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Case Studies

Techno Commercial Review of Decentralised Renewable Energy Applications Across Agriculture, Dairy and Fishery

Photo credit: IIEC and SRIJAN

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Contents

CASE STUDY

01

Photo credit: Vecteezy

Solar Rice Processing unit - Assam

Background and Need for the Solution

Assam is an agricultural state located in the Northeastern region of India, known for its rice production. One of the significant challenges faced by rice farmers in the state is the processing of rice grains, especially during the monsoon season. Most farmers rely on traditional methods, which are labor-intensive, time-consuming, and expensive.

Mr. Sandi Talukdar from Balitara,in Nalbari District, Assam had to get his rice processed throughout the year from a diesel run mill. The use of grid electricity for processing is not feasible for 5-6 hours daily by any local vendor. To overcome these challenges, he decided to opt for solar-powered rice hullers combined with a polisher and grinder that was introduced to him in 2021, which has transformed the condition around him.

Intervention Done

The solar-powered rice huller, combined with a polisher and grinder of 3HP was introduced as an alternative to diesel powered rice processing methods available locally. The machine is operational for 5-6 hours daily and can process 160 kg of rice grains per hour. The system was installed by M/S. Suraj Solar Enterprises, a solar energy company, based in Nalbari itself.

Image: The beneficiary with his installed solar powered rice mill

Sizing of Solar Energy System

The solar-powered rice huller, combined with a polisher and grinder, is powered by 335Wp x 10 solar panels and 200Ah x 10 batteries, 120V. The inverter size is 10kVA, making it suitable for processing 160 kg of rice per hour.

Schematic design

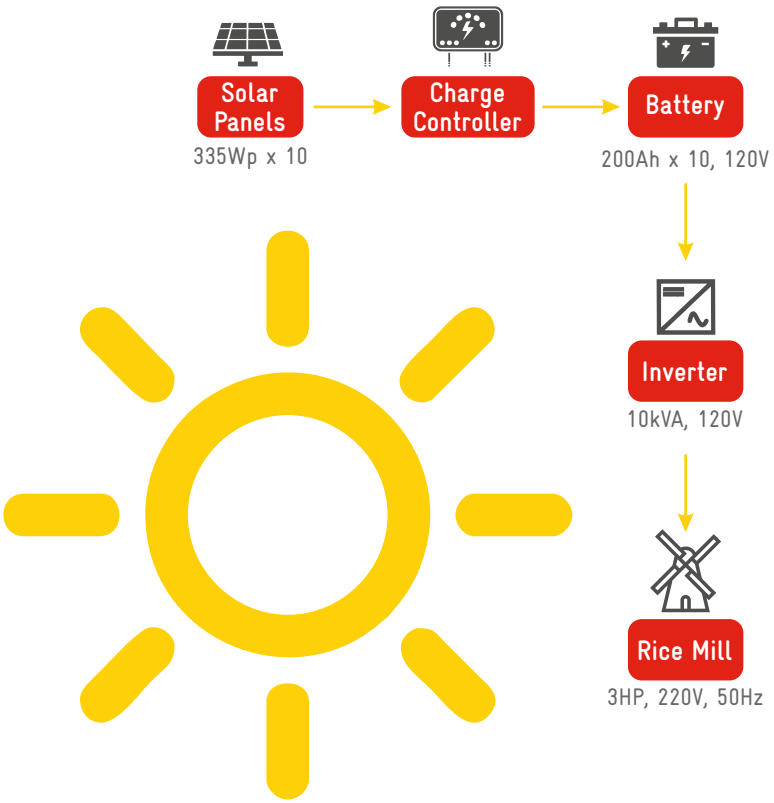


Photo credit: Freepik

Financing Mechanism

Total cost of the system along with solar energy system, A = Rs. 6,40,000

Subsidy provided by the SELCO Foundation = 85% of the total cost = Rs. 5,44,000

Total payment done by the beneficiary in 3 installments = Rs. 96,000

Revenue

Average earnings per day = Rs. 450
Operational days = 330 days
Earning in 1 year, B = Rs. 1,48,500

Payback = A/B = 4.3 years

Benefits

- Ability to process rice grains even during power outages, increasing productivity and income
- Lower processing cost of Rs. 40 per Mon (1 Mon = 40 kg) compared to traditional method at Rs. 60 per 40 kg
- Significant reduction in processing cost, leading to increased profits for the user
- Reduced processing cost for customers.

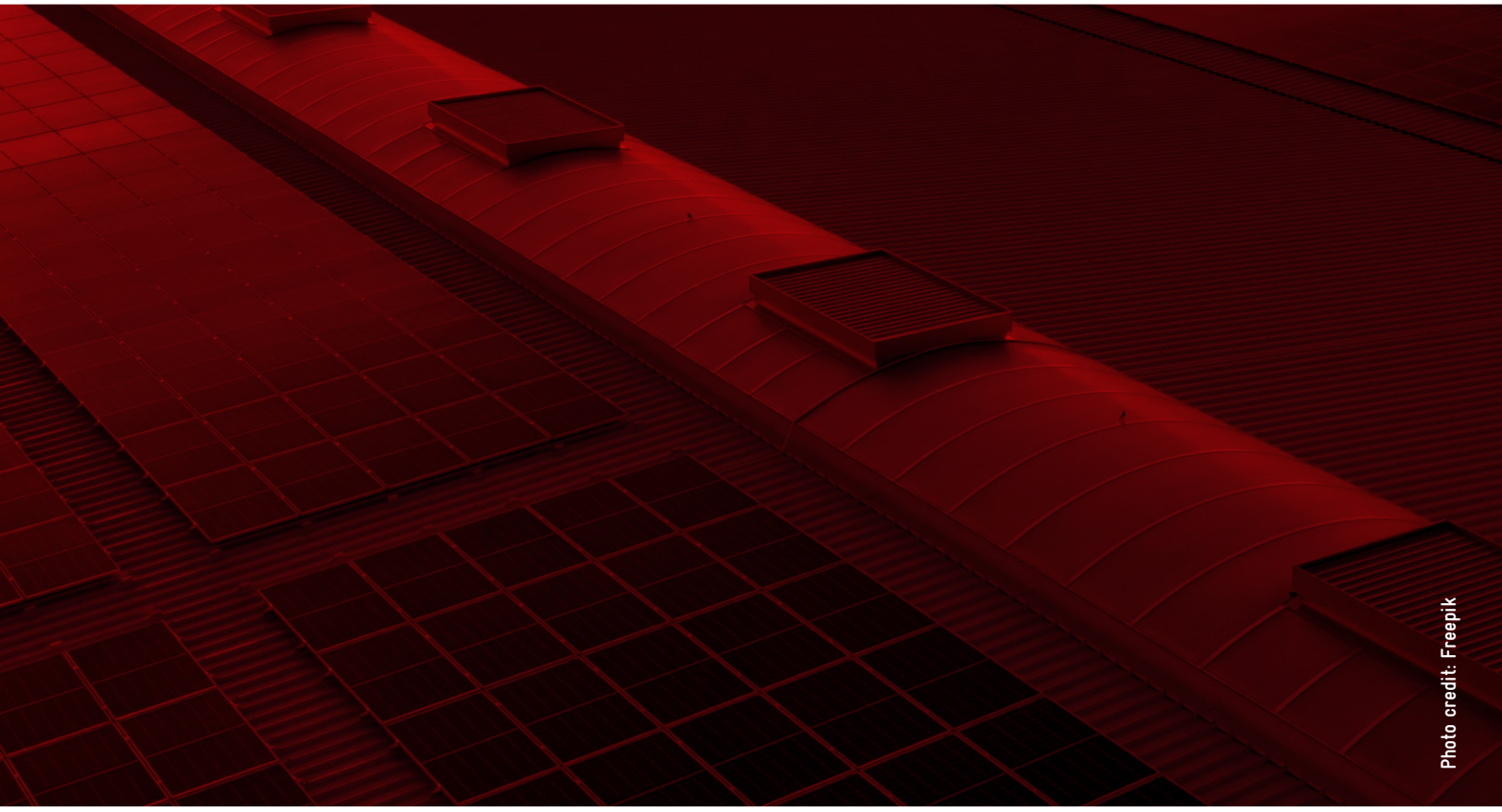


Photo credit: Freepik

CASE STUDY

02

Photo credit: Freepik

Solar Cotton Weaving Loom - Assam

Background and Need for the Solution

Assam is known for its handloom industry and the weavers in the state have been facing numerous challenges such as high electricity bills, frequent power cuts, fluctuations and low voltage and lack of access to modern technology.

A SHG group named Bhagyashree from Nislamari village in the Nalbari district of Assam having 10 members used to work on manual as well as grid electricity powered handlooms and even after working for 6-8 hours per day, they used to produce 6-7m of weaved cloth. This had led to extreme drudgery, poor physical health and electricity bill upto Rs. 5000/month.

Intervention Done

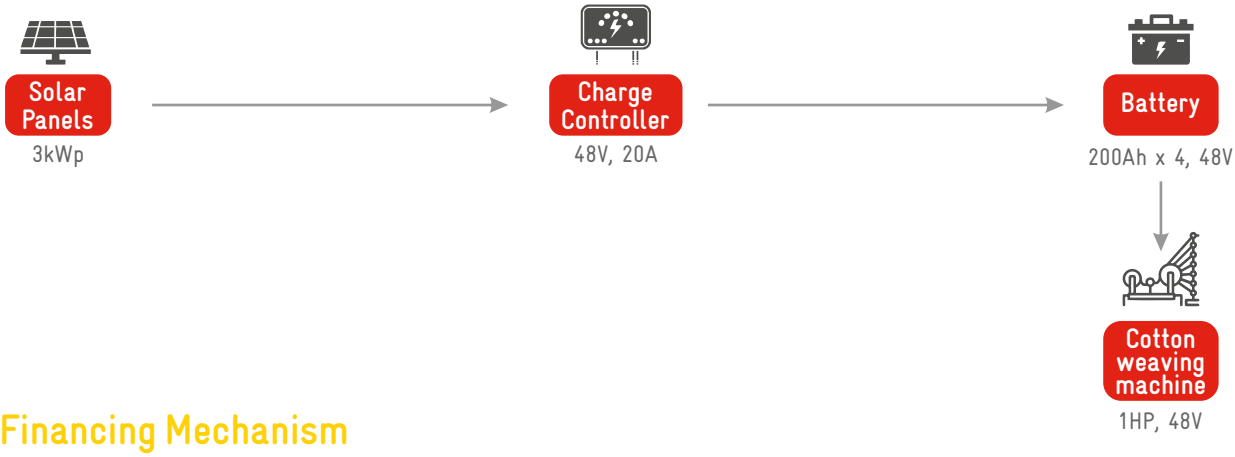
To address these issues, a solar-powered weaving machine was introduced supported by Sustain Plus to improve the productivity and profitability of the weavers. The installation was done by M/S. Suraj Solar Enterprises, a solar energy company, based in Nalbari, Assam.

Photo credit: IIEC and SRIJAN

Sizing of Solar Energy System

The cotton weaving system is powered by an offgrid solar power plant having 3kWp system, battery of 200Ah x 4, 48V and PWM based charge controller of rating 48V, 20A. This is a complete DC system having a motor of 1HP to run the looms.

Schematic design



Financing Mechanism

Total cost of the system along with solar energy system = Rs. 2,40,000

Subsidy provided by SELCO Foundation and Sustain Plus = Rs. 2,40,000 (50% each)

Revenue

The average rate of the weaved cotton cloth irrespective of the weaving mechanism = Rs. 100-120

The profits have increased since the production quantity has increased by 8-10 times.

Images: The solar weaving loom with solar batteries

Photo credit: IIEC and SRIJAN

Images: SHG members with their system

Benefits

The quality of the output is the same as handmade and the production per day has reached 50-60m. The SHG members informed us that the drudgery is now minimal and now they devote more time to other productive work. The net income of the SHG group has increased by 25-30% in addition to savings due to cut in the electricity bill payment.

Issue

There is a need to create a robust supply chain to aggregate the demand and sell the products. More work is required to develop market linkages to further increase the productivity and involvement of SHG members.

