Sa-Dhan
Fostering Inclusive Impact Finance

Standard Operating Procedure for Biodigesters

Standard Operating Procedure for Biodigesters

Prepared by Sattva Consulting

Table of Contents

6. Loan Product Design

6.1. Components of the loan product

- Overview of the loan products
- Segment customers based on the loan product and loan cycle, categorize loans as individual loans or Joint Liability Groups (JLGs)
- Describe components of loan product, including the loan amount, interest rate, loan tenure, repayment schedule

7. Implementation

7.1. Needs Assessment and customer mobilization

- Outline marketing and outreach strategies to increase adoption, including awareness-building sessions, product demos and training sessions to encourage clients to apply

7.2. Loan application and approval processes

- Design a loan application process that is user-friendly, quick and easy for clients
- Describe steps to process the loan application and streamline the approval process

7.3. Disbursement and post-sales support

- Describe steps to disburse the loan as well as best practices for post-disbursal repayment collection process, including regular loan monitoring, follow-ups, and technical assistance for the product

8. Risk Management

8.1. Risk Identification and Mitigation

- Describe steps to develop a risk mitigation strategy across all operations and processes

9. Annexure

9.1. Technical details and specifications of product
9.2. Carbon Credits Financing
9.3. Landscape of other vendors

1. Introduction

1.1. Purpose of the SOP

This document is a Standard Operating Procedure (SOP) designed to provide a step-by-step guide for Micro Finance Institutions (MFIs) to design and offer a loan product for biodigester customers.

For MFIs

- This document provides a clear understanding of the biodigester and its expected benefits to end consumers
- This document serves as a toolkit for MFIs to:
    - Check if their organization is operationally capable and ready to take the product to market
    - Create an accompanying appropriate loan product, and its appropriate repayments
    - Select appropriate vendors who they can work with to ensure the product
    - Take the biodigester loan product to its customer base and enable last mile sales
    - Work with vendors to provide appropriate product demos, product sales, product training, and after-sales support

For Sa-Dhan

- Identify the right MFIs who could take this product to market

The document is divided into section 2-9.

- Section 2 provides an executive summary of the entire SOP
- Section 3 provides an overview of the biodigester product
- Section 4 provides a framework for MFIs to assess the feasibility of offering the loan product and subsequent capabilities required to offer the loan
- Sections 5-9 provide detailed information on criteria, indicators and partnerships needed for the loan product to be successful

2. Executive Summary

Product Overview
A biodigester is a system that breaks down animal waste to produce biogas and bio-fertilizer, providing an environmentally-friendly way of generating renewable energy. Animal dung is fed into a feeding tub as input along with water which gets collected in the reactor. The reactor converts the slurry to biogas which is directly connected to a cooking stove through a gas pipeline, whereas the biofertilizer gets collected in a tank in liquid form.

Ideal Consumer
A farmer household with 3-4 cattle in Central, West and South India is the ideal consumer for biodigesters. Consumer demographics are mainly dependent on the number of cattle as it determines the quantity of dung produced by the household. This is important because the amount of biogas produced by the biodigester increases based on the quantity of dung.

Product Benefit
Biodigesters help in income generation and cost savings for the farmer household. Monthly, an LPG gas cylinder costs around INR 1,000 and chemical fertilizers cost INR 1,000 per acre. Both these expenses can be eliminated through biogas and biofertilizer. The usage of stored dung also leads to other benefits like waste management, carbon sequestration, reduced deforestation and pollution. Biodigesters are extremely useful for mitigating climate change and contribute to several Sustainable Development Goals (SDGs).

Product Installation
The biodigester is delivered to the home of the farmer household, followed by a site visit by the product personnel to help with the land markings for the installation. The biodigester involves a quick free installation process of simply placing the prefabricated bio-reactor into a pit dug close to the kitchen and farmland. The gas pipeline connection is set up and connected to a cooking stove in the kitchen. The entire installation usually takes around 1/2 a day.

Product Pricing
The pricing for biodigesters varies according to the type and capacity of the unit, ranging from INR 30,000 - 80,000. The biodigester is also eligible for a Government subsidy which varies based on the capacity.
For the ideal consumer demographic of a farmer household with 3-4 cows, the price of the biodigester product (2 m3 of biogas per day) is around INR 35,000 - 45,000 with a Government subsidy of around ~ INR 13,000 - 15,000.

MFI Readiness
The MFI readiness framework is important to gauge an MFI's ability to offer a loan product for biodigesters. This framework assesses and analyzes an MFI's capabilities on the following parameters:

1. Availability of the vendors in the region of operation of the MFI
2. Demand for the product
3. Operational capability of the MFI

MFI needs to evaluate all three parameters. Only when all three parameters are satisfied, an MFI is deemed ready to offer the loan product.

Vendor Partnerships

MFIs must select biodigester vendors based on relevant criteria such as geographical areas of expertise, years of experience, product quality and capacity, ability to train MFI staff and clients, competitive price point, sales and marketing capabilities, product lifecycle support, etc.

The roles and responsibilities of the vendor must be clarified across all stages and an implementation strategy must be co-created before taking the product to market.

Implementation

After the loan product has been designed, MFIs can follow a 3-stage process for the implementation. The first stage involves needs assessment and customer mobilization, which includes identifying villages eligible for biodigester loans, door-to-door village surveys and mobilizing customers to build product awareness through demos.

The second stage is the loan application and approval process, which involves interacting with interested customers, conducting training sessions (CGT/GRT) to create an understanding of the product and the overall process, filling out the loan application form, background verification and collecting documents.

The third stage is the disbursement and post-sales support process, which involves customers visiting the MFI branch office, disbursal of loans, loan utilization checks, repayment through field officials and post-sales support through the vendor.

Risk Management

Risk management in the context of MFIs involves identifying, evaluating, and controlling potential risks that could impact loan sales. At every stage of the loan product life cycle, MFIs should identify and control risks. The table in the risk management section highlights some of the mitigation strategies that MFIs can adopt.

3. Product Details

This section provides detailed information on the biodigester product and its features. MFIs can use this section to understand biodigester details and its benefits to customers. A case study on Sistema Bio (a biodigester manufacturing company) provides additional insights into biodigester operations.

3.1. Product Overview

A biodigester is a system that breaks down organic materials such as animal waste to produce biogas and bio-fertilizer, providing an environmentally-friendly way of generating renewable energy whilst reducing waste.

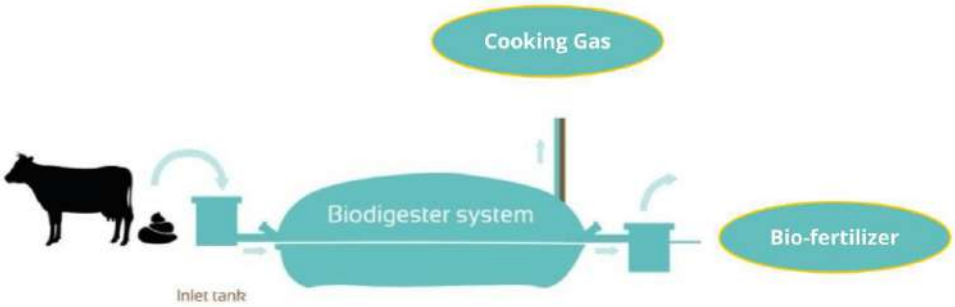


Figure 1. *Mechanism of a Biodigester system*

Animal dung is fed into a feeding tub as input along with water which gets collected in the reactor. The reactor converts the slurry to biogas which is directly connected to a cooking stove through a gas pipeline, whereas the biofertilizer gets collected in a tank in liquid form.

Figure 2. *Balloon Model*

Figure 3. *Prefabricated Flexi Model*

Figure 4. *Fixed-dome*

Farmer households face a variety of challenges like rising energy costs and expensive chemical fertilizers, which account for expenses in the range of INR 1,500 - 3,000 per month.[1]

[1] *Sourced from the product deck (attached in the annexure)*

Additionally, burning firewood for cooking leads to poor breathing conditions for the farmer's household and contributes to deforestation. Hence, there is a requirement for clean energy and fertilizers at reduced costs.

Biogas is a healthy alternative for firewood and LPG. Using biogas eliminates monthly LPG costs, while the biofertilizer can substitute for chemical fertilizers to reduce expenses and improve the nutritional content of the crop yield.

3.2. Product Consumer Demographics

Biodigesters consumers can be segmented into 3 types - farmer households, small businesses, and waste management cooperatives.

