Business Model for Production & Distribution of Biogas

A PROJECT REPORT

Submitted by

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Introduction

It is the 21st century and energy resources as well as energy generation are one of the major issues faced by us humans. As we have developed since the prehistoric area, utilization of resources has been the most important aspect of survival for humanity and we have successfully thrived since then.

- Generation of biogas is not something new but converting it into a business idea by supplying the bio-gas to industries producing electricity from it, is what we aim to do.
- This is not only a renewable and an environmentally efficient way of producing electricity, but it also would cost less as its abundance cannot be justified.
- It is almost UNLIMITED!
- We aim to start a supply chain of biogas by producing it through efficient methods and waste collection techniques and to make it in a successful environment efficient business cycle.

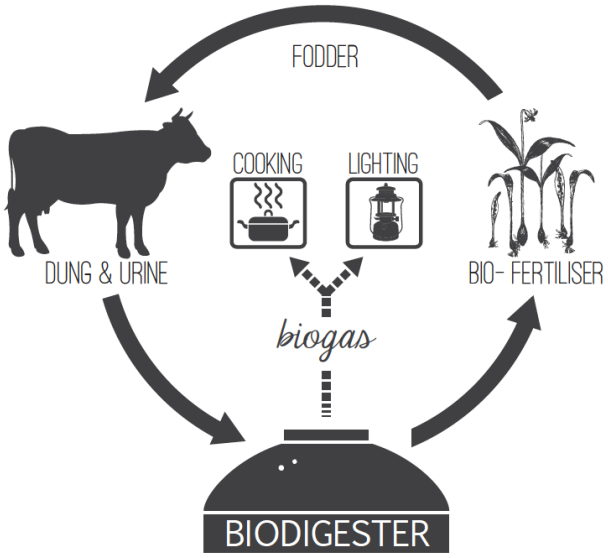
Goals and Motivation

- It is the 21st century and energy resources as well as energy generation are one of the major issues faced by us humans.
- Industrial revolution and modern lifestyle have made us dependent on energy resources for survival.
- We need energy in various forms in order to survive. Energy through food consumption is one of them. Also, we need electricity in order for our gadgets to work.
- As both of them rely on the basic concept of energy to function, we have decided to generate energy from organic waste in the form of biogas to be supplied to thermal-bio plants in order to generate electricity and to use it as fuel for households

About The Product

What is Biogas?

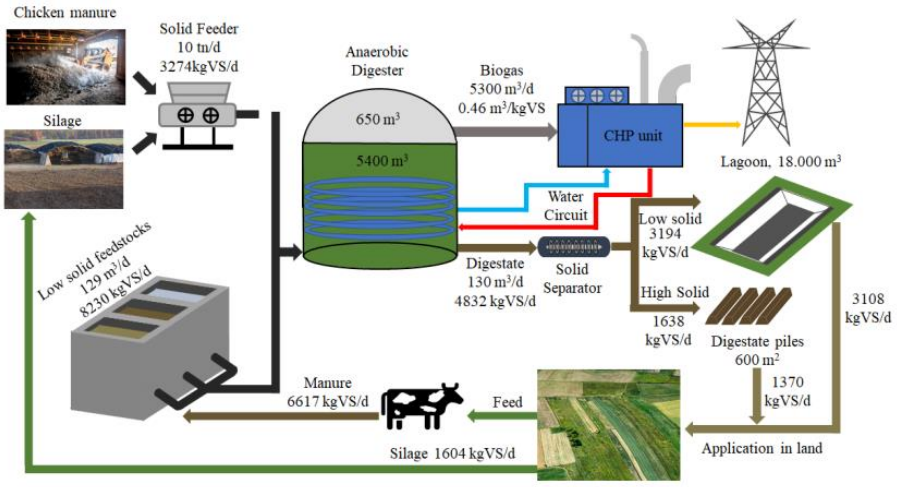
Biogas is a form of energy that is renewable and sustainable .It's manufactured when organic matter, like food or animal manure, plant material, and other wastes like night-soil, poultry litter and agricultural wastes are decomposed by microorganisms without a trace of oxygen, in a cycle called anaerobic absorption. It can be found in villages or can be manufactured in industries which is later used as fuel.



Components of Biogas Plants

- **Mixing tank** - First the wastes are put into the mixing tank. Then a sufficient amount of water is added into it and the wastes are properly mixed until a homogeneous slurry is formed.
- **Inlet pipe** - The slurry that's formed is sent into the anaerobic digester via the inlet pipe.
- **Anaerobic Digester** - The material is then fermented inside the digester and biogas is manufactured through bacterial action in the lack of oxygen.
- **Gas storage tank** - The biogas produced is sent into the gas tank, that stores the gas till the time of use.
- **Outlet pipe** - The digestate is further discharged into the outlet tank either through the outlet pipe or the opening that's provided in the digester.

