

# Standard Operating Procedure for Solar Pump





# **Standard Operating Procedure for Solar Pump**

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# 1. Introduction

## 1.1. Purpose of the SOP

This document is a Standard Operating Procedure (SOP) designed with the objective of providing a step-by-step guide for Micro Finance Institutions (MFIs) to design and offer a loan product for solar pump customers.

### For MFIs

- This document provides a clear understanding of the solar pump and its expected benefits to end consumers
- This document serves as a toolkit for MFIs to:
  - Check if their organization is operationally capable/ 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 solar pump 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 solar pump 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 solar pump is a device that uses solar energy to pump water from the source to the farmland. The pump is powered by a photovoltaic (PV) solar panel that generates electricity when exposed to sunlight. The electricity generated by the solar panel powers a motor which drives the water pump. Based on whether the pump is under or above the surface of the water, solar pumps can be divided into two categories, submersible and surface pumps. Solar pumps can be further divided based on their capacity, which is measured in horsepower (hp):

- Micro solar pump (<1 hp)
- Small solar pump (1-3 hp)
- Large solar pump (>3 hp)

Solar pumps can also be divided based on the ease of portability. Portability mainly depends on the weight of two components, the pump and the solar panels, and varies based on the capacity of the solar pump.

### **Ideal Consumer**

There is no ideal target persona to as any farmer with access to ample sunlight, nearby water source, and with or without grid-connected electricity in the region can use the solar pump. The capacity of the solar pump would be different based on the size of the farmland.

### **Product Benefit**

A solar pump can help the farmer save around INR 30,000 - 50,000 annually per acre from a combination of fuel-cost savings and income generation from additional crop cycles. Solar pumps enable year-round irrigation leading to increased crop cycles resulting in income generation. Using solar pumps, farmers can sow 2-3 crops in a year, leading to an overall increase in crop cultivation. Moreover, solar pumps can also be used in remote villages with poor electricity supply or lack of grid connectivity.

### **Product Installation**

The solar pump is delivered to the home of the farmer's household and does not involve a complex installation process. The solar panels simply need to be set up in a location that receives maximum sunlight throughout the day. The pump needs to be mounted in the water source. Post this, the system consisting of solar panels, a controller, and a battery bank is connected. The solar pump system is portable, and the farmer places it according to the land that requires irrigation.

### **Product Pricing**

The pricing for solar pumps varies according to the type and capacity of the unit. The price of a micro solar pump with a capacity (<1 hp) costs around INR 50,000 - 60,000. Small and large solar pumps (>1 hp) cost between INR 75,000 - 3,00,000.

Currently, subsidies are only available for solar pumps operating at more than 1 horsepower. Subsidies for micro solar pumps (<1 hp) are not available to the farmer.

## **MFI Readiness**

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

- Availability of the vendors in the region of operation of MFIs
- Demand for the product
- 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 solar pump 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, and product lifecycle support.

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 solar pump 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 process, filling out the loan application form, background verification and collection 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 and 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 solar pumps highlighting their use cases and target customers. MFIs can use this section to train their staff on solar pump product details and their benefits to customers. A case study on Khethworks (a solar pump manufacturing company) provides additional insights into solar pump operations.

#### 3.1. Product Overview

A solar pump is a device that uses solar energy to pump water from the source to the farmland. The pump is powered by a photovoltaic (PV) solar panel that generates electricity when exposed to sunlight. The electricity generated by the solar panel powers a motor which drives the water pump.



**Figure 1.** *Demonstration of a solar pump*



**Figure 2.** *Components of a solar pump*

Traditionally, fuel-based pumps have been using non-renewable sources of energy like diesel and kerosene for their operations. These fuel-based pumps are inefficient and expensive due to high operational costs involving fuel and electricity. Additionally, it is difficult to procure diesel from faraway petrol bunks, and often, the diesel is adulterated with kerosene which leads to repairs and damages to the water pump.

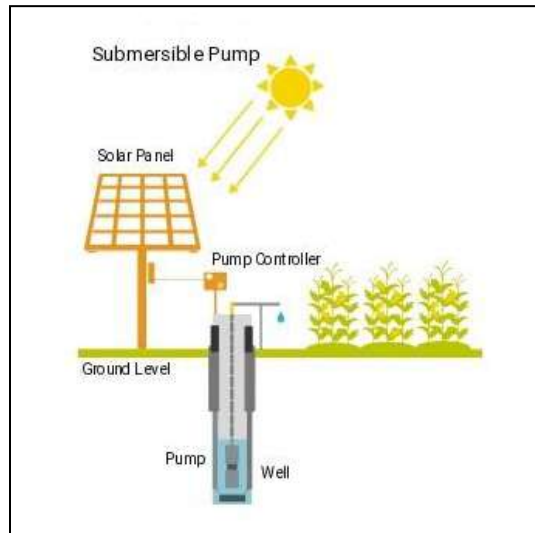
Similarly, traditional electric pumps face challenges in rural areas that have limited or poor access to electricity, which hinders the consistent performance of the pump.

Solar pumps provide an alternative to farmers who have a high dependence on expensive fuel-based pumps and inconsistent electricity supply for irrigation. The expenses involved in fuel and electricity generation can now be saved thereby helping smallholder farmers increase their income and improve productivity.