Farmer households
Farmer households with cattle are the ideal customer segment for biodigester products. Biodigester can provide this consumer segment with a source of clean cooking fuel reducing their reliance on expensive and polluting traditional fuels, as well as with bio-fertilizers for the farmland.

Small businesses
For this segment, biodigesters can be used to generate electricity or heat, providing a reliable and affordable source of energy.

Co-operatives
Cooperatives or community groups that collect and manage organic waste (tobacco waste, bagasse, bran) can use biodigesters to produce energy, thereby generating revenue from waste management. These cooperatives use the byproducts of biogas to generate income.

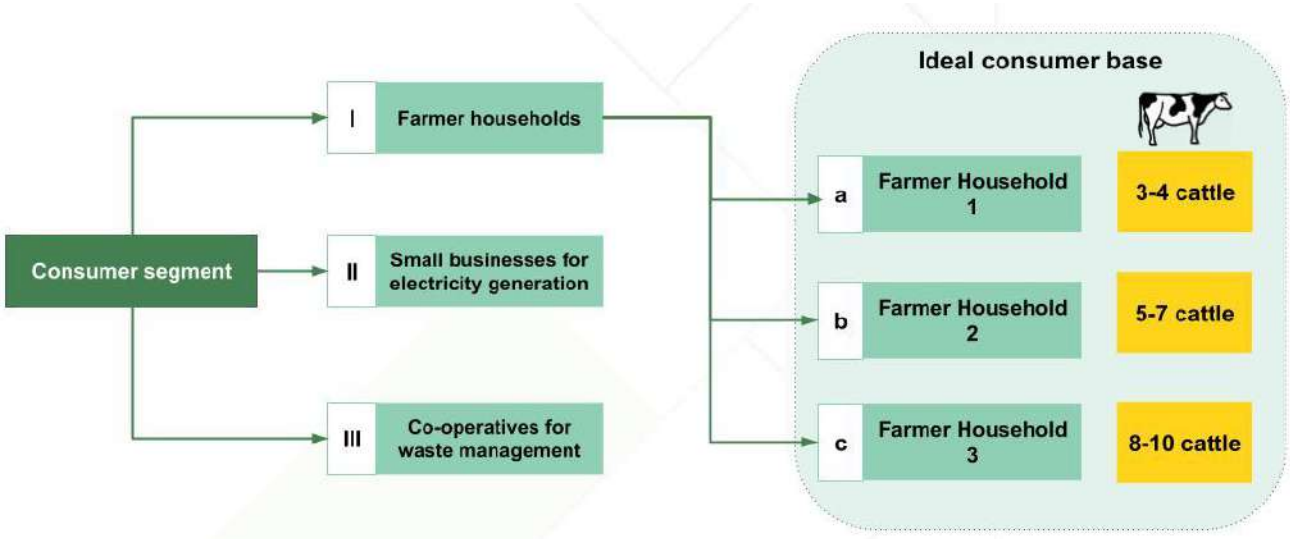


Figure 5. *Consumer segmentation for biodigester product*

Farmer households are the ideal customer base for MFIs as biodigesters can directly fulfill their existing household and agricultural needs. Small businesses and co-operatives have the potential to be future customers as they require extensive use of biodigester systems.

The farmer households segment can further be divided into different categories based on the number of cattle in each household.

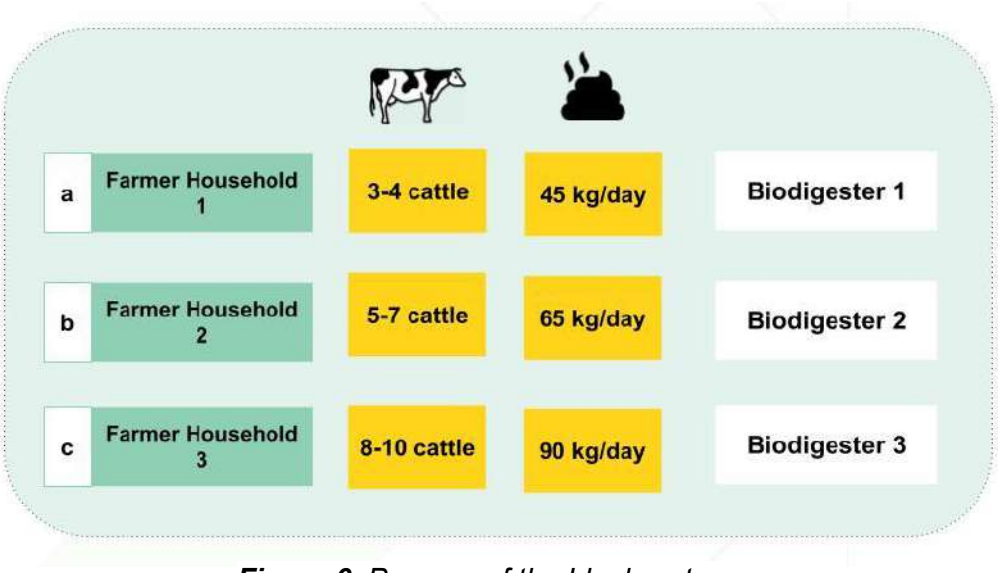


Figure 6. *Persona of the Ideal customer*

The number of cattle determines the quantity of dung produced by the household. This is important because the amount of biogas produced by the biodigester increases based on the quantity of dung. Hence, there are different variants of biodigester products based on their capacity for biogas production.

The focus geography for the biodigester is Central, West and South India as the production of biogas is most optimal in tropical warm climates with temperatures above 23C. In temperate climates with temperatures in the 15-23C range, biogas yield reduces to 60-65% of the original quantity.[2]

[2] *Sourced from the product deck (attached in the annexure)*

3.3. Product Benefit

Consumer Benefits

INCOME GENERATION

Monthly, an LPG gas cylinder costs around INR 1,000 and chemical fertilizers cost INR 1,000 per acre. Therefore, the biodigester helps save INR 1,500 - 3,000 per month for a farmer household.[3]

CLEAN ENERGY ACCESS

Biogas is produced from organic animal waste, making it a renewable and sustainable source of energy. On the other hand, LPG is a fossil fuel and firewood comes from trees.

INCREASED NUTRITIONAL QUALITY

The organic bio-slurry enriches the soil, increasing the nutritional quality of the yield. Additionally, this also increases the overall crop yield.

EFFECTIVE WASTE MANAGEMENT

Since animal waste is being reused, the biodigester is a highly efficient and productive waste management system.

REDUCED POLLUTION

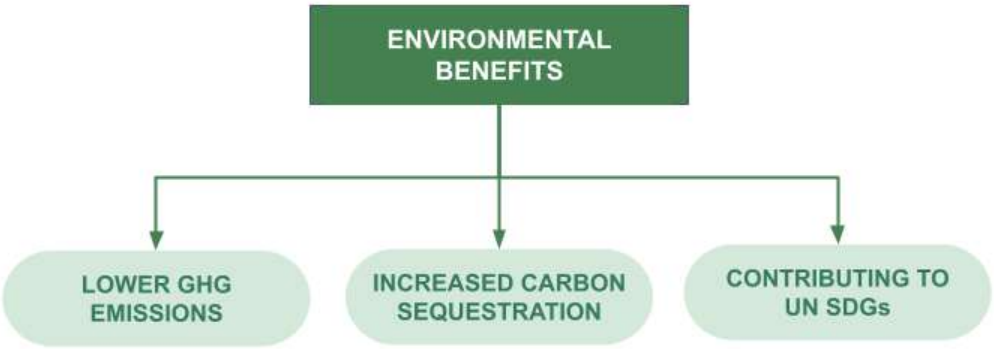
Burning firewood for cooking causes indoor pollution leading to poor breathing conditions. Biogas, on the other hand, provides clean energy access with reduced pollution.

TRANSPORTING FUEL

Using biogas removes the hassle of transporting fuel wood and LPG for households, especially in places where LPG penetration has not happened.

