




Increasing Livelihood
opportunities through
Decentralized Solar Powered
Refrigeration Solutions

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- A woman wearing a bright pink shawl stands on a rooftop. The roof is covered with several rows of dark blue solar panels. In the background, there is a concrete wall, a utility structure, and a lush green landscape with trees and hills under a clear sky.

Devidayal Solar Solutions focuses on design, development and sales of solutions in the distributed renewable energy (DRE) cold chain space. We believe in collaborating with different stakeholders and use of productive-use appliances like solar refrigerators to create and build livelihoods.

NEED

- Lack of reliable cold storage facility that addresses the increasing demand for cold products in the rural and urban regions of the country.
- Food wastage due to increase in temperature

OPPORTUNITY

- Opportunity for micro entrepreneurs to utilize decentralised cooling solutions to create additional livelihoods in their existing business:
 - For strengthening Dairy Value chain
 - For storage of fish & Meat
 - For storage of locally harvested fruit pulp and vegetables
 - For the storage of vaccines in underserved areas and mobile units

SOLUTION

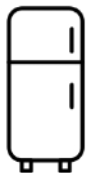
- **Customised Technology** to suit cold storage requirement
- An **Ecosystem approach** focussed on creating additional income for the micro enterprises and entrepreneurs (especially female entrepreneurs).
- **Innovative Financing** to make cold storage solutions affordable

We believe in developing solutions through an ecosystem approach



DDSR 100 L is installed at Bhawanipatna, Orissa through our ground partner DAPTA

Right Technology



Refrigerators of the right size, type, autonomy, cooling capacity and servicing – designed to suit small business entrepreneur's requirement

Right Finance



Appropriate financial product and support to meet the small business owner's need to own the solution, by designing it to suit the entrepreneur's income generation

Right Business Impact

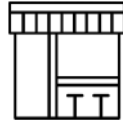


Right need assessment, diversified product range cooled in the fridge, add-on businesses, catering to the local supply/ need, distributorship for dairy value chain

We Customized Solution depending on the ecosystem needs

1. Planning

Govt. Dept /NGO + DDSolar



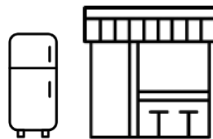
Site Identification: Various typology of the sites are identified through different channels.

Need Assessment: A baseline form is created to gather as accurate information as possible on the right technological need, potential income generation through intervention to design an overall business ecosystem of the chosen site.

5. After Support

Govt. Dept /NGO + DDSolar

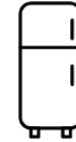
Post installation support is a critical part for the intervention to have the desired impact. Access to easy servicing, annual maintenance support, and effective trouble shooting help the solution to sustain over long-term.



2. Execution

DDSolar

Design of the product: A technological design (type of **TECHNOLOGY** fridge, autonomy required, capacity, solar design, battery back up if any) is proposed considering entrepreneur's requirement, financing available & potential market/ type of products cooled.



Mrs. Gayatri from Adargunchi, Hubli, Karnataka. DDSR 150L is installed at her small petty shop.

4. Enterprise Innovation

Beneficiary/ Customer

Innovative product portfolio

Entrepreneurs identify the impact of cold-storage access as an addition to their existing business soon after the intervention, and explore other business models to improve their livelihoods. Support is given to fine tune the solutions.



Installation & Clear Communication

Selected solar and refrigerator designs are installed at the site, and one of the key aspects is to provide basic communication to the end-users on the usability, maintenance, defrosting, cleaning and other critical parameters about the fridge.

