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POTENTIAL AVAILABLE FOR BIOGAS PRODUCTION IN ALANDI (D), PUNE, INDIA

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ABSTRACT

Vegetable market wastes, kitchen waste, marriage ceremony function, contribute to a great amount of pollution at Alandi(D),Pune; hence, there has been a strong need for appropriate all these waste management systems. These wastes that comprise of high fraction of putrescible organic matter cause serious environmental and health risks. We have calculated the amount of total waste produced and LPG cylinder generated and income from these wastes in area Alandi.

Keywords: Biogas, cattle waste, vegetable waste organic waste-estimation; income, benefits.

I. INTRODUCTION

Now a days there is more problem of human waste, vegetable waste, cattle dung, food waste in market yard in Alandi. The daily per capita per person and cow solid waste generated in our country ranges from about 300 gm to 500gm and 5kg respectively. If we carefully analyse these waste we will realize that majority of it is biodegradable. There are some waste glass, metals and paper which would be recyclable. There is large amount of wastes being produced in every household.Biogas is produced from anaerobic digestion of biological wastes such as cow dung, vegetable wastes, municipal solid waste, industrial wastewater, land fill, etc. the biogas is an environment friendly, clean, cheap and versatile fuel.

II. Characteristics Of The Biogas

The biogas is useful as a fuel substitute for cooking, agricultural residues, petrol, diesel, and generation of electricity depending on the nature of the task, and constraints. Biogas is 20 per cent lighter than that of air and has an ignition temperature in the range of 6200 C to 7300 C. It is colourless odourless and odourless gas that burns with clear blue flame is similar to that of liquefied petroleum gas. The amount of biogas produced from different types of cattle dung is different [3]. Also the amount of biogas produce from different vegetable waste is also different [5]. Its calorific value is 20 Mega Joules (MJ) /kg k and burns with 60 per cent efficiency in a conventional biogas stove. Biogas refers to a gas made from an anaerobic digestion of a agricultural and an animal waste. The gas is a mixture of methane (CH_4) 45-70 %, carbon dioxide 25-40 %; hydrogen 4-10 %, nitrogen 1-2 %, hydrogen sulphide , water vapour 0.3 %. [2]

A pH value between 6.8 and 7.8 has to be maintained for better fermentation of gas production .Biogas systems also provide a residue organic waste, after an anaerobic digestion that has a superior nutrient qualities over the

usual organic fertilizer, cow dung, as it is in the form of ammonia. Anaerobic digesters also acts as a waste degradable system, particularly for human excreta, and can therefore prevent potential sources of an environmental contamination and the spread of pathogen. The biogas technology is particularly valuable in an agricultural residual treatment of animal excreta and kitchen wastes.

III. COMPOSITION OF BIOGAS

Table 1: Composition of Biogas [4]

Component	Concentration (by volume)
Methane (CH_4)	45-70 %
Carbon dioxide (CO_2)	25-40 %
Water (H_2O)	2-7 %
Hydrogen sulphide (H_2S)	20-21,000 ppm (2.1%)
Ammonia (NH_3)	0-0.07 %
Nitrogen (N)	1-2 %
Oxygen (O_2)	0-2 %
Hydrogen (H)	4-10 %

IV. PROPERTIES OF BIOGAS

a. Change in volume as a function of temperature and pressure.
b. calorific value changes with change in temperature, pressure and water vapour content

V. FACTORS AFFECTING THE YIELD AND PRODUCTION OF BIOGAS

Many factors affecting the fermentation process of organic substances under anaerobic condition are,

1. The quantity and nature of organic matter. - If quantity of available waste increases then biogas production also increases.
2. The temperature – If temperature of available waste increases then biogas production also increases.
3. PH value of substrate –If PH value of available waste increases then biogas production also increases.

VI. DIFFERENT TYPES OF WASTE AVAILABLE IN ALANDI (D)

Table 2: Different Type's of Waste Available.

