mr. Rajesh Chakraborty - Project Officer

The working of the Biogas Plant is reported
 to Mr. Neelam Sharma.

श्रीमती सीता शर्मा ग्राम कौस्त का क्षेत्र

10 मई 2018 को जे.पी. यूनिवर्सिटी द्वारा स्थापित
 की गई थी। इस योजना के अंतर्गत
 इस क्षेत्र में बायो गैस से संचयित जलाने का
 को गैस बनाने में मदद हुआ है। इससे
 सड़क जलाने में गैस का उपयोग हो रहा है।
 इससे हमारे घरों में गैस का उपयोग हो रहा है।
 हम हीम डिब्बा का भी उपयोग करते हैं।


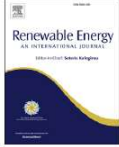
Seeta Sharma




RESEARCH OUTCOMES

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 **Renewable Energy** 

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Techno-economic analysis, kinetics, global warming potential comparison and optimization of a pilot-scale unheated semi-continuous anaerobic reactor in a hilly area: For north Indian hilly states 

Ankur Choudhary^a, Ashish Kumar^{a,*}, Sudhir Kumar^b

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^b Department of Biotechnology and Bioinformatics, Jaypee University of Information Technology, Waknaghat, 173234, Solan, Himachal Pradesh, India

Technical Note  **ASCE**

National Municipal Solid Waste Energy and Global Warming Potential Inventory: India

Ankur Choudhary¹; Ashish Kumar²; and Sudhir Kumar³

Abstract: In this study, the municipal solid waste methane emission, energy, and global warming potential inventory for 2005–2030 is estimated at both national and state level for India using the Intergovernmental Panel on Climate Change (IPCC) default method, IPCC first-order decay methods, the Landfill Gas Emissions Model (LandGEM) with state specific values, LandGEM with default inventory values, and LandGEM with Clean Air Act values. Simulations made by LandGEM with state specific values show that India will be emitting 1,084 Gg methane in 2020 and expected to reach 1,969 Gg in 2030 if the existing scenario does not change in India. If suitable measures, such as the conversion of open dumps into sanitary landfills with landfill gas collection mechanisms, take place, an amount equal to 1,387 MW of energy in the year 2030 (using LandGEM state specific values) can be conserved. The study concludes that efforts in the direction of scientifically managed landfill with proper landfill gas collection mechanisms can turn the table in India's favor in the future and help to achieve the nation's quest for the development of renewable energy. **DOI:** 10.1061/(ASCE)HZ.2153-5515.0000521. © 2020 American Society of Civil Engineers.

Author keywords: Municipal solid waste; Energy; Global warming potential; Open dump; Greenhouse gases; Landfill gas.

RESEARCH OUTCOMES



ASCE

Sustainable Production of Biogas in Large Bioreactor under Psychrophilic and Mesophilic Conditions

Ankur Choudhary¹; Ashish Kumar²; Tanvi Govil³; Rajesh Kumar Sani⁴; Gorky⁵; and Sudhir Kumar⁶

Abstract: This study reports the sustainability of a large semicontinuous anaerobic reactor (3,000 L) for biogas production from food wastes for a period of 324 days. The methane potential ranged from 418.3 to 13.9 mL CH₄/g VS_{added} during the experiment. An average 54.8% reduction was observed in biogas production during the winter season compared with summer. Results showed that food wastes could be utilized in a low-temperature range (0°C–15°C) as well as a high-temperature range (15°C–27°C). The total microbial community analysis revealed mixed consortia representing acetotrophic, hydrogenotrophic, and methylotherophilic archaea (e.g., *Methanobacterium*, *Methanosarcina*, and *Methanospirillum*), indicating a syntrophic pathway for methane production. The bacterial community was well represented by two major phyla: Proteobacteria (31.3%) and Bacteroidetes (14.92%). The highest maximum specific biogas production (R_m) and maximum biogas production potential (A) were 134.5 mL CH₄/g VS/day and 34.1 L CH₄/g VS for modified Gompertz and first-order equations, respectively. The methane production data were modeled, and showed substantial agreement with experimental results; however, the first-order equation had the best agreement with the experimental data ($R^2 = 0.99$). DOI: 10.1061/(ASCE)EE.1943-7870.0001645. © 2019 American Society of Civil Engineers.