- **Gas pipeline** - The gas produced is carried to the connection points like vehicles, stoves or lamps via gas pipeline.



Background Work

While India is riddled with issues such as waste management, an inadequate investment in renewable resources and an enormous demand for continuous electricity fueled by an ever growing population, our team is planning to address the above mentioned problems by creating a commercial and technical platform for everything related to biogas, from residual waste collection to the valuation of biogas and digestate.

Biogas also solves the problem that has troubled India since ages and is able to put the enormous organic wastes into good use.

Our startup aims to serve the society and solve major problems (waste management and energy scarcity) for the community and at the same time develop a stable infrastructure needed to sustain the same.

We aim to offset the equivalent of GHG emissions from a car i.e. 4.6 metric tons of CO2.

We aim to reach the apogee of efficiency by generating more than 0.2 cubic meter of biogas for every 1 kg of organic household waste in a margin of 2 years and create a circular economy in the long run aimed at minimizing waste and making the most of resources.

Targeted Sources For Raw Material

- Food Industries
- Agro Industries
- Household waste collection Organizations
- Major Food waste superstores
- Municipalities

Target Audience

The major factors that have been considered for the start up are :

1. Our target audience can be formulated using the following mindset : A majority of the raw materials needed to produce biogas are found in regions (like rural agriculture-based communities) which in turn lack the resources needed to satisfy the demand of electricity.
2. Biogas also solves the problem that has troubled India since ages and is able to put the enormous organic wastes into good use.
3. Our startup aims to serve the society and solve major problems (waste management and energy scarcity) for the community and at the same time develop a stable infrastructure needed to sustain the same.

About the Company

Company Name

The name of our company is Bio-Best.

Bio here indicates Biogas. Bio here also symbolizes the use of Biodegradable waste products that are used to create the biogas.

Why Best?

Best has been added to our company name because we feel that Biogas is the best remedy to tackle the over-use of non-renewable fuels.

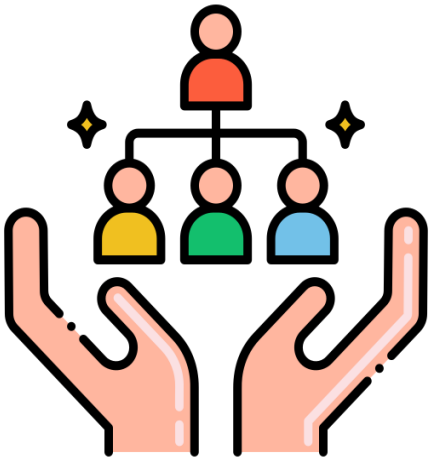
Company Logo

- The logo maintains a green primary color indicative of the green nature of the fuel
- The logo represents a biogas digester which is one of the key component of a biogas plant
- The background is maintained black to denote that our product shall bring light to the dark homes which lack energy supplies.

This is the logo we came up with based on the above details

Organization Structure

- A number of people will be hired to collect organic waste from homes and neighborhood household remains which will be collected for the biogas production plant.
- Another team hired to work at the plant will be utilizing the organic waste to make biogas which takes a period of three days normally.
- This biogas will be distributed to the industries in need of the biogas and manure/compost produced as a by-product can further be transferred to fertilizer plants (thermal biogas plants).



Possible Business Locations

The main factors affecting the location of a business are:

1. Market
2. Raw Material
3. Transport Cost
4. Land
5. Labor
6. Waste disposal

Based on the factors we have decided that our center has to be situated somewhere in a Village near to a city.

- Reason for choosing it in a village is that livestock dung from the villages is one of the most important raw materials for our plant.
- Reason for choosing it near a city is that garbage and organic waste will be collected from the city.
- The waste from our plant is not a problem as it will be just manure which the farmers in the village can also use.

- Uttar Pradesh (UP) has recorded the highest livestock population in 2019-20 followed by Rajasthan, MP, West Bengal, Bihar, Andhra Pradesh, which are the most suitable places for our plant.

