



CLEAN
Clean Energy Access Network

COMPENDIUM OF DECENTRALISED RENEWABLE ENERGY TECHNOLOGIES

First Edition 2020

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For private circulation only.
Clean Energy Access Network (CLEAN)
A-23, 2nd Floor
Behind Green Park Free Church
Aurobindo Marg, Green Park Main
New Delhi - 110 016

Tel.: +91-11-4160 1543
Mobile: +91 8794164691
Web: www.thecleannetwork.org

Edited and Designed by
Academic and Development Communication Services (ADCS)
Chennai and New Delhi
Printed in India by Innovative Designers and Printers, Okhla Phase 2, New Delhi

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Preface

Decentralised renewable energy (DRE) entrepreneurs have been at the forefront of servicing energy requirements of the un-served and under-served population in India and other countries where energy security remains a concern. Access to affordable, reliable, and clean energy has catalysed innumerable lives at the grassroots by creating opportunities for better livelihoods, increased income levels, safe and healthy living conditions, leap-frogged education opportunities and empowered women by eradicating drudgery at many levels. With the growing awareness on climate change and rising need to replace conventional sources of energy with clean energy, manufacturers are demonstrating different ways in which daily applications can be designed to consume lower energy with greater efficiency and sustainably powered by distributed renewable energy.

Meanwhile DRE entrepreneurs working at the last mile have developed innovations, as well as retrofitted existing productive applications, such that machines can be easily powered by distributed clean energy. This outside-in approach to increase adoption of DRE and steadily service the growth in energy demand has opened a new market altogether. However, to mainstream these cleaner productive applications, it will be critical to upgrade policies, product standards, benchmarks, and popularise these new products with financial institutions for creating favourable lending ecosystem. While the modus operandi of developing these solutions has been to create energy access, they continue to contribute significantly in replacing fossil fuels and supporting climate change adaption and mitigation efforts.

In this compendium developed by CLEAN, the readers will observe that distributed clean energy can be integrated across nearly all applications that rely on energy, be it in agriculture, food processing and cold storage, textile manufacturing, construction, fisheries, dairy and other livestock, fast moving consumer goods, handicrafts or any other micro, small, and medium enterprise industry. DRE's potential to emerge as the primary choice of energy provider across the socio-economic spectrum is becoming more and more obvious.

Having said this, one can imagine the new horizons DRE can create when it is economically viable to integrate 'clean' livelihood applications with sensors and other smart technologies.

Adwait Joshi
CEO
Clean Energy Access Network

List of Symbols and Abbreviations

A	Ampere
AC	Alternating current
Ah	Ampere hour
BLDC	Brushless Direct Current
Cmm	Cubic metre per minute
DC	Direct current
DRE	Decentralised renewable energy
Ft	Feet
hp	Horsepower
h	hour
INR	Indian Rupee
kg	kilogram
kmph	kilometre per hour
kWh	kilowatt hour
LED	Light-emitting diode
Li	Lithium
LPG	Liquefied petroleum gas
lph	litres per hour
LiFePO4	Lithium Iron Phosphate
ml	millilitre
mm	millimetre
MNRE	Ministry of New and Renewable Energy
MPPT	Maximum Power Point Tracker
mPa	millipascal
NMC	Lithium Nickel Manganese Cobalt Oxide
pcs	Pieces
PMDC	Permanent Magnet Direct Current
PWM	Pulse Width Modulation
RPM/rpm	Revolutions per minute
Wp	watt peak

About CLEAN

Clean Energy Access Network (CLEAN) is a non-profit organisation committed to support, unify, and grow the decentralised renewable energy (DRE) enterprises in India. Our primary focus is on rural and underprivileged communities where reliable, affordable, and clean energy plays a unique role in accelerating social, environmental, and economic development. CLEAN has contributed to development in many ways: (a) influencing policies for the DRE sector, (b) facilitating access to finance for its enterprises, facilitating technology innovations, assisting its members in accessing markets, and building capacity of enterprises through trainings.

CLEAN is a network of 200+ members across India and is considered as the industry body for the DRE space. CLEAN was set up as a programme in 2014, by its charter members, which include The Energy and Resources Institute (TERI), USAID. Shakti Sustainable Energy Foundation, SELCO Foundation, GIZ, UN Foundation, WWF India, Council on Energy and Water (CEEW), Ashden India Renewable Energy Collective, The Climate Group, The Nand and Jeet Khemka Foundation, and the Indian Renewable Energy Federation.

Acknowledgements

We are deeply grateful to our members and the enterprises listed in this compendium for providing us with information and inputs carried in this document. We could not have proceeded without their valuable support. We also wish to express our heartfelt thanks to the National Rural Livelihoods Mission (NRLM) for giving us an opportunity to compile different solar-powered applications for livelihoods. Special thanks to Alok De and Bajranga Patnaik for their continuous guidance and support to us.

We would like to dedicate this document to the entrepreneurs in rural areas who ceaselessly strive to better the lives of their community members through sheer enterprise and hard work.

We are extremely grateful to the members of the peer-review committee for their valuable inputs and feedback on the content of this compendium, including Hari Natarajan (Independent Energy Expert) and Dr S N Srinivas (REC CSR Foundation).

We express our heartfelt thanks to Good Energies Foundation, without whose funding support none of our work would have been accomplished.

We also would like to thank USAID for their support.

Lastly, we would like to thank the CLEAN Board of Directors and other members of the CLEAN team, including Adwait Joshi, Anuj Xess, David Durani, Ananya Saini, Nibedita Panigrahy, Aayushi Malpani, Juhi Anand, Manoj Kohli, Shobhit Mullick, Karishma, Abhishek Dhawale, Ankita Sharma, and Chhavi Arora, for their support at various stages in the development of the compendium.

Core team

Gopala Krishnan, Rajni Jain,
Amittosh Pandey, and Nitin Akhade

CHAPTER 1-INTRODUCTION

The energy sector in India is evolving rapidly fuelled by decentralised renewable electricity generation. The positive contribution of decentralised renewable energy (DRE) to electricity access casts a change in the energy sector. A closer look reveals the need for affordable and reliable energy access to drive rural livelihoods along with enabling technologies. Public programmes and community level initiatives have traditionally been the key players in the DRE sector. Now, various organisations have emerged to provide electricity access by associating DRE with end-user services, ranging from solar irrigation pumps, livelihood technologies to standalone home systems.

In India, there are millions of small-scale manufacturers, farmers, weavers who still use traditional methods for production and processing. These processes are devoid of modernisation and are laborious. This has inhibited the growth and productivity of poor people.

With access to clean and modern technology, they can improve their livelihoods, expand their businesses, improve productivity, and generate more income. DRE can act as a catalyst for enhancing the livelihoods and alleviating poverty, especially of people living in rural areas. A dire need of adaptable, affordable, and productive end-use of energy has sparked many innovative and energy efficient solutions. Many of them have either penetrated the energy poor markets or have a strong potential to do so.

1.1 Background

There is a need for standardisation to achieve scalable deployment of these solutions. In an attempt to support this process, CLEAN has come up with this compendium. This compendium includes existing DRE-powered appliances and technologies that have the potential to be powered through DRE. The objective of this work is to create a database of energy-efficient appliances that can inspire budding innovators/ entrepreneurs in the DRE sector to come up with improvised technology. This compendium can be used by stakeholders such as policy makers, non-governmental organisations (NGOs), and financial institutions for picking technologies suitable for their demographics. The technical specifications and cost gathered through secondary research have been included in this work. This first version of CLEAN's compendium is a forerunner for much more sophisticated digital portal being developed by CLEAN, for updating the information regularly, including more technologies in the compendium and covering more industry sectors and geographies. To support this effort, CLEAN invites all stakeholders to provide more insights, information about technologies currently not listed in this compendium and collaborate with CLEAN to create awareness about the cause.

1.2 Outline

The compendium is a collection of 130 existing and potential DRE-powered technologies. Various technologies are categorised into 8 segments based on their area of application as shown in Figure 1. The last three segments of this compendium include list of improved cookstoves, fans, and lighting solutions.

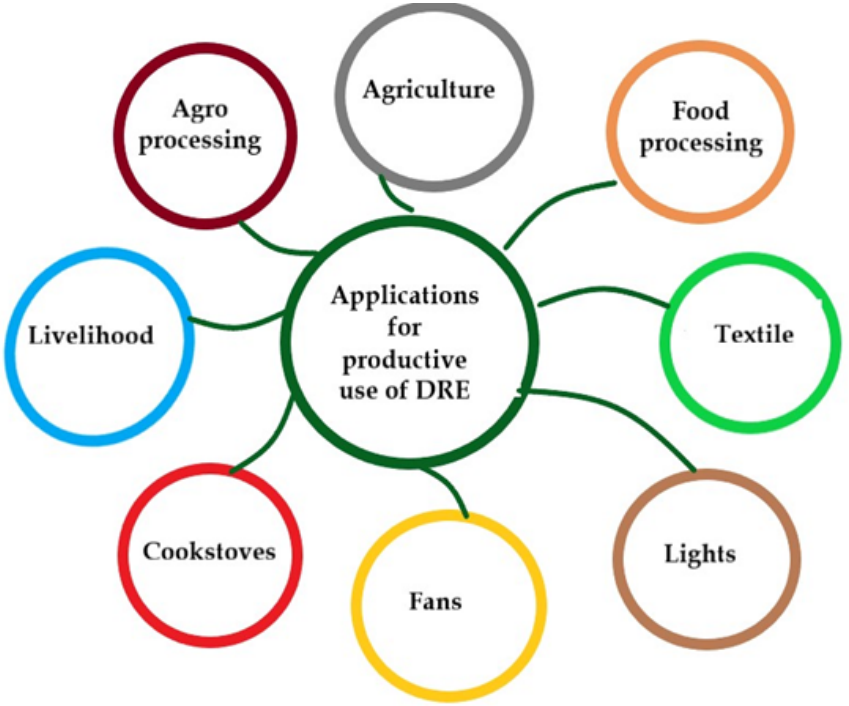


Figure 1. Categories of DRE technologies based on their applications

1.3 Note to the reader

The information provided in this compendium is gathered through secondary research. This compendium is a congregation of existing DRE-powered appliances and technologies that can be DRE-powered. The idea behind this compendium is to highlight the technologies and not the organisations manufacturing it. This compendium intends to direct the users for further research on DRE appliances and does not recommend any specific technology. Readers may find that there are several organisations manufacturing the same product. For illustration, enterprises with maximum available information on the technology are chosen. The prices of products listed in compendium are as of December 2019 and they are subject to variation. QR codes have been included for most of the products, which when scanned directs the user to the product webpage.