CASE STUDY

03

Photo credit: Freepik

Solar Freezer cum Refrigerator - Udaipur

Background and Need for the Solution

Rajasthan, a state in India, experiences severe water scarcity, especially in rural areas where agriculture is the primary source of income for many. Custard apple is an important fruit that is grown in the region, but its storage and processing pose a significant challenge due to limited availability of electricity and lack of awareness about market possibilities. Before 2020, custard apple production (September - November) was either directly sold in the market or wasted due to limited demand. Therefore, there was a need for a sustainable and affordable solution to address this issue. The average land holding of the farmers are 1 - 1.25 acre in the area.

To address the situation, the Gramshree Foundation, with its registered office in Jaipur, recognized the potential of custard apple and mobilized women in the Udaipur district for its cultivation. The intervention included the development of collection centers, training on fruit processing, and the mobilization of women leaders. One of the significant challenges faced in the processing of custard apple is the need for cooling to store and transport the fruit without spoilage.

Intervention Done

Gramshree Foundation Trust with support from Devidayal Solar Solutions, a prominent name in the space of cooling have installed solar powered freezers cum refrigerators to ensure proper storage and transportation of the custard apple pulp and other fruit derivatives. The technical support required in the various stages of processing was provided by the Rajasthan College of Agriculture. The all women FPO named Vandan Shakti Mahila is working with the Foundation on this which comprises 1200 women.

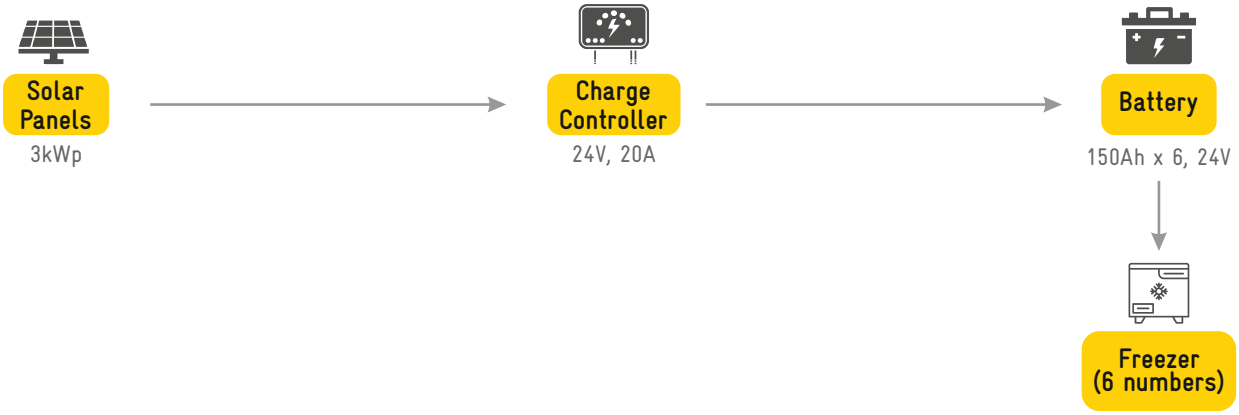
Image: Banner in the processing centre highlighting the processing centres and the partners

Image: Processed and packed custard apple kept in the solar freezer

Sizing of Solar Energy System

Total 10 freezers having capacity of 200 litres each have been installed out of which 6 are installed in the processing unit, powered by 3kWp (320Wp x 9), 150Ah x 6 batteries. The rest of the 4 systems are installed in the transportation vehicle, powered by 320Wp x 2 panels and 150Ah x 4 batteries.

Schematic design



Images: (Left to Right) The solar panels installed on the roof of the processing unit and solar freezers installed.

Photo credit: IIEC and SRIJAN

Image: Solar panels have been set up on the roof of a vehicle, which generates power to run the freezers stored within it.

Financing Mechanism

The entire set of freezers and solar energy system installation was supported by Devidayal Solar Private Limited.

Revenue

Total number of processing units as of now = 3

Average number of women working in each unit = 35

Daily income received by each woman = Rs. 200

Average number of working days/season = 45

Total revenue earned by each woman/season = Rs. (45 x 200) = Rs. 9,000

Total number of seasons is 3 since the organization is also working on other horticulture produce as well such as Jamun (July-August) and Indian Gooseberry or Amla (December-February).

This is in addition to the income generated by women farmers by selling their horticulture produce to the Gramshree Foundation Trust.

Photo credit: Freepik

Photo credit: IIEC and SRIJAN

Image: The Gramshree Foundation Trust team with the women farmers

Benefits

The intervention by the Gramshree Foundation and Devidayal solar has ensured that the negligence towards the horticulture produce is reduced and has channelised the women farmers to cooperate and contribute to the scope of processing. This is to note that the selling price at which the horticulture produce sold by the women farmers has increased to Rs. 12-15/kg from Rs. 4-5/kg due to the intervention by the foundation and their increased ability to store the pulp due to access to solar powered freezers.

CASE STUDY

04

Photo credit: Freepik

Solar Millet, Spice Pulveriser and Slicing Machine - Kandhamal

Background and Need for the Solution

Kandhamal district is located in the southern part of the state of Odisha and is predominantly a tribal-dominated district. The district has a total population of around 7.3 lakh[1], and agriculture is the primary source of livelihood for more than 80% of the population. The district is known for the production of different types of millets such as finger millet (ragi), pearl millet (bajra), and little millet (kutki) as well as spices. Millets are considered to be an important crop in the district as they are drought-resistant, require less water, and are rich in nutrition. However, despite the potential of millets, the processing units in the district face various challenges such as inadequate processing technologies, lack of market linkages, and limited access to finance.

The need of the solution arose due to non-availability of any processing unit in the locality and irregular and low grid voltage supply ensured that no conventional machine works properly.

Intervention Done

It was the year June 2020 when the team of SELCO Foundation and Shanti Maitreyee joined hands to provide solar powered millet grinder, spice pulveriser and slicing machine to be run by a SHG group of 12 women. Interestingly, this system has been installed along with a Odisha government funded maternity centre. Here, the attendants of pregnant women get the chance to deal with the customers when required and get paid a lumpsum amount in order to earn some income during their stay. The maintenance of the system is done by the savings of the SHG.

Images: The maternity centre banner and the installed DRE applications

[1] https://www.census2011.co.in/census/district/414-kandhamal.html

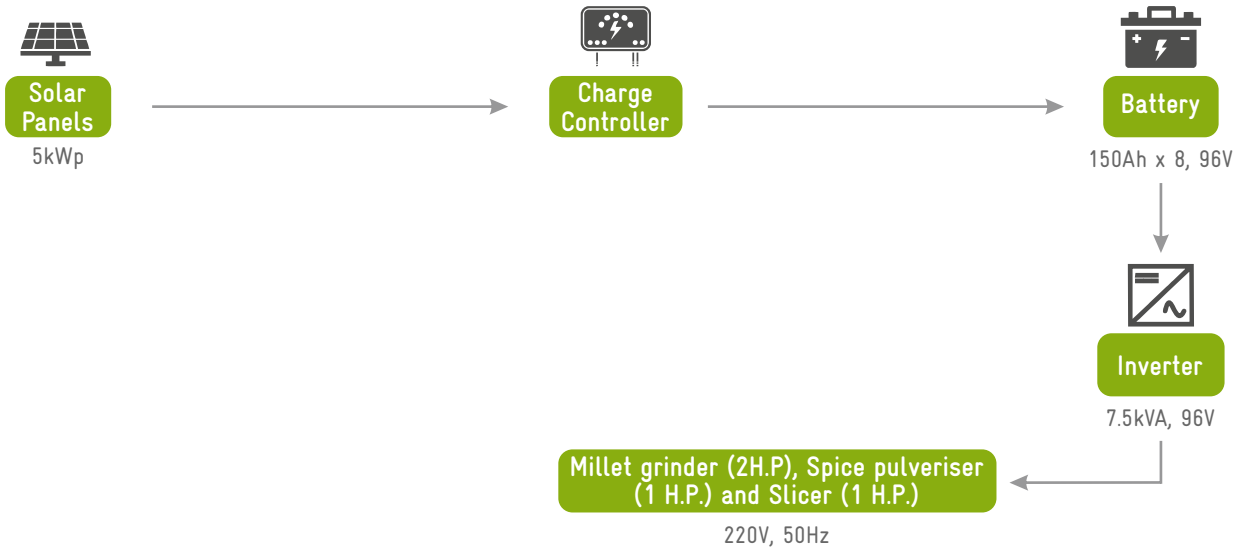
Sizing of Solar Energy System

The solar powered millet grinder (2H.P.), spice pulveriser (1 H.P.) and slicing machine (1 H.P.) is powered by a complete offgrid system of 5kWp and battery capacity of 150Ah x 8, 96V. The installed inverter rating is 7.5kVA.

Photo credit: IIEC and SRIJAN

Images: Installed solar panels on the roof and the batteries for running the loads

Schematic design



Financing Mechanism

Land and infrastructure support was provided by Shanti Maitreyee and the solar energy system along with machineries were supported by SELCO Foundation. There was no financial contribution made by the end user.

Revenue

The processing centre runs almost all round the year on an average of 2 hours per day since it is connected with an FPO having 500+ farmers and a total cultivated area of 1000 acres, and hence gets bulk orders for processing.

Millet processing charge = Rs. 7/kg

Spice processing charge = Rs. 10/kg

Benefits

- The average increment due to the installation of the solar powered processing centres per SHG member = 30-40%
- Commutation time saved

Photo credit: Freepik

Solar Cold Storage - Chhindwara

Background and Need for the Solution

Chhindwara district in Madhya Pradesh is known for its rich forests and natural resources, including Non-Timber Forest Products (NTFPs) like Mahua, Honey, Bamboo, Amla, and Custard apples. These products make up 15-20% of the yearly income for families in the area. However, due to a lack of market awareness and processing facilities, the community gets only a small share of the market potential. Before 2017, farmers sold custard apples for just Rs. 2-5 per kg without any sorting or grading, and the majority of the fruit was wasted.

Intervention Done

To address these challenges, SRIJAN has been mobilizing women SHG members and training them on market potential, processing, and storing techniques to increase returns. They have also created village-level collection centers (VLCCs) and trained the community on collection, grading, sorting, and storage of fruits. SRIJAN has further supported the community by creating linkages with different players for selling pulp and including farmers in the shareholding of the farmer producer company, COFE (Chhindwara Organic Farmers Enterprise). Despite challenges like irregular electricity supply and storage costs, SRIJAN has made progress towards empowering the community.

SRIJAN has leveraged support from Axis Bank Foundation and Bharat Rural Livelihood Foundation (BRLF) initially, to establish the processing set up. But to solve the issues of unreliable electricity, the support was provided by SELCO Foundation with two solar cold storage of 3 MT capacity to minimise damages from issues of power supply, distress sale and to reduce costs involved in storage.

Process of Pulp Processing

Photo credit: IIEC and SRIJAN

Image: Different stages involved in processing of custard apple pulp

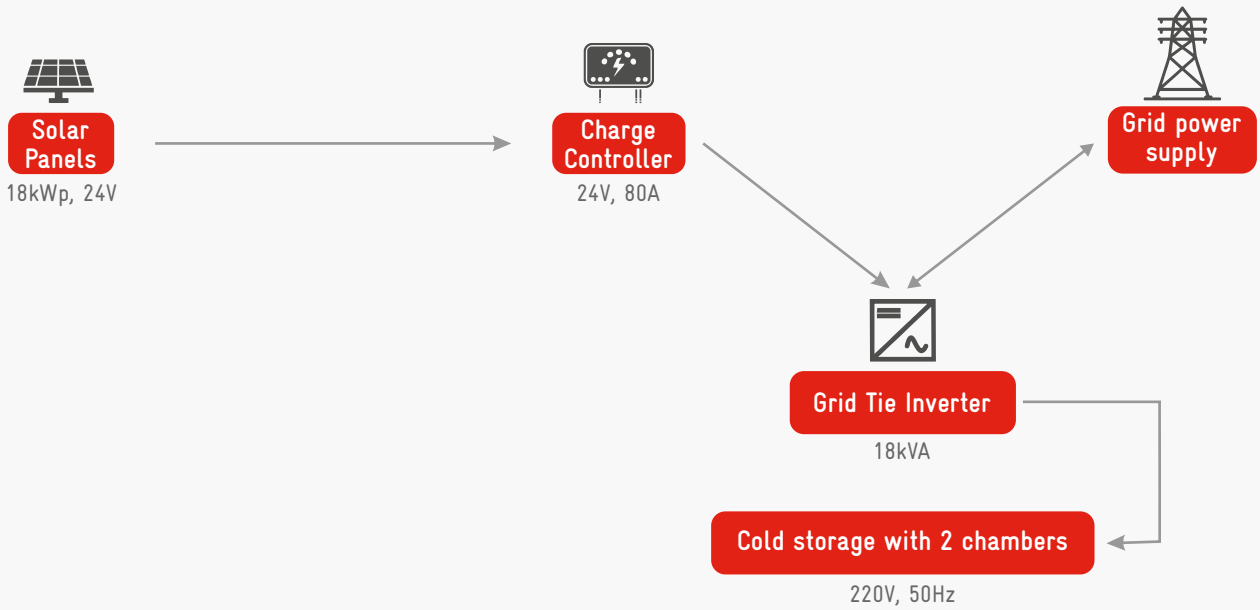
Photo credit: IIEC and SRIJAN

Image: (Left to right) Cold Rooms and installed solar panels on the roof of the processing plant

Sizing of Solar Energy System

One cold storage having two chambers of 3 MT storage capacity each have been installed near the processing unit, powered by 18 kWp mono crystalline solar panels (330 Wp x 54). The systems are set up in a processing plant located in Temni Khurd village of Mohkhed block of the district. This is a grid connected system and has no battery back up.