(Month)	Monthly Waste Dry And Wet (Tonnes)	Monthly Dry Waste (Tonnes)	Monthly Cow And Buffalos Dung (Tonnes)	Monthly Vegetable Waste (Tonnes)	Variable Waste (Tonnes)	Total Waste (2-3+4+5+6) Tonnes	Daily Waste (Tonnes)	Daily Biogas Product-ion (M^3)
Jan.	250	97.90	60	5.678	50	267.77	8.9256	446.28
Feb.	280	97.90	60	5.678	30	277.77	9.259	462.95
march	280	97.90	60	5.678	45	292.77	9.759	487.95
April	340	97.90	60	5.678	25	332.77	11.09	554.5
May	370	97.90	60	5.678	55	392.77	13.09	654.5
Jun.	220	97.90	60	5.678	13	200.77	6.6913	334.565
July	340	97.90	60	5.678	-	307.77	10.259	512.95
Ogu.	280	97.90	60	5.678	-	247.77	8.259	412.95
Supt.	310	97.90	60	5.678	-	277.77	9.259	462.95
Oct.	400	97.90	60	5.678	-	367.77	12.259	612.95
Nov.	310	97.90	60	5.678	10	387.77	9.59	479.5
Dec.	280	97.90	60	5.678	75	322.77	10.759	537.95

VII. LPG GAS PRODUCTION

Table 3:Availability of LPG Gas.

Sr.No.	(Month)	Daily Waste (Tonnes)	Daily Biogas Production (m^3)	LPG Gas Production (Daily) In Kg	Number Of LPG Cylinder
1	Jan.	8.9256	446.28	93.61	6.5
2	Feb.	9.259	462.95	97.11	6.7
3	March	9.759	487.95	102.35	7.058
4	April	11.09	554.5	116.31	8.022
5	May	13.09	654.5	137.29	9.47
6	Jun.	6.6913	334.565	70.18	4.84
7	July	10.259	512.95	107.59	7.42
8	Ogu.	8.259	412.95	86.62	5.974
9	Supt.	9.259	462.95	97.12	6.7
10	Oct.	12.259	612.95	128.57	8.87
11	Nov.	9.59	479.5	100.57	6.94
12	Dec.	10.759	537.95	112.84	7.8

LPG EQUIVALENT OF BIOGAS = (0.30*0.43*total waste) / 12.3

0.30— Because dry weight of cakes is 30% of the weight of dung used to prepare them, 0.43— Because 1 m3 of biogas=0.43 kg of LPG,

12.3— Because 1 m3 of biogas =12.3 kg of dung cakes. [1]

VIII. INCOME FROM BIOGAS

To get a more income from biogas plant if cow and buffaloes dung should be used to run a biogas plant. Firstly, the biogas produced is a fuel of appreciable calorific value is also produced depending on characteristics mention above. Secondly, the residual slurry and organic waste has a good manure of an appreciable nutritional value. It is worth mentioning that the quantity of a residual slurry is the same as that of the cow dung and organic waste fed in a biogas plant. While calculating the income from biogas plant, it has been assumed that only 80 percentage of the gas produced is available for cooking and 20 percentage is wasted due to unavoidable reasons. Here we also, the LPG equivalent of the biogas produced is calculated above for finding the income from biogas. Also we calculate number of cylinder produced in month. The possible income from biogas plant in academic year 2015-2016 is plotted below..

Table 4. Income From Biogas Plant

Sr.no.	(month)	Total waste (tonnes)	LPG gas production (daily) in kg	Number of LPG cylinder (In month)	Income from no. of cylinder produce in month (RS) (A)	Income from compost (RS) (for 1tonnes =1500rs) (B)	Total monthly Income from compost and LPG cylinder (RS) (A+B)
1	Jan.	267.77	93.61	130	78000	401655	479655
2	Feb.	277.77	97.11	201	120600	416655	537255
3	Mar.	292.77	102.35	212	127200	439155	566355
4	Apr.	332.77	116.31	240	144000	499155	643155
5	May	392.77	137.29	284	170400	589155	759555
6	Jun.	200.77	70.18	145	87000	301155	388155
7	July	307.77	107.59	222	133200	461655	594855
8	Ogu.	247.77	86.62	179	107400	371655	479055
9	Sept.	277.77	97.12	200	120000	416655	536655
10	Oct.	367.77	128.57	266	159600	551655	711255
11	Nov.	387.77	100.57	208	124800	581655	706455
12	Dec.	322.77	112.84	234	140400	484155	624555
Total =		**3,676.4**	**1250.16**	**2,321**	**15,12,600**	**55,14,360**	**70,26,960 Rs**