Author keywords: Anaerobic digestion; Organic fraction of municipal solid waste; Psychrophilic temperature; Methane potential; Stability.

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Comparison of Biogas Production in Ambient Temperature Condition and under Green House Canopy

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Abstract—The current study focuses on the production of biogas from pine needles. The experimental study was conducted at Himachal Pradesh, India where temperature hardly exceeds 35°C. There are various type of organic waste used for biogas production such as food waste, cow dung and agricultural waste but the use of pine needles has not been used so much for biogas production. The batch study was done in a plastic made floating type biogas digester. In the biogas digesters, one fermentation bucket and 2nd gas holder was used. The capacity of fermentation bucket and gas holder was 45 l and 20 l respectively. The feed materials were collected from the local sources. The study was batch operated and daily gas production from the digesters was measured. In this study, comparison of biogas production under green house canopy and the ambient temperature condition has been made. The ambient temperature range measured within the testing period was 15°C–28°C.

rising so there is need to explore more alternative source of energy. In this context biogas is one of the clean, cost effective and renewable source of energy.

Biogas is the natural process where microorganisms degrade organic material in the absence of oxygen. The biogas is produced by anaerobic digestion of different raw materials such as manure, food waste, agricultural waste (plant waste, pine needles, rice husk and crop waste etc). A little study has been done so far on utilization of pine needles for biogas production and a little study has been conducted so far on the comparison of biogas production under green house canopy and without canopy. The temperature play vital role for the biogas production. But in the low temperature the biogas

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Use of Pine needles as Substrate for Biogas Production

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Abstract— This paper describes the results of an experimental investigation taken up to check the suitability and potential of the pine needles as substrate in biogas production under batch digester. There are various lignocellulosic biomasses for biofuel production but the use of pine needles has not been realized so much yet. In the present study two batch digesters (each having two plastic made buckets: one for fermentation and second as gas holder) was used. In the first digester cow dung named as DIGESTER1 and in the second digester named as DIGESTER2 ground pine needles were co-digested with cow dung was used as a substrate. The feed material was collected from local sources. In both the digesters, inoculum prepared from cow dung was used. Biogas production using cow dung and pine needles under batch digester has been compared under similar field conditions. In both digesters tap water was used to make slurry in a ratio of 1:1.5 by weight. The different parameters like Total solid, volatile solid are measured & pH, biogas production & temperature are measured on daily basis. The surrounding temperature range during the testing period was between 15°C–23°C and slurry temperature inside the digester was in range of 17°C–26°C. The total volume of biogas production of the 70 days in DIGESTER1 and DIGESTER2 was 2.47 and 5.30 litres.

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A.K.Tripathi et al., Vol.5, No. 3

Generation of Biogas Using Pine Needles as Substrate in Domestic Biogas Plant

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Abstract— Biogas is generated from anaerobic digestion of complex organic wastes. The present study focuses on efficient and cost effective use of biogas digester for the production of biogas from recalcitrant lignocellulosic waste (pine needles). Although production of biogas using anaerobic digestion has been employed in Himachal Pradesh but it is not as yet a successful technology due to various limitations. In the present study feasibility of a compact design of biogas plant is verified with the help of biogas plant installed in our university campus. It is found that biogas plant used for the study is suitable for places with low population density. The cellulose content in pine needles is found to be around 55% making it suitable biomass for energy generation. Pine needles used here as substrate were mechanically comminute to very fine size (1–2mm) before being co-digested with sewage waste water. It is noticed that biogas production peaked from 1.4 l/day to 1.9 l/day during winter month, where as it was 7.3 l/day during months of March and April. The reduction in volatile solids was also noticed during the months of March and April which was close to 64% during April higher compared to its value in winters. The design of biogas plant was found suitable to a major part of Himachal Pradesh.

Keywords— Pine needles, anaerobic digestion, Biogas, Lignocellulose, Total solids, Volatile solids.

RESEARCH GROUP



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THANKS FOR YOUR KIND ATTENTION



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ORDER

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