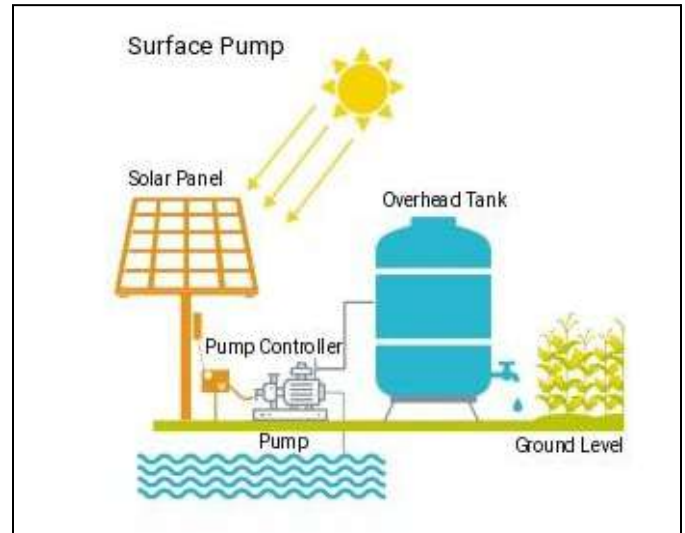
Based on whether the pump is under or above the surface of the water, solar pumps can be divided into two categories, submersible and surface pumps.



Submersible pumps are installed under the surface of the water source and pump the water up to the farmland. The primary source here would be wells and borewells. On the other hand, surface pumps are installed over the surface of the water source and usually pump water from a river or a lake.

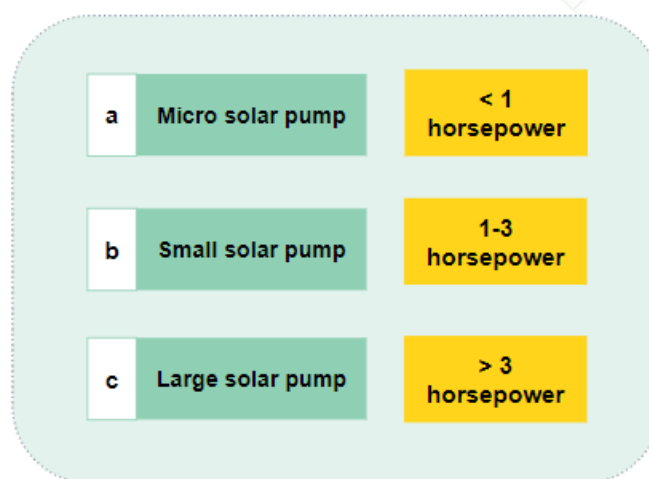


**Figure 3.** Mechanism for a submersible pump



**Figure 4.** Mechanism of a surface pump

Solar pumps can be further divided based on their capacity which is measured in horsepower (hp).



**Figure 5.** Types of solar pumps based on capacity (hp)

Solar pumps can also be differentiated based on whether they use Alternating Current (AC) or Direct Current (DC). However, the price and performance of both these types of pumps are at parity.

## Portability

Solar pumps can also be divided based on the ease of portability. Portability mainly depends on the weight of two components, the pump and the solar panels.

In terms of the pump, the solar pump is very light compared to the heavier fuel-based and electric pumps.

	Fuel-based pump	Electric pump	Micro solar pump	Small solar pump	Large solar pump
Capacity (hp)	2 hp	2 hp	<1 hp	1-3 hp	>3 hp
Weight (Kg)	15 Kg	35 Kg	3-7 Kg	8-15 Kg	>16 Kg

**Figure 6.** Weight of different types of pumps based on their capacity

As the capacity of the solar pump increases, more solar panels are required to supply the required power. Solar panels come in varying sizes, weights and capacities.

	Small solar panel	Medium solar panel	Large solar panel
Size (Ft)	4.8 x 2.2 Ft	6.5 x 3.25 Ft	7.5 x 3.7 Ft
Weight (Kg)	11 Kg	22 Kg	30 Kg
Wattage (W)	170 W	330 W	550 W

**Figure 7.** Different types of Solar panels available in the market <sup>1</sup>

<sup>1</sup>

[https://lumprodsta.blob.core.windows.net/prodcontainer/Catalogues/9ac151f0-7c66-488f-bec7-d592a837e914\\_Solar%20Main%20Catalogue%20Nov\\_22\\_V6.pdf](https://lumprodsta.blob.core.windows.net/prodcontainer/Catalogues/9ac151f0-7c66-488f-bec7-d592a837e914_Solar%20Main%20Catalogue%20Nov_22_V6.pdf)

	Capacity (hp)	Required Wattage of panels (W)	Total weight of the panels (Kg)	Number of Small panels	Number of Medium panels	Number of Large panels
Micro solar pump	<1 hp	200-900 W	15-60 Kg	1-5 panels	1-3 panels	1-2 panels
Small solar pump	1-3 hp	1000-3000 W	60-190 Kg	6-17 panels	3-9 panels	2-5 panels
Large solar pump	>3 hp	>3000 W	>200 Kg	>18 panels	>10 panels	>6 panels

**Figure 8.** Comparison of different types of solar pumps in the market

Apart from carrying the solar panels manually, solar pumps can be made portable by using appropriate equipment to move the solar panels from one place to another.<sup>2</sup>

However, farms over 2 hectares generally require a fixed solar array to provide enough power to pump the volume of irrigation water needed.<sup>3</sup>

### 3.2. Product Consumer Demographics

There is no ideal target persona to as any farmer with access to ample sunlight, nearby water source, and with or without grid-connected electricity in the region can use the solar pump.



**Figure 9.** Target consumer persona for solar pumps

<sup>2</sup> <https://www.pv-magazine.com/2022/02/17/mobile-solar-pump-deployed-in-remote-areas-of-india/>

<sup>3</sup> <https://futurepump.com/the-ultimate-guide-to-solar-water-pumps/>

Solar pumps can be used by all 3 farmer personas mentioned above. The capacity of solar pumps (hp) would be determined by the size of the farmland that needs to be irrigated.