Schematic design



Financing Mechanism

The financial support provided by SELCO Foundation for the solar cold storage = 100% = Rs. 14.44lakhs
The cost of the foundation for the installation was provided by COFE = Rs. 20,000

Revenue

Total number of processing units as of now = 1

Average number of women working in unit = 60

Daily income received by each woman for working in the unit= Rs. 200

Average number of working days/season = 20

Total revenue earned by each woman/season = Rs. (20 x 200) = Rs. 4,000

On an average, around 200 families have been selling their collected custard apples to the processing set up. They get prices based on the quality and grade of the fruits they have bought for selling. On average per season each of the families earn around Rs. 2000-4000 from selling fruits to the unit.

Benefits

- Intervention has resulted in economic gains for the community.
- Community trained and capacitated for value addition of fruit and better returns from the market achieved.
- Price of fruit increased to Rs. 10-12 per kg and hence increased revenue for the farmers.
- 50% reduction in power consumption costs which is up to Rs. 6000 per season
- Increased ability to store produce
- Reduced power costs allowed for new product development
- Green pea and mango fruit pulp added to pulp processing.

In broader view, the solar powered cold storage and office set has been new for the community which has helped them break the view that solar power can only be used for small operations. Therefore, there has been raising awareness on solar power as well as implements for agriculture and power generation among the community.

Photo credit: IIEC and SRIJAN

CASE STUDY

06

Solar Dryer - Vijaywada

Background and Need for the Solution

Vijayawada, a city located in the state of Andhra Pradesh in India, is known for its agricultural produce, especially lemons. The farmers of the Harivillu Farmer Producer Organization based in Kuchimpudi village, Pedavegi Mandal, Eluru district of Andhra Pradesh face several challenges in maintaining the quality of their produce and distress sale. Farmers face losses due to spoilage of the produce, especially during the monsoon season. Moreover, after sorting and grading, the farmers used to throw away the lemons that were not of the desired quality, resulting in further losses.

Images: (From top left and clockwise) The banner of the FPO at the installation site, the project team in conversation with the CEO of the FPO, the CEO with the installed solar dryers and the dried lemons ready to be taken out from the dryer.

The FPO consists of 510 farmers as on date and the average land holding is 2-2.5 acres per farmer. The average lemon production is 8-9 MT per acre of land and almost 6% of it gets wasted during the season.

Intervention Done

Mr. C.H. Gandhi, CEO and on behalf of the FPO took the initiative of utilizing the thrown away lemons and with the financial support from Sustain Plus Energy Foundation, installed 7 solar dryers to with an aim to dry the lemons, and also explore the possibility of drying other products, in December, 2022. M/S. Raheja Solar Food Processing is the technology provider. It also buys back the dried lemons from the farmer ensuring a sustainable supply chain and regular income for the FPO In this project, there has been an agreement in place to ensure sustainability and continued operation of the dryer by buying back the dried products from the FPO, for a period of 3 years. Raheja Solar is also helping the FPO in exploring alternative markets for the dried products, in future.

Sizing of Solar Dryer

A total of 7 solar dryers of 100kg capacity each is installed. Individual dryers have 5 fans of 4W each and are powered by a 20Wp solar panel. These fans are fitted in the direction towards the dryer content to serve two purposes: to push out moist air from inside via a net like outlet at the opposite end of the fans and to bring in outside hot air inside the dryer working like an exhaust fan.

Financing Mechanism

Total cost of the solar dryers along with solar energy system, A = Rs. 7,70,000
Financial support provided by Sustain Plus = 85% = Rs. 6,55,000
Upfront contribution by the FPO = 15% = Rs. 1,15,000

Revenue

The conversion ratio of fresh to dried lemon = 10:1

For 10kg lemon drying:

Average cost price of lemon which was thrown away earlier = Rs. 250
Selling price of 1kg dried lemon to Raheja Solar = Rs. 350

Hence, for a full batch of processing utilizing all 7 dryers, the gross profit = Rs. (3500 - 2500) x 7
= Rs. 7,000

Note that a maximum of 2 days is required to get the lemons dried.
Even if they process, 5% of the total produce which gets thrown away,
The quantity of lemons being dried = 5% of (8.5 MT/acre x 1000 acres)
= 510 MT of lemon

Number of batches of drying required = (510 MT x 1000)/700
= 700 (approx.)

Approximate number of sunshine days/year = 250
Number of batches that can be processed = 250/2 days per batch drying = 125

Hence, yearly gross income = Rs. 7000 x 125 = Rs. 8,75,000

Labour charges = Rs. 4,200/batch of drying
Total annual labour charges = Rs. 4200 x 125 = Rs. 5,25,000

Net annual income, B = Rs. (8,75,000 – 5,25,000) = 3,50,000

Payback = A/B = 2.2 years

Benefits

- The wastage of the lemon dried has immensely reduced and is now an additional income for the farmers as well as FPO after processing.
- In 4 months of operation, the revenue has increased by 5-6% at the FPO level.
- The trust of the local farmers on the solar drying technology has developed.
- Non-FPO members can also get their lemons processed on pay per use basis hence extending the service beyond the FPO.

Image: Array of installed solar dryers at the site

Photo credit: IIEC and SRIJAN

CASE STUDY

07

Photo credit: Freepik

Solar Bulk Milk Chiller - Bengaluru

Background and Need for the Solution

At Oolavadi milk collection centre under Karnataka Milk Federation (KMF), a dairy cooperative in Bengaluru collects milk from 431 farmers in the surrounding region and stores till the time of the pick up. One of the major challenges faced by KMF is to maintain the quality and freshness of the milk during transportation and storage.

The temperature of the milk has a significant impact on its quality, shelf life, and nutritional value. Therefore, it is important to maintain the milk at a suitable temperature during storage. In regions like Bengaluru, where the temperature can rise up to 35-40°C during summers, it becomes even more crucial to keep the milk cool to avoid spoilage.

Traditionally, milk was stored in conventional milk chillers using a grid and diesel generator set, which require a lot of energy and are not always available. In contrast, solar bulk milk chiller units can maintain the milk at a suitable temperature using solar power, which is abundant in India. These units are cost-effective, energy-efficient, and easy to maintain, making them a viable solution for small-scale dairy cooperatives like KMF. The average cattle holding of milk farmers involved with this collection centre is 4-5.

The primary motive to install a solar run BMC was to cut down the electricity bill which was around Rs. 23,000-25,000/month which was being paid by the government. Additionally, the milk chilling time was around 5 hours/shift.

Photo credit: IIEC and SRIJAN

Image: The Bulk Milk Chiller installation site

Intervention Done

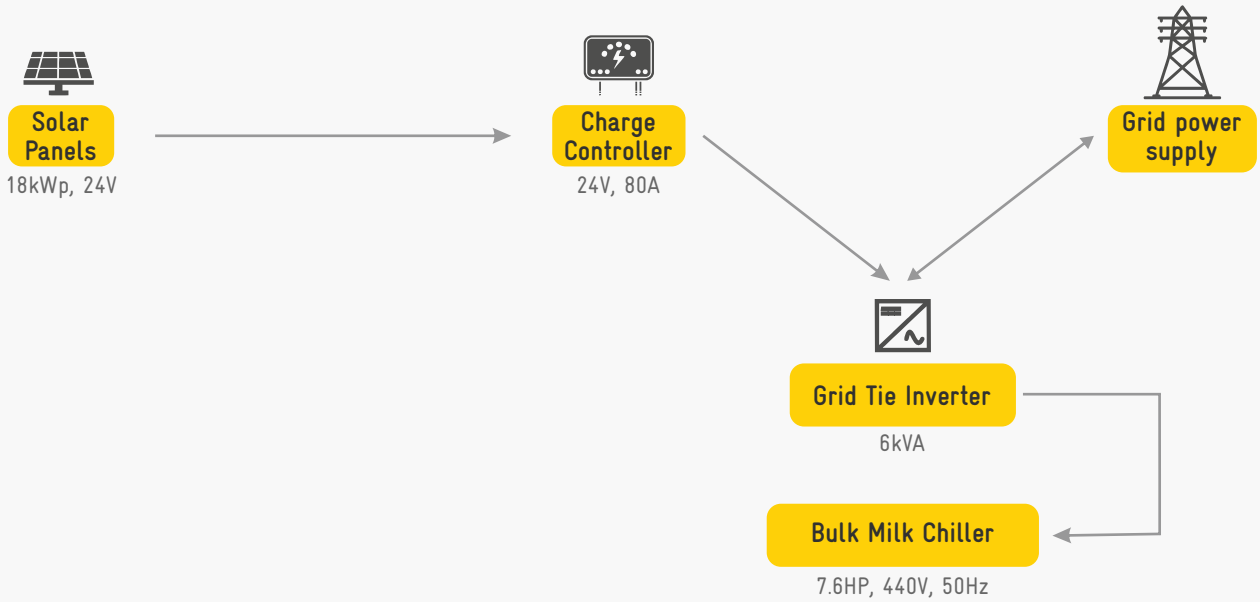
In December 2020, KMF decided to implement a solar powered Bulk Milk Chiller in this collection centre in order to reduce their operating costs and move to a sustainable solution. The capacity of the BMC is 3000 litres, installed by Inficold India Private Limited. The energy system installed is a 3 phase grid connected system. The system instantly chills the milk from 35°C to less than 100°C where the chilled milk is then transferred to the existing milk chilling system where it is further cooled to 40°C.

Image: The installed BMC with battery bank and heat exchanger

Sizing of Solar Energy System

The BMC has a power rating of 7.6HP, 3 phase, working at 440V. The operational energy required is partially met by 7kWp solar panels and battery capacity of 150Ah x 4.

Schematic design



Financing Mechanism

Total cost of the system along with the solar energy system (exclusive of transportation and installation), A = Rs. 15,00,000

Upfront payment done by KMF = 100% = Rs. 15,00,000

Revenue

Savings in electricity bill post installation per month = Rs. 14,000 (This is the savings for the government due to the initiative taken by KMF)

Reduction in diesel consumption/month = 50% = 10 litres

Savings due to reduced diesel consumption/month = Rs. (10 litres x Rs. 80) = Rs. 800

Total yearly savings, B = Rs. (14,800 x 12) = Rs. 1,77,600

Payback = A/B = 8.5 years

Photo credit: IIEC and SRIJAN

Image: The collection centre incharge with the Bulk Milk Chiller

Benefits

- Quality of milk has improved due to fast chilling.
- Reduced maintenance and diesel cost
- The chilling time has reduced to 1 hour/batch.


CASE STUDY
08
Photo credit: Istock

Solar Milking Machine - Mangalore

Background and Need for the Solution

Mangalore is a city in the Indian state of Karnataka, which has a significant population engaged in dairy farming. Many small-scale dairy farmers in the region are women who depend on their cows for their livelihoods. However, milking cows by hand can be a time-consuming and labor-intensive task, especially for women who may also have other domestic responsibilities.