From Table No - 4 :We have calculated that the total income from plant is 70,26,960 Rs.(seventy lakh twenty thousand nine hundred and sixty Rs. only)

IX. RESULTS AND DISCUSSION

9.1 .Different Types of Waste Available in ALANDI (D):

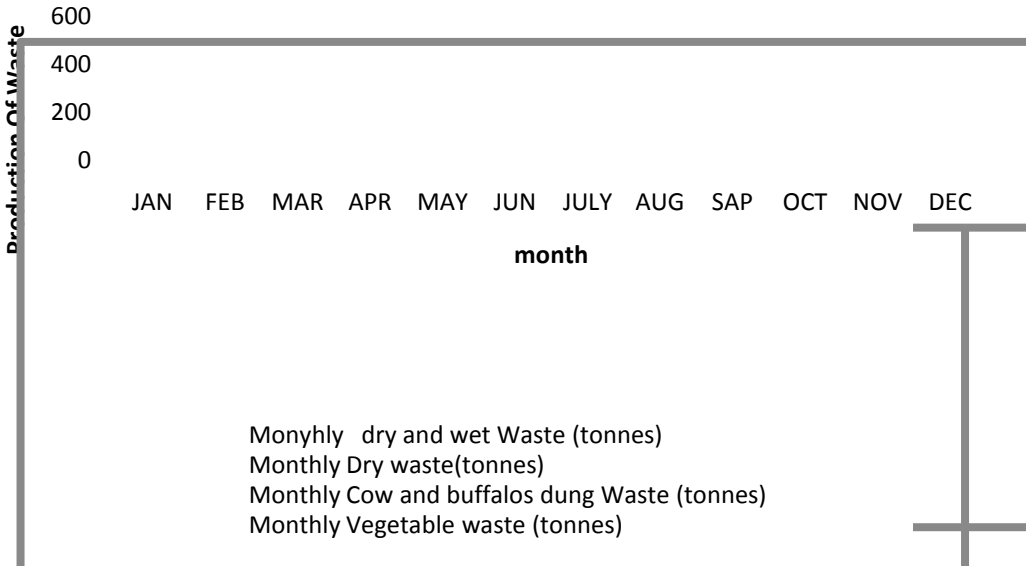

Fig 1 : Different Types Of Waste (From Table no:2)

9.2. Daily Biogas Production In Month

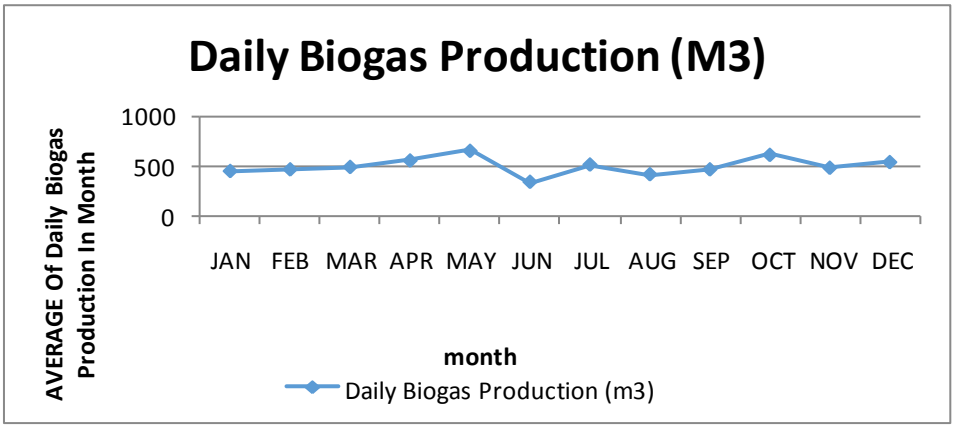

Fig 2: Daily Biogas Production (From Table No: 2)

From the above fig 1 and fig 2. It is clear that the waste available is varying with the month because of marriage function, kartiki and ashadhiyatra.