The farmer should also have commercial aspirations of cultivating more than 1 crop during the season. There are no limitations in terms of geography as long as the customer has access to ample sunlight and a nearby water source.

### 3.3. Product Benefit

#### Consumer Benefits

A solar pump can add economic value ranging between INR 30,000 - 50,000 annually per acre per household from a combination of fuel-cost savings and income generation from additional crop cycles.<sup>4</sup>



#### REDUCED OPERATIONAL COSTS

Irrigation requirements for farmland vary based on the season. The solar pump can help the farmer save around INR 20,000 - 30,000 annually per acre by eliminating fuel costs for traditional fuel-based pumps.

Following is a table that outlines the operational cost for irrigating 1 acre of land using fuel-based pumps.

	No. of months of irrigation required (A)	No. of days of irrigation per week (B)	No. of days of irrigation per season (C) = (A) x (B)	Irrigation Cost per day (D) = (3 hours x fuel cost)	Operational Cost per season (C) x (D)	
Rainy Season	1 month	3	12	240	~ 3,000/-	
Winter Season	3.5 months	3	42	240	~ 9,000/-	= ~ 27,000/-
Summer Season	3.5 months	5	70	240	~ 15,000/-	
		Cost of fuel pump	Cost of fuel	Total Cost		
		~ 15,000/-	+ ~ 27,000/-	= ~ 42,000/-		

**Figure 10.** Operational cost for irrigating 1 acre of land using a fuel-based pump<sup>5</sup>

<sup>4</sup> Sourced from the product deck (attached in the annexure)

<sup>5</sup> Sourced from the product deck (attached in the annexure)

**Note:**

- 1) This table indicates the **maximum possible savings** in operational costs for water pumps
- 2) It requires **3 hours per day** for a fuel-based pump to irrigate land of 1 acre.
- 3) For 1 hour of operation, **1 L fuel** (diesel/kerosene) is required. The price assumed is **INR 80/Litre**
- 4) Cost of a fuel-based pump is one-time, but the cost of fuel is recurring every season.

**Benefits of Solar Pumps over fuel-based pumps**

- In 2017, the government announced that the price of subsidised kerosene will be raised by 25 paise per fortnight until the subsidy is totally withdrawn. Thus prices of kerosene are no longer as attractive as they were before.<sup>6</sup> The price of diesel also keeps fluctuating as per global oil prices and is hard to procure in remote rural areas where the nearest petrol pump may be 10-15 kms away.<sup>7</sup> In addition to this, kerosene-adulterated diesel causes damage to the diesel pumps, thereby decreasing the durability and mandating expensive repairs.
- For a paddy crop, nearly 7-8 hours are spent in irrigating one acre of land at a time and during this duration, 16 to 17 litres of diesel is consumed. So, about 80-85 litres of diesel is consumed towards cultivating the paddy crop in a one-acre land in season. Whilst not all crops consume the same amount of water, using solar pumps offsets the fuel costs.<sup>8</sup>

**RELIABILITY**

Solar pumps can be used in remote locations without access to grid electricity as the farmers only need access to sunlight and a nearby water source.

**Benefits of Solar Pumps over electric pumps**

- The quality of electricity shortage and unavailability is another reason for choosing solar pumps because rural households in many northern and eastern states typically receive less than 20 hours of grid supply.<sup>9</sup> In certain cases, only 3-4 hours of electricity is available. Any disruption of supply generally takes a very long time to repair, sometimes even extending to around 2 weeks.<sup>10</sup> Often, the timing of the power cuts coincide with crop cycles and climatic conditions when irrigation is needed the most, leading to low crop yield and crop loss.

<sup>6</sup> <https://timesofindia.indiatimes.com/blogs/Swaminomics/time-to-end-the-worst-subsidy-of-all-kerosene/>

<sup>7</sup> <https://en.gaonconnection.com/farmers-dilemma-the-msp-prices-have-gone-up-but-diesel-is-costlier-now/>

<sup>8</sup> <https://en.gaonconnection.com/farmers-dilemma-the-msp-prices-have-gone-up-but-diesel-is-costlier-now/>

<sup>9</sup> <https://www.ceew.in/publications/state-electricity-access-india>

<sup>10</sup>

<https://www.deccanherald.com/state/mangaluru/frequent-power-disruption-low-voltage-affects-farmers-residents-in-ko-daqu-953855.html>

- In cases where the electricity may be available in houses, a connection still needs to be made to the fields where the electric pump needs to be used. Hence, farmers need to plug a long wire from their house to the location on the field where a water source is present. The length of the electric wire sometimes leads to a voltage drop due to which farmers are unable to use large electric pumps in the field.<sup>11</sup>
- In addition to this, the electric pump weighs around 35 kg and requires an able-bodied man with a carriage to carry this around. Women certainly find it difficult to carry this, thereby limiting product usage and adoption.



#### INCREASED CROP CULTIVATION

Solar pumps enable year-round cultivation resulting in increased crop cycles leading to income generation of around INR 15,000 - 20,000 per acre annually.<sup>12</sup>

Usually, farmers who use fuel-based pumps sow 1-2 crops in a year, mostly during the rainy and winter season. During summer, the process of irrigation using fuel-based pumps becomes very expensive as 1 hour of operation consumes 1 litre of fuel. Solar pumps use solar energy to function which is available free of cost, thereby enabling year-round irrigation of farmland even in the summer months. Using solar pumps, farmers can now sow 2-3 crops in a year, leading to an overall increase in crop cultivation.



#### EFFICIENCY

Solar pumps are more efficient than fuel pumps, as they do not suffer from fuel inefficiencies and losses associated with burning fuel.