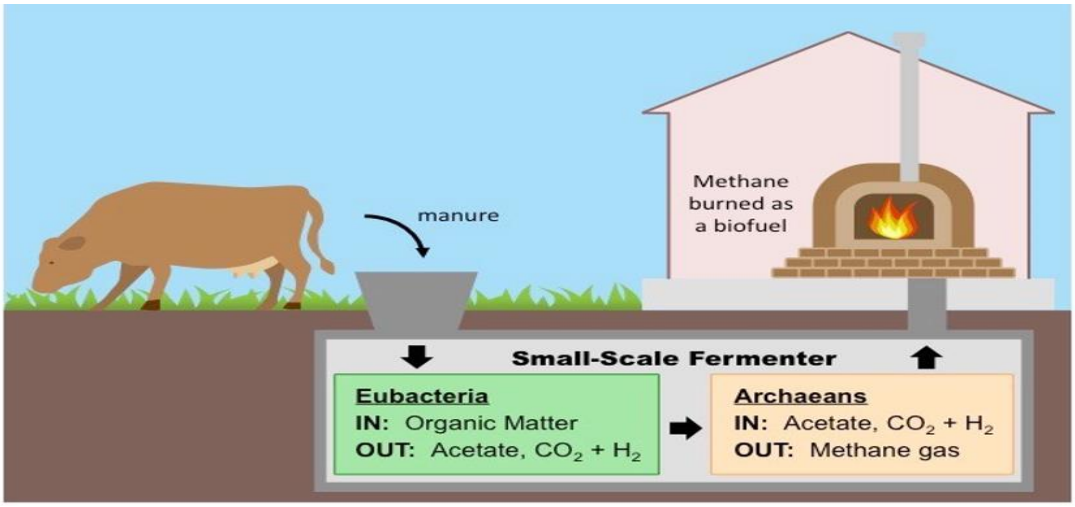
Services

Typical composition of biogas

Compound	Molecular formula	Percentage
Methane	CH_4	50–75
Carbon dioxide	CO_2	25–50
Nitrogen	N_2	0–10
Hydrogen	H_2	0–1
Hydrogen sulfide	H_2S	0–3
Oxygen	O_2	0–0

Biogas is a combination of the following above gases:

It mainly comprises of hydrocarbon which is combustible and can produce heat and energy when burnt. Biogas is produced through a Bio-chemical process in which certain types of bacteria convert the biological wastes into useful Biogas. Since the useful gas originates from biological process, it has been termed as bio-gas. Methane gas is the main constituent of biogas.

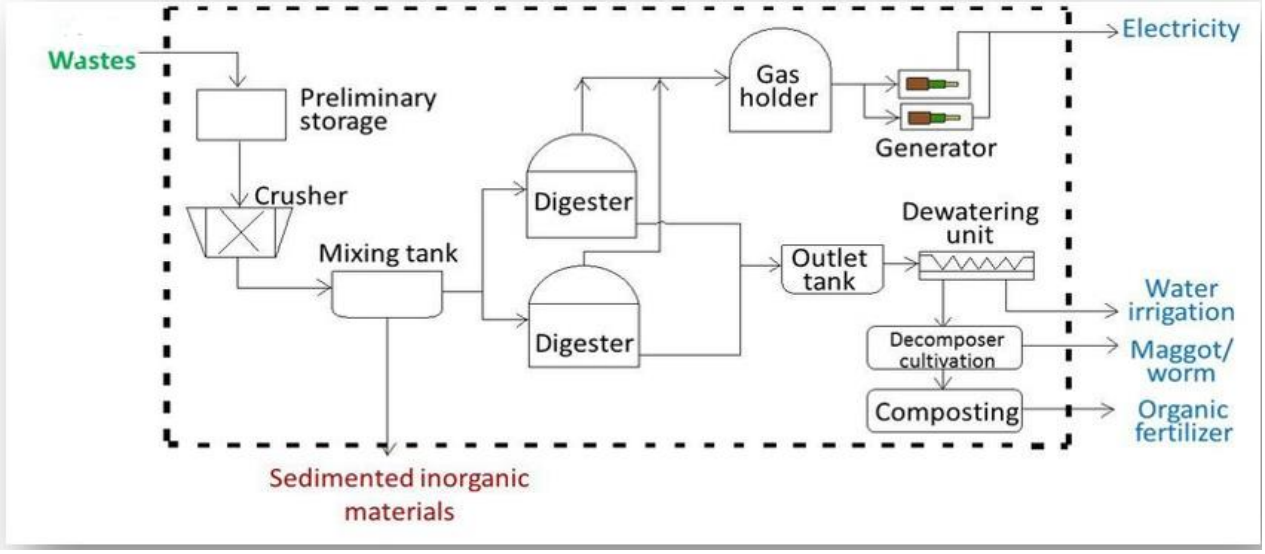


A simple schematic of production of biogas

The process of Biogas production is anaerobic in nature and takes place in two stages. The two stages have been termed as acid formation stage and methane formation stage. In the acid

formation stage, the biodegradable complex organic compounds present in the waste materials are acted upon by a group of acid forming bacteria present in the dung. Since the organic acids are the main products in this stage, it is known as acid forming stage. In the second stage, groups of methanogenic bacteria act upon the organic acids to produce methane gas.