CHAPTER 2-AGRO PROCESSING

In rural settings, farmers have traditionally relied on animal and human labour, or wood fuels for agro processing. Nevertheless, the high cost of conventional energy sources, susceptibility to price volatility, and lack of energy access may restrict production in these communities to low-quality, low-diversity products. The implementation of decentralised sustainable technologies in downstream activities along the agri-foodchain will result in significant revenue generation, increased productivity and improved market access. Moreover, power from solar PV can drive both AC and DC motors to power a mill. Among the economic benefits of introducing a solar mill is the potential for savings on spending on alternative fuels, in cases where it replaces a diesel-powered mill.

2.1 Phase change material (PCM) based dryer

PCM-integrated dryer offers an advantage of 24x7 consistent drying. In addition, the use of solar PV-powered low capacity fans makes it an off-the-grid product. PCMs are products/chemicals that enable energy storage during sunshine hours in the form of latent heat. The thermal energy transfer occurs when the material changes phase from solid to liquid and vice versa. The latent heat is typically 100 times more than the specific heat. This enables large amount of energy storage in relatively small space.

Company details

Pluss Advanced Technologies

B 205, Tower B, Pioneer Urban Square,
Sector-62, Gurugram - 122 008, Haryana, India
Telephone: +91 - 124 -4309490/91/92
Fax: +91 - 124 - 4309493, +91-124-4824214
Email: info@pluss.co.in

Clusters

Tamil Nadu, Goa, Daman Diu,West Bengal, Haryana, Odisha, and Andhra Pradesh

Battery	12 V, 7 Ah
Charge controller	12 V, 6 A
Solar panel sizing	2 panels of 10 W each
Motor type	PMDC motor, 4 fans of 0.8 W each
Drying capacity	20-25 kg/batch
Number of evacuated tube collectors	20 numbers, 1800 mm length, 58 mm Outer diameter
Cost	INR 1,80,000–2,20,000

2.2 Copra drying (Solar tunnel drying)

In India, traditional methods (kiln, solar drying) used for processing copra produce poor quality.

Solar dryers can protect grain and fruit, reduce losses, dry faster and more uniformly, and produce a better product compared to open-air methods. Coconut farmers can sell the copra produce to coconut oil manufacturers.The savings in drying time using coconut as produce is 16 hours, with 42% cost saving when compared to open sun drying method.

The drying time for sago drying in solar tunnel dryer is 5 hours with 20% cost saving when compared to open sun drying method (11 hours).

Company details

Tamil Nadu Agricultural University
Professor and Head
Department of Bioenergy. TNAU
Coimbatore – 641 003
Phone: 0422-661 1276
Email: bioenergy@tnau.ac.in

Other organisations manufacturing similar product

India Green Organics, Diamond Engineering Enterprises, Solar Marketing, etc.

Product specifications

Collector material	200 µm thick UV stabilised polyethylene
Temperature	Air temperature up to 60 °C
Size	Base area: 3.75 × 18 m
Drying capacity	1.0–1.5 tonnes/day 5000 nuts/batch for coconut
Cost	INR 1,30,000

Clusters

Trivandrum, East Godavari, Coimbatore, Theni, Dindigul, Tanjore, etc.

2.3 Step-type solar dryer

Mulberry silk produced in India is drawn from mulberry silk cocoons. The present system of silk reeling operation involves cocoon drying, cooking, reeling, and re-reeling. Silk cocoon stifling is generally carried out using an electric oven or by using firewood and boiling water. This is an energy intensive process and results in high operational costs. Step-type solar dryer can be used for the process of stifling cocoons.

1. Solar dryer takes 40 hours for drying 50 kg of papaya, while conventional sun drying takes 61 hours. Thus, there is a saving of 21 hours, which is 35% when compared to conventional drying.
2. The dryer handles 10 kg of cocoon per batch and each batch takes 30–40 minutes for completion of stifling. 80 kg of cocoon per day in 8 batches can be conveniently stifled in a day.

Company details

Tamil Nadu Agricultural University
Professor and Head
Department of Bioenergy, TNAU
Coimbatore – 641 003.
Phone: 0422-661 1276
Email: bioenergy@tnau.ac.in

Other organisations manufacturing similar product

Indian Council of Agricultural Research, etc.

Product specifications

Collector area	2.4 × 1.8 m
Number of trays	10 in 5 steps
Insulation	10 cm (Glass wool)
Collector	20-gauge GI sheet
Production	80 kg/day
Energy savings	480 kWh/y
Cost of unit	INR 15,000

Clusters

India is the second largest producer of silk in the world.

Silk is produced using traditional methods in Karnataka, Andhra Pradesh, Tamil Nadu, West Bengal, Jammu and Kashmir, Madhya Pradesh, Maharashtra, Manipur, and Mizoram.

2.4 Solar cabinet dryer

Amla is used in various food items and beverages. Solar cabinet dryer can be used to dry amla. It is provided with 4 trays (0.5 m^2 area) having perforations at bottom to load the product. The hot air passes across the crop spread in a thin layer on trays in the drying cabinet. Drying time reduces by 40%–50% and microbial counts by 3–4 times as compared to open sun-dried product.

Drying time of the cauliflower and amla fruits was reduced by 4–5 days as compared to 8–10 days in open sun drying.

Company details

Shree Manak Industries
70B, Sec. H, Industrial Area Govindpura
Bhopal – 462 023 (Madhya Pradesh)
Phone: 0755-258 1683

Other organisations manufacturing similar product

E Solar Shoppe, Blue Stallion Equipments Private Ltd etc.

Product specifications

Drying capacity	20 kg/batch
Collector area	2.5 m^2
Energy savings	1.5–2.0 kWh/kg
Cost	INR 25,000

Clusters

Pratapgarh

2.5 Solar tent dryer

Solar tent dryer is a small, portable, low-cost dryer for domestic applications. It works on natural convection. Product quality is better than open sun-dried product. The product is easier to load, unload, and handle.

Drying efficiency varies between 18% and 25%.

Drying time per batch varies from 1 to 1.5 days depending upon the product.[3]

Company details

Rural Engineering School At. Rojmal, Ta. Gadhada (SWA)
Dist. Bhavnagar 364 750 (Gujarat)
Phone: 02847-294127
Email: manishpancholi72@gmail.com

Product specifications

Drying capacity	0.5–1.0 kg/day
Glazing	Industrial PVC 100 µm
Cost	INR 800

Clusters

Pan India

2.6 Solar conduction dryer

Solar conduction dryer (SCD) is the solar-powered food dehydrator that produces value-added dehydrated products and increases shelf life of agri-commodities to one year.

The Solar conduction dryer has four drying chambers constructed from hollow sections of stainless steel. Each chamber has a drying tray, which is covered with transparent plastic. The trays are coated with black color special food-grade coating, where the products to be dried are placed. A low-height air vent to create air current is provided at the middle of the dryer along horizontal direction, which also separates the drying chambers in two parts. It can be used to dry raw mango, turmeric, etc.

The dryer takes 5 hours to dry 1 batch (20–22 kg) of tomato and 5 hours to dry 9 kg of raw mango.[4]

Company details

S4S Technologies
Chandrakanta Complex
New Ashok Nagar Road, Block B, Block B1, New Ashok Nagar
New Delhi, Uttar Pradesh – 110 096

Other organisations manufacturing similar product

Swami Samarth Electronics, Rudra Solar Energy, etc.

Product specifications

Drying capacity	10–12 kg	100 kg
Area of dryer	4 m^2	32 m^2
Cost	INR 38,800	INR 2,80,000

The product is intended for individual women and small farm holders. Total market size for dehydrated products is $16 billion. Estimated demand for SCDs in India is very high.

2.7 Forced convection solar cabinet dryer

The forced convection solar cabinet dryer consists of solar collector cum drying chamber, trays, exhaust fan, and solar PV module. Forced convection solar cabinet dryer is made of double-walled fabricated the casing with 40 PUF insulation. Inner wall of the casing is made of SS 304 and the outer wall with GI sheets with painted finish.

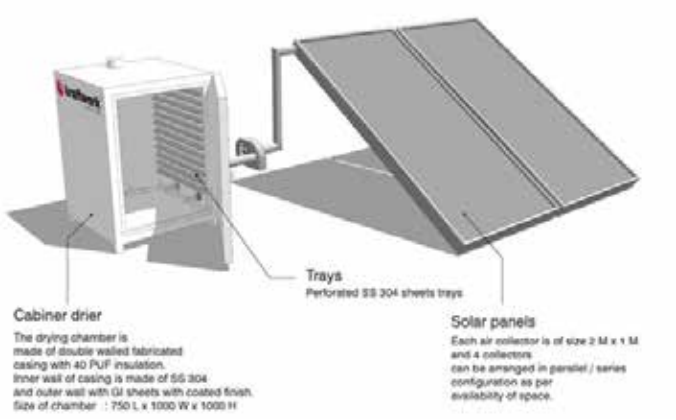
This machine can be used for drying herbal products and fruits such as chipts and grapes.