### **Environmental Benefits**



#### REDUCED EMISSIONS

Solar water pumps play a significant role in delivering a sustainable water supply in a climate-sensitive world by reducing harmful greenhouse gas emissions. Replacing kerosene or a diesel pump with a solar pump can significantly reduce the amount of CO2 emissions.

<sup>11</sup>

<https://www.deccanherald.com/state/mangaluru/frequent-power-disruption-low-voltage-affects-farmers-residents-in-ko-dagu-953855.html>

<sup>12</sup> Sourced from the product deck (attached in the annexure)



## CONTRIBUTION TO UN SDGs

Using solar pumps creates benefits in providing dignified work, supporting domestic technology and innovation, managing water sustainably, and strengthening climate resilience. It also enables gender equality by aiding women workforce participation by eliminating the need for manual irrigation, thus saving time, additional labour, and generating income through a higher yield.

Solar pumps contribution to the following UN Sustainable Development Goals:



### 3.4. Product Pricing

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

	Micro solar pump	Small solar pump	Large solar pump
	< 1 hp	1-3 hp	> 3 hp
Farmland cover	1 acre	2-5 acre	> 5 acre
Price (INR)	50,000-60,000	75,000 - 1,50,000	1,75,000 - 3,50,000
Subsidy	Nil	60%	60% (till 7.5 hp)
Price after Subsidy	50,000-60,000	30,000 - 60,000	70,000 - 1,40,000

**Figure 11.** Pricing for solar pumps based on their capacity

The table listed below is a comparison between the features of Solar Pump and other traditional pumps available in the market.

S.No.	Features	Khethworks Solar Pump	Honda Diesel Pump	Honda Kerosene Pump	Electric Pump
1	Power (in hp)	0.3 hp	2 hp	1.5 hp	2 hp
2	Weight (in kg)	4 kg	15 kg	14 kg	35 kg
3	Water Output (litre/min)	60 litre/Min	670 litre/min	600/litre/min	830 litre/min
4	Installation cost (in INR)	INR 40,000	INR 24,000	INR 24,000	INR 18,000
5	Operational cost (in INR)	Hardy any operational cost	Linked to Diesel costs	Linked to Kerosene costs	Depends on electricity supply



The cost of purchasing a solar pump (~ INR 55,000)<sup>13</sup> would be more than purchasing a fuel-based pump (INR ~ 15,000).<sup>14</sup> However, the cost of the solar pump can be recovered quickly as there is no annual operational cost for using fuel (~ INR 27,000/annum). Hence, a solar pump is a more cost-effective option for the farmer in the long run.

	Solar pump (< 1 hp)	Fuel-based pump (1.5 hp)
Price Year 1	55,000	47,000
Price Year 2	Nil	27,000
Total Price for 2 Years	55,000	74,000

**Figure 12. Solar pump vs Fuel-based pump cost**

### Government Subsidy

Currently, subsidies are only available for small and large solar pumps, operating at more than 1 horsepower. Subsidies for micro solar pumps (<1 hp) are not available to the farmer.

The farmers are eligible for subsidies on small and large solar pumps through the PM - KUSUM Yojana. Under Components B and C of the scheme, the farmers can avail of a subsidy of 30% from the Central Government, and another 30% from the State Government. The farmer would be required to bear 40% of the cost of the solar pump.<sup>15</sup>

However, these subsidies are only available for small pumps and large pumps with a maximum capacity of 7.5 horsepower.

### Availing of the Subsidy

The farmers can avail of subsidy by filling out an online form, which can be accessed through the PM-KUSUM portal. The MFI officials should help the farmers register for the subsidy. Alternatively, farmers can visit the Government operated Common Service Centres (CSCs). The subsidy is availed after the purchase of the product and is therefore credited to the farmer's account ~ 3 months after the approval. Hence, the farmer would initially have to take a complete loan amount from the MFI, as the EMI will start 1 month after the disbursement of the loan.

<sup>13</sup> Sourced from the product deck (attached in the annexure)

<sup>14</sup> <https://www.indiamart.com/proddetail/petrol-engine-pump-set-13709479562.html>

<sup>15</sup> <https://pmkusum.mnre.gov.in/landing-about.html>

### 3.5. Product Lifecycle

The installation and support process is carried out by the farmer whereas the vendor will support the farmer with product demonstration and post-sales support.

Action items	Lead	Support
1) Delivery of the solar pump	Vendor	--
2) Setting up the solar pump system near the farmland	Farmer	Vendor
3) Regular maintenance of the solar pump	Farmer	Vendor
4) Post-sales and repair support	Vendor	--

The following steps can be used to efficiently set up a solar pump:

#### Delivery of Solar Panel

The vendor delivers the solar pump to the farmer's household.

#### Solar Pump setup

The farmer receives training from the vendor on setting up the solar pump during the product demonstration and training process. The setup process is very simple and intuitive. The solar panels need to be installed in a location that receives maximum sunlight throughout the day. The submersible solar pump must be mounted at the water source securely at an aligned angle, and connected to the system consisting of solar panels, a charge controller, and a battery bank using appropriate connectors. The connections should be protected from moisture.

The farmer, if required, can reach out to the vendor for technical support and assistance telephonically or through video calling.

#### Maintenance

The farmer must regularly maintain the solar pump system to ensure long-term performance and reliability. Protecting the solar panels is important because if the panels get damaged, the whole pump stops working. Hence, the farmer must regularly clean the solar panels, check the battery bank and replace components as and when necessary.