Ms. Yamuna, a resident of Laila village of Belthangady Taluk in Mangalore was also one of them, owns a small land and is a dairy farmer. Previously she used to own a few cattles and sell the milk to local consumers. She used to manually milk all of them which was tiring and time consuming.

To grow financially and support her family, she decided to opt for solar milking machine and save time for other productive work. It used to take her around 15 mins to milk a single cow.

Intervention Done

In January 2021, a solar powered single cluster milking machine was installed at her cow shed by SELCO Foundation, manufactured by M/S. Ksheera Enterprises. The machine is operational 2 times a day to milk the cows.

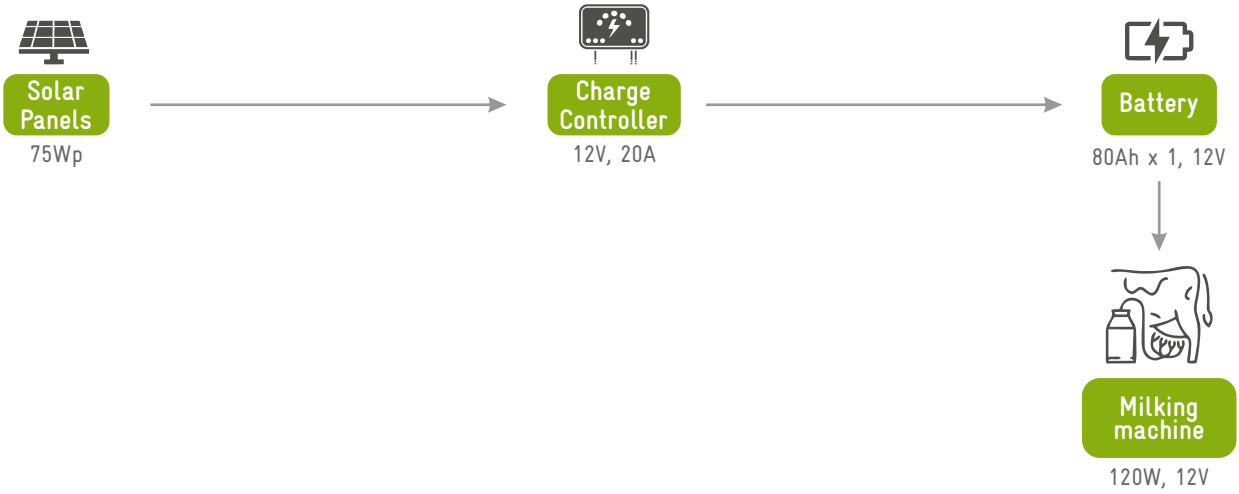
Photo credit: IIEC and SRIJAN

Image: Ms. Yamuna and her daughter with their cattle and solar milking system

Sizing of Solar Energy System

The solar powered single cluster milking machine of power rating of ⅙ H.P. (120 W) is powered by 75 Wp solar panel, 80Ah x 1 battery with a 20A charge controller operating at 12V. The entire system comes with a 20 litres storage tank.

Schematic design



Financing Mechanism

Total cost of the product along with solar energy system = Rs. 64,000

Amount of loan (unconditional) taken from her Self Help Group (having an account in SBI) = Rs. 64,000 (for a period of 36 months)

Subsidy from the Karnataka Milk Federation (KMF) = Rs. 15,000

Financial grant support from SELCO Foundation = Rs. 15,000

This financial support was provided by KMF with a condition that she will contribute atleast 20 litres of milk every day to the nearest collection center set up by KMF for 1 year.

The loan EMI to the bank, A = Rs. 500/week.

Total amount to be paid back to the SHG, A = Rs. (2000/month x 36 months)

= Rs. 72,000

The rest of the loan amount was used to buy more cows to increase the milk production.

Revenue

Considering 6 cows:

Average total milk production per day = 60 litres

Average selling price of the milk = Rs. 35

Gross Profit/day = Rs. (35 x 60) = Rs. 2,100

Number of milking days per year = 280

Gross profit per year = Rs. (2,100 x 280) = 5,88,000

Feed expenses per day = Rs. 1,300

Annual expenditure on feed and medicine including insemination = Rs. (1,300 x 365 + 2000)
= Rs. 4,76,500

Yearly payment towards the loan component = Rs. (72,000/3 years)
= Rs. 24,000

Annual net profit, B = Rs. (5,88,000 – 4,76,500 – 24,000)
= 87,500

Payback, A/B = 10 months

Approximate time saved on annual basis due to usage of solar milking machine = (45 mins x 28 = 210 hours (which she now devotes to the agricultural field and other productive use)

CASE STUDY

09

Photo credit: Freepik

Solar Cold Storage - Dharwad

Background and Need for the Solution

Dharwad and Hubli are neighboring cities in Karnataka, India, known for their agriculture and vibrant farming communities. The region has a predominantly agricultural economy, with a significant population engaged in farming. Both cities have mandis where vendors sell their produce. Farmers bring fruits and vegetables to be sold at the mandis. Due to limited storage infrastructure, excess produce is either sold at low prices or discarded. Wastage ranges from 20% to 25% of the bought produce.

As soon as Mr. Anand B., one of the residents of the area after completing his studies, had opened a computer cafe with printing and xerox facilities in Dharwad to support his family. But as years progressed and increasing access to smart mobile phones and personal computers, his shop has been losing half of his customers. One of his friends is a fruits and vegetable vendor in the Agricultural Produce Market Committee (APMC). He has come across the SELCO Foundations support to promote solar cold storages and their support program to agri entrepreneurs. Anand has been aware about the problem as it has come up often during his discussions with friends and also being from the area he has known about it. He has approached SELCO Foundation with interest to establish a cold storage in the APMC.

Intervention Done

In July, 2021, a cold storage facility of 5 MT capacity was installed in Mahanteshwara APMC of Dharwad with support from SELCO Foundation, manufactured by Inficold India Private Limited. The system is completely off-grid and has a backup of 16 hrs. The solar micro cold storage was designed as a solution to store fresh fruits, vegetables and green leafy vegetables.

Photo credit: IIEC and SRIJAN

Image: APMC Cold Storage

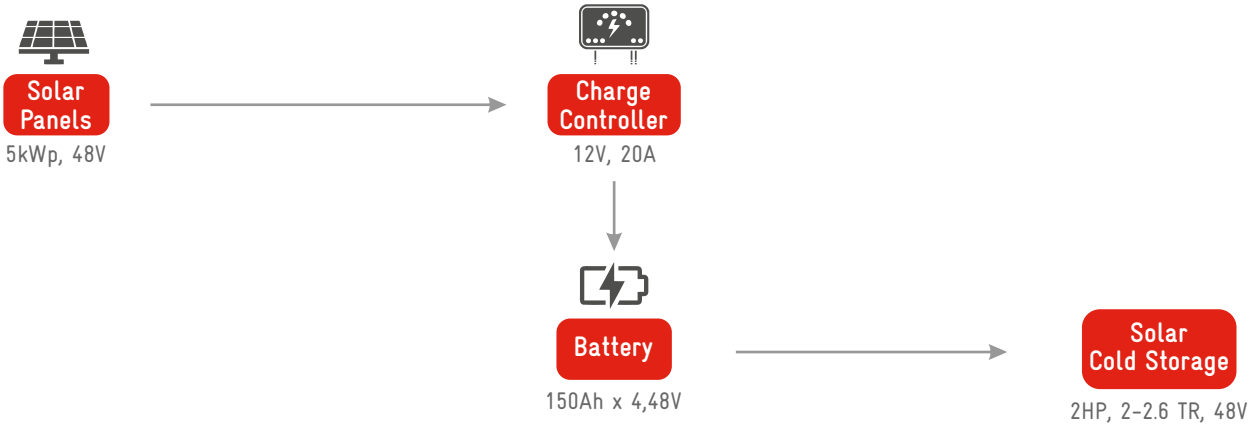
Image: Mr. Anand B. collecting storage charges from a vendor

Image: Project Team with Mr. Anand B.

Sizing of Solar Energy System

The solar powered cold storage system of 5 MT storage capacity has per panel capacity of 5 kWp (250Wp x 21) and battery capacity of 150 Ah x 4, 24V. The thermal energy based technology for efficient compressor operation is installed. Present system has the capacity to backup storage of 2-3 days with 8 hrs of run time daily.

Schematic design



Financing Mechanism

Total cost of the product along with solar energy system, A = Rs. 14,50,000

Cooperative Society loan for a tenure of 3 years = Rs 3,00,000

Subsidy provided by SELCO Foundation = Rs. 11,40,000

Own cost for installation infrastructure (Flooring and shed construction) = Rs. 1,00,000

Revenue

The facility is run on a Pay As You Go model, where charges are levied as per quantity stored in the facility. Anand runs the facility from 7 am till 1 pm in the afternoon. Charge details are as follows:

1. Tray / Crate- upto 20 kg or less = Rs. 10 per day
2. Tray / Crate- upto 20 kg - 40 kg = Rs. 20 per day
3. Gunny Bag - 40 kg or more = Rs. 30 per day

Maximum days for storage is upto 3 days per stock as after that usually vegetables and fruits don't get sold.

As per Anand, since installation, people usually store their products from February till October months but volume of trade fluctuates. Between June - October, usually on average 50% storage capacity of the facility is used per day while between February - May, 100% storage capacity is utilised and hence, revenue also varies. As per his experience of running the facility since installation, he has reported revenues as per below:

1. June - October - Rs. 10,000 per month
2. February - May - Rs. 20,000 per month

Annual income, B = Rs. (10,000 x 5 months + 20,000 x 4 months)
= Rs. 1,30,000

Payback = A/B = 12 years

Benefits

Anand has distributed pamphlets and installed posters in the mandi for the promotion of the storage facility. So far, according to his estimate, around 50 vendors have used the facility while some of them are regular, few farmers and vegetable vendors occasionally use the facility whenever they need the service. Farmers and vendors has been majorly in following aspects:

- The shelf life of vegetables, fruits and green leafy vegetables has increased by 2 days which allows the food suppliers with ample time to sell their produce with minimum wastage of 5%.
- Reduced transportation cost and reduced loss due to wastage.
- The solar system is capable of supplying continuous electricity which makes the cold storage independent of the grid and grid induced issues such as frequent power outage.

CASE STUDY

10

Photo credit: Vecteezy

Solar Puffed Rice - Dharwad

Background and Need for the Solution

Mr Fayaz Heveri owned one of the puffed rice units at Govankoppa village. They have been running this business for the last three to four generations. This unit is the only source of income for their family. They use primitive furnaces and low-grade fuels, which are highly hazardous to health. Their whole family is engaged in this unit. The puffed rice is labour-intensive work, and the average worker needs to spend more than 10 hours per day in that environment, which highly impacts their productivity and health, making them retire earlier than most workers in other professions. The whole process is time sensitive. If you once start preparing paddy for puffed rice, you have to complete it by afternoon so that you start preparatory work for the next day's processing.

They need uninterrupted electricity for the 1HP stirrer and 1HP blower to run the puffed rice system. An uncertain power supply and the long duration of power cuts deter the optimal productivity of the unit and additional labour time for completing puffed rice processing. It forces him to bear additional expenses for the labour charges or chances of loss. The electricity problem in the Govankoppa village is similar to most rural areas.

Photo credit: IIEC and SRIJAN

Image: Project team and SELCO Team member with Mr. Faiyaz Haveri in his unit.