Company details

Kraft Work Solar Pvt. Ltd
29/2862, Adithya, Near Gandhi Square Poonithura
Kochi - 682 038
Phone: +91 484-270 7228, 211 2777
Email: info@kraftworksolar.com

Other organisations manufacturing similar product

Radha energy Cell, etc.



Product specifications

Size of the chamber	3030 × 1050 × 455 mm
Tray size	600 × 900 × 30 mm
Drying capacity	3–5 kg
Solar collectors	6 pieces of size 2 × 1 m
Backup	6 kW
Number of trays	10
Blower	1.5 hp
Cost	INR 1,50,000

2.8 Smart solar control box

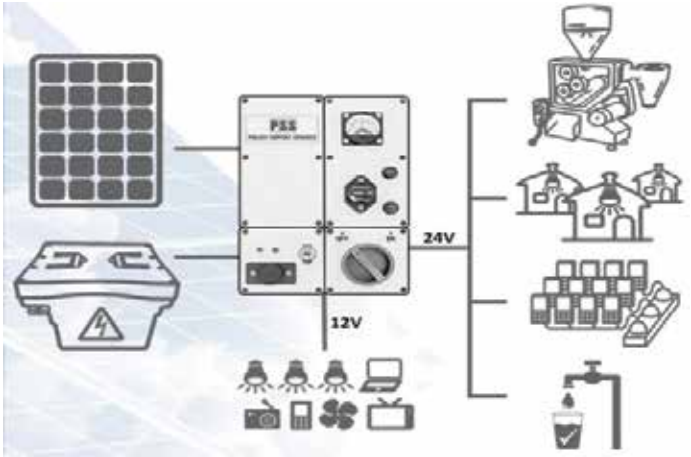
The PSS Power Platform is an adaptable power unit that can run multiple machines and devices. At the heart of the Platform is the Smart Solar Control Box. It comes with high amp 24 V outlets that can power milling machines, clean water supply, small businesses or a mini grid. It also has low amp 12 V outputs for lights, phone chargers, and small appliances. With the Power Platform, one can grow one's system over time by adding solar panels, batteries, other machines and devices.

Company details

Project Support Services Ltd
Lae Malahang Industrial Centre
PO Box 1912 Lae, MP
Phone: +675 472 0088
Email: pss@psspng.com

Other organisations manufacturing similar product

Cygni manufactures solar inverterless controller



Product specifications

Charge controller	20 A, 30 A
Power outlets	24 V, 12 V

2.9 Maize thresher

After harvesting with sickle and plucking of cob manually, grain is obtained by shelling the cob traditionally, i.e. by beating the dehusked cobs with sticks or with fingers or sickle, etc.

The produce is sold by farmers in pods at nearby markets to the middlemen, who directly or through other levels of middlemen sell it to the processer. Processers shell the corn and sell the grain to the market. More income can be generated by farmers if corn is shelled and kernels are sold by themselves in market.

Solar-powered maize thresher produced by Project Support Services can be used to hull corn kernels from dry cobs. It can be connected to PSS power platform and used.

Company details

Project Support Services Ltd
Lae Malahang Industrial Centre
PO Box 1912 Lae, MP
Phone: +675 472 0088
Email: pss@psspng.com

Other organisations manufacturing similar product

AC-powered maize threshers are manufactured by Bharat industries, Kovai Classic Industries, etc.

Product Specifications

Capacity	200 kg/h
Power	550 W
Voltage	24 V
Motor type	BLDC
Power supply	Can be connected to PSS power platform (2.7)

Clusters

Northern Transition Zone (Hyderabad-Karnataka region), Raigar, in India.

2.10 Combination of Cassava grater and coconut scraper

In India, Cassava starch is used in the production of sago. Cassava starch is also used in textile industries, adhesives, dextrin, pharmaceuticals, and confectionaries. In rural areas, manual grating of cassava is practiced. Solar-powered cassava grater produced by PSS can be used to produce grated cassava or other root vegetables. It can also be used to shred coconut from fresh nuts. It increases productivity and reduces drudgery in workplace.

Company details

Project Support Services Ltd
Lae Malahang Industrial Centre
PO Box 1912 Lae, MP
Phone: +675 472 0088
Email: pss@psspng.com

Other organisations manufacturing similar product

AC-powered cassava grater is manufactured by Kishori Kirpa Enterprises, Thomas International, etc.

Product specifications

Capacity	40–60 nuts/h, wet cassava (40 kg/h)
Power	200 W
System voltage	12 V/24 V
Motor type	Brushed DC
Power supply	Can be connected to PSS power platform (2.7)

Clusters

In India, the cultivation of cassava is mainly done in Kerala, Tamil Nadu, Andhra Pradesh, Nagaland, Meghalaya, Assam, etc. Sago production units are located in Tamil Nadu (Namakkal), Andhra Pradesh, Gujarat, and Maharashtra.

2.11 Groundnut decorticator

The average peanut kernel price per kilogram can be approximately twice the price of pod. More income can be generated by farmers if peanuts are decorticated and kernels are sold by themselves in market. Tinytech groundnut decorticator shells the groundnuts in husks and kernels. Husks are thrown away by an inbuilt air blower and kernels are screened to separate broken kernels from whole kernels. It is electrically driven.

Company details

Tinytech Plants
Near Bhakti Nagar Railway Station Tagore Road, Rajkot
Gujarat 360 002, India
Phone: +91 281 248 0166
Email: tinytech@tinytechindia.com

Other organisations manufacturing similar product

Goyum Screw Press, Unisoft Pheripherials, Chetan Agro Industries, etc.

Product specifications

Production	300 kg/h
Power	1.5 kW
Cost	INR 55,000
Power supply	AC grid/could be DRE-powered

Clusters

Dharamsala

2.12 Tea blending machine

To ensure a consistency in flavor, different types of tea are blended based on regional preferences. It has an advanced blending motor, which blends tea in minimal time. Tea blending machine is easy to operate and gives trouble-free performance.

Company details

Sara Udyog
Shop No-C-167, Industrial Area
Rd Number 2, C Block, Sector 10 Noida, Uttar Pradesh - 201 301
Email: saraudyog@yahoo.co.in

Other organisations manufacturing similar product

Shankara Engineering Corporation, Shree Hari Traders, GS Packaging Machine, etc.

Product specifications

Production capacity	100 kg/day
Power	1.5 kW
Drum speed	200 rpm
Motor speed	1440 rpm
Cost	INR 1,25,000
Power supply	AC grid/could be DRE-powered

Clusters

Siliguri, Nilgiris, Kangra, Munnar, Darjeeling, Assam, the Nilgiris, the Northeast, Kangra in Himachal Pradesh.

2.13 Mango pulp machine

The process of extraction of pulp is predominantly manual. The pulp of the mango is usually extracted by squeezing. This process is unhygienic and slow. A mango pulper can extract pulp in a faster and hygienic manner. When the fruit material comes into the extracting compartment via the hopper, the brush pushes the fruit-material against the wall of the perforated sheet. Pressure exerted by brush is sufficient to extract the pulp from the fruit.

Company details

Tinytech Plants
Near Bhakti Nagar Railway Station Tagore Road, Rajkot
Gujarat-360002, India
Phone: +91 281 248 0166
Email: tinytech@tinytechindia.com

Other organisations manufacturing similar product

M/s Sanjivan Industries, Varsha Dairy and Food Engineering, etc

Product specifications

Power	2 hp
Production capacity	400 kg/h
Speed	1440 rpm
Price	INR 90,000
Power supply	AC grid/could be DRE-powered

Clusters

Chittoor, Ratangiri, Kakinada

2.14 Automatic fruit grader

At present, the fruits are graded manually, which is time consuming. Manual grading gives a wide variation in the sizes of graded fruits. The roller-type fruit grader has four pairs of rollers with adjustable diverging gaps between each pair of rollers. It is useful for grading spherical fruits into 3 to 4 grades, based on diameter. Fruit grader fetches higher price for commodity, thereby increasing profit.

Company details

Maa Durga enterprises
J 19, MIDC 3,
Akola - 444 104,
Maharashtra, India
Phone: 0724 – 225 8523 / 225 8529

Other organisations manufacturing similar product

Agro Asian Industries

Product Specifications[3]

Power	750 W
Capacity	1000 kg/h
Speed	1440 rpm
Cost	INR 72,000
Power supply	AC grid/could be DRE-powered

Clusters

Pune, Anantpur, Nagpur

2.15 Coconut dehusker/Coconut fibre peeling machine

The use of spear, a popular traditional method for coconut dehusking, poses threat and danger to the life of people involved. Coconut dehusker machine dehusks the coconuts in a safe way. Coconuts are manually loaded into tension lever. The rollers with spikes rotate in opposite directions towards the centre causing both the gripping and tearing of husk of coconut fruit placed in between the rollers.

Company details

Kovai Classic Industries
No.1, Iyer Hospital Road Opp Coimbatore Capital
Singanallur, Tamil Nadu – 641 005
Phone: 093458 37456
Email: info@kovaiclassicindustries.com

Other organisations manufacturing similar product

Autoprint Machinery Manufacturer, Orbit Textool Engineers, etc.