9.3. Lpg Gas Production

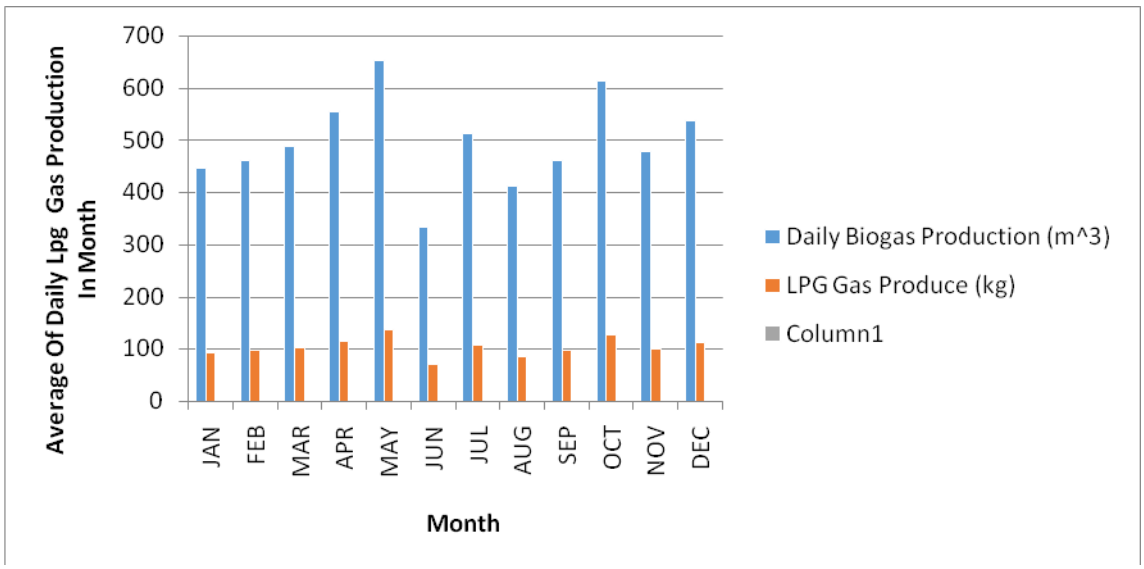

Fig 3: Availability Of Daily LPG Gas In Month (From Table No: 3)

LPG EQUEVAALENT OF BIOGAS = (0.30*0.43*total waste) / 12.3

0.30— Because dry weight of cakes is 30% of the weight of dung used to prepare them,

0.43— Because 1 m^3 of biogas=0.43 kg of LPG,

12.3— Because 1 m^3 of biogas =12.3 kg of dung cakes. [1]

9.4. Number Of Cylinder Produce

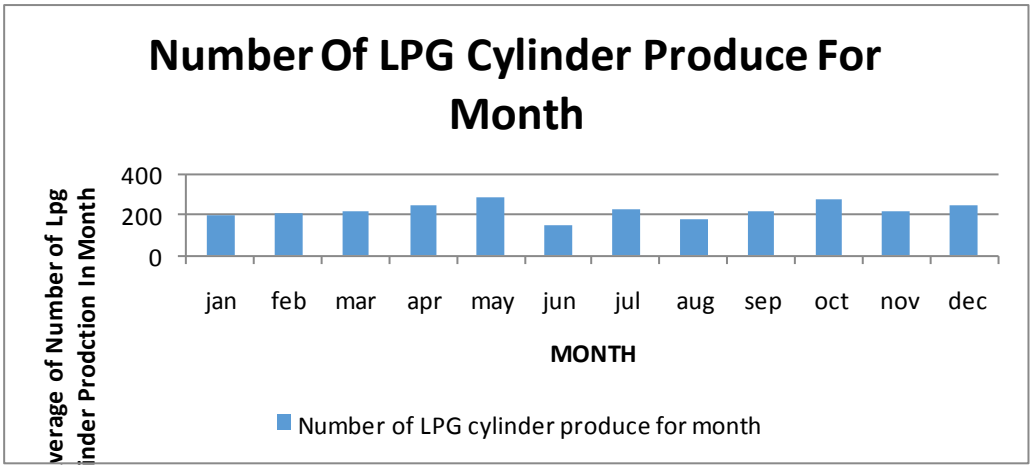

Fig 4: Production of Cylinder (Month) (From Table No: 3)

