

'Kachra lao - Biogas ley jao': Bio Energy Mission Model

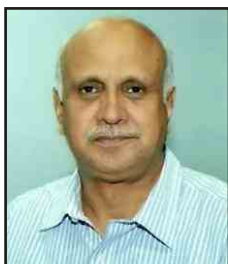
Self-Reliance is only a step away



A Joint Initiative by Bio- Energy Mission Cell and Unicef UP



Anoop Mishra
I.A.S.



Ph. : (0522) 2621599, 2238212 (O)
: (0522) 2239283 (Fax)
: (0522) 2239461 (Res.)
Government of Uttar Pradesh
(Lal Bahadur Shastri Bhawan)
Lucknow - 226001
E-mail : csup@nic.in

Date: 11 oct, 2011

MESSAGE

I am pleased to know that Bio-Energy Mission Cell and UNICEF have jointly developed Solid Waste based Bio-Gas system, which offers an effective solution to the problem of managing solid waste.

Despite making significant improvement in social development indicators during the 11th Five-year Plan period, Uttar Pradesh is still facing challenges in terms of improving the sanitation conditions, not only in rural areas, but in urban pockets too.

Solid Waste based Bio-Gas system has been tried and tested in various conditions and is found to be working efficiently. Simple technology blended with user-friendly operation and maintenance features is attracting rural and urban masses for wide scale adoption. This is an encouraging step for making the sanitation conditions more hygienic.

I urge all districts of the State to adopt this simple, eco-friendly and economical solution for managing solid waste.

Anoop Mishra
(Anoop Mishra)

ALOK RANJAN

I. A. S.

Agriculture Production Commissioner



Govt. of Uttar Pradesh
9-10, Bahukhandi Bhawan,
Secretariat,
Lucknow - 226 001



: 0522-2238082 (O)

: 0522-2238145



: 0522-2238393 (Fax)

: 0522-2235161 (R)

E:mail : apc@up.nic.in

Date : 19.8.2011

Message

I am highly delighted to note that Bio Energy Mission Cell in partnership with UNICEF, Lucknow has successfully developed a model of Solid Waste based Bio Gas project. For the state of Uttar Pradesh, with an agrarian economy, this model is a boon. It uses agricultural wastes and other organic wastes, improves sanitation and also provides gas for cooking and running electrical appliances. Moreover it also reduces methane emissions thereby qualifying for earning Carbon Credits for our nation. **With this model, waste is not 'waste' anymore...It is a resource for the community, the nation and the environment"** I encourage all districts to use this model.

(Alok Ranjan)

Manjit Singh
I.A.S.



Principal Secretary
Department of Planning
Govt. of U.P.

☎ (0522) 2238973
(0522) 2238467

Lucknow: Dated 27 September, 2011

MESSAGE

Bio-Energy Mission Cell, a unit of Planning Department has been working to evolve decentralized community based models of harnessing renewable energy resources. With support from UNICEF, it has been instrumental in developing a solid waste based bio-gas plant which also overcomes some of problems faced by previous bio-gas models. Two such plants have been set up and are functional in Ballia and Lucknow for about three years. The model promises to be economically viable and has strong potential to contribute to improvement of our rural economy.

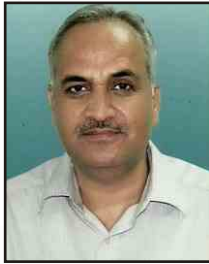
The present document highlights the basic features of the new bio gas model, its costing and its benefits. The model has caught imagination of many who are working in the area of utilizing wastes to meet the requirement of energy as also to have cleaner environment. It has good potential to be an important component of total sanitation campaign underway in the rural areas.

I express my appreciation for the commendable work done by Bio-Energy Mission Cell in collaboration with UNICEF and hope that the document will help disseminate the new technology tried out by them.