Product specifications

Power	1.5 kW
Capacity	500 nuts/h
Cost	INR 2,00,000
Power supply	AC grid/could be DRE-powered

Clusters

Deltaic regions of South India, Kazipara, Hooghly, Mayurbhanj

2.16 Sugarcane deskinning machine

Manual de-skinning is highly labour-intensive and tedious. Sugarcane when stored without deskinning develops a fermented smell, due to the waxes present on skin. Automatic sugarcane deskinning machine can deskin the sugarcane rapidly. The de-skinning machine, when installed and implemented at the rural level, will have far-reaching benefits in terms of hygiene, better product quality, and better premium for diversified products.

Company details

CFTRI Mysore
Cheluvamba Mansion, Valmiki Rd, Opp. Railway Museum
Devaraja Mohalla,CFTRI Campus, Kajjihundi
Mysuru, Karnataka – 570 020
Head, TTBD
Phone: 0821-2514534
Email: ttbd@cftri.res.in

Product specifications

Power	0.75 kW
Production capacity	120 kg/h
Cost	INR 850

This technology is yet to be commercialised.

Clusters

Bagpat, Surat, Cuddalore, Dharmapuri, Haridwar, etc.

2.17 Continuous feed aloe-vera gel extraction equipment

Pharmaceuticals, therapeutic and cosmetic industries are major consumers of aloe vera. Farmers can go forward with contract farming with aloe-vera buyers. Aloe-vera leaves are fed onto the conveyer of the continuous feed gel extraction equipment. The leaves pass through top and bottom pair of rubber pressure roller assembly, peeling both the top and bottom rinds in a single pass. Pulp of the gel is extracted undamaged. The saving in time and cost over conventional method is up to 70% and 50%, respectively.

Company details

Director
ICAR-CIAE, Nabi Bagh
Berasia Road, Bhopal – 462 038
Phone: 0755-2737191
Email: director@ciae.res.in, director.ciae@ICAR.gov.in

Other organisations manufacturing similar product

Raman Industries, Sanjivani Photo Pharma etc.

Product specifications

Power	0.75 kW
Production capacity	200–225 kg/h 900–1000 leaves/h
Cost	INR 60,000
Power supply	AC grid/could be DRE-powered

Clusters

Bikaner, Alwar, Satnapalli, Kangayam

2.18 Turmeric polisher

Polishing of dried turmeric rhizomes is done to remove outer corky surface to get smoother surface texture and appearance. Polishing is done in two stages: primary polishing (at farmer level) and secondary processing (at trader level). ANGRAU Turmeric Polisher can perform preliminary as well as secondary polishing.

Company details

Dr. B. John Wesley
Principal Scientist (Agri Engg) and Head
AICRP on Post Harvest Engineering and Technology
Acharya N.G. Ranga Agricultural University
Bapatla – 522 101, Guntur (Dist.), Andhra Pradesh
Phone: 09441936374
Email: phtcbapatla@gmail.com

Other organisations manufacturing similar product

Shree Industrial Equipments, AI Industries, Shree Dhanalakshmi Lathe Works etc.

Product specifications

Power	2 hp
Production capacity	700 kg/hr
Cost	INR 40,000
Power supply	AC grid/could be DRE-powered

Clusters

Warangal, Nizamabad, Karimnagar, Adilabad, Sangli

2.19 Solar rice huller

Rice hulling is removal or separation of husk (dehusking) and bran to obtain the edible portion for consumption. The process has to be accomplished with care to prevent excessive breakage of the kernel and improve recovery of paddy or rice. Solar rice huller automates the process of removing the chaff of grains of rice. It uses steel rollers to remove husk. It is an energy-efficient machine, which can be run by solar panels. For dehusking different varieties of rice, the gap between the machine huller can be easily adjusted by 0.1–1 mm.

Company details

Alto Precision
Bengaluru, Karnataka
Phone: 08048993435
Email: precisionalto@gmail.com

Other organisations manufacturing similar product

AC-powered solar rice hullers are manufactured by Sun Agro, Aggarwal Sales Corporation, Jay Khodiyar Industries, etc.

Product specifications

Power	0.5 hp
DC voltage	24/48 volt
Battery	2 batteries of 12 volt ,50 Ah
Solar panel	1 kWp
Battery backup	8 h
Production capacity	100 kg/h
Motor	PMDC
Motor speed	1500 rpm
Cost	INR 1,50,000

Clusters

Jalpaiguri, Cooch Behar, Malda, Patiala, Firozpur, Ludhiana, Sangrur, Amritsar, Faridkot and Jalandhar, Gorakhpur, Bareilly, Muzaffanagar, Kheri, Faizabad, Barabanki, Banda, Varanasi, Naimtal.

2.20 Solar milling machine

Solar milling system is a photovoltaic solution to grind cereals to obtain edible flour, specially designed for off-grid conditions. Solar milling machine is designed as a modular system, where a combination of different functionalities apart from grinding cereals can be plugged to the system as options (sets). The product is designed with the similar concept as any electrical mill. The stone mill is based on pure granite 500 mm horizontal stones and is powered by a DC motor (1.5 kW) specifically designed for solar PV applications. Solar grain milling incurs no running costs and only very low maintenance cost.

Company details

Solar Milling
Alemanya 5808700
Igualada
Barcelona, SPAIN
Phone: +34938050311
Email: sales@solarmilling.com

Other organisations manufacturing similar product

AC-powered milling equipment is manufactured by Topsun Energy, etc.

Product specifications

Capacity	Wheat, Maize - 35–150 kg/h Barley - 30–110 kg/h Millet - 25 kg/h Sorghum- 35 kg/h
Voltage	230 VAC / 150–300 VDC
Motor	1.5 kW
Panel	275 Wp each, 6 units
Battery (optional)	24 V/800 VA

Clusters

These machines can be used in many states like West Bengal, Maharashtra, Karnataka, Gujarat, Rajasthan, Madhya Pradesh, Andhra Pradesh, and Tamil Nadu.

2.21 Mini sugarcane juicer

In India, the machinery used for extracting sugarcane juice uses either diesel or electricity from the grid. Energy-efficient machines can be used for this purpose, which can be solar powered by further modifications. Jeeva is a three-Roll Sugarcane Juice Machine weighing about 40 kg. Powered by a 40-W electric motor, juice chamber, rollers and cabinet are made from SS-304. Jeeva mini can be used in small shops and at home for making sugarcane juice. Another model, **Jeeva Avval** sugarcane crusher can be used for large-scale production of sugarcane juice.

Company details

Nachiketa Engineers
16/18, Samrat Industrial Area
Rajkot – 360004, Gujarat, India
Phone: 0 80489 95723

Other organisations manufacturing similar product

AC-powered sugarcane juicer is manufactured by SGK Industries, Kanan Plast, Manjeet Kitchen Equipments, etc.

Product specifications

Power	0.5 hp
Crushing Capacity	100 kg/h
Voltage	220–240 V
Weight	40 kg
Cost	INR 47,200
Power supply	AC grid / could be DRE-powered

Clusters

Major sugarcane producing states are Uttar Pradesh, Karnataka, and Andhra Pradesh.

2.22 Arecanut dehusker

Conventionally, arecanuts are peeled manually, and husk is removed. Arecanut dehusker can be used to increase the efficiency of dehusking. This machine is more suitable for fresh green Arecanut dehusking. This machine is also available in bigger sizes.

Company details:

Maruthi Engineering Works
Old Market Place
Near Laxmi Talkies Road
Channagiri – 577213 Davanageri(D), Karnataka
Phone: 98445 73633, 94486 92444
Email: info@maruthiengineering.co.in

Clusters

Chikmagalur, Shimoga, Davangere, Dakshina Kannada,Tumkur, Chitradurga, Malappuram, etc.

Product specifications

Motor	1 hp
Speed	1400 rpm
Capacity	168 kg/h
Cost	INR 1,35,000
Power supply	AC grid / could be DRE-powered

2.23 Pepper thresher

Pepper is usually manually threshed, which is a cumbersome and time-consuming job. During manual threshing, the berries may get damaged and the threshing percentage is also low. This machine is used to thresh pepper berries both mechanically and manually.

The thresher consists of a feeding hopper made of an iron sheet, a rotating wire-loop type threshing drum, and a concave metal sheet with a perforated bottom, all of which are mounted on the main frame. Power from the electric motor is transmitted through the V-belt and pulleys to the threshing drum. The machine also has the facility of manual operation. The harvested pepper spikes are directly fed to the hopper through the rotating drum. The threshed pepper passes down through the perforations and gets collected at the berry outlets.

Company details

National Innovation Foundation
India Satellite Complex
Nr. Mansi Cross Roads, Satellite
Ahmedabad–380 015,
Gujarat, India
Phone: +91-79-2673 2456, 26732095
Email: bd@nifindia.org
Web: www.nif.org.in

Other organisations manufacturing similar product

Kuttamthadathil Traders, VRF Industrial Corporation, etc.

Clusters

Idukki, Wayanad, Uttara Kannada and Kodagu, etc.

Product Specifications

Price	Rs 24,250
Capacity	150 kg/h
Power	0.5 hp
Power supply	AC grid/could be DRE-powered

2.24 Supari cutting machine

In many rural areas, supari is cut manually using a hand tool. The traditional method is tedious and less productive. Supari cutting machine will help the villagers to cut the nut efficiently in less time and in bulk. The betel nut or dry fruit is fed into the hopper. From the hopper, it enters into the cutting chamber where the betel nut is cut into the small sizes under the action of shearing force between stationary and rotary blades.

Company details

Sai Enterprises
Dhebar Road, Near Atika Railway Crossing
Near KishanWay-Bridge, Opposite Municipal Office
Rajkot – 360002, Gujarat, India
Phone: 09824348014

Other organisations manufacturing similar product

Sara Udyog, Unique Manufacturer, R.K. Enterprises, etc.