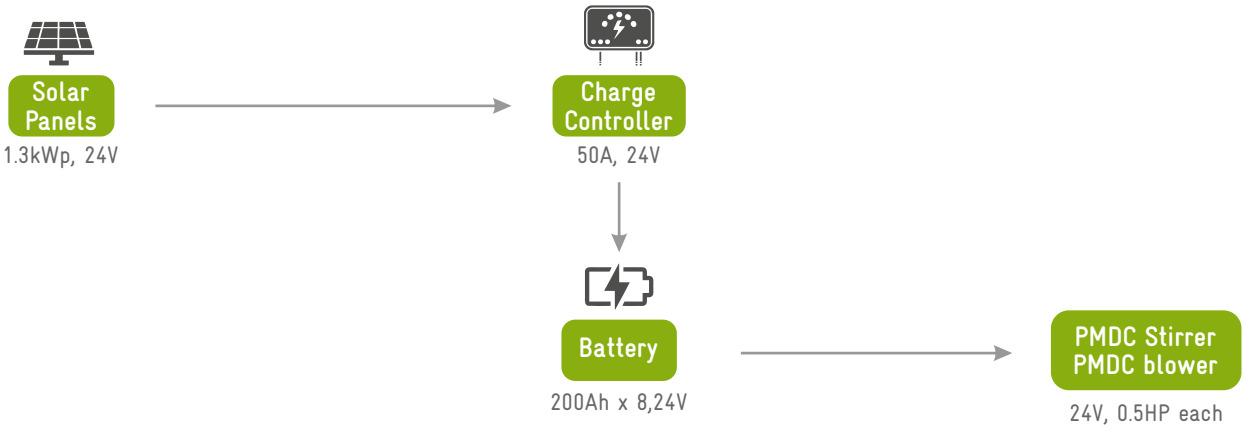
Photo credit: IIEC and SRIJAN

Image: Overnight soaked rice is being dried in the sun

Intervention Done

In 2021, he came in contact with the SELCO foundation and learned about the available solar-based innovation in puffed rice. A DRE-based cluster approach was adopted as a solution for the unit. A solar-based 0.5 HP, 24 V, DC stirrer and 0.5 HP, 24V, Dc blower system was installed in a hybrid model with 335Wp x 4 solar panels, 200Ah x 8 battery and a charge controller of 50A, 24V rating.

Schematic design



Financing Mechanism

The total cost of the system along with the solar energy system, A = Rs. 2,11,633

A loan from KVG Bank for a tenure of 5 years = Rs 55,046

Subsidy provided by SELCO Foundation = Rs. 1,56,616

Revenue

S.No.	Particulars	Amount
1	Total Bag of puffed rice per day per unit (8 Bags. @Rs. 400/bag	12800
	Cost of production per day	
2	Paddy Cost (340 kg @20/Kgs)	6800
3	Labour Charges (4 Labour, @ Rs. 600/Day)	2400
4	Electricity Charges for preparing rice and sow mill (Around 1000 per day for 5 such Units)	200
5	Water and sand Charges	200
6	Total Cost	9600
7	Other expenses	1000
8	Net profit/day	2200

Average number of operational days per month = 20

Net annual income, B = Rs. (20 days x 2200 x 12)

= Rs. 5,28,000

Payback = A/B = 5 months

Benefits

Post-intervention of the program, production is not dependent on the grid power. They are able to save around Rs.1000 on electricity per month. It has also improved the working condition by saving time for the labourer engaged in this unit.


CASE STUDY
11
Photo credit: Freepik

Solar Spice Pulveriser - Dharwad

Background and Need for the Solution

Dharwad-Hubli, with its favorable agro-climatic conditions and fertile soil, has traditionally been a significant hub for chilli farming. This region has long been associated with chilli cultivation and the production of high-quality chilli powder. There are a number of small and medium sized chilli powder production units across the area in the outskirts of villages, which use both hand pounding and electric machines for spice making from chilli, coriander and turmeric. While hand pounding involves drudgery and labour intensive, units dependent on electricity for power, often faced problems of disrupted electricity supply and higher costs involved in production.

Mr. Gulam Rabbani of Unkal, Dharwad district was a salesman at a private company and an aspiring entrepreneur. Despite his physical disability, he has always been exploring opportunities to set up a business for himself and explored spice production as he had seen it from a young age. He had therefore enrolled himself in an Entrepreneurial Development Program anchored by District Innovation Center (DIC) Dharwad. Having received the training, with a loan from KVG Bank and support from SELCO Foundation, he has set up a chilly, turmeric and coriander powder making unit in his ancestral land near Unkal Lake.

Photo credit: IIEC and SRIJAN

Image: Chilli Pounding unit of Gulam Rabani, Unkal

Intervention Done

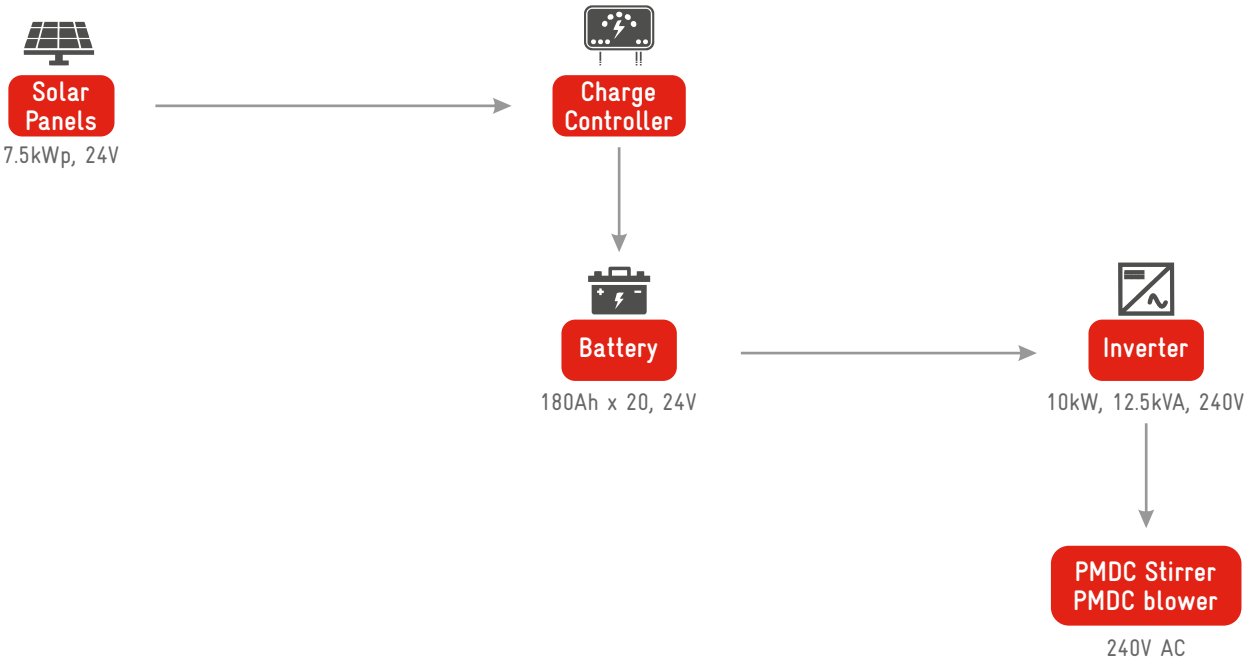
After receiving the training, Gulam Rabbani has applied multiple times for loans in DICGC (Deposit Insurance and Credit Guarantee Corporation) under the PMEGP (Pradhan Mantri Employment Generation Program) and in Central Bank. But each time his application was rejected as the land selected for the unit was categorised as agricultural land and was not connected to the electricity grid. SELCO Foundation has been involved with the DIC, Dharwad and came across his proposal and approached him extending support.

In 2020, with support from the foundation and loan from KVG Bank, 2 units of 2 HP Spices pounding machines were installed in the facility. The machine can produce 10 kg of chilly powder per hour.

Sizing of Solar Energy System

The solar system consisting of 250Wp x 30 solar panels, 180Ah x 20, 12 V batteries with an inverter of 12.5kVA, 12kW and 240V.

Schematic design



Financing Mechanism

Total cost of the unit including solar energy system, A = Rs. 12,00,000

Loan from KVG Bank (against security deposit of Rs. 3,00,000) = Rs. 6,00,000

Contribution of Gulam Rabani for security deposit = Rs. 2,00,000
Contribution of SELCO Foundation for Surety Deposit = Rs. 1,00,000
Subsidy provided by SELCO Foundation = Rs. 6,00,000

Revenue

Presently, Gulam has 2 ongoing revenue streams from the business – through direct selling of chilli powder in the market and providing services to people for pounding the dry chilli for powder making.

Direct chilli powder is sold under the brand name of "Ujjwal Food Products". He charges Rs. 350 – Rs. 400 for each kg of chilli powder sold. Major buyers are local eateries, one of which is Mishra Pedha. Last year, Gulam was able to strike a deal with the Mishra Pedha for supplying 100 kgs of chilli powder each month. Through the deal, he has been able to generate revenue of approximately Rs. 30,000 per month.

Next, he also provides services of chilli pounding, to the people who bring dry chillies to be pulverised in the unit. He charges Rs. 35 for each kg of chilli powder pounded. It constitutes nearly 20% of the total business revenue.

Approximate monthly revenue from both the streams = Rs. 40,000

Average annual revenue, B = Rs. 4,80,000

Payback = A/B = 2.5 years

Starting with chilli pounding, Gulam is also eager to extend his business to making coriander and turmeric powder. He has also sent a sample to Europe with the intention of exporting the spices made.

Benefits

- The unit has been able to diversify Gulam Rabani's source of income. Now, apart from working as a salesman, he could also work in the unit for making the powder and sell them in the market.
- With the installation of the unit in the area, people has been learning about the potential of solar powered appliances as well as its capabilities to run heavy power consuming units like spice pounding

CASE STUDY

12

Photo credit: Freepik

Solar Oil Expeller - Dharwad

Background and Need for the Solution

The use of traditional oil extraction methods has long been a staple in agricultural communities, with Dharwad in Karnataka, India, serving as a prime example. Dharwad, known for its rich agricultural heritage and thriving farming community, has historically relied on conventional oil extraction methods that involve the use of heat and chemicals.

Mr. Fakkir Gouda is a progressive farmer practicing organic farming for a decade in Lakkundi, Gadag District of Karnataka. He owns a 5 acres land where he organically cultivates groundnut, horticulture crops, and processed organic jaggery. He has been selling his produce in the market promoted by Savayava Santhe (a platform that promotes and showcases organic and natural products to consumers). The farmer was inspired to do value addition by installing an oil extraction unit in his farm to process groundnut oil. The farmer has received training on value addition of groundnut by Savayava Santhe.

Intervention Done

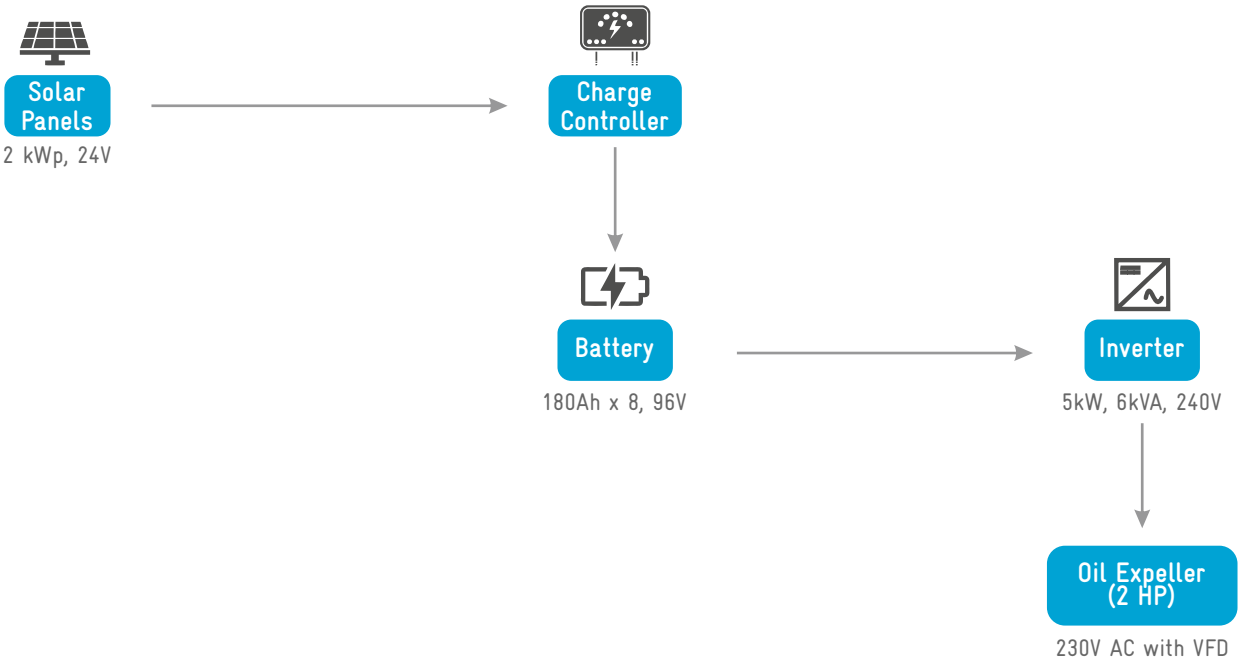
Facilitated by Savayava Santhe, with support from SELCO Foundation, he has installed a cold press oil expeller in his home itself. The machine can extract oil from 10 kgs of groundnut in 2.5 hrs of time.