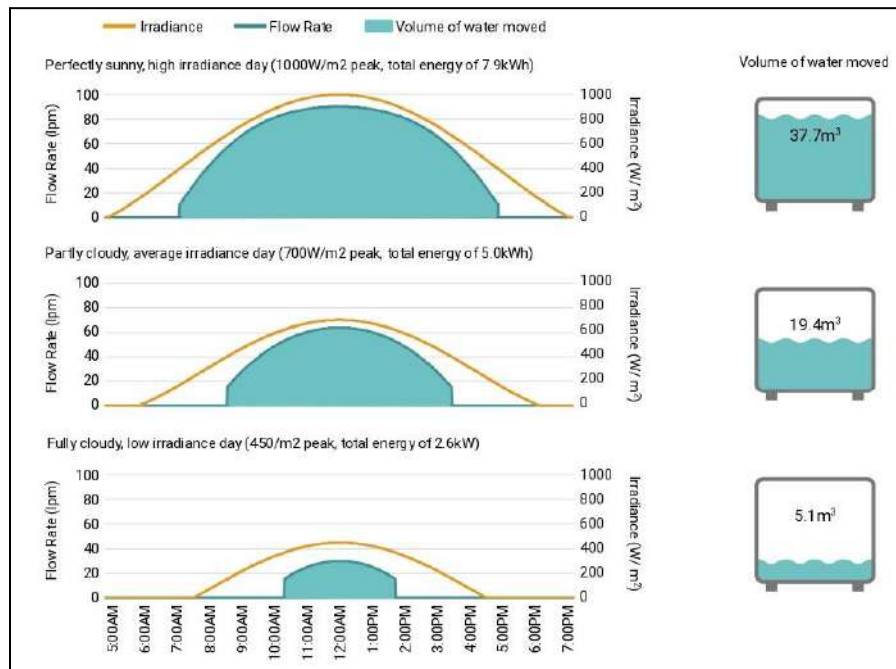
#### Support for repair

The vendor will provide support to the farmer throughout the lifecycle of the product. The product is simple and easy to repair, thereby consuming less time for repair, which is crucial for irrigation.

### 3.6. Product Limitations

One of the challenges with solar pumps is that their performance is highly dependent on the use case, intended application, size of the energy system, and other environmental factors.

In addition to this, the performance of the solar pump is dependent on the weather conditions. This is due to the variation in the total energy produced due to the unavailability of sunlight, based on which the volume of water pumped will vary.<sup>16</sup>



**Figure 13.** Indicator of solar pump performance on different solar days

Another major challenge for using a solar pump is the lack of consistent water availability, especially during the summer months.

### 3.7. Case Study on Khethworks<sup>17</sup>

This section provides an outline of Khethworks, a solar pump manufacturer with a vision to enable year-round irrigation, cultivation, and income generation for smallholder farmers.

<sup>16</sup> [https://storage.googleapis.com/e4a-website-assets/2019-Global-LEAP-SWP-Buyers-Guide\\_final.pdf](https://storage.googleapis.com/e4a-website-assets/2019-Global-LEAP-SWP-Buyers-Guide_final.pdf)

<sup>17</sup> All details in the section have been sourced from the Product deck and insights shared by the Vendor



**Figure 14.** *Khethworks solar pump being used on field*

### **3.7.1. Product Overview**

The components of the Khethworks solar pump include 2 solar panels (160 watt each), a controller (with an on/off switch), a 4 kg portable pump, Brushless Direct Current (BLDC) motor and an outlet for water flow. BLDC motor increases efficiency and reduces maintenance.

Khethworks' solar pump has a flow rate of 1 Litre per second and a motor capacity of .34 horsepower (hp). The pump is optimized to cover 1 acre of land. Khethworks also has a patent for their submersible centrifugal pump.



**Figure 15.** *Khethworks solar pump next to a shallow source of water*

### 3.7.2. Installation

The solar pump is easy-to-adopt and requires no expertise to operate. The pump is portable since it weighs only 4 kg. The process of installing the pump is mentioned below:



**Figure 16.** A step-by-step process on installing the Khethworks solar pump on the field

- The farmers carry the solar pump from their homes to the field
- The farmers then choose the location on-field that needs to be irrigated. The pump needs to be submerged in a nearby source of shallow water like a well or borewell (20-50 feet deep).
- The controller is connected to the solar panels and pump. The panels must be placed at an angle with optimum access to sunlight.
- The whole system is controlled with the push of a button on the controller. Once the switch is on, water would flow through the outlet pipe and the farmer can irrigate the field.
- Additionally, the farmers can also connect with the vendors telephonically or through video calls for installation support.

### 3.7.3. Repair

Khethworks solar pump is small in size and has a simple design, ensuring that its maintenance and repair are easy and cost-effective. The pump can be repaired in any motor or electrical repair shop in proximity to the farmer.

Khethworks has trained local mechanics at the village level to build their capability to repair solar pumps. In addition to this, mechanics who have prior experience with solar appliances are selected to ensure better quality. For instance, the vendor has set up efficient repair ecosystems in Mayurbhanj and Keonjhar districts in Odisha.



The Khethworks solar pump is expected to run smoothly for a period of 5 years without any repairs. Khethworks offers a 1-year warranty on the motor and a 20-year warranty on the solar panels. However, the solar pump system has to be completely replaced if the solar panels are damaged.

Additionally, Khethworks also plans on ensuring the availability of stock of spare parts. Since the new batch of Khethworks micro solar pumps would be made in India, the components and spare parts would be readily available at a cheaper price. Spare solar pumps and controllers can also be stored in the villages for farmers to use till their pumps are repaired.



**Figure 17.** Khethworks repair ecosystem in a rural district

### 3.7.4. Differentiator

The following table shows a comparison between Khethworks micro solar pump to the ones benchmarked by the Ministry of New and Renewable Energy and the winners of the Global LEAP Awards, an international competition that identifies the world's best and most energy-efficient off-grid appliances.