Clusters

The major arecanut producing states in India are Karnataka, Kerala, and Assam. The production of arecanut is also increasing in Maharashtra, Andhra Pradesh, West Bengal and Odisha.

Product specifications

Power	0.5 hp
RPM	1440
Weight	110 kg
Power consumption	0.50/kg
Cost	INR 55,000
Power supply	AC grid/could be DRE-powered

2.25 Solar coffee roaster

Solar coffee roasting provides higher incomes by reducing the costs of production, promotes organic practices, decreases CO_2 output, and allows small-scale farmers to continue to work and live in remote areas. Solar coffee roaster is a parabolic mirror array that focuses on a roasting drum and heats it to 300 °C. This roaster can be installed easily in any place and does not need frequent maintenance. This roaster comes in two types: parabolic and square parabolic. The parabolic scheffler cooker takes 8 minutes to boil 1 litre of water, the square parabolic cooker takes 12 minutes to boil 1 litre of water.

Company details

B. Barefoot Enterprise

Barefoot College

Tilonia Campus

Tilonia – 305 816

Via Madanganj District Ajmer

Other organisations making the similar product

Coffee Tech Engineering, etc.

Product specifications

Type	Parabolic
Price	INR 40,000
Mirrors	300
Roaster box dimensions (L×B×H) ft	12 × 4 × 4
Dish dimensions (L× B×H) ft	10×10×7.9
Weight of dish (kg)	120
Maximum temperature (°c)	300
Area m^2	2.7
Capacity	3 kg per batch
Roasting time	4 h

2.26 Banana fibre extraction machine

Banana fibre is a natural fibre with high strength, which can be blended easily with cotton fibre or other synthetic fibre to produce blended fabric and textiles. Banana fibre extraction machine is the best way to obtain fibre of both good quality and quantity in an eco-friendly way. In this process, the fibre is extracted by inserting the pseudo-stem sheaths one by one into a fibre extraction machine. Less maintenance cost and safe to operate. Superior quality fibre in terms of length and softness, strength, and colour can be obtained.

Company details

Riddhi Enterprises
No. 8, Tirth Estate, Inside Sakariba Estate
B/h. Indogerman Tool Room, Phase-4, Vatva GIDC
Ahmedabad–382 445, Gujarat
Phone: +91 8511596585
Email: contact@riddhientmachines.com

Other organisations manufacturing similar product

Bishwash Enterprises, Preci-tech Industries, etc.

Clusters

The major banana producing states of India are Tamil Nadu, Maharashtra, Karnataka, Gujarat, Andhra Pradesh, Assam, and Madhya Pradesh.

Product specifications

Power	1 hp
Production	10–20 kg
Cost	INR 80,000
Power supply	AC grid/could be DRE-powered

CHAPTER 3-AGRICULTURE AND AQUACULTURE

India is an agrarian economy. Lack of grid connectivity, erratic power supply, and lack of exposure to modern agricultural practices limit the income and productivity of the agricultural sector. Farmers rely on diesel for irrigation. Huge quantities of perishables get wasted due to lack of proper cold storage facilities. DRE can be used to do a number of farm tasks such as irrigation, cold storage, and pesticide spraying, to name a few.

3.1 Windmill water pump

In order to meet various needs such as drinking water, irrigation, salt farming and aqua culture, water is pumped from the ground, rivers, canals, and wells using hand pumps, centrifugal pumps, and diesel pumps. Wind pumps are particularly useful in remote coastal areas where there is good wind. A wind pump offers several advantages over conventional pumps as it needs no fuel, little maintenance and usually lasts 20 years or more.

Company details

Auroville Energy Products Auroshilpam
Centre for Scientific Research
Auroville, Tamil Nadu – 605 101
Email: info@aep-auroville.com

Product specifications[1]

Windmill type	Gear
Tower height	9 m
No. of blades	24
Rotor diameter (m)	5.7
Pipe size (inches)	2 to 4
Wind speed (kmph)—Cutin	10

Pump type	Reciprocating pump
Pump diameter (mm)	64–160
Water output (lph)	4000 at 15 m head
Water depth (ft)	Up to 200
Energy savings (diesel equivalent)	INR 50,000 in single season (8 months)
Cost of unit	INR 1.5 lakh

Clusters

Gujarat, Tamil Nadu, Rajasthan, Maharashtra, and Andhra Pradesh

3.2 Bulk milk chiller

Solar bulk milk coolers are powered by solar photovoltaics and they store energy in thermal storage system for cooling during non-solar hours. The system provides most affordable and reliable cooling backup for bulk milk coolers. Thermal storage system stores cooling energy in the form of ice, which is one of the most reliable, cost-effective, and non-hazardous form of energy storage.

Company details

Inficold India Pvt. Ltd
G-21, Sector 11, Noida, UP
Email: info@inficold.com
Mobile: + 91-98107 11800

Solar photovoltaic panel capacity	5.2 kWp	7 kWp
Battery	48 V 100 Ah	48 V 100 Ah
Capacity	500 litres	1000 litres
Temperature range	4 °C–10 °C	4 °C–10 °C
Cost	INR 8.7 lakh	INR 10 lakh

Clusters

Uttar Pradesh, Maharashtra, Gujarat.

3.3 Mobile solar aerator system

Aeration of water body can increase yields, improve food security, and reduce antibiotic use. Mobile solar power pond aeration system is a good alternative to a grid or diesel engine pond aeration system. The demand for dissolved oxygen (DO) in a fishpond is high between 3 a.m. and 4 a.m. because that is when fish start to come up to the water surface. The system is designed to operate automatically at designated hours thus eliminating the need for a manual switch-on at night.

Company details

Supernova Technologies
ARVINDHOUSE
C.S.No. 180/1, Quay Street
Next to Sewree Police Station at Reay Road (E)
Darukhana Mumbai – 400 010
Phone: +91 98692 27095
Email: milton1@vsnl.net, srswg@yahoo.com

Other organisations manufacturing similar product

Shiv Aqua Products

Product specifications

Pump capacity	1/3 hp
Solar panel	300 Wp
Battery	12 V, 150 Ah
Inverter	12 V, 800 VA
Daily hours of use	3 hours
Pond size	2 acres
Pump capacity	80 rpm
Energy savings (diesel equiv)	125–150 l/y
Cost	INR 80,000

Clusters

Rayadurg, Krishna, West Godavari

3.4 Battery-operated live fish carrier

"Live Fish Carrier System (LFCS)" runs solely by DC power drawn from four lead–acid batteries that is non-polluting. It has all facilities including aeration, filtration, and ammonia removal to keep fish alive during transportation. The fish mortality is less than 1% per trip of 40 km. It can be used for live table fish transportation from culture pond to retail market, live fingerlings transportation for aquaculture, and live brood fish transportation for breeding purposes. It can also be used as a mobile fish selling shop.

Company details

ICAR-CIPHET-PAU
Dr. Armaan U. Muzaddadi
Principal Scientist **(ICAR-CIPHET PAU)**
Ludhiana –141 004
Phone: 95309 26962
Email: drarmaan@gmail.com

Product Specifications

Capacity	500 kg
Battery capacity	4 lead–acid batteries 12 V, 100 A each 60–80 km on single charge
Water requirement	50% less than traditional systems
Cost	INR 1,75,000
Power supply	Could be solar powered

Clusters

Rayadurg, Krishna, West Godavari

3.5 Solar DC freezer and chiller

The cold chain industry in India is still at a nascent stage and despite large production of perishable produce, the cold chain potential still remains untapped due to lack of enabling infrastructure like power and roads. Erratic power supply affects the industry adversely. Solar DC freezer could be used to reduce the dependency on grid. It can be used to store ice cream, fruits, vegetables, and cold beverages. This product is a combination of Cygni inverterless controller and Devidayal DC freezer.

Company details

Devidayal Solar

709, 7th Floor Maker Chambers 5
Nariman Point, Mumbai - 400021
Phone: +91 22 22849999
Email: customercare@ddsolar.in

Other organisations manufacturing similar product

Ecozen, Durasun Solar Solutions, Shri Jagannath Solar Energy, etc.

Product specifications

Power	150 W
PV panel capacity (Cygni inverterless)	500 Wp
Battery capacity (Cygni inverterless)	2000 Ah
Voltage	48 V
Motor type	BLDC
Storage capacity	100 litres
Cost	INR 35,000

Clusters

Kanpur cold storage, Nalbari, Ranchi, Aurangabad

3.6 GreenChill biomass refrigeration system

GreenCHILL is an off-grid, biomass-powered refrigeration system designed for farmers living in rural and remote locations. GreenCHILL uses the principle of vapour absorption for refrigeration. The system does not require a compressor. A conventional compressor-based 7 kW cooling capacity cold storage requires 4 kW of grid power to operate; this vapour absorption machine needs less than 10%, i.e. 0.3 kW for operation.

Company details

NEW LEAF
B-1, Block B1, Mohan Cooperative Industrial Estate Delhi-Mathura Road, Badarpur
New Delhi – 110 044
Phone: +9198108 16292
Email: info@newleafdynamic.com

Other organisations making the similar products

Energy Concepts, etc.

Product specifications

Power required	0.3 kW
Fuel used	Biomass waste
Storage capacity	5–10 Mt of fruit, vegetables, fish
Milk storage	500–1000 litres
Dimensions	2 × 10 × 9 ft
Adjustable temperature	-5 °C to 18 °C
Cost	INR 5–6 lakh Approx. (as per capacity)

Clusters

Smallholder farms, rural communities, cooperatives or projects in off-grid areas.

3.7 Agriculture sprayer

Solar-operated spray pump helps farmers in remote areas of the country where fuel is not easily available. They can perform their regular work as well as save fuel up to a large extent. It is made up of lance steel with Indian nozzle fitting.