(Manjit Singh)

बी.एम.मीना

आई.ए.एस.
प्रमुख सचिव



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पंचायती राज विभाग

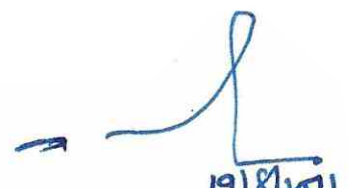
उत्तर प्रदेश शासन
कक्ष संख्या-224, बापू भवन, सचिवालय
लखनऊ-226 001

दिनांक : 19.8.2011

MESSAGE

I am very delighted to note that Bio Energy Mission Cell, Department of Planning, U.P. in partnership with UNICEF has made a major breakthrough in addressing the problem of disposal of solid based in the rural areas. The innovation by its name "Kachra Lao Bio Gas Le Jao" denotes the essence of importance of the issue. It brings a paradigm shift in the entire approach of treating rural waste as a valuable resource in the shape of energy. By it's nature the initiative is community based aiming to address individual problem, which is the philosophy of sanitation program. This model is successfully operational in Ballia and Lucknow for more then 3 years and under total sanitation campaign it has been implemented in J.P. Nagar, Kaushambi, Mathura and Sant Kabir Nagar.

I urge all districts to replicate this model with zeal and commitment to have a NIRMAL PRADESH.


19/8/2011
(B. M. Meena)

Navneet Sehgal

I.A.S.

Secretary



Telefax : 0522-2238392

Tel. (CH) : 0522-2214702

**Govt. of Uttar Pradesh
Department of Energy**

232, Bapu Bhawan, Secretariat
Lucknow

Date : 30.9.2011

MESSAGE

Government of Uttar Pradesh is committed to make the State self-reliant in the energy sector. This Vision will be achieved not only by the big infrastructure based projects but also by innovative technological advancements. I have learnt about one such technological advancement which has made by Bio-Energy Mission Cell, Planning Department and UNICEF, by developing Solid Waste based Bio-Gas model. The simple concept that any organic waste can be utilised as the feed for this unit makes it very cost effective. In this model methane gas which otherwise goes as a waste is properly trapped and is utilised in generating electricity and cooking.

The model has demonstrated that rural areas can be energy self-reliant with this decentralised approach.

I congratulate Bio-Energy Mission Cell and UNICEF in developing a technology which will have multi dimension benefits in the overall development of the State.

(नवनीत सेगल)
सचिव,
ऊर्जा विभाग,
उत्तर प्रदेश सरकार।

D. S. Srivastava
Special Secretary
& Director




No. **9017**..... :/V.S./P R/2011
Panchayati Raj Department, U.P.
Lucknow : Date: **27** July, 2011

Message

I am very delighted to share the successful launch of Solid Waste Based-Bio Gas model which has been developed by Bio Energy Mission cell of Government of U.P. This is a unique model of its kind which has been designed in for the first time in our country. This model is of great importance to all classes of society and to village as a whole. Economic benefits from this model make it completely viable for rural areas of the state. We are in a position to showcase that Total Sanitation Campaign (TSC) can make an impact on livelihood promotion too.

State Sanitation Mission (SSM) has taken a lead to replicate this model in the entire state and facilitated evolution of household based model too for the benefit of rural masses. SSM has adopted this in the Total Sanitation Campaign (TSC) guidelines which has helped us to move in a direction of effective and efficient utilisation of 10% budget of TSC, which was lying unused in majority of districts.

I strongly urge all districts to plan and initiate this invention. SSM would provide necessary technical support from its side for the successful implementation of SLWM component of TSC.