[3] *Sourced from the product deck (attached in the annexure)*

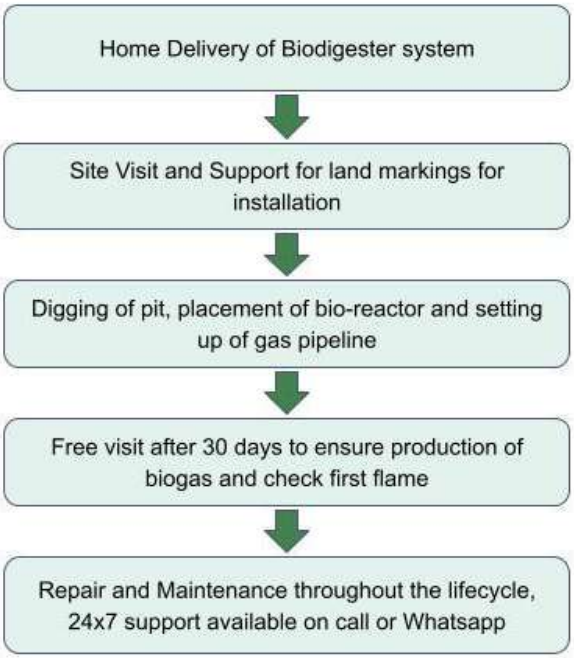
Environmental Benefits



Biogas produces fewer greenhouse gas emissions than LPG and firewood, making it a cleaner and more environmentally-friendly source of energy. Biogas production also helps reduce methane emissions from animal waste.

The usage of stored dung increases carbon sequestration, reduced deforestation and reduced pollution. Additionally, biodigesters are extremely useful for mitigating climate change and contribute to several Sustainable Development Goals (SDGs).

3.4. Product Installation and Support



The entire installation and support process is carried out by the biodigester vendor.

The biodigester is delivered to the home of the farmer household, followed by a site visit by the product personnel to help with the land markings for the installation. The biodigester involves a quick free installation process of simply placing the prefabricated bio-reactor into a pit dug close to the kitchen and farmland. The gas pipeline connection is then set up to the kitchen and connected to a cooking stove. The entire installation usually takes around 1/2 a day.

Post the first input, the biodigester requires a month to convert the animal waste and produce biogas for cooking.

Figure 7. *On-field installation of a Flexi biodigester system*

The biodigester requires repair and maintenance when:

- Cattle dung is fed into the reactor without adequate water
- Accidents caused due to cattle damaging parts such as the feeding tank or the gas pipes
- Accidental damages to the reactor

There are zero safety hazards associated with the biodigester, as biogas is safer than LPG. In the event of gas leakage, the biogas escapes into open spaces as it is lighter than air, whereas on-field LPG gas being heavier than air usually settles on the ground.

3.5. Product Pricing

The pricing for biodigesters varies according to the type and capacity of the unit.

	Biodigester 1	Biodigester 2	Biodigester 3
No. of cattle	3-4 cattle	5-7 cattle	8-10 cattle
Amount of dung	45 kg/day	65 kg/day	90 kg/day
Biogas generated	2 cu.mt 3 hrs/day	3 cu.mt 4.5 hrs/day	4 cu.mt 6 hrs/day
Price	INR 35,000 - INR 45,000	INR 45,000 - INR 55,000	INR 70,000 - INR 80,000

Figure 8. *The pricing model of Biodigesters based on their capacity*

The biodigester product is eligible for a Government subsidy, which varies based on capacity. At the Central level, the New National Biogas and Organic Manure Programme (NNBOMP) scheme is offered by the Ministry of New and Renewable Energy (MNRE). State Governments also have schemes in place for renewable energy like biogas. For a biodigester producing 2-4 m3 biogas per day, the subsidy offered is around ~ INR 13,000 - 15,000 per unit per household.[4]

[4] https://biogas.mnre.gov.in/about-the-programmes

Sr. No	Particulars of Central Financial Assistance (CFA) and States / UTs, regions & categories of beneficiaries	Biogas Plants under Biogas Programme ranging from size 1 to 25 cubic Metre biogas per day (In ₹per plant)					
A	CFA Applicable	1 M^3	2-4 M^3	6 M^3	8-10 M^3	15 M^3	20-25 M^3
	• Hilly/NER States (Arunachal Pradesh, Assam, Himachal Pradesh, Jammu & Kashmir, Ladakh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura and Uttarakhand) • Island; and • Scheduled Castes (SC)/ Scheduled Tribes(ST).	17,000	22,000	29,250	34,500	63,250	70,400
	• All other States and Categories	9,800	14,350	22,750	23,000	37,950	52,800
B	**Additional fixed Subsidy for** • Biogas plant if linked with sanitary toilet • Biogas plant if linked with MNRE approved Biogas slurry filter Unit.	1,600 1600	1,600 1600	1,600 1600	1,600 1600	NA 1600	NA 1600
C	**Turn-Key Job Fee for** construction, supervision, commissioning, and free O&M warranty for 5 years trouble free operations.	₹ 3,000/- per biogas plant for size ranging from 1 to 10 M3 and ₹ 5,000/- per plant for size ranging from 15 to 25 M3. This turn key job fee is applicable only for plants involving onsite construction such as fixed dome design Deenbandhu Model, floating gasholder KVIC Model. Turnkey job fee will not be eligible for pre-fabricated/ manufactured biogas plants.					
D	**Incentive for saving fossil fuels & electricity.**	An additional incentive of ₹10,000/- per Biogas based Generator set / Biogas engine water Pumping System (BPS) for meeting small farm power needs and water pumping from the biogas plant of 10 to 25 M3. CFA will be eligible only if the Generator set / BPS will run on 100% Biogas.					

Figure 9. *A range of subsidies is available depending on the capacity of the biodigester*[5]

The biodigester product price can drastically vary through a carbon financing project. The next section outlines a case study with a vendor Sistema Bio who has been able to discount the price of a 2 m3 biodigester from INR 39,000 to INR 6,000 through a carbon financing project.[6]

3.6. Case Study on Sistema Bio[7]

This section provides an outlay of Sistema Bio, a global manufacturer of biodigesters with a prominent national presence across 17 states in the country.

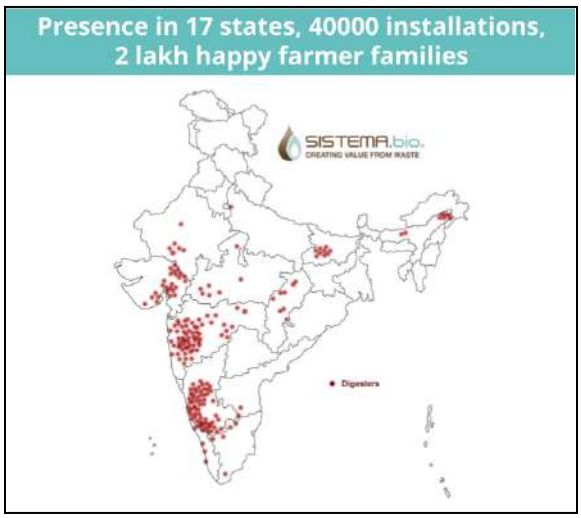


Figure 10. *Sistema's geographic presence in India*

[5] https://biogas.mnre.gov.in/about-the-programmes
[6] *Sourced from the product deck (attached in the annexure)*
[7] *All details in the section have been sourced from the product deck and insights shared by the vendor*

Sistema Bio has many biodigester products across varying capacities.

	Model Name	No. of cows	Input: cow dung Kg/day	Input: Water Lit/day	Area required in Feet		Biogas production			Bio-fertilizer production	
					Total area	Pit Area	m3/day	hrs/day	Equivalent in LPG (Cylinder/ month)	Ltr/day	acre/year
Warm Climate (>23°C)	Sistema 6	3-4	45	90 L	12 x 20	7.2 x 7.2 x 3	2 cu.mt	3 Hrs	1.5	135	12
	Sistema 8	4-5	65	130 L	12 x 24	9.8 x 7.2 x 3	3 cu.mt	4.5 Hrs	2.2	195	18
	Sistema 12	8-9	90	180 L	12 x 30	13.1 x 7.2 x 3	4 cu.mt	6 Hrs	3.0	270	25
	Sistema 16	12-13	130	260 L	12 x 36	19.6 x 7.2 x 3	5 cu.mt	9 Hrs	4.4	390	36
	Sistema 20	16-18	180	360 L	15 x 44	26.2 x 7.2 x 3	6 cu.mt	13 Hrs	6.1	540	49
	Sistema 30	24-26	260	520 L	15 x 56	39.3 x 7.2 x 3	10 cu.mt	19 Hrs	8.7	780	71
	Sistema 40	33-36	350	700 L	15 x 70	52.4 x 7.2 x 3	15 cu.mt	25 Hrs	11.7	1,050	96
	Sistema 80	65-70	700	1400 L	30 x 70	2 pits of Sistema 40	25 cu.mt	50 Hrs	23.5	2,100	192
	Sistema 120	100-105	1050	2100 L	45 x 210	3 pits of Sistema 40	35 cu.mt	75 Hrs	35.1	3,150	288
	Sistema 200	165-175	1800	3500 L	75 x 350	5 pits of Sistema 40	70 cu.mt	130 Hrs	58.0	5,400	479

For the mentioned farmer household consumer base, following are the corresponding products for each target market segment.