Company details

K D Agrotech
No. 72, Barcelona Business Park, Sardar Patel Ring Road, Odhav
Ahmedabad – 382 415
Gujarat, India
Phone: 0 80487 53991

Other organisations manufacturing similar product

Ganpathy Agro Industries, V J Agro Services, etc.

Product specifications

Power	12–15 W
Pressure	0.15–0.60 MPa
Battery rating	12 V, 8 Ah
Weight	6.8 kg
Capacity	16 litres
Cost	INR 2500

Clusters

Dharwad, Raichur, Bellary and Gulbarga, Nanded, Amravati, Parbhani, Mahesana, Kheda, Sabarkantha, Surat, Amreli, Guntur and Prakasam. Adilabad, Kumool, Coimbatore, Salem, Madurai, Tiruchirapalli, Ramnathapuram, South Arcot, Vallalur, and Chengalpattu.

3.8 Battery-operated tea leaves plucker

Traditionally, the tea are plucked by hand by the tea workers. This manual process takes a lot of time. By using a battery-operated tea plucker, the time taken for plucking tea will decrease drastically.

Company details

Sreevatsa Agchamp
41, Jayam Complex, Nehru Street Ram Nagar
Coimbatore – 641 009, Tamil Nadu, India
Mobile: 080484 12553
Email: srivatsaagchamp@gmail.com

Other organisations manufacturing similar product

Neptune Simplify Farming, etc.

Product specifications

Power	0.75 kW
Speed	7500 rpm
Weight	14 kg
Cost	INR 29,500

Clusters

Darrang, Goalpara, Kamrup, Lakhimpur, Dibrugarh, Nowgong, Sibsagar, Cachar, Karbi Anlong, North Cachar. West Bengal, Darjeeling, Terai (west Dinajpur), Doors (Cooch Bihar) Kanyakumari, and Tirunelveli.

3.9 Battery-operated safflower petals collector

Traditionally, safflower varieties grown by Indian farmers are spiny and petal collection is extremely tedious and difficult. Safflower petal collectors (battery-powered and S.I. engine-powered) machine can ease the process of collecting safflower petals. One battery charge can last for 3 hours and hence a solar photovoltaic (PV) is included to charge the batteries in the field. As the battery charging time was 3 hours, the system is capable of charging two batteries per day to be used alternatively for one unit.

Company details

Anil K Rajvanshi, Director,
Nimbkar Agricultural Research Institute (NARI)
P.O. Box 44, Phaltan – 415 523, Maharashtra
Email: nariphaltan@gmail.com

Product specifications

Item	Battery-operated collector (two snout)	S.I. engine-based collector
Power	12 V, 27 W	0.8 kW petrol-powered spark ignition engine
Motor speed	5000 rpm	5600 rpm

Motor type	PMDC	
Battery	1 × 12 V, 14 Ah lead acid	-
Dimension	250 mm (L) × 230 mm (W) × 500 mm (H). All made of PVC pipes. It has two snouts.	-
Weight of collector	9.4 kg	16 kg
Petal collection; kg/day	0.8	4
Fuel charges (Rs/day)	2 (battery charging from grid)	80 (2 litres of petrol/day)
Cost	INR 20,000 (with solar panel), INR 5500 (charging from grid)	INR 7800

Clusters

Hingoli, Osmanabad, Parbhani, Gulbarga, Dharwad, Adilabad, Medak, and Nizamabad.

3.10 Solar-powered tractor

Solar-powered tractor runs on electricity generated from solar PV and is completely an eco-friendly vehicle. It has absolutely no running cost. It has zero maintenance, zero carbon emission and no noise pollution compared to other diesel tractors. It can be used for spraying pesticides in the farm, for pumping water and fast charging of batteries even in insufficient light.

Company details

Saur in Autosol Pvt. Ltd
107, Matrix complex,
Near Divya Bhaskar Press,
S.G. Highway,
Ahmedabad, Gujarat, INDIA
Phone: +91 98251 58071
Email: info@saurinautosol.com

Product specifications

Power	5 hp
Panels	1260 Wp
Motor	5 hp
Speed	1440 RPM
Battery	12 V × 110 A – 4 batteries

3.11 Cattle feed grinder

Solar powered cattle grinder can reduce the drudgery of manual chaff cutting operations and can also be a solution to erratic power cuts. It can ensure timely availability of fodder for the cattle.

Cattle feed grinder system comes with retrofit kit, solar panel and battery. Cattle feed grinder has IoT locking mechanism and is available in bigger sizes and IoT-enabled remote locking mechanism.

Company details

Ekak Innovation
113/216-A, Swaroop Nagar
Kanpur – 208 001, Uttar Pradesh
Phone: 97113 83665

Other organisations manufacturing similar product

AC-powered cattle feed grinders, are manufactured by Namdhari Agro Industries, Asha Enterprises, etc.

Cluster

Pan India

Product specifications

Solar panel capacity	5 kWp
Motor power	3 HP
Battery	2250 Ah
Feed capacity/extraction rate (in kg/h)	90
Cost	INR 5,48,500

CHAPTER 4-FOOD PROCESSING

Processing of food is carried out manually in most parts of India. Implementation of DRE in the food processing sector improves the wellbeing of communities, improves productivity, creates opportunities for employment. It also reduces the amount spent on electricity/fuel and the drudgery of people involved. Lack of mechanisation limits the productivity of this sector. Introduction of food production machinery can inspire people to open new enterprises.

4.1 Meat mincer-keema maker

There is a huge market potential for the processed canned meat products in India as well as international market. Meat mincer can be used to mince meat, vegetables, fish and to make cattle pellets. Meat mincer is armed with powerful blades.

Many AC-powered meat mincers are available in the Indian market. DC-powered meat mincers are rarely available in India.

Company details

Project Support Services Ltd
Lae Malahang Industrial Centre
Postal Address: PO Box 1912 Lae, MP
Phone: +675 472 0088
Email: pss@psspng.com

Other organisations manufacturing similar product

AC-powered meat mincer is manufactured by Manjeet Kitchen Equipments, Naru Equipments, etc.

Product specifications

Capacity	400–500 kg/h
Power	1.2 kW
Machine voltage	48 V
Motor type	BLDC
Power supply	Can be connected to PSS platform

4.2 Fish de-boner

Fish de-boner is useful for separation of fish bone and meat from different varieties of fish. The principle involved is to compress the whole dressed fish between the moving belt and a rotating perforated drum, so that the soft flesh of the fish is squeezed/pushed inside the perforated drum through the perforations provided on the periphery and the perforations are drilled through the thickness of the rotating drum. The technology would open the avenues for utilisation of low value and under-utilised fishes as a cheap protein source.

Contact details

Dr. Udaykumar Nidoni

Research Engineer, AICRP on PHT and
Head, Dept. of Processing and Food Engineering
College of Agril. Engineering, Raichur
University of Agricultural Sciences, Raichur (Karnataka)
Phone: 08532 -221577/ 0 90086 88430
Email: udaykumarnidoni@yahoo.co.in

Product specifications

Capacity	60–80 kg dresses/h
Power	1 hp
Cost	INR 90,000
Speed	1440
Deboning efficiency	90%–95%
Power supply	AC grid/could be DRE-powered

Clusters

Veravel, West Godavari, Nellore

4.3 Papad-making machine

The conventional method of making papad consists of hand rolling the kneaded dough using roller and plate. The major drawback of this manual process is the rolling capacity, which can produce only about 30–40 papad/hour. An electric papad maker can enhance the production by multifold leading to increased incomes. Dough is manually fed into the machine, and at the outlet, raw papad is obtained.

Company details

Gaurang enterprises
4, Plot No. 24/25, Zaveri Industrial Estate Near Goga Maharaj Mandir Kathwada, Ahmedabad – 382 430, Gujarat, India
Phone: 0 80485 51023

Other organisations manufacturing similar product

Jackson Machine, Karni Engineering, etc.

SELCO manufacturers solar-powered Roti rolling machine. It can be used as a papad roller.

Product specifications

Production	6” - 1800/h 7” - 700/h 8” - 700/h
Power	1 hp
Speed	1440
Cost of unit	INR 1,24,000
Power supply	AC grid/could be DRE-powered

Clusters

Uttarasanda, Lijjat, Amritsar, Churu papad bari

4.4 Poha-making machine

Traditionally, flaking of paddy is done in mortar. This process is time consuming and tedious. Using Poha-making machine, manufacture of rice flakes of high quality can be done satisfactorily at commercial level and even in the rural areas. Soaked paddy is roasted with fine sand till two or three grain burst and then fed into the flaking machine after removing the sand. The machine operates on the basis of pressing the paddy grain between two rollers made out of mild steel.

Company details

ABC Engineering Works
Shanthi Medu, Coimbatore, Tamil Nadu
Phone: 080487 31083
Email: sales@abcengineering.co.in

Other organisations manufacturing similar product

Taurus Solutions, Bharat Engineering, Sandha Enterprise

Product specifications

Production capacity	200 kg/h
Power	1.5 kW
Speed	1440 rpm
Power supply	AC grid/could be DRE-powered
Cost	INR 70,000 approx.

Clusters

Bhatapara, Raipur

4.5 Electric kadhai with stand

Electric kadhai is available in different sizes. Electric kadhai has temperature control feature so the temperature can be adjusted as per user requirements. Even heating can be achieved using this.

Company details

Nirav
R. D. Industries
Survey No. 36, Balaji Chowk, B/H.
Krishna Park Hotel, Vavdi Industrial Area,
Rajkot–360 004, Gujarat, (India)
Phone: +91 99794 93935
Email: rdindustries11@gmail.com

Other organisations manufacturing similar product

Ravi Raj Industry, Vishvakarma Machine Tools, Leenova Food Processing Machinery, etc.