27.7.11
(D.S.Srivastav)

'Kachra lao - Biogas ley jao': Bio Energy Mission Model

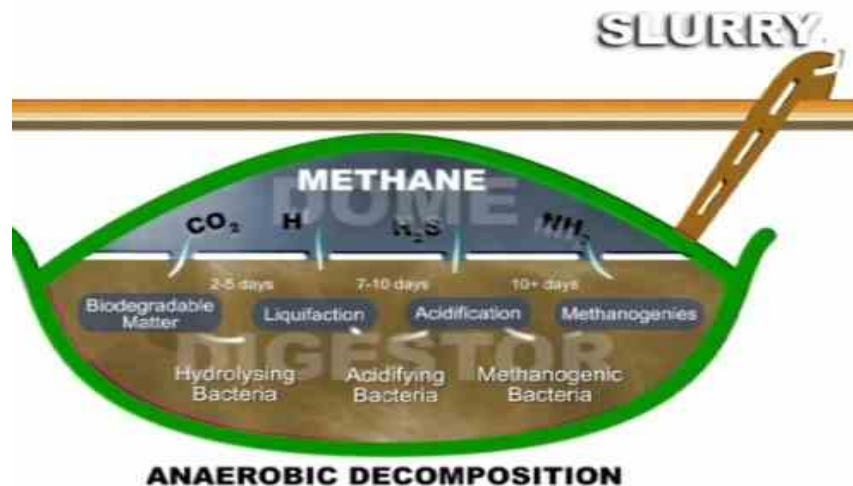
Waste is all around us...it comes from homes, kitchens, markets, animals, farms and toilets.... It has assumed alarming proportions today. There exists a dire need to consume waste productively. The Government of India's **Total Sanitation Campaign (TSC)** has been focusing on safe disposal of waste, especially human faecal matter. But management of human faeces and wastes alone is insufficient in breaking the “true” faecal-oral-transmission route which causes numerous illnesses. Animal waste from about 485 million livestock population in India contributes excess nutrients, pathogens, organic matter, solids, and odorous compounds to the environment (Ministry of Agriculture, 2006). Hence, there is a need to focus on animal waste management as well. GoI has recently modified TSC guidelines to incorporate solid as well as liquid waste management.

One cow gives enough cow-dung in a year to produce methane gas equivalent to 255 litres of petrol in energy terms, according to *the Gobar Gas Research Station* in Kanpur Gaushala Samiti in U.P.

It has been seen that anaerobic (without oxygen) decomposition of organic waste leads to methane production which is a good fuel. The large scale availability of cow-dung and other organic waste in rural areas can be used to produce methane gas in an organized way. It is estimated that with existing cattle population, India can produce enough methane gas to entirely replace LPG and kerosene in cooking, and substitute petrol in transportation. In terms of calorific value, one kg of methane gas is more or less equal in energy content to one kg of petrol, LPG, kerosene or diesel. Moreover, the by-product can serve as excellent organic manure, substituting expensive chemical fertilizers which again require LPG as raw material.

PROCESS: In the new bio energy mission model it is possible to hasten and mimic the natural anaerobic process by putting organic wastes (manure and vegetable matter) into insulated, air-tight containers called digesters. The digester is fed with a mixture of water and wastes, called 'slurry'. Inside the digester, each day's load progresses down the length of the digester to a point where the methane bacteria are active. Here large bubbles force their way to the surface where the gas accumulates.

The gas is akin to natural gas and can be burned directly for heat and light, stored for future use, or compressed to power heat engines. This gas constitutes of 65-68% methane and 31-