From above fig 3 and 4. The waste available is more in month may so, more biogas cylinder is available

9.5. Income From Biogas Plant:

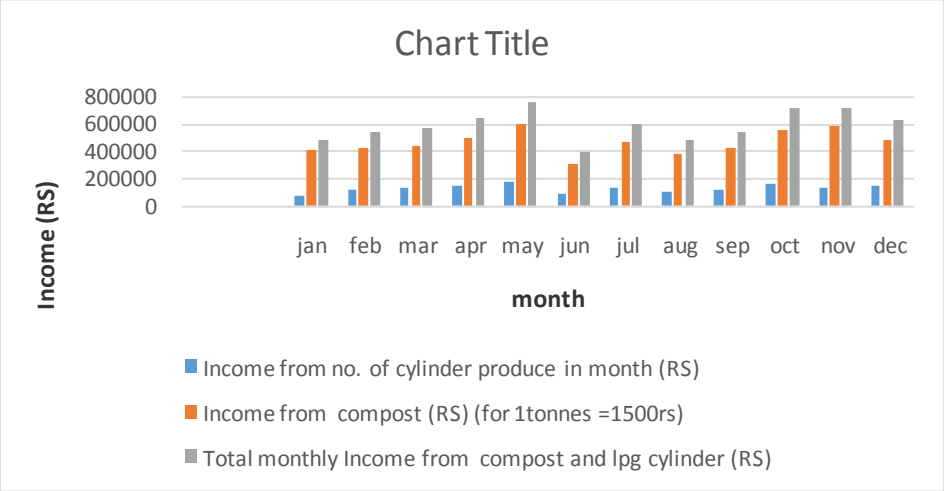

Fig 5: Income from biogas plant (from Table no: 4)

From fig 5. Income come month may is about 759555 RS. Is so high; hence there is more scope for biogas production in that month.

X. PROJECT COST

Total cost of the biogas plant having capacity of 900 m^3 as per scope of supply is Rs**. 1, 33, 00,000/-** (Rs. One Hundred Thirty three Lakh only)

XI. BENEFITS OF BIOGAS PLANT

1. The better use of organic waste is possible.
2. The improvement of general conditions of farmers due to the local availability of organic compost.
3. It also helps to prevent deaths of women and children in rural households due to air pollution caused by smoke and soot from burning fuel-wood in traditional Chula's.
4. Decrease in smell and scavenger rodents and birds.

XII. CONCLUSION

1. We conclude that potential available for production of biogas from ALANDI (D) is sufficient.
2. Also the number of LPG cylinder produce is 2321 in year also sufficient and income Frome cylinder production is 1512600Rs. also high.
3. Yearly total income from plant is 7026960 Rs. is good.
4. The pay back return from plant is in possible in 18 month only.

REFERENCES

[1] .K. Jatinder Singh and Sarbjit Singh Sooch,Comparative study of economics of different models of family size biogas plants for state of Punjab, India, ELSEVIER,Received 7 June 2003; accepted 12 September 2003

[2] . Prof. Eng. Joaquin Perez Diaz (PhD),MulalliraBwanikaand VianneyTumwesige, Biogas production from kitchen waste / refuse,

[3] .Anjan K. Kalia and S. P. Singh, Horse dung as partial substitute for cattle dung for oerating family size biogas plant in hilly region , ELSEVIER, Received 4 June 1997; revised version received 29 August 1997; accepted 29 August 1997

[4] .S.S. Kapdi, V.K. Vijay, S.K. Rajesh, RajendraPrasad,Biogas scrubbing, compression and storage: perspective and prospectus in Indian context, ELSEVIER,Received 8 May 2003; accepted 23 September 2004 Available online 19 November 2004.

[5] .TanusriMandalAnd N. K. Mandal, comparative study of biogas production from different wastematerial ,PERGAMON, (Receiced 24 October 1995)