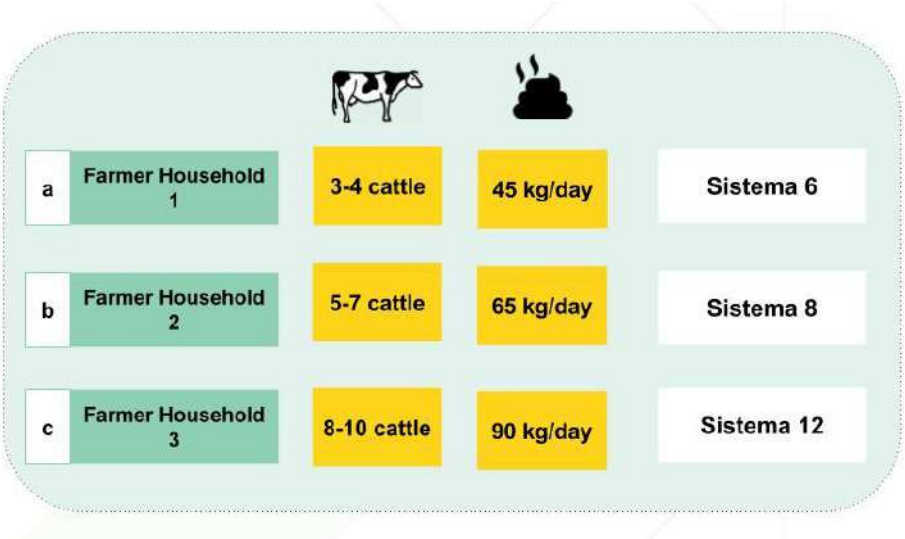
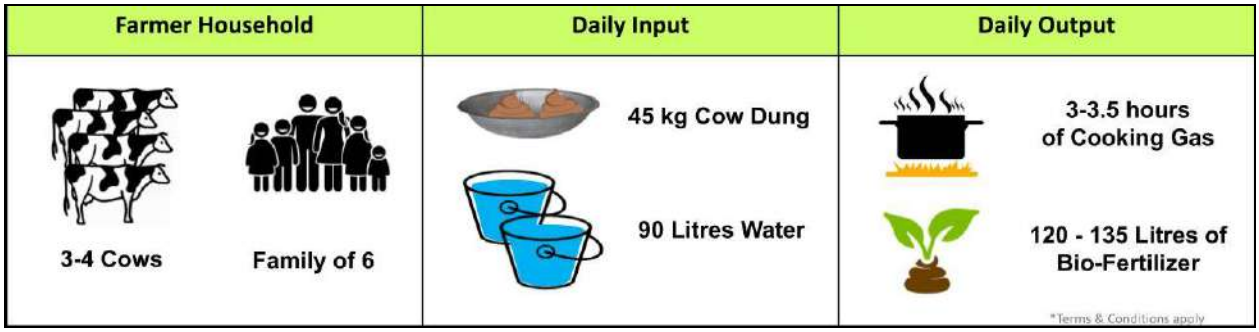


Figure 11. *Different biodigesters available from Sistema*

Amongst these, Sistema 6 is the vendor's most successful product, accounting for over 96% of all products sold in India. This also indicates that farmer households with 3-4 cattle constitute the ideal consumer demographic.

3.6.1. Sistema 6 Overview

The Sistema 6 biodigester requires an input of 45 kg dung mixed with 90 L of water to produce 2 m3 of gas daily, which is equivalent to 3 hours of cooking gas daily.



Along with the biogas, Sistema 6 produces 135 litres of biofertilizer per day, which can be used for 12 acres per year. Organic farming training is provided by the vendor to enable the farmer to transition from chemical fertilizers.

3.6.2. Sistema 6 Installation

Figure 12. *Installation of Sistema 6 biodigester*

The components of the Sistema 6 biodigester include the feeding tub, LLDPE reactor, a 30 m gas pipeline, an aluminium 2-burner stove, and filters for excess gas, moisture control and smell removal.

Sistema 6 involves a quick free installation process of simply placing the prefabricated LLDPE reactor into a *7.2 x 7.2 x 3 feet* pit dug by the farmer. Each LLDPE reactor unit is 70 Kg, and small trucks are used for transporting it. The gas pipeline connection is then set up to the kitchen and connected to a cooking stove. The installation takes about 1/2 a day.

Operational costs for installing biodigesters in rural areas are high due to the logistics and manpower required, ranging anywhere between INR 5,000 - 18,000. Sistema Bio has offset this

cost through a ‘cluster’ model that ensures operational feasibility. Each cluster, covering a radius of 75-80 km with over 100,000 eligible farmers, has a dedicated warehouse supported by a local team.

The biodigester takes about a month from installation to produce biogas. There is a free service provided 30 days after installation to ensure first flame in the cooking stove. Product support is available 24/7 through calls or Whatsapp.

The lifecycle of the biodigester is 10 years, hence there is a 10-year warranty for the LLDPE reactor and a 1-year warranty for all the other plastic parts. The LLDPE reactor is extremely sturdy and secure, unless cut with a knife or a major impact like an electric pole falling on it. Even in such cases, it is designed to be repaired exactly like a tyre puncture which is quick and efficient.

3.6.3. Sistema 6 Pricing

Including the installation costs, Sistema 6 costs INR 39,000 + GST.

There are 2 ways in which the vendor has been able to reduce the price of the product to the end consumer i.e., Government Subsidy and Carbon Financing.

However, both ways cannot be combined and added on top of each other; only one method can be used per product.

Government Subsidy

The subsidy varies based on the capacity of the biodigester. The available government subsidy for Sistema 6 (2 m3 capacity) is INR ~ 13,000 - 15,000 per unit per household. After purchasing the biodigester product, the farmer household needs to apply for the subsidy and post the verification of the biodigester, the subsidy amount will directly be transferred to the farmer account in 2-3 months.[8]

[8] https://biogas.mnre.gov.in/about-the-programmes

Carbon Financing

Sistema Bio has developed a comprehensive carbon financing ecosystem through which the price of Sistema 6 is reduced by over 80% and is now being offered at INR 6,000 + GST*.

Each Sistema 6 biodigester unit offsets over 5 tonnes of CO2 every year. So far, Sistema Bio has offset over 1.7 lakh tonnes of CO2.

Details on Carbon Financing projects are mentioned in the Annexure.

**Note: Every biodigester unit with a specific capacity will offset a different quantity of CO2 each year. Therefore, the carbon credits generated for every biodigester product is contingent on the capacity of the biodigester. The price indicated here is just for Sistema 6 and can vary with other biodigesters*

3.6.4. Sistema Bio Sales Performance

Since 2020, Sistema Bio has installed over 40,000 units across 17 states, with over 75% of sales in Central, West and South India i.e. Maharashtra, Karnataka, and Gujarat.