Flowchart of the Powerplant



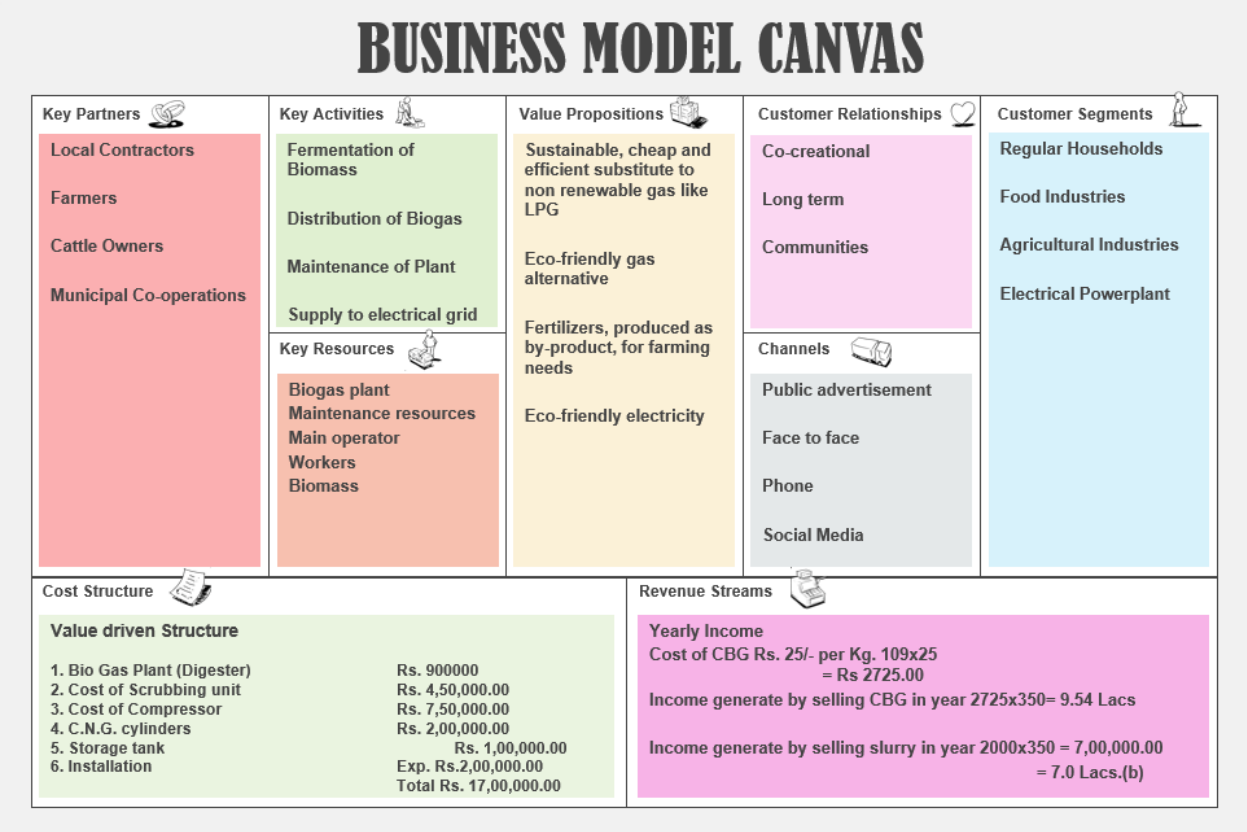
How will Biogas be supplied?

The prepared biogas will be collected and filled in **pressurized cylinders** and transported through trucks and trolley to various bio power plants like the one in Namakkal district of Tamil Nadu.

Material for cylinder = Cast iron
Stroke length = 100mm
Pressure range = 3 to 4 bar
Temp. Range = 0 to 800 C
Media = Biogas
Internal diameter of cylinder = 35mm
Ultimate tensile stress = 2500 kgf/cm2
Assuming factor of safety = 4

In the future, it can be decided to prepare a pipeline distribution system if procured location meets the requirements of a budget suitable to distribute pipeline.

Business Model Canvas



Startup Models

- Market place
- Sponsorship
- Franchise
- Re seller
- White labeling
- Disintermediation
- Subscription
- Pre order
- Paper use
- Bait and hook

Subscription Model

The membership model is a well known business model that includes an organization selling a product by means of a membership instead of a one-time product.. This plan of action is being utilized by a large number of organizations to acquire stable incomes that are recurrent.

In our Biobest startup, customers will register themselves with us and pay a monthly subscription fee.