Source	MNRE Micropumping Specs		*Khethworks	Global LEAP Award Winners	
Model	Model I	Model IV**	320	Surface	Low-head, low-flow
PV Array (watts)	300	500	320	500	1000
Water output (liters/day at 10m)	10,000	20,000	34,447	22,400	31,400
Tested energy (KWh/m2/day)	7.15	7.15	7.15	7.9	7.9

**Figure 18.** Comparing Khethworks solar pump to other solar pumps available in the market<sup>18</sup>

<sup>18</sup> [https://storage.googleapis.com/e4a-website-assets/2019-Global-LEAP-SWP-Buyers-Guide\\_final.pdf](https://storage.googleapis.com/e4a-website-assets/2019-Global-LEAP-SWP-Buyers-Guide_final.pdf)

The data suggest that Khethworks solar pump outperforms the MNRE Micropumps by delivering 3x the water volume, and 75% more flow for pumps with 0.5 horsepower at a cheaper price. The Khethworks solar pump is also more efficient than the LEAP Award-winning large pumps. In addition to efficiency, the portable and easy-to-use design of the Khethworks solar pump has enabled more adoption and product usage by women farmers.

From an environmental perspective, replacing a kerosene pump (capacity of 1.5hp) with a solar pump (capacity of <1 hp) can save over 300 kg worth of CO2 emissions per pump annually.

### 3.7.5. Pricing

A Khethworks solar pump costs around INR 55,000 for a capacity of .34 horsepower. The solar pump can be utilized for multiple hours a day since it has zero operating cost. Any member of the household can use it on the field as the pump is portable and easy to operate. The solar pump system has 3 main components:

Component	Price (INR)
Solar Panels	12,000
Pump	30,000
Controller	7,000

### 3.7.6. Testimonials and Reviews

Mentioned below are 2 testimonials from farmers who have been using Khethworks micro solar pump since 2020-21.

#### High Return on Investment



Kanchan, Subhadra and Sarita from Keonjhar, Odisha have been cultivating chilli during the summer season and earning INR 8,000 using a watering can for manual irrigation. Since switching to Khethworks pump jointly, Kanchan earned INR 38,000, Subhadra earned INR 15,000 and Sarita earned INR 6,000. This totals an amount of INR 59,000, resulting in a 7x increase in income in a single cropping season.

**Figure 19.** Women farmers using Khethworks solar pump



### Customer satisfaction

“Having used the Khethworks pump since 2020, the pump is a lot easier to use because it does not have any recurring cost. It's a one-time investment and eliminates the need to search for kerosene. For instance, the actual profit from earning Rs. 20,000 would be Rs. 10,000 while using a kerosene pump. But with the Khethworks solar pump, the entire Rs. 20,000 will be the profit.”

- Manoj, Khunti, Jharkhand

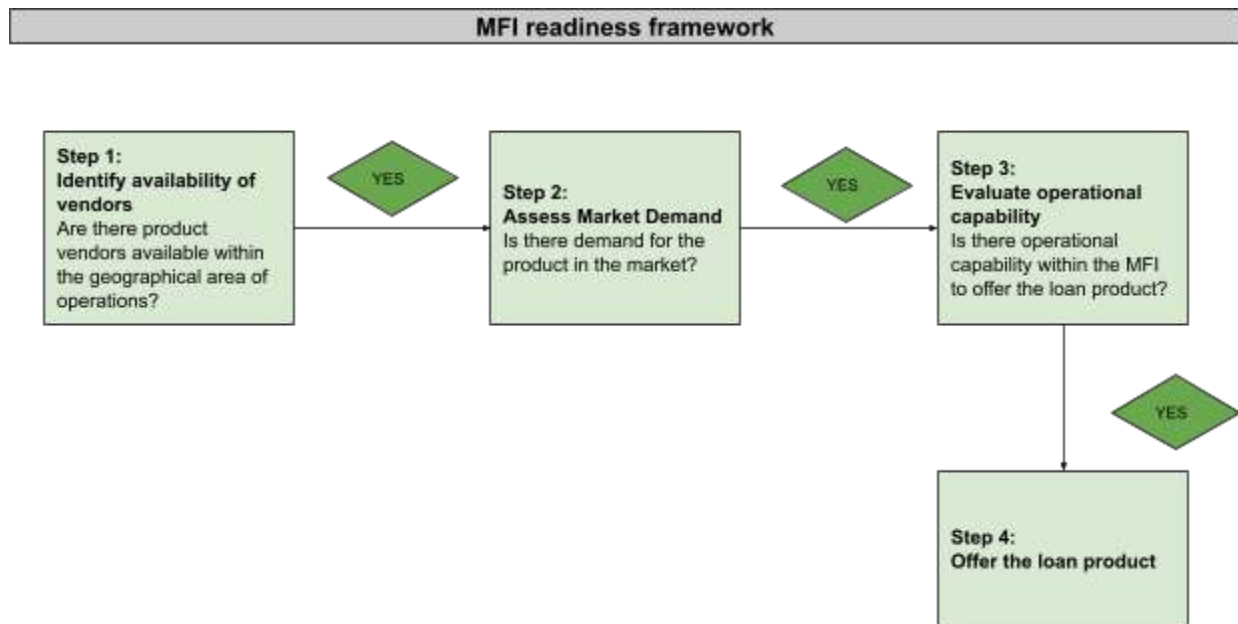
***Figure 20. Customer with the Khethworks team on field***



## 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 solar pump. 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 solar pumps. If there are no vendors in the MFI region of operation, then the 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.