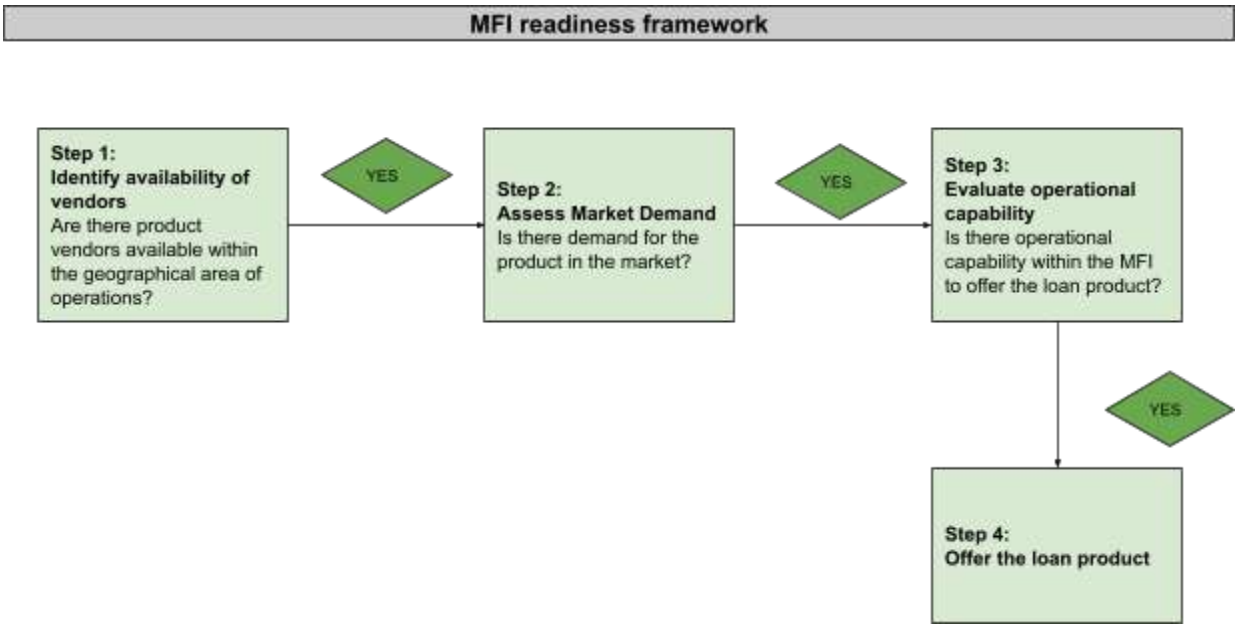
The vendor has seen a considerable increase in sales performance post launching its carbon credits program in November 2022 which led to drastically reduced prices i.e. INR 39,000 to INR 6,000. Over 7,500 units have been sold in just 4 months between Nov 2022 and Feb 2023.

With the increased demand and adoption, the vendor has forecasted sales of over 50,000 units in 2023.

4. MFI Readiness

4.1. Framework for the MFIs to assess their ability and capacity to launch a loan product for a particular product offering

The objective of this section is to provide MFIs with a framework to assess and analyze the operational capabilities needed to launch a new loan product for the biodigester. By using this MFI readiness framework, an MFI will be able to identify the capacity and resources needed to launch a new loan product into the market. The readiness framework is in the form of a step-by-step guideline which MFIs can follow sequentially.



Step 1 - Identify the availability of vendors

Within the serviceable market, identify if there are vendors in the market selling biodigesters. If there are no vendors in the MFI region of operation, then MFI should not proceed further.

Step 2 - Assess market demand

If the answer in step 1 was “Yes”, proceed to step 2 to assess the market demand
This step answers the question “Is there market demand for the product in the market?”

The following toolkit will guide on assessing the market demand with an example.

Note: This is a sample toolkit. The numbers are used for example purposes however, the formulas and steps are rightly placed. MFIs can use this tool to enter their numbers in the gray highlighted cells to estimate the sales within an area of operation (this could be a combination of multiple villages)				
			Customers	**Comments**
1	Select ideal customer persona	Number of farmer households (HH) in the area of operation	15000	
2	Apply eligibility criteria using following indicators	Apply criteria check - Household income - Number of cows - Number of members in the household		
3	Segment farmer households	Number of farmer household with <3 cows	1000	**Not eligible customers**
		Farmer household that have >3 cows and have upto 30% of disposable income	6000	Vulnerable households
		Farmer household that have >3 cows and have upto 40% of disposable income	5500	Low income households
		Farmer household that have >3 cows and have upto 45% of disposable income	2500	Manageable households
				Note the sum of the four types of farmer households should add up to total number of farmer households. (i.e. point 1 = sum of all the four households mentioned in point 3) **15000 = 1000+6000+5500+2500**
4	Estimate Sales (SOM) for an area of operation	**Therefore, Targer number of customer**	**8000**	This is sum of low income households and manageable households because that is the segment MFIs should target
		Demand for product in vulnerable HH (assumption)	0%	Demand estimation. Demand for the biodigester in vulnerable households is assumed to be 0 The other percentages mentioned as estimates. MFI can change the demand % based on their estimation and understanding of the consumer demography
		Demand for product in low income HH (assumption)	60%	
		Demand for product in manageable HH (assumpton)	70%	
		Estimated Market capture by the MFI	25%	Assumption. MFI can change this number based on their estimate of the total market that they can capture
		Average loan size for the biodigester	39000	Sistema 6 The loan amount will vary from product to product
		Total Sales (units of product) for which loan is taken	1262.5	Formula is: Demand for product in vulnerable households*Farmer households that have >3 cows and have upto 30% disposable income + Demand for product in low income households*Farmer households that have >3 cows and have upto 40% of disposable income+ demand for product in manageable households*Farmer households that have >3 cows and have upto 45% of disposable income
		Total loan amount (revenue) for the fiscal year	**₹49,237,500**	

Follow the toolkit step by step to select ideal customers and apply filter criteria.

a. Filter the households on the basis of the number of cows in the households. If the farmer has less than 3 cows in the household, then the household is not eligible for the biodigester product.

b. After filtering, segment the customers on the basis of household income.

c. Apply eligibility criteria to filter farmer households that may not be ready for buying the product. Eligibility criteria check indicators are:

- Household income
- Number of members in the household

(Note: These indicators are not exhaustive. MFI can do a criteria check based on available information from the following list. They can also include more criteria if they want)

Segment 1: Vulnerable households	**Segment 2: Low income households**	**Segment 3: Manageable households**
Farmer household that has >3 cows and has up to 30% of disposable income	Farmer household that has >3 cows and has up to 40% of disposable income	Farmer household that has >3 cows and has up to 45% of disposable income

- Segment 2 and Segment 3 are the MFI target customers.

d. For each segment, an estimation of sales should be calculated. Refer to the toolkit for an example to get to projections of sales.

Step 3 - Evaluate operational capability

The sales projection becomes the Serviceable Obtainable Market (SOM). The last step is to assess the operational capabilities existing in the organization to enter the market and start operations. The questions below provide a checklist towards assessing the operational capabilities.

MFI	**Vendor**
☐ Leadership is aligned on offering the loan product in the decided geographic location ☐ Staff is trained in product details and benefits ☐ Staff is well trained to encourage women to be primary loan applicants ☐ Staff is well trained in the process of loan process (from awareness stage to loan disbursal stage) ☐ Staff is technical i.e. can operate digital systems to update documents ☐ MFI has dedicated and enough staff to meet loan demand	☐ Vendor is ready to provide post-sales support. ☐ Vendor is aligned on the roles and responsibilities of the MFI and vendor.

4.2. Market Size Estimation

As of 2022, the Indian biogas market is valued at $ 1.41 billion. The market is expected to grow at a rate of 6.3% CAGR till the year 2029 and reach $ 2.25 billion.[9]

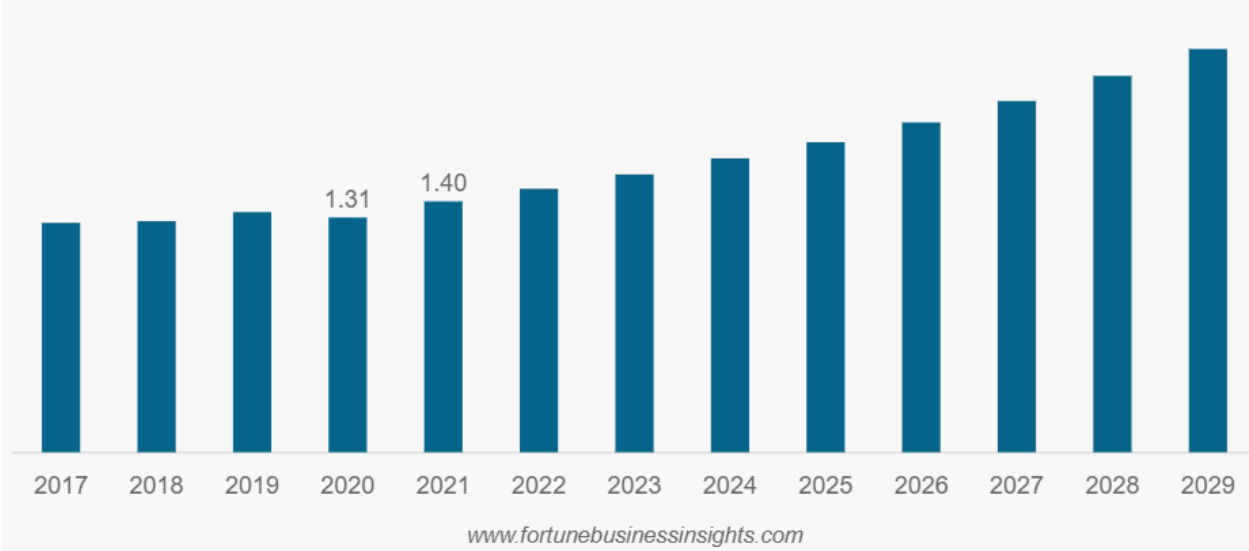


Figure 13. *India Biogas Market Analysis, 2018-29 (USD Billion)*[10]

A study conducted in 2019 suggests that there are 5.028 million active small scale biogas plants (<2 m3/day) in the country.[11] These small-scale biogas plants are used by farmer households. As per the market need, there is a gap of 7 million small scale biogas plants. This presents an opportunity for MFIs to partner with biogas providers to fulfill the market need.