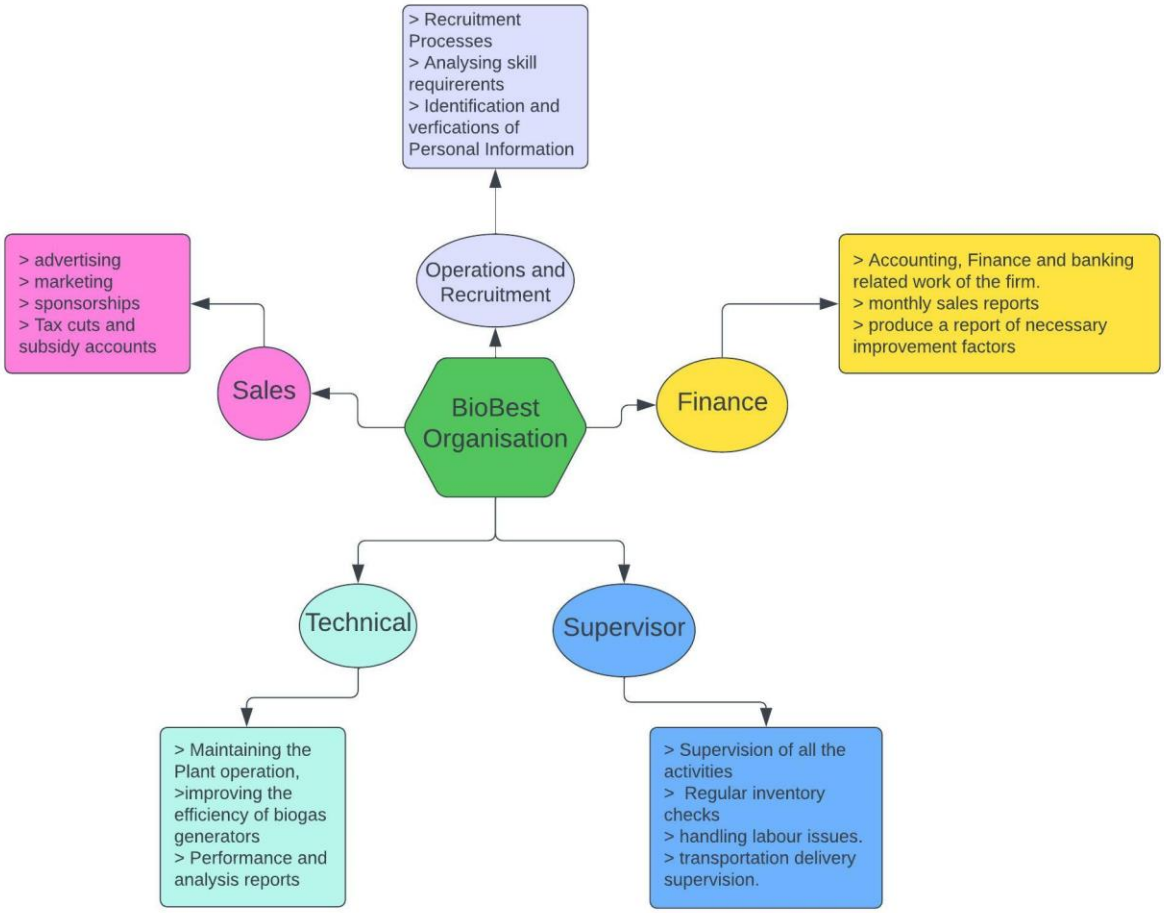
Operating Plan

We have an overview of the activities related to day-to-day operations of our business: producing the Biogas and transporting to customers, and managing personnel to achieve the company's objectives. Important elements to consider are:

1) Business premises situation, major fixtures and equipment our business requires e.g. technical equipment for operation of a biogas plant: Line for the collection and treatment of expired foodstuff, food leftovers, kitchen waste; Weighing tanks, Solid input system for solid manure or renewable raw materials (silage); Cylindrical digesters etc.
2) Main suppliers/vendors, sub-contractors and terms of payment
3) Terms of conditions of sale, mechanism for sales and service, credit policy for customers, reductions
4) Stock control procedure, quality assessment and quality control

Main Activities of Our Organization

- Biogas production
- Transportation of biogas
- manage personnel



Important Considerations

- Maintenance and checks of the facility , Input Systems checks, Production check and waste treatment check
- Main Suppliers and Vendors
- Quality assessments and controls
- Payment and Contract policies

Management and Employees

Management

Apart from the supervisor taking care of the startup as a whole, in order to ensure the smooth functioning and proper management of our company we have the following facilities and (or) guidelines laid out:

- **Working hours** – Will be from 9-5 for all employees except the garbage collectors. For the garbage collectors, the working hours will be from 8-1.
- **Safety equipment** – Such as first aid box will be available at all time. Also, we will put up a board that will contain all the emergency helpline numbers in case of any emergency.
- **Late night Shifts** – In case of late-night shifts, especially for female employees, we will provide a shuttle service from office to their home.
- **Insurance for employees** – Medical insurance of some minimal amount will be provided to all employees of our firm.