3. Financing

Financial Partner + DDSolar

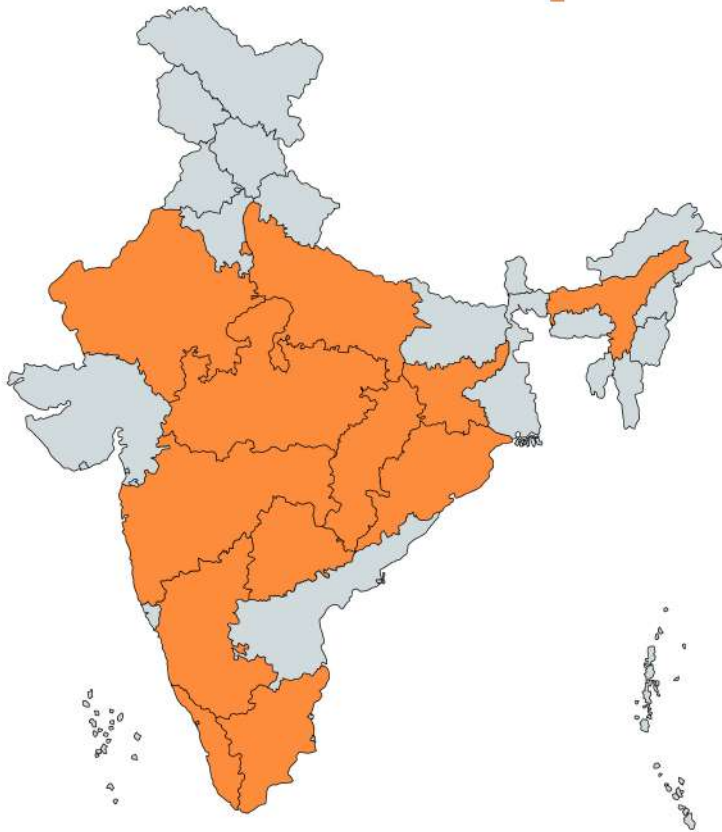
Affordable and innovating financing

During the assessment, the financial flow mapping is done for the entrepreneur. Considering the increase in income due to the intervention, loan terms are designed.



Snapshot of work so far

We serve the bottom of the pyramid, low-income households which are in an informal rural settlement. We have successfully installed 575 units till Jan'22



DDSolar successful Installations



Mrs. Shobha Mohan from Belgaum, Karnataka. DDSR 100L is installed at her Kirana Store.

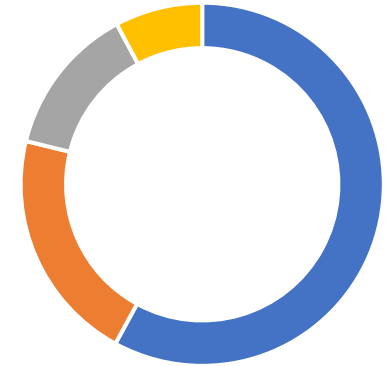


82%
of male & female
entrepreneurs are from
rural areas



Rs 4000-7000 pm
Average profit/ month
from the interventions
across typologies.

Capacity



■ 100 L ■ 150 L ■ 200 L ■ 268 L

Present in following segments:

- Dairy
- Fisheries
- Human & Vet Vaccines
- Kirana store
- Mobile vans
- Dhaba Restaurants

How Solar Refrigerators support the entrepreneurs ?



Decrease Input & Transaction Cost

Savings from the food spoilage

Larger quantity purchase at the same or lower cost

Savings on Ice to preserve the product

Lower transaction cost - from lesser frequent visits to buy the product

Reliable energy source - zero cost for electricity

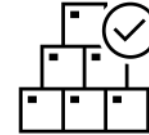


Increase Output

Longer shelf life of the products

No product loss due to water melting from ice cubes

Selling when the prices or demand is higher



Product Range & Quality

Storing and selling the products with more margins

Quality is preserved and hygienic compared to the usage of ice

Involvement of different stakeholders in the ecosystem



NGO Ground Partner

- Marketing and Business development activities
- Market survey and need assessment to get the potential beneficiaries
- Installation and signing of documents & agreements with the beneficiaries
- Training of the beneficiaries and ground partners
- Collecting customers documents like Aadhar Card, Pan card, Installation completing certificate with minimum three photographers of installation, Invoice copy, Know your customer (KYC) form and payment receipt copy.
- Getting M&E done
- After sales service

- They will support our field staff in generating potential leads.
- As they are the local face of their community in our ecosystem, they will also help us in supporting our after sales services by diverting the requests to our service centres.

Finance Partner

- Financial flow mapping of the entrepreneur
- Collection of the instalments.
- Maintaining the track record of the beneficiaries