9 https://www.fortunebusinessinsights.com/india-biogas-market-106563

10 https://www.fortunebusinessinsights.com/india-biogas-market-106563

11 https://www.german-energy-solutions.de/GES/Redaktion/DE/PDF-Anlagen/Aktuelle_Meldungen/20200225-indian-biogas-association-biogas-market-india.pdf?__blob=publicationFile&v=2

5. Vendor Partnership

The section explains the process to ensure a successful partnership with a biodigester product vendor.

5.1. Vendor Selection Criteria

Geographical areas of expertise
MFIs must have strong operational capabilities in the vendor's geographical area of expertise to take the loan product to market.
Vendor Case Study : Sistema Bio's geographical expertise is spread across Gujarat, Maharashtra and Karnataka.

Years of experience
MFIs must partner with vendors who have many years of experience in the market to ensure smoother operations, improved capability, stability and strong brand loyalty.
Vendor Case Study : Sistema Bio has over a decade's experience in biodigesters globally, having installed its first product in 2010. In India, the vendor installed their first unit in 2017.

Product Quality, Capacity and Efficiency
MFIs must ensure that vendors have strong, stable and diverse product portfolios.

Vendor Case Study : Sistema Bio offers over 7 different capacities of biodigesters, thereby catering to a wide range of consumers. Sistemo Bio's first biodigester installed in 2017 is still operational and functional, demonstrating the quality and longevity of the product.

Training MFI staff and clients

MFIs should ensure that the vendor has the capability to train all necessary stakeholders across the customer awareness journey.

Vendor Case Study : Sistema Bio offers training and product demos to the MFI staff as well as to end consumers.

Price Point

MFIs should ensure that vendors have knowledge of carbon financing projects and have set up robust systems to ensure the successful implementation of these projects.

Vendor Case Study : Sistema Bio has used a carbon financing project to reduce the price of their best-selling product by over 80% i.e. from INR 39,000 to INR 6,000.[12] This drastic reduction in the price of the product has been extremely important in driving customer adoption.

Sales and Marketing capabilities

MFIs should ensure the vendors have a thorough sales and marketing process to capture clients in their geography.

Vendor Case Study : Sistema Bio uses a cluster-based sales approach that targets clusters of 75-80 km with over 100,000 eligible farmers. Each cluster has a dedicated warehouse and is supported by a local team, which will work well with the operational model of MFIs.

Post-sales support

MFIs must conduct comprehensive due diligence of the vendor to assess the product lifecycle quality and the capability to provide post-sales product lifecycle support.

Vendor Case Study : Sistema Bio provides a 10-year warranty for their bio-reactor and provides 24x7 support through phone.[10] In addition to this, 96% of their product installations required no post-sales repair.

5.2. Vendor Responsibilities

The roles and responsibilities of the vendor must be clarified across all stages and an implementation strategy must be co-created to take the product to market. The following is an indicative table that demarcates the roles and responsibilities of the vendor and the MFI.

[12] *Sourced from the product deck (attached in the annexure)*

Responsibility	Vendor	MFI
Product quality assurance		
Competitive pricing having made full use of subsidies		
Demo and product training to MFI staff		
Loan product design		
Outreach and awareness building		
Product Sales		
Loan application, disbursement and collection		
After sales service and support		

Product quality assurance
The vendor is responsible for ensuring product quality standards.

Competitive pricing
The vendor should have explored different ways to reduce the cost of the biodigester, including Carbon Financing. In the case of carbon financing, the vendor should have an existing network of auditors and buyers along with smoothly functioning operations.

Demo and product training to MFI staff
The vendor is responsible for providing product demos to the MFI staff and then training them on all the technical details of the product.

Loan product design
MFI needs to design the loan product internally after obtaining necessary product details like pricing, lifecycle, income generation, factors affecting repayment, etc.

Outreach and awareness building
The vendor and the MFI need to pool their resources and network together to ensure maximum outreach to clients through demos and product training.

Product Sales
The vendor is responsible to ensure the final sales of the product. The vendor should explore and finalize different partners and channels for selling biodigesters. For instance, previously, biodigesters have worked well in partnerships with dairies, where the milk receipts have been

previously used as payments for a biodigester loan.

Loan application, disbursement and collection

The MFI is responsible for receiving loan applications, designing the approval process, rolling out the disbursements and monitoring the clients to ensure timely loan repayments.

After-sales service and support

The vendor is responsible for providing post-sales support including checking the first flame of the cooking stove as well as repair and maintenance of the biodigester.

Note: A list of biodigester vendors apart from Sistema Bio is mentioned in the Annexure.

6. Loan Product Design

This section highlights the process for the loan product design. The following best practices in designing a loan product will enable the creation of a customer-centric product. The chart below highlights the steps in designing the loan product.

1. Customer specific loan design

For the ideal customer segment identified, determine if a customer is new or a returning one. In each case, the loan amount that they are eligible will vary.

2. Women as primary loan applicants

Encourage women to be the primary loan applicant, as they will be the end users of the product and will be responsible for its adoption, maintenance, impact, etc,

3. Determining loan structure

Once the customer type is identified, design the loan structure. MFI can offer loans to individuals or JLGs in two cases *(refer below)*.
Note: Case 1 is only applicable where vendors are able to provide carbon financing
Case 2 is applicable for most vendors

4. Loan implementation

Once the loan structure and type of loan have been designed, follow the steps in the loan implementation to outreach and create awareness of the loan

MFI must ensure that the components of the loan product are designed in a manner that makes it more affordable, accessible and sustainable whilst meeting the needs of the clients.

Loan Product Design Case 1

With Sistema Bio (Vendors that provide Carbon financing)

	Sistema 6	Sistema 8	Sistema 12
	3-4 cattle	5-7 cattle	8-10 cattle
Loan Amount	6,000/-	8,000/-	10,000/-
Interest Rate	18-24%	18-24%	18-24%
Loan Term	12 months	12 months	12 months
EMI	600-700	800-900	1,000-1,100

Figure 14. *Loan product design with an option for Carbon Financing* [13]

Note:

1. All of the mentioned numbers including loan amount, interest rate and EMI are indicative, and will vary based on MFIs and vendors.

2. The loan amount is exclusive of GST and the interest rate considered is 24%.

Business case for MFIs

The loan product makes economic sense for a farmer household that currently spends INR 1,000 on LPG and INR 1,000-2,000 on chemical fertilizers monthly. With the monthly EMI being INR 600-1,100, the household will immediately benefit economically by switching to a biodigester.[14]

[13] *Sourced from the product deck (attached in the annexure)*

[14] *Sourced from the product deck (attached in the annexure)*

Loan Product Design Case 2

Without Sistema Bio (Vendors that don't provide Carbon financing but use Govt. subsidy)

	Biodigester 1	Biodigester 2	Biodigester 3
	3-4 cattle	5-7 cattle	8-10 cattle
Loan Amount	40,000	50,000	75,000
Interest Rate	18-24%	18-24%	18-24%
Loan Term	24 months	24 months	24 months
EMI	2,300-2,500	3,000-3,200	4,600-4,800
Effective EMI*	1,800-2,000	2,400-2,600	4,000-4,200

Figure 15. *Loan product design including Government subsidies* [15] [16]

Note:

1. *All of the mentioned numbers including loan amount, interest rate and EMI are indicative, and will vary based on MFIs and vendors.*
2. *Effective EMI* includes the subsidy amount received. For biodigesters, subsidy is around INR 13,000 - 15,000 per farmer household. While the farmer needs to take the complete loan amount upfront, the applicable subsidy usually gets credited to the farmer's account in ~ 3 months after applying for the subsidy.*
3. *The loan amount is exclusive of GST and the interest rate considered is 24%.*

Business case for MFIs

The most popular biodigester product across the country caters to farmer households with 3-4 cattle and the effective EMI for this loan product is in the range of INR 1,800-2,000 for 24 months. This loan product is still feasible for a farmer who currently spends INR 1,000 on LPG and INR 1,000-2,000 on chemical fertilizers monthly.[17]

---

[15] *Sourced from the product deck (attached in the annexure)*

[16] *https://biogas.mnre.gov.in/about-the-programmes*

[17] *Sourced from the product deck (attached in the annexure)*

7. Implementation

The section provides an overview of the entire process of reaching out to the beneficiaries, loan application and disbursement. The MFIs need to follow the three steps outlined below in implementing the loan product.