Product specifications

Capacity	8 litres
Body material	Stainless steel
Dimension	22” × 22” × 15”
Diameter	18”
Weight	16 kg
Voltage	220 V
Power supply	AC grid/could be DRE-powered
Cost	INR 14,300

Clusters

These electric kadhai can be implemented in the small shops and potato chips making units and farsan making shops.

4.6 Ghee-making machine

Ghee-making machine is useful for the production of ghee from butter. The inner shell with cylindrical body, and hemispherical bottom is made up of 6-mm thick SS-304 material. Intermediate shell with hemispherical bottom is made up of MS plate of 6 mm thickness. Outer shell hemispherical bottom is made up of 2 mm thick SS 304 sheet. In this machine, a motor is provided for continuous stirring of butter and the container is heated with LPG. This machine can also be used for khoya making after a few changes in speed and temperature.

Company details

Technomond
Shiv Vihar, Vikas Nagar
Uttam Nagar, New Delhi - 110 059, India
Phone: +91 99994 57662
Email: info@technomond.com

Other organisations manufacturing similar product

Varsha Engineers, Smart Engineering, JMS Industries, etc.

Product specifications

Price	INR 1,00,000
Motor	0.25/0.5 hp
RPM	1425
Separation Temperature	35–40 °C / 95-108 °F
Solid Removal Time	40–60 min
Capacity range	100 to 2000 litres
Power supply	AC grid/could be DRE-powered

Clusters

The machine can be used in major dairy-products manufacturing states such as Haryana, Maharashtra, Madhya Pradesh, Punjab, Gujarat, Andhra Pradesh, and Rajasthan.

4.7 Solar concentrator

The temperature required for pasteurisation and other dairy processes is around 90–150 °C, which can be achieved using solar thermal concentrators. Solar concentrators could be used for pasteurisation thereby reducing operational costs. The receiver at the focus of the ARUN30 solar concentrator transfers the heat of solar radiation to water. Once the water is converted into steam, and desired pressure and temperature is achieved, the steam is delivered to the application area or the common boiler header.

Company details

Clique Solar
G-223, Raghuleela Mega Mall, Poisar
Behind Poisar Bus Depot, Kandivali (W)
Mumbai – 400 067
Phone: +91 86910 22 351 / 86910 22353
Website: info@cliquesolar.com
Email: sales@cliquesolar.com

Other organisations manufacturing similar product

Parabolic solar concentrator manufactured by College of Technology and Engineering, MPUA&T, Udaipur, is smaller in size (1.08 metre diameter) and can be used in small-scale milk processing units. It can pasteurise 10 litres of milk in 95 minutes.

Product specifications

Aperture area (m^2)	34
Thermic medium	Steam, hot water, hot air, hot oil
Outlet temperature (°C)	Up to 300
Energy output (kJ)	4.2
Operating pressure (bar)	Up to 20
Dry steam/day (kg)	150
Cost	INR 4,50,000
Fuel savings (litres/year)	3750

Clusters

Gandhinagar, Kamathipura, Vadodara

4.8 Solar-powered butter churner

Solar butter churner mechanises the process of churning butter. It can be used in homes and small-scale dairy industries. It can be used in any kind of utensil irrespective of its shape and size.

Company details

Tracksun Solar Pvt. Ltd
303, Pragati Deep Tower, District Center, Laxmi Nagar,
Delhi – 110 092, India
Mobile: 08802 71638

Other organisations manufacturing similar product

Bimal Industries, SELCO, etc.

Meerut, Agra, Muzaffarnagar, Bijnor, Aligarh and Mathura, Ludhiana.

Cluster

Pan India

Product specifications

Capacity	10 litres
Power	36 W
Charge Controller	6 A
Battery	26 Ah
Solar Panel	40 Wp
Operation Voltage	12 VDC
Cost	INR 950

4.9 Dough mixer machine

Automatic dough kneader device reduces the stress of unhygienic hand-kneading and makes the method totally hygienic and convenient.

Company details

Nirav
R. D. Industries
Survey No. 36, Balaji Chowk, B/H. Krishna Park Hotel, Vavdi Industrial Area, Rajkot–360 004
Gujarat, (India)
Phone: +91 99794 93935
Email: rdindustries11@gmail.com

Product specifications

Power	0.5 hp
Motor speed	1440 RPM
Kneading time	5–7 minute
Weight	55 kg
Bowl material	Stainless steel
Cost	11,000/piece

Other organisations manufacturing similar product

Techmate Industries, Naru Equipment, Sahith Engineering, etc.

Clusters

The dough kneader can be used in many places like restaurants, bakery, and can also be used for the small-scale papad-making, pasta-making units.

4.10 Soya milk-making machine

With increasing health consciousness among Indian people, the use of soymilk is getting acceptance. Soya milk-making machine can be used to produce soya milk. Overnight soaked soybeans are crushed with water and filtered to get the soymilk.

Company details

Pushpanjali agro

Plot No 177, Industrial Area Phase 1, Panchkula, Haryana
India
Phone: +9177078 01500, 77078 01600
Email: pushpcare@gmail.com

Product specifications

Production capacity	320 litres/hour
Power	1.5 kW
Milk tank	80 litres
Cost	INR 1,28,000
Power supply	AC grid/could be DRE-powered

Other organisations manufacturing similar product

Machine X Industries, Kabir Foundry Works, Alfa Tech India, etc.

Clusters

Baran, Kota

4.11 Makhana popping machine

Traditional processing of makhana seeds (roasting in an earthen pot, followed by malleting) is a cumbersome process. Makhana popping machine can save the poor fishermen from the drudgery and for improving upon their working conditions besides producing high quality makhana. The machine consists of a hopper, screw conveyor type roaster (having two continuous barrels, one heated with oil and other by mounting three band heaters) and can be used to pop makhana.

Company details

M/s Jwala Engineering and Consultancy Services
354, Sector 2, Growth Centre, Saha, Ambala – 133 104 (Haryana)
Tel.: 0171-2821836

Product specifications

Power	2 motors - 0.5 hp, 1.0 hp
Popping capacity	30–35 kg/h
Cost	INR 1,50,000
Power supply	AC grid/could be DRE-powered

Other organisations manufacturing similar product

Blacknut Agri Food Machinery Pvt. Ltd, etc.

Clusters

Bihar accounts for more than 85 % of the makhana produced in the country. Darbhanga, Madhubani, Sitamarhi, Saharasha, Katihar, Purnia are makhana clusters.

CHAPTER 5-TEXTILE

Many processes in the textile sector are physically demanding and undignified process, thigh reeling being one of the examples. Rural women struggle to produce silk in large volumes and make a good living.

Powering the technological advancements through DRE can fuel the thermal and electrical energy needs of the textile industry. DRE gives textile producers leverage over one of the essential cost variables, electricity. DRE can alleviate the problem of power cuts faced by the decentralised power loom units in the country.

5.1 Solar wool spinning machine

Sheep tending is a major source of income across India, especially in rural areas. If the sheared wool could be spun into yarn, then the return on produce is higher and also the volume reduces drastically for transport. Solar powered portable wool spinning machine can be used to spin wool on field.

Company details

Flexitron
Email: flexitron@yahoo.com
Phone: +919845113109

Product specifications

Solar panel capacity	15 W
Motor power	10 W
Motor speed	3000 rpm
Production capacity	Up to 600 m yarn
Cost	INR 6000

Clusters

Karzoo, Ropa, Ludhiana

5.2 Auto-grooving machine

During continuous operation of the double roller gin, the rollers become smooth. The grooving of the rollers after every 16 to 20 working hours is necessary to increase the roughness. As grooving is done manually with hacksaw, the grooves are not uniform. Auto-grooving machine can be used to make helical grooves on the rollers used in gins. The auto-grooving machine reduces drudgery and improves the efficiency of grooving.

Company details

Raji Electrical and Engineering
P/22 /7 Hingna MIDC, Nagpur – 440 028 (Maharashtra)
Tel: 07104-88284

Product specifications

Production	6 roller/h 18 grooves/roller
Power	0.75 kW - cutter blade 0.75 kW - roller
Cost	INR 1,50,000
Power supply	AC grid/could be DRE-powered

Other organisations manufacturing similar product

Raghuvir Tools and Engineering

Clusters

Surat, Sourashtra, Thirupur, Marathwada

5.3 Unnati

Unnati is world's first compact, portable, Solar powered Silk yarn Reeling + Twisting + Spinning machine. It is ideal for reeling of silk for warp and for spinning of variety of silk yarns. Yarn for both Warp and Weft can be produced on Unnati.

- Fully solar powered
- High quality twisted yarn
- Can make yarn for warp and weft
- Safe and lightweight
- Can reel, spin and twist silk
- Useful for Tassar, Eri, and Muga silk yarns

Company details

Resham Sutra
Ashreya' Behind Shirdi Sai Hospital, Bariatu, Ranchi 834009, Jharkhand
Works – No. 8 Ghevera Village, Mundka Udyog Nagar (North), New Delhi 110041
Email: admin@reshamsutra.com

Product specifications

Power	12–15 W
Solar Panel	30 Wp
Yarn Production	100–250 g
Weight	15 kg (approx.) (excluding Solar)
Price	INR 28,000

Other organisations manufacturing similar product

Gajalakshmi Industries, Sun Konnect Impex India, etc.

Clusters

Andhra Pradesh, Tamil Nadu, West Bengal and Jammu and Kashmir. Mysore and North Bangalore.

5.4 Sunkargha

Sunkargha increases productivity by 2-3 times over traditional hand looms. It has 3 operating modes – solar motor assisted, pedal powered and single hand motion. It is ideal for production of stripes and plains. Option of Dobby and Jacquard also available.