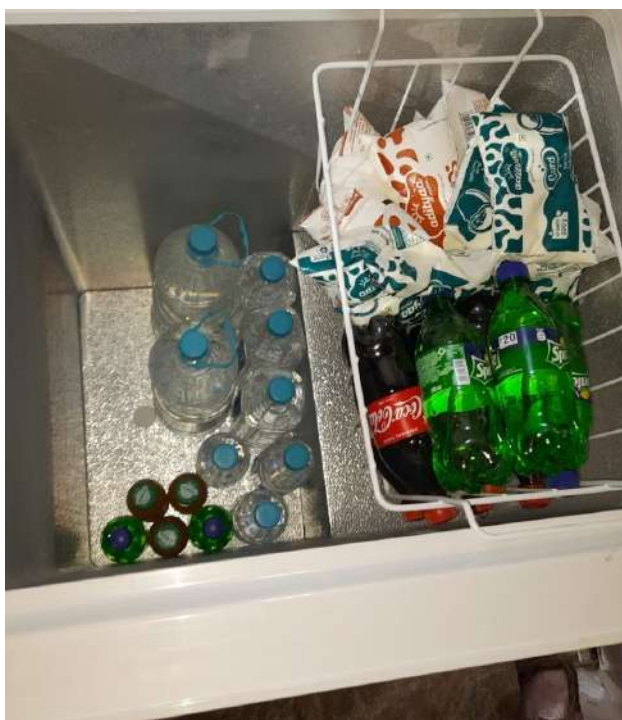


Product details: Solar DC Refrigerator DDSR 100L (65W/95W)

- Designed for Vet Vaccines storage, Dairy products , cold drink & Kirana stores and fish storage.
- Most efficient solar freezer in this range. Digital display, rugged construction, environmentally compliant refrigerant.
- Temperature range 1 to 11°C & -18 to 10°C
- Solar DC 12V/24V power supply
- Tested by CLASP in The Netherlands - IEC 62552 (steady-state operation power consumption at 16C, 32C, and 43C, load processing efficiency, freezing capacity).
- Finalist for Global LEAP Award. Winner of the Consumer Affordability Prize.
- Data logger and energy meters available.
- Warranty: 1 year *



Dairy Segment



PC: SELCO foundation

Strengthening Local Dairy Value Chain



Supporting Kirana store/ Petty shop owners by decreasing their Electricity bills & increasing income

Product details: *Dairy Cooler Eco*

- Specially customised for dairy products , cold drink and Kirana stores to maintain the temperature at 2°C which is ideal for dairy products
- Available in 100L & 200 L capacity
- Can store up to 40L of milk*
- Once the battery is completely charged, dairy cooler can run for up to 36 hrs * continuously.
- Most efficient solar freezer in this range. Digital display, rugged construction, environmentally compliant refrigerant.
- Packaged with 2 Solar Panel (150W)*, 1 L/A battery (100Ah)* & 1 Charge controller
- Temperature range 2 -8°C (default setting of 2 ° C)
- Solar DC 12V/24V
- Tested by CLASP in The Netherlands - IEC 62552 (steady-state operation power consumption at 16C, 32C, and 43C, load processing efficiency, freezing capacity).
- Data logger and energy meters available.
- Warranty on the complete unit 1* year

Note: 40 L of milk in pouches can be stored or 27 L of milk in bottles in 100 L capacity 36hrs continuously under standard conditions

Number of Solar Panels & Battery composition may vary depending on the capacity



Success stories: Dairy Segment

Solar electrification is a blessing

Sufiya Bano and Khalil Ahmed are owners of “Muskaan Bakers and Dairy” in Faizabad district U.P.

Challenges:

- They had a commercial refrigerator installed at their bakery initially, but it generated an electricity bill of Rs 1500-1600 per month.
- In the bad climatic conditions they use to suffer sudden power cuts in their village at least once in a month which resulted in at least spoilage of dairy and bakery products worth Rs 500-600.

Intervention: Dairy Cooler of 150 L capacity was installed by our Area Sales Manager

Testimonial: “The refrigerator is such a blessing in the areas where electricity is so uncertain, also the features of the refrigerator like temperature control are so user friendly that anybody can adjust it just by going through the manual.



Parameters	Pre-intervention	Post-intervention
Quantity of milk sold/ day	15- 20kg	24-25kg
Average expenses on food spoilage /day	Rs. 100	0
New range/variety of milk products added	-	Paneer, Butter milk
Electricity bill per month	Rs. 2000-2200	Rs. 900
Average increase in revenue/ month because of solar refrigerator	-	Rs. 15,000

Vaccine segment



Supporting the life span of Medicines & Vaccines by maintaining the cool temperature

Product details: *Vaccine Saver* (100 L)

- Specially designed for vet vaccines storage and medical uses to maintain the temperature at 2°C which is ideal for storage of the vaccines
- Available in Standard and Pro packages with 48 hrs* & 96 hrs* autonomy respectively
- Can store up to 100* units of 250ml of Vial
- Most efficient solar freezer in this range. Digital display, rugged construction, environmentally compliant refrigerant.
- Packaged with 2 Solar Panel (250W)*, 2 L/A battery (100Ah)* & 1 Charge controller
- Temperature range 2 -8 ° C
- Solar DC 12V/24V
- Tested by CLASP in The Netherlands - IEC 62552 (steady-state operation power consumption at 16C, 32C, and 43C, load processing efficiency, freezing capacity).
- Finalist for Global LEAP Award. Winner of the Consumer Affordability Prize.
- Data logger and energy meters available.
- Warranty on the complete unit 1* year