Employees

- **Garbage collectors** – For collecting the bio-degradable or wet waste from residential areas, apartment complexes, restaurants and even college messes. Approximately ten garbage collectors will be hired initially.
- **Technical heads** - Technicians who are familiar with biogas plant and producing biogas from these plants, will be hired.
- **Sales heads** – Employees will be hired for the sale of the fertilizer produced as a byproduct of the biogas plant and especially the sale of biogas as fuel for major electricity providing companies.

- **Finance head** – We will be dealing with the profit-loss ratio of our startup alongside keeping a strict account of transactions to/from our budget. He is also responsible for giving all the employees their salary on time and on the stipulated date.
- **Supervisor** –He is responsible to ensure the smooth functioning of our entire startup, that is, managing everything- making sure all the employees are doing their assigned work diligently. He is also responsible to ensure a safe and efficient work environment.
- **Activities** – To build or rejuvenate morale among employees (except for the garbage collectors), we will host fun activities or a field trip once

in six months. This will also help in building team spirit and trust among the employees thus resulting in more efficient work from them.

- **Accountability** – To ensure accountability, either the supervisor or an external supervisor will go on surprise checks to ensure no slacking during work hours.

- **Biometric & ID card** – All employees (except garbage collectors) are asked to give biometric attendance once they enter the office premises in order to have a full-proof account of the presence of the person during work hours. Garbage collectors are required to give their biometric attendance once they collect the garbage and bring it to the firm from their respective sources. This indirectly ensures efficient work and security of all the employees as we can track the coming and goings of each and every employee.

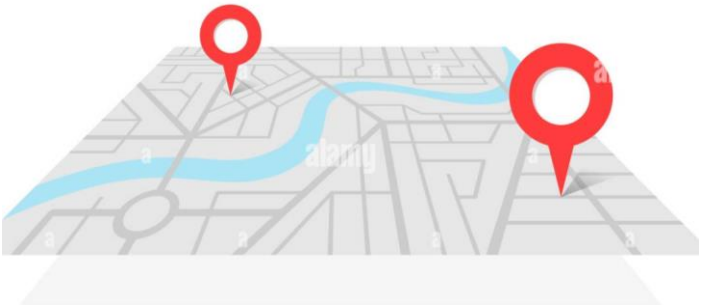
Marketing Strategy

Advertising

Using headlines that grabs the attention of users

Campaigning

Going from village to village and explaining the product



Digital Marketing

Using one-click ads on websites and inbound links on websites

Viral Marketing

A good quality TV commercial, creating merchandise, partnerships with other brands and organizations

Affiliating the organization with government Initiatives

Recently, Indian government is planning to setup 5000 biogas plants which will definitely have to produce biogas in order to generate electricity. With our initiative, we can sell our product not just to private companies but at lower rates to government initiative thereby creating a positive impact on society as well as Indian motto of "Swaccha Bharat Safal Bharat". Creating such an impact also makes our startup initiative unique and it will tend to attract other customers also which is another beneficial aspect of govt. Affiliation.

Targeting schools and teenage audiences.

One important thing that we learn in schools is moral education and schools teach children to be better people in life and to protect and nurture the environment.

Thus, targeting schools and children studying in these schools would be the best way to reach out to people. Distributing pamphlets and taking up environment conservation classes to make these children aware of our initiative who will further propagate the information to their parents is what we foresee through this aspect of customer targeting.

Creating awareness

General public doesn't know why waste must be managed. They all live their life but don't care about the environment. Generic plays, road shows, flash mobs will be a medium of communication to the public. This is because when something is seen "LIVE " it always "LIVES" in your heart.

Make yourself towards the public

To provide full access to ourselves towards the public so that complaints, feedback and other important messages can be acted upon soon using all social media handles like Whatsapp, Facebook, Twitter , Instagram etc...\

Being Transparent to the public

Making ourselves open to the public and letting them know how we work. This is the easy way of gaining sympathy and faith at the same time. This would seem pointless at the beginning but you surely see the result in your coming future.