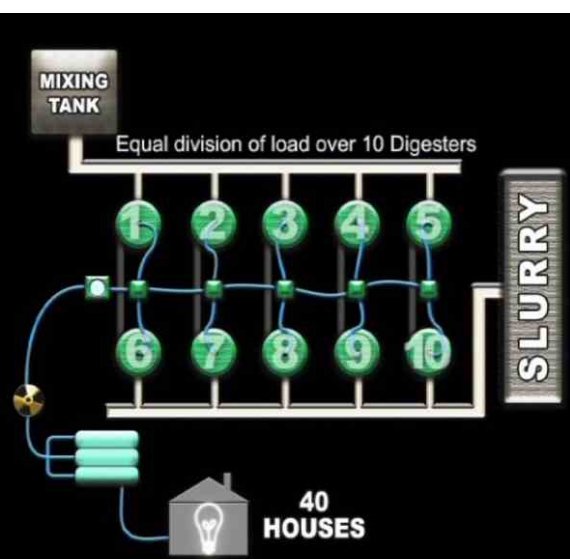


Unique features-Bio energy mission model

- 100% leak proof
- All (solid/ liquid) organic wastes can be used
- Modern construction complete in four days
- Can be upscaled from family size to 1000 cum
- Consistent production of bio-gas
- Fertilizer (high NPK value) as by-product
- Provides gas for highly efficient appliances
- Easy to repair as also safe to handle
- Inlet & outlet as per need of user
- Placed underground, aesthetically better

33% carbon dioxide along with H₂S and moisture (1-2%) as also traces of ammonia. It is passed through lime water to remove the carbon dioxide and over iron fillings to remove hydrogen sulphide (H₂S). It then becomes enriched with methane. A compressor can extract and compress this methane gas into portable standard-size CNG cylinders. These methane gas cylinders can then be used for cooking or in automobiles and two wheelers. A community unit may provide piped gas to house-holds in rural as well as urban areas. About 50% agro-

waste is available as leftover in bio energy mission model, which is used to produce organic manure rich in nitrogen and phosphorus.



PILOT PROJECT: Funded by UNICEF under its T.S.C. programme as a pilot project at village Mullahikhera in Lucknow district & village Mishrawallia in Ballia district, it is functioning successfully for last 3 years. At present, Bio-energy mission model, based on "**Kachra Lao - Bio Gas Ley Jao**", at an average cost of Rs 8 lakhs per model, is providing facilities to a village/ community having 40-50 households on an average. This model is different from all other existing models like KVIC (Khadi Village Industry Commission), Janta-1 and Janta-2 in many aspects (as outlined in the table below).

Bio-Energy Mission model	Other existing models
Easy maintenance & cleaning	Difficult to maintain & clean
Expected life is approx 20 years	Life expectancy is only 3-4 years
No leakage as dome made of FRP	Leakage as dome is made of iron
Bio-gas production is consistent, not affected by season shortage	Varies with season (excess production in summers & in winters)
No bad odour emitted as only 20% cow-dung required	Strong smell emitted
80 kg gas/day produced with weekly feeding	Gas produced significantly less
Anaerobic decomposition hence 75-80 cm water table pressure created	Aerobic decomposition: 4-5 cm water table pressure created
No moisture on burner	Moisture comes over burner often
Hydraulic Retention-flow Time (HRT) is only 48 -72 hours	Hydraulic Retention-flow Time (HRT) is about 45 days
Individual unit is possible	Individual unit is not possible
Inter digester linkage possible	Inter digester linkage not possible

MODEL: In bio-energy mission model, different kinds of agro and complete organic house hold wastes are collected and fed into the bio-digester.



“पहले चूल्हा फूकने से महिलाओ को सांस की तकलीफ हो जाती थी”



“Khana bahut swadisht banta ha.....jalti bhi banta hai.... bahut tez jalti hai yeh gas,” says **Rita**.



“Today I am earning a lot with the sale of bio-fertilizer that I supply in packets of different sizes,” says **Malti**

Each bio-digester has a capacity of 200 kg of waste per week, which implies that 2000 kg can be fed on weekly basis in the bio-energy mission model with 10 digesters. After filling the required quantity and manually stirring it, the waste is allowed to move in the bio-digesters, each sealed with pre-fabricated dome of Fibre Range-force Plastic (FRP). Anaerobic decomposition takes place and initially it takes about 4-5 days for gasification to begin, then it becomes a continuous process. The gas coming out is treated with a mix of chuna powder (approx 1 kg) with 600 gms of alum and 300 gms of iron which cost merely Rs 125 and lasts for three months. This mixture works as desulphurizer (eliminate hydrogen sulphide) and demoisturiser (to eliminate moisture). Bio-gas thus produced is then stored in the storage tank and supplied to the households with the help of a compressor unit.