Note: Can vary depending on the shape of the bottles
48 hrs & 96 hrs continuously under standard conditions

Number of Solar panels & battery composition may vary according to the package/autonomy requirements



Success stories: Vet Vaccine and Medicine Segment

Under the “Mission 2020 Smart Village Lakhpati Kissan” initiative, Tata trust is supporting vet vaccine project.

Challenge:

Earlier they used the normal AC refrigerator which was installed in the block office for office use. The issue with that was after the office was closed because of lack of continuous access of electricity they were not aware for how long vaccines didn't get refrigeration at night which could result in spoilage of vaccines.

Intervention: Created a sustainable earning business model for a local community member called “Entrepreneur”.

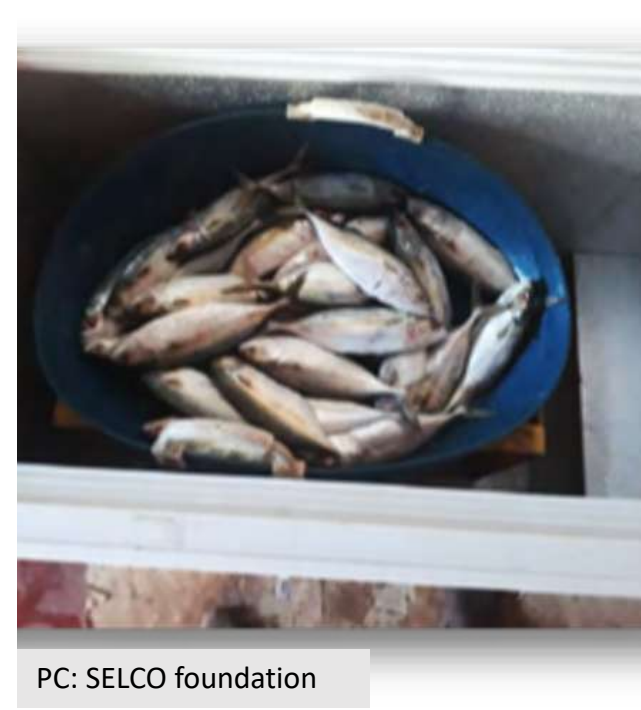
For this initiative, Solar Refrigerators are installed at the block offices in Chuchu and Dahdi block of Hazaribagh district. The focus is to support 3000 HHs by providing vaccination to Goats and Pigs on half yearly basis or as per requirement.



Impact:

- Entrepreneur are serving 3000 HHs of these two blocks, all the vaccines are stored in these refrigerators. Also, the entrepreneurs of other blocks use the refrigerator by keeping the bulk vaccines in it to avoid spoilage.
- The temperature range of 2-8 degrees is perfect for the vaccines, they are very satisfied with the unit installed as there is continuous electricity supply.

Fisheries Segment



PC: SELCO foundation



PC: SELCO foundation

Avoiding fish spoilage & saving on usage of ice

Product details: *Fish chiller Eco*

- Specially designed for storing fishes and sea food to maintain the temperature at 2°C which is ideal for storage of fishes.
- Available in 100L & 200 L capacity
- Once the battery is completely charged, fish chiller can run for up to 36 hrs * continuously.
- Can store up to 35Kg of medium size fish*
- Most efficient solar freezer in this range. Digital display, rugged construction, environmentally compliant refrigerant.
- Packaged with 2 Solar Panel (150W)*, 1 L/A battery (150Ah)* & 1 Charge controller
- Temperature range 2 to 4 ° C
- Solar DC 12V/24V
- Tested by CLASP in The Netherlands - IEC 62552 (steady-state operation power consumption at 16C, 32C, and 43C, load processing efficiency, freezing capacity).
- Data logger and energy meters available.
- Warranty on the complete unit 1* year

Note: Can vary depending on the size and variety of the fish in 100 L capacity
36hrs continuously under standard conditions
Number of Solar panels and battery composition can vary depending on the capacity



Success stories: Fisheries Segment

Increased the storage capacity and variety

Vasantha is from village Fathima Nagar in Madurai, she owns a small shop where she sells fishes.