Feasibility Study

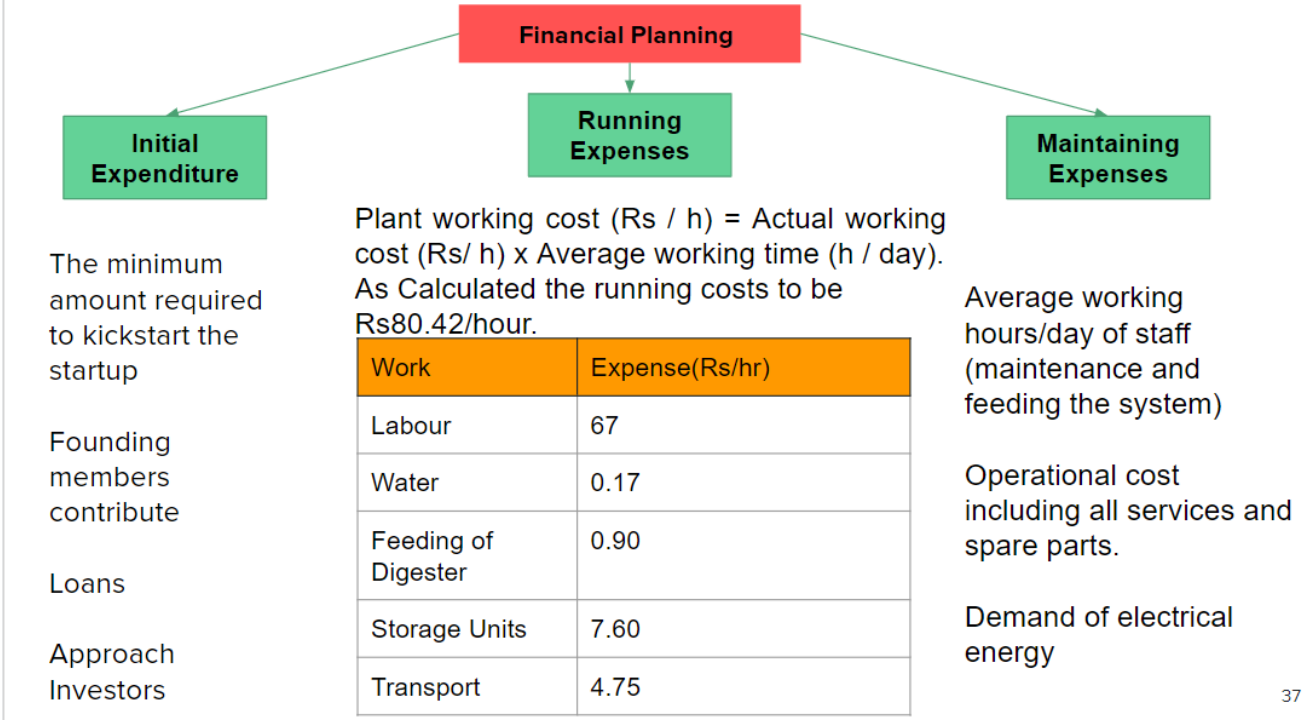
Feasibility analysis for a biogas plant of 300 M3 per day capacity with biogas enrichment and bottling plant has been shown below.

Dung requirement - For 300 q.m.

Biogas Plant = 6000 Kgs.

Assuming cost of Dung = 0.20 Rs/kg.

Cost of Dung for Biogas plant = 1200 Rs. per day.



Capital Cost

1. Bio Gas Plant (Digester)	Rs. 3000/- per cubic meter capacity, for 300 cubic meter capacity Rs. 9,00,000.00
2. Cost of Scrubbing unit	Rs. 4,50,000.00
3. Cost of Compressor	Rs. 7,50,000.00
4. C.N.G. cylinders	Rs. 2,00,000.00
5. Storage tank	Rs. 1,00,000.00
6. Installation Exp.	Rs. 2,00,000.00
Total	**Rs. 17,00,000.00**

Operation Cost

A. Fixed operational cost

1. Interest on capital @ 10% per annum = 0.1x 14,00,000
= Rs. 1,40,000 per annum
2. Depreciation @ 5% per annum = 0.05x 42,50,000= Rs.70,000 per annum.
Total cost = Rs 2,10,000 per annum

B. Annual Running (Operational) Cost:

1. Dung cost 1200x350 = Rs. 4,20,000 P.A.
2. Labors Cost (1 skilled and 2 unskilled labors) 300x 350 = Rs. 1,05,000 P.A.
3. Electricity cost (10 Kwhx12 Hrs) 360x350 @3/- unit = Rs. 1,26,000 P.A.
4. Repair and Maintenance@ 2% capital cost on 14,00000 = Rs. 28,000 P.A.
Total cost = 6,79,000 per annum