Photo credit: India Mart

Sizing of Solar Energy System

The energy system consists of 5kWp of solar panels, battery capacity of 180Ah x 8, 96V and an inverter of rating 5kW, 6kVA and 240V.

Schematic design



Financing Mechanism

Total cost of the product along with solar energy system, A = Rs. 5,45,000
Loan from KVG (now Bank of Baroda) for 5 years= Rs. 1,60,000
Subsidy provided by the SELCO Foundation = Rs. 3,85,000

Revenue

Conversion ratio of groundnut to oil: 3:1

Quantity of ground nut processed in 2022 = 1800 kg
Cost of the ground nut = Rs. 100/kg
Total cost price = Rs. (1800 x 100) = Rs. 1,80,000

Quantity of oil produced = 600 litres
Selling price of oil/litre = Rs. 350
Total gross profit generated = Rs. (600 x 350 – 1,80,000)
= Rs. 30,000/season
Revenue from selling oil cake @ Rs. 40/kg = Rs. (40 x 800kg)
= Rs. 32,000/season
Total income, B = Rs. (30,000 + 32,000) = Rs. 62,000

Payback = 8.5 years

This has been his additional source of income apart from the agricultural produce.

The machine is majorly used by him to extract oil from groundnut, while few people in the village and nearby areas also use it for extracting oil.

Benefits

- Increased diversified income post harvest income through the implementation Promotes Agri-Entrepreneurship at farm level.
- The villagers and surrounding villages are happy with the intervention as they are now being benefited by healthy and organic oil for cooking purposes.
- This is a model demonstration across North Karnataka and has influenced policy based initiatives such as Pradhan Mantri Formalisation of Micro Food Processing Enterprises Scheme to take up such DRE based processing at village level.

CASE STUDY

13

Photo credit: India Mart

Solar Khowa Making Machine - Dharwad

Background and Need for the Solution

Khowa, also known as Khoya or Mawa, is a rich and delectable dairy product widely used in Indian sweets and desserts. It involves a meticulous and labour-intensive process that begins with sourcing high-quality milk from local dairy farms. It has thrived over the years, and local artisans take immense pride in their craft.

Mr. Dadafeer belonging form Thorkar Shigihalli village of Dharwad. At a very early age of 16, he started working at Khowa Mill in his nearby village. He worked there for almost 6 years and earned Rs. 100 per week working as a labourer. In 2014 he left the job and started his own Khowa-making unit by borrowing Rs. 50,000 from the local money lender with an interest rate of 3% per month. Daily he has to collect milk from different households, process it, and sell it to the Dharwad market. He has hired one labour for the same and paid him Rs.2000/week as labour charges. They were working two shifts and spent at least 7-8 hours per day at the unit in an extremely heated environment. The whole process is very labour-intensive as one person always churns the hot milk contender for at least 3-4 hours while the other has to ensure homogeneity . As a drudgery ridden, it is very difficult to maintain the texture and quality of the khowa. He was always in search of low-cost technology, which reduces drudgery. During this time SELCO foundation has installed the solar-based Khowa Processing unit at his nearby village.

Image: (from left to right) Mr. Dadafeer in his unit and his khowa making unit

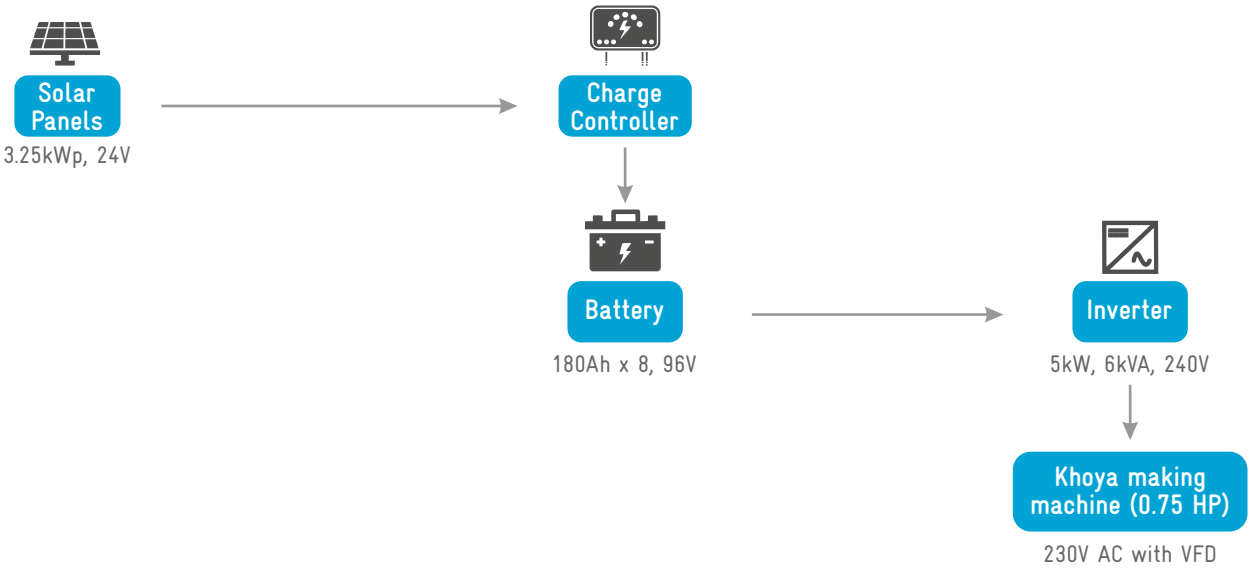
Intervention Done

After he got to know about the installation, he visited the site and found it very innovative, user-friendly and doesn't need any additional labour to operate it. He approached the SELCO foundation for his interest in adopting that technology. After completing the feasibility study by the SELCO Foundation team, he installed the unit with 600 litre/day capacity.

Sizing of Solar Energy System

10 Solar Panel with 325 Wp and 24V and having batteries of 180 Ah x 8. Since the khoya making machine is an AC model, an inverter of 4kW and 5kVA rating is installed. The rating of the application is 0.75HP having a capacity of 600 litres producing close to 150 kg/day of khoya.

Schematic design



Financing Mechanism

The total cost of the Khowa making machine = Rs. 2,40,000

Total cost for the Solar energy system = Rs. 3,45,000

Total cost of the system = Rs. (2,40,000 + 3,45,000)

= Rs. 5,85,000

The loan from KVG (now Bank of Baroda) for 5 years = Rs. 3,45,000

Upfront contribution made by the beneficiary = Rs. 2,40,000

Revenue

He prepares Khowa on a daily basis and sells it to the Dharwad market. Since installation, he has been selling around 80 kg per day during the rainy season, i.e. July to October, and the remaining days, he sells Rs. 50 kg per day.

- July to October: 80 kg x 120 days x Rs. 180/kg = Rs. 9,600
- Nov to June: Daily, 45 Kg x Rs. 180= Rs. 8,100

He uses 85% of Cow milk and 15 % buffalo milk.

He collects 200 litres of milk during the rainy season and 120-140 litres for the rest.

S.No	Particular	July to October (Rs.)	November to June (Rs.)
A	Revenue Per day		
1	Revenue Received by selling Khowa. (July to October: Daily 80 Kg Khowa*Rs.180/Kg= Rs. 14,400 Nov to June: Daily, 45 Kg Khowa*180/Kg= Rs. 8,100)	14,400	8,100
B	Cost of Production per day		
1	Raw Milk (July to October: Cow Milk Daily 170 litres@Rs. 30 per litre and buffalo milk 30 litres*Rs. 45= Rs. 6450 Nov to June: Cow Milk Daily 110 litres *Rs. 30 and buffalo milk 20 litres*Rs. 45= Rs. 4200)	6,450	4,200
2	Cost of Milk Collection @Rs. 1000/Week, i.e. Rs. 150/Day	150	150
3	Fuel cost for heating (Rs.)	2,000	2,000
4	Total cost of Production (Excluding transportation)	8,600	6,350
C	Net profit per day	5,800	1,750

Gross Revenue per annum = (Rs. 5800 x 120 days) + (Rs 1750 x 240 days) = Rs. 11,16,000

Fixed costs (Labour + Depreciation + Interest Payment) = Rs. 5,50,000

Annual net profit, B = Rs. 5,66,000

Payback = A/B = 1 year

Benefits

By installing the solar-based Khowa Production unit, the per-day production has Increased. Earlier, on Normal days, he produced around 30 kg and, in peak season, 60 kg per day. After installing, he produces 40-50 kgs during normal days and 80 Kg per day. It also eliminated his dependency on labour.

CASE STUDY

14

Photo credit: Freepik

Solar Dryer - Amreli, Gujarat

Background and Need for the Solution

Jafrabad Agricultural Producer Company Limited initially used open sun drying for small fish, but later purchased a solar dryer to test its quality and efficiency for fishing and seafood. They shifted from open drying due to issues with cats, dogs, polluted air, and dust settling on the dried fish. Sunlight and humid air also led to slower drying and increased seafood wastage if not dried within three days. Shipping fresh fish across India incurred costs and risks, but drying improved shelf life, reduced weight, and allowed for easier and cheaper transportation. Overall, the solar dryers addressed farmer issues, minimized wastage, and improved dried fish quality.

Intervention Done

With technology partner Rudra Solar, SELCO Foundation installed 3 solar dryers to support the beneficiary in addressing the issues of wastage and open sun drying.

Photo credit: IIEC and SRIJAN

Image: The beneficiaries with the solar dryers.

Sizing of Solar Dryer

A total of 3 solar dryers of 10 kg capacity each is installed. Individual dryers have 2 numbers of fans of 2W each and are powered by a 10 Wp solar panel.

Financing Mechanism

Total cost of the solar dryer along with the solar energy system, A = Rs. 27000

Financial support provided by SELCO Foundation = 25 % = Rs. 6750

Upfront contribution by the FPO/beneficiary = 75 % = Rs. 20250

Revenue

The conversion ratio of fresh to dried fish = 10:1
For 10 kg of fish drying:

Average cost price of Fish which was thrown away earlier = Rs. 200
Selling price of 1kg dried fish to Local market and Online platform = Rs. 1000

Hence, for a full batch of processing utilizing all 3 dryers, the gross profit = Rs.800 x 3
= Rs. 2400

Note that a maximum of 2 days is required to get the fish dried.

Number of approximate sunshine days in a year = 280
Total number of batches of processing = 280/2 = 140
Quantity of fish processed in an year = 140 days x 30kg
= 4,200 kg

Quantity of dried fish = 4,200/10 = 420kg

Yearly Gross profit after raw material cost = Rs. (420 x 800)
= Rs. 3,36,000

Labour charges = Rs. 200/batch of drying
Total labour charges = Rs. (200 x 140)
= Rs. 2,80,00

Net annual income, B = Rs. (3,36,000 – 28,000)
= Rs. 3,08,000

Payback = A/B = 1.5 months

Benefits

- The wastage has now reduced and is supporting the farmers who used to throw away.
- Safe from external factors and remains hygienic.

CASE STUDY

15

Photo credit: Freepik

Solar Multipurpose processing centre - Faizabad

Background and Need for the Solution

Hundreds of farmers of the region used to grow various crops such as paddy, wheat, oil seeds etc. and used to sell them a minimum support price (MSP) set by the government or lesser than that due to lack of customers at the later stage. There existed an opportunity to locally process these agricultural output and gain a larger price for the higher value product. Earlier they used to process the products powered through a diesel generator set.

Mr. Bhuwan Bhaskar, a computer science engineering graduate, saw this opportunity and formed a Farmer Producer Company named as KhetKisan with which more than 750+ farmers are associated now.

Khetkisan provides all handholding support to the associated farmers complementing their tagline ' Beej se lekar Baazar Tak'. They also have launched their branch 'Aaharam' under which they sell their products. He has no grid connection and does not wish to get one as it alone with cost around Rs. 2-2.5 lakhs just for the connection and recurring bill is another issue considering the machineries that he runs daily.