USAGE: At present, ten houses have been connected to this 100 cubic meter bio gas plant. Bio-gas is supplied to these houses via pipe-line for limited hours on trial basis. Nanhelal's family is using bio-gas and they pay as per the metre attached to the pipeline. Then Mahesh has started using biogas for igniting his furnace for his wire business which involves making utensil stands and other items made of wire. Convinced with the

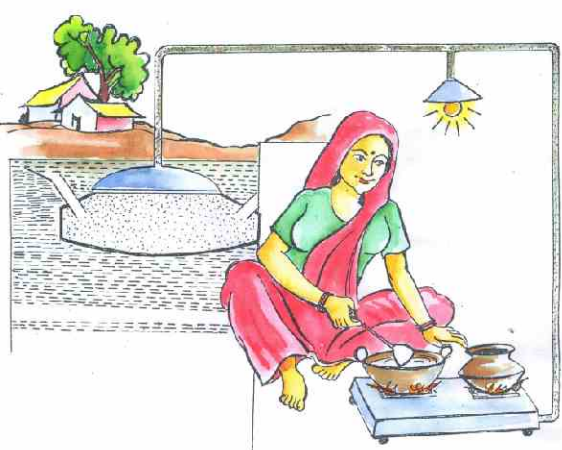
Cost of 100 Cubic Meter Biogas Plant	
Land	Community Contribution
Cost of Shed	60,000.00
Cost of equipments	660,000.00
Gas Stoves & lamps	60,000.00
Miscellaneous expenses	20,000.00
Monthly Recurring expense	15,750.00
Total	8,15,750.00



remarkable and consistent performance of low cost bio-gas in his furnace, he has applied for a business loan of 25 lakhs. Malti has started her business of manure production and marketing from the waste available.

The major product is bio-gas, a clean fuel that costs much lesser than L.P.G. This unit can produce about 2475 kg of bio-gas. As a by product, good quality compost is produced which can be easily marketed either in the village itself on whole sale basis or in the nearby urban area in small packets for use in kitchen gardens. Then desulphurization process produces concentrated H_2SO_4 which can easily be sold to chemical units.

INDIVIDUAL UNITS: Space being limited, an individual unit too has been designed that can be set up for each house separately in 10' by 10' space. Not only that, as the bio-digester can be placed underground and there is no foul smell created at the inlet, the space above can be used easily for other activities as well. As seen from the bio-gas plant diagram, a single unit is given an inlet to the underground bio-energy mission model which is providing bio-gas as fuel and as a substitute for electricity for gas lamp. Such unit costs Rs 31,150. Similarly a single unit of Bio Energy Mission model which lights 4 CFLs and 1 fan as also provides fuel for cooking costs merely Rs 50,000. Self-reliance at low cost - amazing!



व्यक्तिगत इकाई

FUTURE: Our future would be bright if we can meet our energy needs through renewable resources. The bio-energy model is providing for cooking & lighting in rural households. The next step could be decentralized electricity generator



units at village level, and even towns at a later stage. Moreover, it is environmental friendly as it leads to reduction of methane released in the atmosphere. This helps in reduction of global warming and earns Carbon Credits for our country in accordance with 'Kyoto Protocol'. The benefits do not end here. Various by-products generated create numerous employment opportunities for rural masses at their doorstep on a sustainable basis.

Some Important Points Regarding Bio Gas

- (A) All type of bio-mass (Carbon : Nitrogen : 20-30) can be used in B.E.M.C. model.
- (B) Comparison of thermal efficiency of various means of fuels.