Sum of Fixed Operation cost and annual running cost: =6,79,000+2,10,000

Total cost of Operation = Rs. 8,89,000.00 /-

Income

Total production of BioGas per day is 300x80%(capacity utilized)= 240 m3 .
In Bio Gas there is 60% pure methane gas so we can say 240x60% = 144 m3 methane.
In terms of CNG Cylinder we get total 144 m3 x 76% = 109 Kg.
Each Cylinder has 12 kgs. = 9 Cylinder.
Cost of CBG Rs. 25/- per Kg. 109x25 = Rs 2725.00

Therefore income generate by selling CBG in year 2725x350 = 9,53,750.00
= 9.54 Lacs.(a)
Total production of digested slurry @33% of daily feed = 2000 Kgs.
Yearly production of digested slurry 2000x350 = 700 Tons
Cost of slurry @1/- kgs. X 2000 kgs. Per day = 2000 Rs.
Therefore, income generate by selling slurry in year 2000x350 = 7,00,000.00
= 7.0 Lacs.(b)
Total income from Biogas Bottling plant and Slurry = (a+b)
Rs. 16,54,000.00 (Yearly)

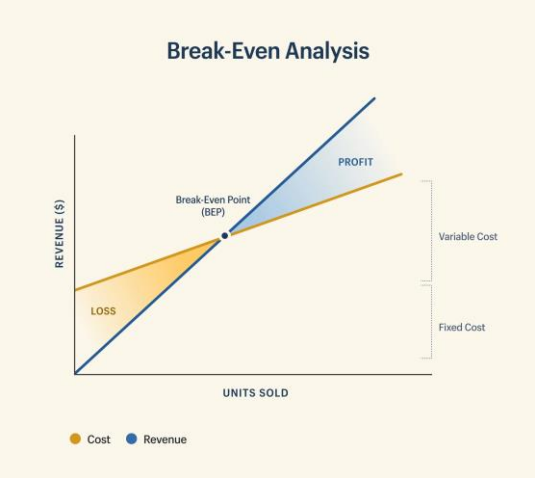
Break Even Analysis

Fixed Costs : Land, Rent on factory, etc.

Variable Costs : Wages and salaries, equipment, transportation and distribution, etc.

Break Even Point is the point where the profit and loss are equal hence the total output of the sales with respect to cost price is zero.

$$\text{Break Even Point in Units} = \frac{\text{Fixed Costs}}{\text{Sales Price per Unit - Variable Cost per Unit}}$$



Strategy to Attract Target Customers

- Commercial Hoardings and Social Handle/ Outreach through Mass Media.
- Creating offers to attract large masses of customers and providing a long term subscription based model.
- Targeting schools and teenage audiences in order to make them aware of our business model which is a great boon to renewable energy as well as environmental benefactor.
- Targeting industrial and Government initiatives like Swachh Bharat.
- Stamping Logos across many small goods like public dustbins , carry bags , garbage trucks, walls along slum areas etc to create awareness.
- Usage of youtube or other OTT platforms like Hotstar to gather big investors and customers.

Competitors

- Regarding our competition, we don't have much competition in our sector except for some industries like the IBA, Vijaya Industries, Xergi industries, Burhani Industries etc.
- Among them IBA and Vijaya corp. focus on generating energy from the biogas thereby making it a huge process for them to handle including the fact that major part of their output depends on the input obtained in the form of biogas from bio-digesters.
- This can primarily be taken to our advantage so that we may be able to supply biogas to these industries and hatch a deal which may profit both the parties in terms of monetary as well as business factor gains.
- Making competitors your business partners by focusing on their weak aspects i.e. generation of ample biogas in order to maintain plant monthly energy units' productions. This way everyone would be benefitted.

Industrial Estate Formation

- **Separate plots and sheds:** The entire land area allocated to the estate is divided into different plots and sheds.
- **Cluster:** An industrial estate is a planned cluster of units because more industries and more government is willing to invest money in road infrastructure. areas due to labor, accessibility of roads and organic waste from villages.
- **Regional development:** Industrial estates promote regional development. They have been instrumental in developing backward areas in the country. They provide employment opportunities to many of the unemployed youth in the regions in which they are located.

- **Common infrastructure:** Infrastructure such as roads, electricity, water ,telecommunications, postal facilities, banks etc. are provided in the industrial estate. All enterprises located in the industrial estate can access the infrastructural facilities located in the area.
- **Developed in all areas:** Industrial estates can be developed in all areas such as urban, suburban and rural areas. They can be developed in developed as well as in underdeveloped areas. But are major priority should be suburban

Future Goals

A business expands depending upon the initial response of the general audience on it. Suitable measures must be taken in order to expand a business. Strategies to expand a biobest business are as following:

- Adding new products and services
- Selling more products to the existing customers
- Targeting new customer Market
- Finding new territories
- Government Support