Stage	Action items	Lead	Support
Stage 1 Needs Assessment and Customer Mobilisation	1) Conduct door-to-door village surveys	MFI	--
	2) Identify villages that are eligible for the loan product	MFI	--
	3) Mobilising crowd in the identified villages to conduct a basic product demo for awareness	Vendor	MFI
Stage 2 Loan Application and Approval Process	4) Interact with customers who have an intent of buying the product	Vendor	MFI
	5) Conduct training sessions (CGT/GRT) to create an understanding of the product and process	MFI	Vendor
	6) Customers to fill the loan application form	MFI	--
	7) Collect documents and conduct background checks for verification	MFI	--
Stage 3 Loan Disbursement and Post-sales Support	8) Customer to visit the MFI branch office after verification to claim loan	MFI	--
	9) MFIs to disburse loan after the loan approval process	MFI	--
	10) MFI officials to visit the customers to collect repayment and monitor loan utilisation	MFI	--
	11) Post Disbursement support to the customer	Vendor	MFI

7.1. Stage 1: Needs Assessment and Customer Mobilization

The Needs Assessment and Customer Mobilization section highlights the steps and best practices to identify potential customers of biodigesters and establish customer relationships.

7.1.1.Conduct on-field village surveys

In this step, field officials need to identify and visit rural areas and conduct an assessment of the village. A door-to-door survey is conducted by interacting with some of the beneficiaries in the village. Here, the field officials conduct a basic eligibility check to assess if customers have the required background to take a loan for biodigesters.

A sample questionnaire has been created with a checklist of recommended parameters.

- Household Income Assessment - Enabling MFI to identify eligible households that exist in the village for the biodigester loan product
- Well-being Assessment - Using necessary indicators from the sample questionnaire to help the MFI develop a qualitative assessment of the household

Sample Questionnaire for Village survey*

Parameters
Rented house/ Kuchha house
Roof Material (Tiles, Sheet, Thatch)
Number of rooms in the house
Number of Cattle
Availability of Toilet
Availability of Furniture
Children studying in Govt. school
Landless / Landhold (Agriculture)
MGNREGA work
Access to Gas Cylinders and Electricity
Client's Access to Smartphone, Scooter
Access to BPL Card
Treatment from Govt. Hospital

1. What is your mode of accommodation?
    a. Have your own place
    b. Renting out

2. Also what type of house is it?
    a. Kacha House (Thatch roof)
    b. Pakka House (Tiles, Sheet)

3. How many rooms are there in the house?
    a. 1
    b. 2
    c. 3
    d. 4

4. Do you have toilet and sanitation facilities in the house?
    a. Yes
    b. No

5. What type of furniture do you have? Select as many as applicable. Do
    - Air cooler

- Refrigerator
- Gas stove
- Bed and Mattress
- Wardrobe
- Sofa
- Entertainment devices like TV, Radio

6. Do you have access to Grid electricity and Gas cylinders?
    a. Yes
    b. No

7. Do you own any agricultural land?
    a. Complete ownership
    b. Land on lease

8. What is the size of your farm and how much land do you use for irrigation?
    a. 1-acre
    b. 2-5 acre
    c. More than 5 acres

9. How many cattle do you own?
    a. 3-5
    b. 5-7
    c. 8-10

10. What is the crop type you cultivate and how much water is required for irrigation per acre of land?

    _____

11. What is the distance between the water source (well, borehole, etc.) and the farmland for irrigation?
    a. Less than 50 m
    b. 50 - 100 m
    c. 100 - 150 m
    d. More than 150 m

12. Do you currently use a fuel-based pump (kerosene/diesel) for irrigation?
    a. Yes
    b. No

13. How much do you spend on fuel per month for irrigation per acre of land?

    _____

14. Have you taken benefit from the MGNREGA scheme?
    a. Yes
    b. No

15. Do you have access to a BPL / AADHAR card?
    a. Yes
    b. No

16. Do you have access to a smartphone or a personal vehicle like a scooter?
    a. Yes
    b. No

17. Have you taken any treatment from a Government Hospital before?
    a. Yes
    b. No

** This is not an exhaustive list and includes qualitative and quantitative parameters that will help in assessing a customer's ability to take a loan and repay the same. More parameters can be added to make it more contextualized.*

The survey can be translated into Hindi or other regional languages based on geography.

7.1.2. Identify villages eligible for the loan product

The results from the survey will help the officials shortlist villages with the right demography for the loan product. The awareness and adoption will differ across geographies.

7.1.3. Crowd mobilization and product demonstration

Once the villages are identified, a basic product demonstration is conducted by the vendor for the beneficiaries to give them an idea of the product. The officials should help the vendors mobilize the crowd to a common place for the demonstration.

The vendor and MFI officials should focus on the mobilisation of women leaders and other women-centric groups and collectives as women are the primary operators of the product. The demonstration should focus on ensuring women understand the product details, benefits and usage so that the rate of product adoption increases.

The vendor must also share important literature like pamphlets on the product details.

7.2. Stage 2: Loan Application and Approval Process

This section highlights the steps for the loan application and approval process. The complete approval process takes up to 5-7 days.

7.2.1. Interaction with potential customers

The customers intending to purchase the product will reach out to the vendor or the MFI officials. As women constitute a significant portion of the agricultural labour force, the officials should encourage them to be the primary loan applicants. There is evidence which suggests that there are lesser defaults in cases of women being primary loan applicants, thus encouraging women to be loan applicants would be beneficial for the MFI.

7.2.2. Extensive training to understand the loan product

Next, the officials conduct Continuous Group Training (CGT) and Group Recognition Test (GRT) to provide a detailed understanding of the loan product. This training process usually takes 2-3 days to complete.

As the product will be primarily used by women, officials must ensure that women are given the necessary training whilst highlighting the key product features of the biodigester. Ideally, vendors should also be present for this meeting.

The following pointers should be considered while conducting the training:

- Provide details about the product features
- Elaborate on product usage and benefits for the consumer
- List of vendors that sell the product.
- Provide information on the loan product, loan types, cycles, interest rate and timeline
- Share best practices for repaying loans to minimize the probability of loan default

7.2.3. Filling out the Application Form

After the Continuous Group Training (CGT) and Group Recognition Test (GRT), customers who express interest in the product should be asked to fill out the application form. Necessary training and sensitization should be provided to the officials to encourage women to be the primary loan applicant.

Officials should ask the customers to visit the branch office to apply. The customers fill up the application form with the help of the MFI officials.

7.2.4. Background check and verification

The officials visit the customers to conduct a background check after the loan application is filled. Below are some important parameters* to be considered for the background check.

- ☐ Personal details
- ☐ Assets (Cattle, Agriculture tools, Land, etc)
- ☐ CIBIL Score and credit history

- ☐ The purpose for loan application
- ☐ Documents on Income Tax Data, KYC details

**This is not an exhaustive list and includes qualitative and quantitative parameters that will help in assessing a customer's ability to take a loan and repay the same. MFIs must follow the parameters that RBI has mandated for the loan application.*

These details are crucial to determine the eligibility of the customer to procure the loan.

7.3 Stage 3: Disbursement and post-sales support

The section describes steps to disburse the loan, post-sales support and payment collection process. They are important to examine the correct utilization of the loan.

7.3.1. Customer visit to the branch office

Once the customer is deemed eligible for the loan product after the background check, the final step would require the customer to come to the branch office to sign the disbursal document. The branch manager must use this opportunity to clarify any doubts regarding the loan and repayment.

7.3.2. Disbursement of loan

The loan is disbursed within 24-96 hours after the signing of the loan approval document. A specific EMI date and time should be communicated to the client and the field executive must collect it on the same day.

7.3.3. Repayment and Monitoring

As it takes a month for the biodigester in the beginning to produce biogas, the first EMI collection needs to be adjusted accordingly. MFI officials must consult with the vendors to determine the date of the first EMI as this period will vary for different vendors.

Digital collection methods should be leveraged to make the process of repayment transparent and convenient. Partnering up with fintech providers like Paytm, Phonepe, Cashfree, etc will help increase digital transactions.