Type of fuel	Unit	Kcal	Use	Thermal efficiency	Effective het Generation (K.Cal.)
Bio-gas	Cubic meter	4713	Gas burner	60.0	2830
Kerosene	Litre	9122	Pressure store	50.0	4561
Fire-wood	Kg.	4706	Ordinary chulha	17.3	814
Upala (Dry dung)	Kg.	2092	Ordinary chulha	11.0	230
Coal	Kg.	6292	Ordinary chulha	28.0	1762
L.P.G.	Kg.	10882	Gas burner	60.0	6529
Furnace Oil	Litre	9040	Boiler	75.0	6781
Coal gas	Cubic Meter	4004	Gas burner	60.0	2402
Electricity	K.W.	860	Burner plate	70.0	602

(A)Use of Bio-gas in different means of heating & their results:

Means of Bio-gas use	Specifications	Bio-gas use (cubic meter/hr)
Cooking	Gas burner	
	• 2 Burners	0.33
	• 4 Burners	0.47
	• 6 burners	0.64
Gas lighting	100 Cd. Light	0.13
Refrigerator	Per cubic feet capacity	0.034
Incubator	Per cubic feet capacity	0.014-0.020
Gasoline	1 Litre	1.33-1.87
Diesel oil	1 Litre	1.50-2.07

(A) One cubic meter bio-gas may generate either of ;

- 60 watt. Lamp for 15 to 16 Hrs.
- Cooking facility for 5-6 person/family per day.
- 0.60-0.80 Kg. (by Weight) petrol equivalent energy.
- 1 H.P. electric motor may rum for 2 Hrs.
- 1.25 K.W. power generation.

(B) Best recommendable use of Bio-gas is heating.

Acknowledgment

On our part, from “Bio-Energy Mission Cell” I am thankful to the then Principal Secretary Planning & Secretary Planning under whose guidance the Cell could initiate the pilot project supported of by UNICEF in 2007-2008. I am also thankful to beneficiaries of the village Mishrawallia and MullahiKheda who successfully run this pilot project and the same has got the national level recognition. My special thanks goes to our present Principal Secretary Planning Sri Manjit singh, Secretary Planning Sri Rajneesh Gupta, Special Secretary Planning Sri S.K. Srivastava, Special Secretary Planning Mrs Himanshu Singh and Joint Secretary Planning Sri P.N.Singh under whose guidance our team has been able to move ahead with execution of this project. I shall be obliged throughout my life to Department of Panchayati Raj, U.P. and UNICEF for extending their missionary support to create the awareness of the project among the people through TSC (Total Sanitation Campaign) program.

I have to express my gratitude to mason Sri Om Prakash & Sri Rameshwar, young entrepreneurs Sri Vishwanath Toshiwal, Sri Surendra, Sri Ajit Kumar, Sri Vishnu Kumar, Sri Mahesh, Sri S.S. Bhatia & Sri Ravi Gupta for shaping our dream together with Dr. Girish Khare & Shri Ranjeet singh for his technical advice and Mr. Amit Mehrotra, Project officer (WASH) UNICEF whose continues corporation was always extended to us. Now, we have established various mode of use of Biogas use up to the extent that we may say **“Bio-gas is the source of future energy”**. I am also especially grateful to Mrs Arti Agrawal Environment Scientist without whose pain-staking efforts this document would have not taken on record.

At the last, I am thankful to the members of my team, Sri Jitendra Kumar Misra, Additional Statistical Officer , Sri Nirmal Chandra Yadav Field teacher, Sri Prabhakar Chandra Vishwakarma Assistant Statistical Officer, Mrs. Jyoti Chug, Stenographer, and Sri Jgarnath Ram who have worked hard for visualizing the dream.

Dated- 13/10/2011

Place- Lucknow



(P.S.OJHA)

State coordinator,

Bio-energy Mission cell,

Dept. of Planning, Govt. of U.P.

534, Vth floor, Yojna Bhawan, Lucknow

Ph : 0522-2215698, Fax : 0522-2236213

email : ps_ojha@yahoo.com

web site: <http://jetrophu.up.nic.in>



unite for children

यूनीसेफ — उत्तर प्रदेश
3/194, विशाल खण्ड, गोमती नगर,
लखनऊ — 226010
वेबसाइट: www.unicef.in
अक्टूबर, 2011