<b>Note: This is a sample toolkit. The numbers are used for example purposes however, the formulae 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)</b>			
		Customers	Comments
1	Select ideal customer persona	Number of farmer households (HH) in the MFI's area of operation (-Availability of farm 1 acre or more)	15000
2	Apply eligibility criteria using following indicators	Apply criteria check - Household income - Number of members in the household	
3	Segment farmer households	Farmer households that have upto 30% of disposable income	7000
		Farmer households that have upto 40% of disposable income	5000
		Farmer households that have upto 45% of disposable income	3000
			<b>Segment 1- Vulnerable households</b> <b>Segment 2- Low income households</b> <b>Segment 3- Manageable households</b> <b>Note the sum of the three types of farmer households should add up to total number of farmer households. (i.e. point 1 = sum of all the three households mentioned in point 3)</b> <b>15000 = 7000+5000 +3000</b>
4	Estimate Sales (SOM)		This is sum of low income households and manageable households because that is the segment MFIs should target (i.e. 5000+3000)
		<b>Therefore, Targer number of customer</b>	<b>8000</b>
		Demand for product in vulnerable HH (assumption)	0%
		Demand for product in low income HH (assumption)	40%
			Demand estimation. Demand for the solar pump 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 manageable HH (assumption)	60%
		Estimated Market capture by the MFI	25%
		Average loan size for the solar pump	55000
		Total Sales (units of product) for which loan is taken	950
		<b>Solar Pump loan Portfolio AUM for the year</b>	<b>₹52,250,000</b>

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

- Select ideal customer persona: There is no ideal target persona as any farmer with access to ample sunlight, nearby water source, and with or without grid-connected electricity in the region can use the solar pump. The capacity of the solar pump would be different based on the size of the farmland.
- 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)

- Once the criteria check is executed, classify customers into the following segment:

Segment 2: Vulnerable households	Segment 3: Low income households	Segment 4: Manageable households
Farmer households that have up to 30% of disposable income	Farmer households that have up to 40% of disposable income	Farmer households that have 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

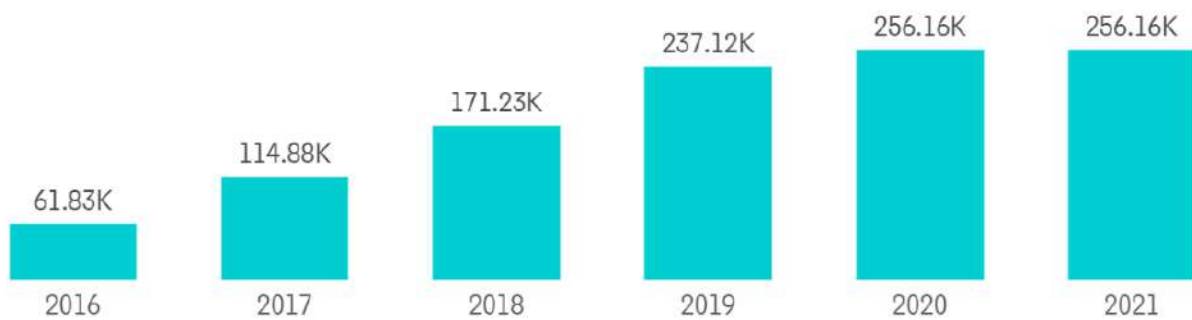
The sales projection becomes the Serviceable Obtainable Market (SOM). The last step is to assess the operational capabilities existing in the organization to enter the market and start operations. The questions below provide a checklist towards assessing the operational capabilities.

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

## 4.2. Market Size Estimation

The solar pump market in India is expected to grow at a CAGR of 15% between 2019 to 2028. According to a study conducted in 2021, almost 250,000 solar pumps have been installed in the country.<sup>19</sup>

<sup>19</sup> <https://www.mordorintelligence.com/industry-reports/india-solar-water-pump-systems-market>



**Figure 21.** Solar water pumps installed capacity units in India <sup>20</sup>

The market for both, submersible and solar pumps has grown positively in the last 5 years. It is a great opportunity for MFIs to partner with solar pump providers to accelerate growth.

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<sup>20</sup> <https://www.mordorintelligence.com/industry-reports/india-solar-water-pump-systems-market>

## 5. Vendor Partnership

The section explains the process to ensure a successful partnership with a Solar Pump 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.

#### **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.

#### **Product Quality, Capacity and Efficiency**

MFIs must ensure that vendors have strong and stable product portfolios.

#### **Training MFI staff and clients**

MFIs should ensure that the vendor has the capability to train all necessary stakeholders across the customer awareness journey. Proper training and product demos should be provided to the MFI staff as well as to end consumers.

#### **Price Point**

MFIs should ensure that vendors have competitive pricing in comparison with fuel-based pumps, while having adequate knowledge about Government subsidies.

**Sales and Marketing capabilities**

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

**Post-sales support**

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

**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.

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 solar pump, including subsidies and other programs.

**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 solar pumps.

**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.

## 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.

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 women typically take more responsibility and ownership leading to better product adoption, usage, maintenance, etc.
3. Determining loan structure
Once the customer type is identified, design the loan structure. MFI can offer loans to individuals or JLGs
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

The 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.



Following is the loan product design for 3 different types of solar pumps based on their capacities.

	Micro solar pump (<1hp)	Small solar pump (1-3hp)	Large solar pump (>3hp)
	1 acre	2-5 acres	> 5 acres
Loan amount	50,000-60,000	75,000 - 1,50,000	1,75,000 - 3,50,000
Interest rate	18 - 24%	18 - 24%	18 - 24%
Loan term	24 months	24 months	24 months
EMI	3,100 - 3,700	4,700 - 9,000	11,000 - 21,000
Effective EMI*	3,100 - 3,700	2,800 - 5,500	6,500 - 13,000

**Figure 22. Loan product design <sup>21</sup>**

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 small and large solar pumps (1-7.5 hp), subsidy is around 60% and is not available for micro pumps (<1 hp). 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 farmer can save around INR 20,000 - 30,000 annually per acre on the pump operation costs, which is equal to INR 1,500 - 2,500 on a monthly basis. In addition to this, year-long crop cultivation can lead to an additional income generation of INR 20,000 - 30,000 per acre per year, equivalent to INR 1,500 - 2,500 on a monthly basis.