Challenges:

- Her home and shop both are in the area where continuous electricity supply is a big issue.
- To support her business, she has to incur daily cost of ice in the form of ice cubes or slab to keep the fish chilled and they had to sell it on the same day of the catch as it can get spoiled otherwise.

Intervention: Selco foundation, our knowledge partner approached them and DD solar installed Solar Refrigerator of 150 L capacity at beneficiary's home.

Testimonial: “Earlier we were not aware that even a refrigerator can be run on solar and that too for whole day i.e., 24*7. It seemed that this product was made to resolve our issue like continuous requirement of ice, no continuous electricity, fish spoilage and in result increase our monthly income. The refrigerator has been very helpful for our business, I recommend this to all the other people who visit my shop who are facing similar electricity issues”.



Parameters	Pre-intervention	Post-intervention
Quantity of fish sold/ day	20kg	24-28 kg
Expenses on Ice/ day	Rs. 100	0
New range/variety of fishes added	-	Mural fish
Avg selling cost (often last few kg of fish were sold for very low price due to lack of storage)	Rs. 180	Rs. 200
Average increase in revenue/ month because of solar fridge	-	Rs. 20,000

Other Success Stories



PC: SELCO foundation



PC: SELCO foundation



PC: SELCO foundation



Creating a value chain for locally made home based perishable products

Success stories: Retail Segment

Creating change in the rural household

Mahendra Kumar Bansal lives in Lakhimpur district, Uttar Pradesh.

Challenges:

One of the challenges faced by the people of this locality is lack of continuous supply of electricity. Mahendra ji also had to face all these issues at home as well as at his Kirana shop where he sells water, cold drinks and juices.

Intervention: Solar Refrigerator of 150L capacity was installed in September 2020 as well as he installed Solar Panels for his domestic use.

Testimonial:

“The the locality in which I live the requirement of solar appliances is in every home, it is just that we need to make the consumer understand that the change it is going to create in their lives.” Adding to it, he shares; “Even I am ready to keep the products at my shop and sell them but only if “Surya Battery” vouches for the products.”



Parameters	Pre-intervention	Post-intervention
Increase in demand because of availability of cold beverages	L	L
New range/variety of milk products added	-	Juices
Electricity bill per month	Rs. 2000-2200	Rs. 1000
Average increase in revenue/ month because of solar refrigerator	-	Rs. 10,000

Success stories: Fruit Pulp



Ghummar mahila producer company, Pali Rajasthan

The company generates source of income for the women entrepreneurs from bottom of the pyramid community. The women pluck fruits (Sitaphal & jamun) from the near by areas, de seed them to get the pulp and package it to store and sell in the near by marketplaces.

Challenge:

- They didn't have a solution for storing the pulp , they had to sell it in the market in a set time period otherwise the pulp use to get spoiled.
- Other challenge was the transportation of the pulp.

Intervention: Total 8 Solar refrigerators were installed; 2 at a vehicle for transportation and 6 on ground for storage.



PC: Ghummar Mahila Company



PC: Ghummar Mahila Company

Impact:

- Earlier only 2 Tn of pulp use to be produced per season which can be increased up to 5 Tn.
- The rate was Rs 4-5 per Kg to middlemen now which is increased to Rs 12 per kg.
- More women will be involved now as the capacity is increased so it will impact more households.

Success stories: Fruit Pulp



Jovaki Agro Foods Pvt. Ltd. Udaipur, Rajasthan

The company processes the fruit locally and freeze the pulp and store it to make it available to the industries for the entire year. Jovaki's objective is to enhance woman improvement & increase in family income through employment generation and post harvesting activity. 60% of the benefit goes to the Tribal community as an immediate expense in terms of wages and paying cost to harvest the forest fruits.

Intervention: Total 6 Solar refrigerators were installed on ground for the storage of fruit pulp in October 2020.

Impact:

- Last year they produced 3 MT Jamun pulp whereas it has increased to more than 10 MT in this season.
- They are pulping 600 Kg per day
- More than 600 women are involved in plucking the fruit and delivering it to the company's collection center.
- Around 160 women are involved in the whole process of production of fruit pulp.
- In addition to Jamun, company also processes Sitaphal, Amla and other fruit pulps.
- The company is planning to sell their products online through different platforms as the production is increased.
- The focus product being fruit pulp, the company also has other value-added products like Sitaphal shake, Sitaphal ice cream, Jamun Strips, Jamun Flakes, Jamun Seed Powder and Jamun tea, they are also working towards new product development in vegetable segment.



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SOLAR SOLUTIONS

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