Mr. Bhuwan Bhaskar
Along with these systems, he also installed a cold room cum ripening chamber which was subsidised by Sustain Plus.

Intervention Done

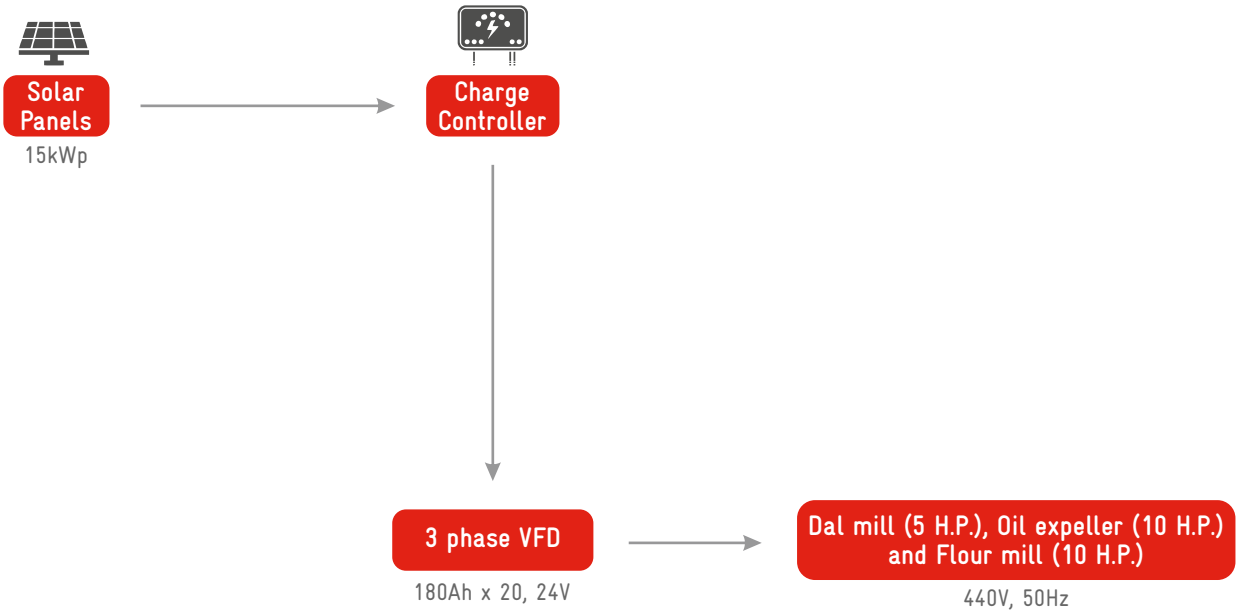
Mr. Bhaskar has installed a 15kW solar energy system to run 3 phase motors based Dal mill machine, Oil expeller and Flour machine. For the installation, technical inputs were provided by Oorjagram India Private Limited.

Sizing of Solar Energy System

15kWp solar panel system with 3 phase VFD has been installed along with Dal mill machine (5 H.P.), Oil expeller (10 H.P.) and Flour mill (10 H.P.). No battery has been installed with the system and runs directly on solar in the daytime.

This type of DRE system installation is beneficial for aggregation model type entrepreneurship and also keeps the overall cost of the system low.

Schematic design



Financing Mechanism

Total cost of the installation including solar system and machineries = Rs. 11,60,000

Subsidy availed from Pradhan Mantri Formalisation of Micro Food Processing Enterprises Scheme (PMFME) = 35% of the total project cost (maximum upto 10 lakhs) = Rs. 4,06,000

Self contribution = Rs. 7,54,000

Revenue

Mr. Bhaskar runs the system almost 10 hours a day and processes 100-125 quintals of dal/season,

Due to the shift to solar, he now saves close to Rs. 50,000 – 60,000 per month on diesel.

CASE STUDY

16

Photo credit: Freepik

Solar Flour machine and Oil expeller - Aligarh

Background and Need for the Solution

In Aligarh, hundreds of dedicated farmers have long been cultivating a diverse range of crops, including paddy, wheat, oil seeds, and more. However, despite their hard work, they often found themselves at the mercy of the government-set minimum support price (MSP) or even selling their produce for less, as finding customers for their crops became increasingly challenging.

Mr. Rajpal, a resident of Kher Tehsil in Aligarh, grabbed the opportunity to support nearby farmers by providing access to processing machines and market the products locally.

Intervention Done

Mr. Rajpal has installed a 25.6kW solar energy system to run 3 phase motors based Oil expeller and Flour machine. The installation support and hand holding was provided by Deyhaat Energy based out of Ghaziabad. He got to know about the services of Deyhaat Energy through their social media posts.

Sizing of Solar Energy System

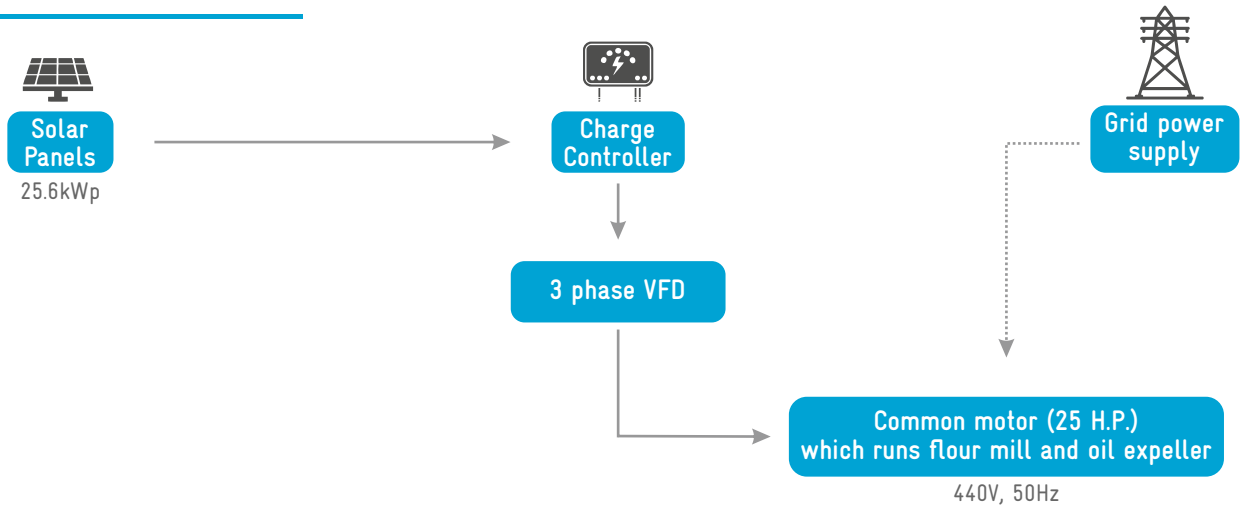
The solar energy system comprises 400Wp x 64 solar panels which runs the load through a 3 phase VFD. The energy system has no back up and runs on day time only. The system powers a motor of capacity 25 H.P. which runs various loads through the belt system.

This model is suitable for entrepreneurs who are working as aggregators and provide services to farmers connected to them.

Photo credit: IIEC and SRIJAN

Image: The entrepreneur with his solar plant installed at the roof of the processing centre

Schematic design



Financing Mechanism

Total cost of the installation including solar system (machineries were already there) = Rs. 10,72,000

Loan from Metafin @ 14% interest (Deyhaat Energy has a tie up with them to financially support such projects) = 70% = Rs. 7,35,000

Upfront payment by the beneficiary = Rs. 3,15,000

Processing charges (borne by the beneficiary) = Rs. 22,000

Monthly installment to be paid by the beneficiary to Metafin for 2 years = Rs. 31,500

Total cost of the system for the beneficiary after loan repayment, A

= Rs. (31,500 x 24 + 22,000 + 3,15,000)

= Rs. 10,93,000

Photo credit: IIEC and SRIJAN

Image: Project team member in conversation with the owner of the system

Revenue

Mr. Rajpal has been able to aggregate the demand from the farmers of 10 nearby villages and also provides processing facilities under PAYG model by individual farmers as per their requirement.

After calculation of day to day operational expenses including raw material costs, the average per day profit = Rs. 5000

Average monthly income = Rs. 1,50,000

Monthly loan repayment amount = Rs. 31,500

Net monthly profit, B = Rs. (1,50,000 - 31,500)

= Rs. 1,18,500

Payback = A/B = 9 months

Benefits

- The initiative provided access to local as well as diesel free processing facilities to the farmers.
- The savings due to non-payment to electricity or diesel is close to Rs. 900 - 1200 per day.

CASE STUDY 17

Photo credit: Freepik

Solar Flour machine and Oil expeller - Kanpur

Background and Need for the Solution

To achieve reduced transportation expenses for farmers and tap into local entrepreneurial opportunities, Mr. Mahesh Kumar understood the requirement and possibility for consolidating farmers' produce in a localised way. He connected with local farmers and partnered with them for the supply of wheat and oil seeds for his upcoming business set up.

Intervention Done

Mr. Mahesh got in touch with Deyhaat Energy, a solar solution provider, through their social media posts and has installed a 17.7 kW solar energy system to run 3 phase motors integrated Oil expeller and Flour machine through a VFD. Deyhaat Energy has partnered with Metafin, which is a NBFC , set up to finance clean energy solutions. The machineries include wheat milling and grinding machines of 10 and 17 H.P. respectively and oil expeller of 15 H.P.

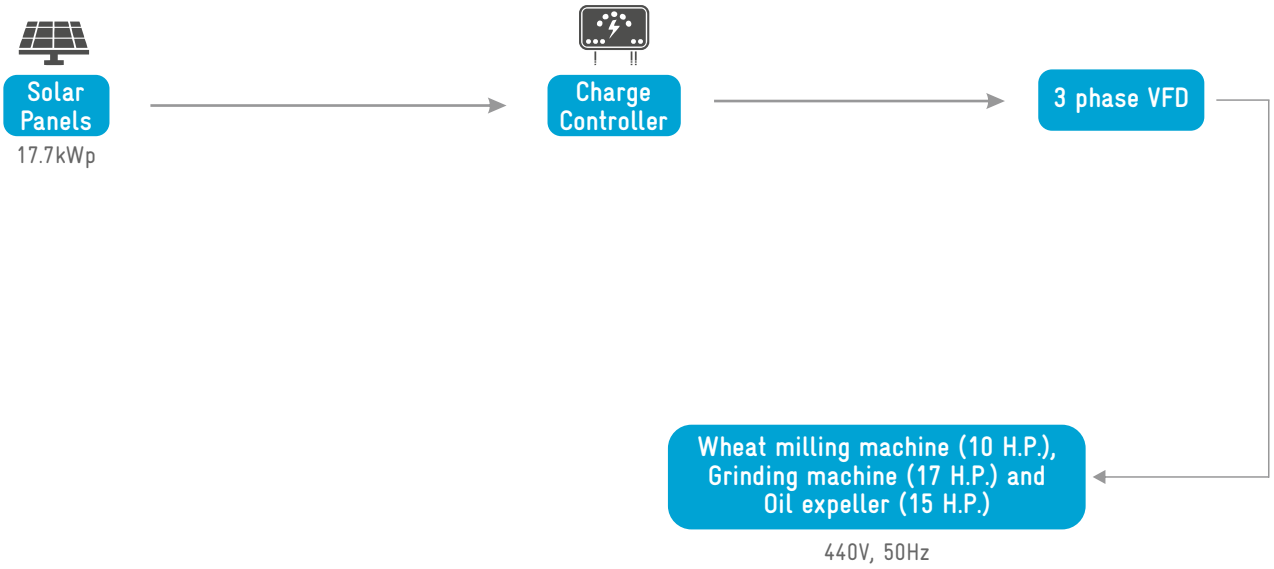
Image: (Left to Right) The installed solar panels on the roof of the processing centre and a worker of the centre working on the oil expeller

Sizing of Solar Energy System

The solar energy system comprises 555Wp x 32 solar panels which runs the load through a 3 phase VFD. The energy system has no back and runs on day time only.

This model is suitable for entrepreneurs who are working as aggregators and provide services to farmers connected to the and showcases a good business model as well as sustainability of the implementation.