Therefore, on average, a farmer can save around INR 3,000 - 5,000 monthly per 1 acre of land.

#### For micro solar pump (<1 hp and 1 acre)

As the farmer can save around INR 3,000 - 5,000 monthly per acre, monthly effective EMI of INR 3,100 - 3,700 makes economic sense to the farmer.

<sup>21</sup> Sourced from the Product deck and insights shared by the Vendor

For small solar pump (1-3 hp and 2-5 acres)

As the farmer can save around INR 3,000 - 5,000 monthly per acre, total savings can range between INR 6,000 - 20,000. Therefore, monthly effective EMI of INR 2,800 - 5,500 makes economic sense to the farmer.

For large solar pump (>3 hp and >5 acres)

As the farmer can save around INR 3,000 - 5,000 monthly per acre, total savings can range between INR 15,000 - 30,000. Therefore, monthly effective EMI of INR 6,500 - 13,000 makes economic sense to the farmer.

## 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
<b>Stage 1</b> 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
<b>Stage 2</b> 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	--
<b>Stage 3</b> 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 solar pumps 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 in which MFIs interact 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 solar pumps.

A [sample questionnaire](#) has been created with a checklist of recommended parameters. The survey can be translated into Hindi or other regional languages based on geography.

- Household Income Assessment - Enabling MFI to identify eligible households that exist in the village for the solar pump 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
Availability of Toilet
Availability of Furniture
Access to Gas Cylinders and Grid Electricity
Landhold for agriculture
Crop grown for cultivation
Location of water source
MGNREGA work
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.
- 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. What is the crop type you cultivate and how much water is required for irrigation per acre of land?
- 
10. 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
11. Do you currently use a fuel-based pump (kerosene/diesel) for irrigation?
- a. Yes
  - b. No
12. How much do you spend on fuel per month for irrigation per acre of land?
- 
13. Have you taken benefit from the MGNREGA scheme?
- a. Yes

b. No

14. Do you have access to a BPL / AADHAR card?

a. Yes

b. No

15. Do you have access to a smartphone or a personal vehicle like a scooter?

a. Yes

b. No

16. 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 mobilization of women leaders and other women-centric groups and collectives as women can be the key users of the product. The officials should ensure that women are present in large numbers for the product demonstration. The demonstration should focus on ensuring women understand the product details, usage and benefits.

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.

Since the product can be used easily by everyone, officials must ensure women participation and training whilst highlighting the key product features of the solar pump. 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 the loan 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 so as to encourage women to be the primary loan applicant.

Officials should ask the customers to visit the branch office to file the application. MFI officials should help the customers fill out the application form to fasten this process.

### **7.2.4. Background check and verification**

After the application form is filled out, the officials must 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 (Agriculture tools, Land, Source of water)

- ☐ 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 disbursement 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**

The officials must visit the field across regular intervals post the 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, pump usage, irrigation and crop cultivation during summer, etc.

As mentioned in the product limitations, the solar pump can help the farmers generate income in the summer season through crop cultivation only if there is water availability in the region. Therefore, MFIs must take this into account and design repayments accordingly in case farmers are unable to generate income during summer months.

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.



#### **7.3.4. Post Disbursement Support**

The vendors are responsible for processes on the product's lifecycle 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, disbursement 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 the different phases of the loan cycle.

<b>Risk</b>	<b>Stage of the risk</b>	<b>Impact of risk</b>	<b>Mitigation strategy</b>
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	<p>1. During village surveys, focus on villages that have high demand and more customers fitting the ideal customer base for the product.</p> <p>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.</p> <p>3. Low customer demand can also be due to no subsidy being available for less than 1 hp product. In such a case, MFIs should pitch higher hp solar pumps to customers because these pumps have government subsidies associated with the product.</p>
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 to avoid any due diligence-related delays.
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 shared by Khethworks.

### 9.2. Vendor List for Solar Pumps

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

1. Khethworks
2. Tata Power Solar
3. CRI pumps
4. Shakti pumps
5. Jain Irrigation systems
6. Unnati pumps

#1	Khethworks	Tata Power Solar	CRI Pumps
Geography	17 Indian states	Present in 12 States	21+ manufacturing facilities across the globe and presence in 120 countries
Brand Recognition	Start up and an innovator	A well-known brand in the industry	Part of the International chain of the CRI group
Experience	Since Dec 2020	32 years of experience	50+ years of engineering experience
Product Capacity and Efficiency	.34 HP	1 HP	From 1 HP to 10 HP
Pricing	INR 55,000	INR 75,000	INR 85,000 for 1 HP
Sales	850 units sold till date	<i>Data not publicly available</i>	<i>Data not publicly available</i>

#2	Shakti pump	Jain Irrigation systems	Unnati Pumps
Geography	Global presence in 120+ countries	Global presence in 126 countries	Global presence in 50+ countries
Brand Recognition	One of the pioneers in manufacturing of energy-efficient pumps and motors since	One of the largest micro irrigation companies in the world	A well-known manufacturer in of solar pumps
Experience	Since 1982	Since 1963	Entered the industry in 1985

Product Capacity and Efficiency	1 HP - 3 HP	1 HP - 10 HP	From 1 HP to 10 HP
Pricing	INR 1,00,000 for 1 HP	INR 1,00,00 for .5 HP	<i>Data not publicly available</i>
Sales	<i>Data not publicly available</i>	More than 30,000 pumps sold	4000 pumps sold through MNRE

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



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