The officials must visit the field at regular intervals post disbursement to check the correct utilization of the loan. Verification checks focus on observing the changes in the farmer's household as a result of product utilization, such as product installation, biogas usage, replacement of LPG and chemical fertilizers, organic farming, etc.

7.3.4. Post Disbursement Support

The vendors are responsible for the product lifecycle support such as product technical assistance, maintenance, after-sales services, etc. The MFIs are responsible for providing technical assistance with respect to the loan product, financial education, hand holding with repayments, etc.

8. Risk Management

This section provides an overview of the risk that can come during the stages of loan product design, outreach, implementation, disbursal and post disbursement. To effectively offer a loan product, MFIs need to identify risks and ways to mitigate the same. The section below lists some of the common risks that an MFI may encounter during different phases of the loan cycle.

Risk	Stage of the risk	Impact of risk	Mitigation strategy
Lack of financial partners	Design stage	High	1. Identify 2-3 financial partners who would be willing to fund the loan product. This should happen before the MFI readiness check.
Low customer demand	Outreach stage	High	1. During village surveys, focus on villages that have high demand and more customers fitting the ideal customer base for the product (i.e. farmer households of 3-4 people with 3-4 cows in the family). 2. Conduct awareness sessions with the product vendors so that more queries about products and loans can be addressed to mitigate any doubts about the effectiveness and benefits of the product.
Competitor MFIs offering loans at lower rates	Outreach stage	High	1. As part of outreach and awareness, prioritize the customer base where there are existing relationships and vendor trust.
Staff not fully aware of product benefits, operation mechanism and challenges	Operational stage	Moderate	1. Train field staff using the SOP document before field surveys and awareness programs.
Delay in loan disbursal	Operational stage	Low	1. Collect all documents and other information during the customer's visit to the branch.
Poor after-sales support by the vendor	Operational stage	High	1. While doing vendor identification, have a very clear MOU established with the vendor on the after-sales

			service. Only select those vendors, who are reputed for the after-sales support.

9. Annexure

9.1. Technical Details of the Product

Refer to this source to access a product deck provided by Sistema Bio.

9.2. Carbon Credits Financing

In a carbon financing program, carbon credits obtained from biodigester units are sold to various organizations looking to offset their CO2 emissions. The revenue from this process is used to discount the price of the biodigester.

Biodigesters reduce carbon emissions in two ways.

1. Effective Manure Management: When cow dung is thrown in open areas, it releases methane into the atmosphere, which increases carbon emissions.
   In a biodigester, the cow dung is fed into the bio-reactor where biogas is produced and the resultant bio-fertilizer is utilized for the farmland. This ensures that methane is not released from the dung into the atmosphere.

2. Eliminating usage of Firewood: Collecting and burning firewood results in deforestation and pollution, both of which increase carbon emissions.
   Biogas, on the other hand, is a form of clean, renewable energy.

In this way, the amount of CO2 emissions offset by each unit is measured through technical calculations based on the calorific value of the cowdung, the amount of methane generated, the efficiency of burning, and so on. Based on these calculations, ‘Carbon credits’ are generated for each unit, where one carbon credit is equivalent to offsetting 1 tonne of CO2 eq. emissions.

Process Flow

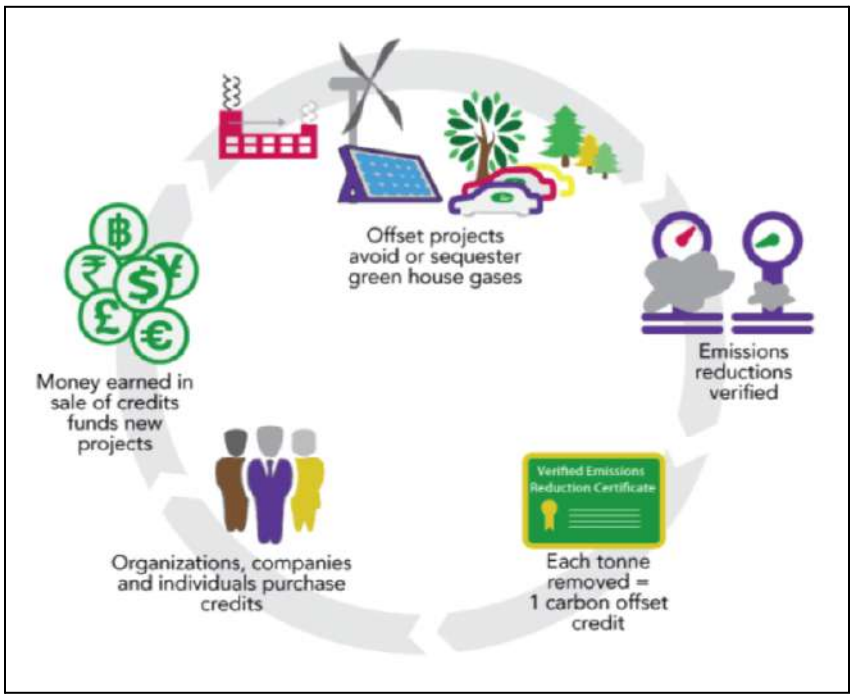


Figure 16. *Process flow for Carbon Credits Financing*

- Technical calculations are done for each biodigester unit and a base case paper is prepared. An audit firm is presented with the technical calculations and testing is carried out on a working unit and calculations are verified.

- The vendor then applies for a carbon financing project that involves many individual biodigesters. The vendor is presented with a provisional approval for the estimated carbon credits of the project.

- At the end of every year, a verifying agency randomly samples different units in the project. Each project is given a rating ranging between 50% to 100% which determines the value of the carbon credit. A 100% rating indicates that 100% of the estimated amount of carbon emissions have been offset by the project, whereas a 60% rating indicates that only 60% of the forecasted emissions were offset by the project due to various performance issues.

- Post this verification, the provisional approval is converted into a Verified Emission Rating (VER) which can be sold to any buyer on a carbon trading platform.*

  ** Note: India does not have a carbon trading market yet. Currently, carbon credits are sold on a voluntary market model, where any buyer and seller can create a legal agreement to trade credits at a mutually agreed price.*

9.3. Vendor List for Biodigesters

A list* of vendors who provide biodigester solutions is given below for reference. The list of vendors:

1. Sistema Bio
2. JRMS Engineering Works
3. Symber Bio labs
4. Atmos power

#	Sistema Bio	JRMS Engineering Works	Symber Biolabs	Atmos power
Geography	25 Countries Central and South India	Pan India operations	*Data not publicly available*	South East Asia
Experience	10 years of global experience	*Data not publicly available*	*Data not publicly available*	Work with corporations like Amul
Product Quality and Catalogue	Prefabricated, Linear low-density polyethylene (LLDPE)	FRP (Fiber glass reinforced plastics) Ecofriendly, rust proof, light weight, leak proof, easy to install	Tanks, Biotoilet with digester	Fully Automatic SCADA operated systems Zero Emissions/Pollution Low Power demand Quick Installation time
Product Capacity and Efficiency	~ 3500 L	Vertical and Round in shape 500L to 2,00,000 L	500-1500L	Flexible flow rates starting from 20Nm3/Hour
Pricing	39,000 + GST Govt subsidy of ~ 13,000 - 15,000/-	38000 for 2L Rs 19/ L + GST Transport cost extra Free installation	30,000/- for 1500/L capacity	*Data not publicly available*
Sales and Marketing	Dairies and cooperative - NGOs, Foundations, CSR agencies, Rural retail	*Data not publicly available*	*Data not publicly available*	*Data not publicly available*
After Sales Support	Upto 10 years warranty 24/7 sales support is offered to the customers telephonically and Whatsapp. The complete maintenance of the product is free of cost and easy to repair the product	*Data not publicly available*	*Data not publicly available*	Continuous operation 365 days a year. Negligible Maintenance Cost and a Small system footprint

Ability to Train MFIs	Organic training is provided to the customers. Easy-to-use product with a step-by-step process can operate without prior knowledge about biodigesters	*Data not publicly available*	*Data not publicly available*	*Data not publicly available*

** Note: Indicative Vendor Landscape details sourced only from publicly available data*

Sa-Dhan
Fostering Inclusive Impact Finance

Sa-Dhan,
A 1 - 248, 3rd Floor, Safdarjung Enclave
New Delhi - 110029 (India).
T : +91 11 47174400 | F : +91 11 47174405
E : info@sa-dhan.org | W : www.sa-dhan.net