Schematic design



Financing Mechanism

Total cost of the installation including solar system (excluding machineries) = Rs. 7,40,000
Loan from Metafin = 70% = Rs. 5,18,000
Upfront payment by the beneficiary = Rs. 2,22,000
Processing charges (borne by the beneficiary) = Rs. 18,000
Monthly installment to be paid by the beneficiary to Metafin for 30 months = Rs. 22,800

Total cost of the system for the beneficiary after loan repayment, A
= Rs. (22,800 x 30 + 2,22,000 + 18,000)
= Rs. 10,93,000

Revenue

Mr. Mahesh has successfully established a dependable and affordable service that caters to farmers seeking processing solutions for their produce. Additionally, he directly sources from farmers, processes the goods, packages them, and sells them in the market.

On an average, he processes close to 15 – 20 quintal of wheat and 4 – 6 quintal of oil seeds on a daily basis.
After calculation of day to day operational expenses including raw material costs, the average per day profit = Rs. 4,500
Average monthly income = Rs. 1,35,000
Monthly loan repayment amount = Rs. 22,800

Net monthly profit, B = Rs. (1,35,000 – 22,800)
= Rs. 1,12,200

Payback = A/B = 10 months

Benefits

- Setting up a solar plant is saving close to Rs.900/day
- The reliability of the energy has helped him scale the processing plant output and provide uninterrupted services to the customers.

CASE STUDY

18

Photo credit: Freepik

Solar Water Aerator - Balasore

Background and Need for the Solution

The insufficient feeding, improper management of Dissolved Oxygen (DO) levels and pH values in the water, labor-intensive processes, and heavy reliance on diesel generators for power supply have contributed to a significant increase in fish and prawn mortality rates in the region. This reliance on generators not only led to substantial operational costs but also contributed to a larger carbon footprint near the water body. Consequently, fish and prawn farmers faced reduced income.

Intervention Done

Thinkraw in partnership with the Basta Farmers Producer Company have installed six units of DhivaraMitra (name of the moving solar water aerator) at Basta with funding support from NABARD, Odisha & MSME Hackathon. The mobilization support of the FPO was provided from Sparsha, a local NGO in March 2023.

The beneficiaries of the intervention are 100 fish and prawn farmers attached to Basta Farmers Producer Company Limited having average land holding capacity of approximately 2.5 acre per farmer.

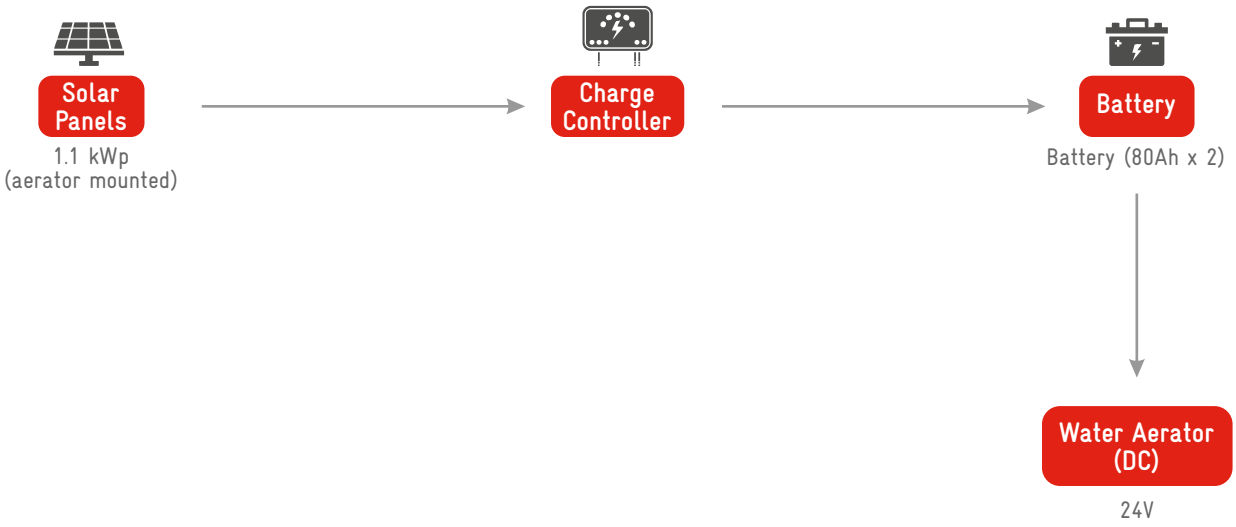
Photo credit: IIEC and SRIJAN

Images: ThinkRaw team after installation of the movable solar water aerator designed by ThinkRaw

Sizing of Solar Energy System

On the top of the system, a solar panel capacity of 1.1kW is installed with a battery capacity of 80Ah x 2 for fulfilling the DO requirement at night.

Schematic design



Financing Mechanism

Total cost of the solar aerator along with the solar energy system = Rs. 2,20,000

Financial support provided by NABARD = 90 % = Rs. 1,98,000

Upfront contribution by the FPO = 10 % = Rs. 22,000.00

Revenue

The farmers were producing 2.5 MT of fish and 1 ton of prawn each per 1 acre of water body area when done manually. After the installation of the solar water aerator, the production has increased by 30 – 40% in addition to the reduced labour utilisation by 40 – 50%.

Benefits

- The feed wastage has gone down by 20 – 30% and stock damage has gone down as well by the same margin.
- Increased DO and the movable model has provided improved health of the fish.

CASE STUDY

19

Photo credit: Freepik

Solar Multipurpose Agro Processing centre - Bindiki

Background and Need for the Solution

Near to Kanpur, a village in Bindiki region, unreliable electricity and high diesel costs plagued. Shramik Bharti was working on a CSR project on organic and sustainable agriculture with support from HDFC Foundation. The need for owning a processing unit was felt which would help them to reduce their processing cost which they used to get from a far off diesel or grid run processing shop and hence would be able to fetch a better margin of profit.

Intervention Done

The federation, Samriddhi Mahila Samiti has installed a 12 kW solar energy system to run 3 phase motors based Oil expeller and Flour mill of 7.5 H.P. each, destoner of 3 H.P., Spice pulveriser (3.5 H.P.), Rice mill (5.5 H.P.) and Daliya mill (2 H.P.), . The installation support and hand holding was provided by Shramik Bharti Foundation. The Samiti also packages the items processed and sells in the nearby region like Bundelkhand, Unnao etc.

Images: The processed and packaged items under the brand Satvikam

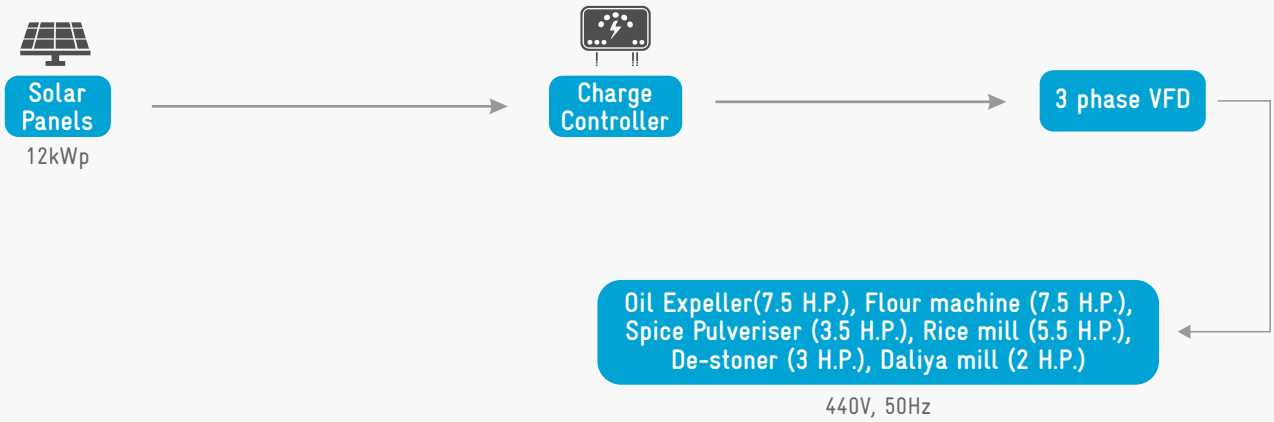
Images: Various processing machines being run by solar energy system in the centre

Sizing of Solar Energy System

The solar energy system comprises 335 Wp x 36 solar panels which runs the load through a 3 phase VFD. The energy system has no back up and runs on day time only.

Images: The installed 12kW solar energy system at the roof of the processing centre

Schematic design



Financing Mechanism

This installation was completely grant supported, raised by Shramik Bharti Foundation.

Total cost of the installation of the solar system and machines, A = Rs. 12,00,000

Contribution by the Samriddhi Mahila Samiti = Rs. 55,000

Contribution by HDFC's CSR support = Rs. 11,45,000

(The processing rate for various items are: Oil at 4/kg, Atta - 1/kg, Daliya at 5/kg, Spices at 25/kg and Rice at 250/quintal)

Revenue

The centre is connected to a FPO which has 410 farmers and hence gets orders to process their produce on a regular basis.

The average net profit per day made by the centre = Rs. 500

Average monthly profit, B = Rs. (500 x 30)

= Rs. 15,000

Payback = A/B = 6 years

Benefits

- Reduced labour and processing charges
- Increased sale due to implementation of higher value chain activity

Photo credit: Freepik

Solar Water Pumping system - Bhawanipatna

Background and Need for the Solution

In the remote village of Thumularampur in Bhawanipatna District, Odisha State, there are approximately 5000 households, and around 75% of the population works in agriculture. The main crops cultivated by the villagers include paddy, seasonal vegetables, oil seeds, spices, and seasonal fruits. However, the geographical conditions of the area are predominantly hilly, and the climate is characterized by a maximum temperature of 43 degrees Celsius and a minimum temperature of around 30 degrees Celsius. One of the major challenges faced by the community is the scarcity of water, which hampers both cultivation and access to drinking water.

Given that this village is located in a rural part of Odisha, electricity shortage is also a significant issue that disrupts daily activities. Consequently, a group of farmers approached an NGO called, Harsha Trust, which specializes in Agriculture and Livelihood intervention, seeking solutions to their water scarcity problems in relation to agricultural processes.

Intervention Done

After the Initial round of discussion, a solution came out to install a Solar Irrigation pump with proper borewell and openwell system to irrigate the agricultural land. Technical survey report stated that 1.5 H.P. of Solar AC/DC pump can be used for upto 3 acres of land. But according to the land survey only 2 farmers can use 1 number of 1.5 H.P. solar pumps. Thus the group of farmers were divided into sub-groups.

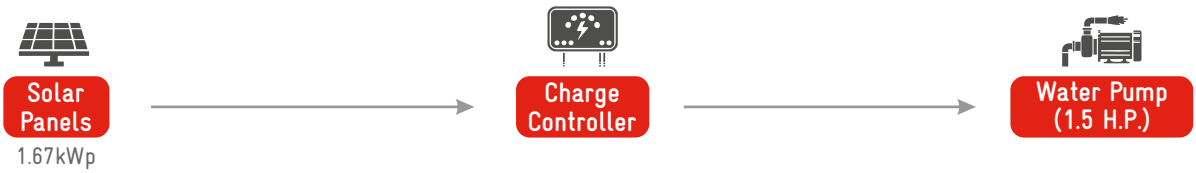
Solar Infra, a Odisha based solar energy enterprise, supported the project with the installation and complete handholding.

Images: The installed solar energy system and the water pump

Sizing of Solar Energy System

The solar energy system comprises 335Wp x 5 at 24V solar panels which runs the solar pump of 1.5 H.P. through a pump controller.

Schematic design



Financing Mechanism

Total Cost of 1.5 Hp pumping System (Includes Installation, Transportation & AMC) = Rs.1,48,000

Farmers contributions (collected by Harsha Trust) = Rs. 44,400

DMF contribution directly to Harsha Trust = Rs.1,03,600

(50% advance paid to solar Infra along with PO & rest 50% payment done after completion and survey by the district administrator and Harsha Trust).

Revenue

The farmers share the pumps and their operational costs have become zero due to non-renting of the diesel pumps anymore. Also this has helped them diversify their crops.

The average growth as per the discussion = 20 – 30%

Acknowledgement

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