- Width available from 36" to 90"

Company details

Resham Sutra
Ashreya' Behind Shirdi Sai Hospital, Bariatu, Ranchi - 834009, Jharkhand
Works – No. 8 Ghevera Village, Mundka Udyog Nagar (North), New Delhi - 110041
Email: admin@reshamsutra.com

Product specifications

Production capacity	2 m/h
Motor	BLDC
Power	150 W
Price	INR 1,00,000

Clusters

Andhra Pradesh, Tamil Nadu, West Bengal and Jammu and Kashmir. Mysore and North Bangalore.

5.5 Solar charkha 8 spindle

A manual charkha produces less amount of output yarn and requires lot of hard work. With the help of a solar charkha, a person can produce 32 hanks of 1.25 kg in a single day without much drudgery.

Company details

Udhyog Bharti
Chordi Darwaja, Udhyog Bharti, Gondal, Rajkot - 360311, Gujarat, India
Phone: 09327960607

Product specifications

Power	60 Wp
Voltage	12 V
Solar panel	150 Wp
Charge controller	12 V, 15A
Battery	12 V, 100 Ah
Production	32 hanks,1.25 kg for 8 spindle/8 hours
Cost	INR 1,00,000

Other organisations making similar product

Karigar Foundry, etc.

Clusters

Khanwa village of Nawada district of Bihar.

CHAPTER 6-LIVELIHOOD APPLIANCES

A lot of people in India lack reliable access to electricity. Their livelihood options are limited, and the quality of life is adversely affected because of this reason. DRE can open doors for new small-scale business units across the nation and can boost incomes of the energy-poor. The operational costs are eliminated by using a DRE source. The owners need not worry about power cuts. By adopting mechanisation, small-scale enterprises can increase their productivity and eliminate the drudgery in workplace.

6.1 Brick making

Even today, traditional techniques are used to produce bricks, and the process involves the use of inefficient methods and manual labour. With Solar Block Machine, bricks for buildings and construction trades, roads, and gardens can be manufactured. The machine comes with a detachable trailer, hence it can be moved near the aggregate source or water source. SB20 uses solar power, hence the manufacturing costs are low, and the manufacturers do not have to worry about power outages disrupting their business.

Company details

Solar Block Machine
275 Brockville Street, Smiths Falls
ON, Canada K7A 4Z6 Ph +1 613 275 2438
Email: info@solarblockmachine.com

Other organisations manufacturing similar product

Solar-powered brick-making machine is not available in the Indian market. A lot of AC-powered brick-making machines are available in India.

Product specifications

PV panel sizing	100 W, 12 V – 2 panels
Inverter	12 V/ 110 V–220 V
Charge controller	30 A, 12 V/24 V
Production rate	2000 bricks/day
Capital cost	2200 Canadian dollars (INR 1,20,000)

Clusters

Durgapur, North24 Parganas, Asansol, Sankarankovil, Tripura, Nagpur, Pune, Mandla, Rajgarh, Sangamnagar, Satna, Sehore, Shajapur, West nimar, Guna bricks, Hoshangabad, Indore, etc.

6.2 Agarbathi-making machine

Agarbathi makers bend down throughout the day to roll thousands of agarbathis. This causes pain in the spine and hands. Automatic Agarbathi-making machine eases the burden of workers.

The agarbathi dough is manually fed into the machine. The machine flattens the dough and cuts it into long stripes and wraps the dough around each bamboo stick. Productivity of making agarbathis can be increased by at least 200% using this machine.

Company details

Shree Hari Traders
Mavdi, Plot No. 8, Anand Bangla Chowk
Near Ashoka Garden, Suraj Beshan Street
Industrial Area, Rajkot – 360 004, Gujarat, India

Other organisations manufacturing similar product

Krishna Engineers, Maa Tarini Enterprises, Aman Impex, etc.

Product specifications

Power	1.5 kW
Production	350–400 strokes/min 10–15 kg/h
Motor	DC motor, 12 V
Cost	INR 1,25,000
Power supply	AC grid/Could be solar-powered

Clusters

Kanauj, Jahanabad, Gaya, Pune, Hindupur, Farukkhabad, Jalgoan, Tiruchandur, West Tripura, South and North Tripura, Dhalai, and Nadia.

6.3 Toothpick shaving machine

Bamboo generates opportunities for value addition at the household-level and opportunities for entrepreneurs to manufacture bamboo products at commercial-level and at scale. Bamboo is preferred against wood as a raw material for toothpick due to its fast growth and easy availability. Sliced bamboo sticks are fed into the toothpick-making machine. They are made into sticks and then cut into sizes, polished, and sharpened with toothpick-making machine.

Company details

Prashant Bamboo Machines
12, Jamuna-2, Dr Ambedkar Square
C.A Road, Lakadganj, Nagpur – 440 008

Maharashtra, India

Other organisations manufacturing similar product

Indian Machine Tools, Shree Hari Traders, etc.

Product specifications

Power	2 hp
Motor type	AC induction
Speed	1440 rpm
Production	520–625 pcs/min 25 kg/h
Cost	INR 1,75,000
Power supply	AC grid/could be solar-powered

Clusters

North24 Parganas, Bairabi, Hazaribagh, Ghagara, Mandar, and Angara.

6.4 Bamboo kulfi stick-making machine

Bamboo stick making has been carried out manually for years using knives. It is a tedious, time-consuming, and risky activity. The manual process also produces uneven sticks, which are not accepted in the market. The bamboo kulfi stick-making machine can be used to cut the bamboo into required shapes, which are used in small-scale industries to prepare kulfi sticks and ice cream sticks.

Company details

Prashant Bamboo Machines
12, Jamuna-2, Dr Ambedkar Square
C A Road, Lakadganj, Nagpur – 440 008
Maharashtra, India
Phone: 0 80460 31246

Other organisations manufacturing similar product

Shanta Engineering, Anil Enterprises, UK Industries, etc.

Product specifications

Power	1 hp
Speed	1440 rpm
Production	25 kg/h
Cost	INR 65,000
Power supply	AC grid/could be DRE-powered

Clusters

North24 Parganas, Bairabi

6.5 Solar-powered vending cart

Vegetable vendors use wet gunny bags and/or sprinkle water. This leads to spoilage of produce, particularly leafy vegetables, leading to loss of income. Solar-powered mobile vending cart (Rehri) can store fresh fruits and vegetables safely for 2–5 days. It is provided with an effective and uniform evaporative cooling arrangement with forced air circulation by DC fans and lighting facility through DC LED light powered by a solar panel. It can be used in winter season also when ambient condition is dry.

Company details

Indian Agricultural Research Institute Delhi
Dr A K Singh
Director (Additional Charge)
Phone: +91 11 2584 2367
Fax: +91 11 2584 6420
Email: director@iari.res.in

Product specifications

Solar PV capacity	100 Wp
Battery capacity	7 Ah
Temperature reduction	–8 °C to 5 °C
Increase in relative humidity	15%–30%
Cost	INR 30,000

Clusters

PAN India

6.6 Blouse hook-making machine

Blouse hook making machine can be used to make hooks used in blouses. The copper or iron wire is set in the roller of the machine. Once the machine is started, hooks will be made automatically.

Company details

SB Machine Tools
23/4, Lane No. 11, Anand Parvat Industrial Area
New Delhi – 110 005, Delhi, India
Phone: 0 98112 53128

Other organisations manufacturing similar product

Sri Abbirami Machine Works, Ramji Engineering Works, etc.

Product specifications

Power	0.5 hp
Speed	1440 rpm
Production capacity	110–120 pieces/min 1.25 kg/h
Cost	INR 1,00,000
Power supply	AC grid/could be DRE-powered

6.7 Camphor tablet-making machine

Camphor powder is given heat treatment to remove the dampness available in the powder. Treated camphor powder is filled into the hopper of the tablet machine. Tablet machine produces the tablet of specific shape and weight according to the dies.

Company details

Shree Hari Traders
Mavdi, Plot No.8, Anand Bangla Chowk
Near Ashoka Garden, Suraj Beshan Street
Industrial Area, Rajkot – 360 004, Gujarat, India
Phone: 0 80487 62561

Other organisations manufacturing similar product

Sigmatech Engineering, PTH Pharma Industries, etc.

Product specifications

Power	1 hp
Motor speed	1440 rpm
Production	13 kg/h
Cost	INR 95,000
Power supply	AC grid/could be DRE-powered

Clusters

Kothapalli

6.8 Cotton wick-making machine

Cotton wicks for diyas are mostly made by women using their hand manually. It provides income generation opportunity for rural and urban people. Cotton wick-making machine automates the process of making round cotton wicks compared to the manual process where one can make only about 8–10 wicks per minute. This machine can produce 36–40 good quality wicks per minute.

Company details

VB Techno
Chitra, GIDC, Bhavnagar – 364 001 Gujarat, India
Phone: +91 97379 53244
Email: vbmktech@gmail.com

Other organisations manufacturing similar product

Harikrishna Engineering, KR Enterprises, Amrit Enterprises, etc.

Product specifications

Power	0.25 hp
Production capacity	36–40 wicks/min
Cost	INR 20,000
Power supply	AC grid/could be DRE-powered

Clusters

Thirupur, Pochampally, Sourashtra

6.9 Solar suitcase

Solar suitcase is suitable for emergency medical care as it provides both lighting and power for medical equipment every day. The system operates on 12 V DC with fault protection and has a sealed 20 Ah vapour-free battery, making it safe to use inside of a healthcare facility.

Suitcase has two WCS lighting sockets, two 12 V DC accessory (lighter) sockets, two USB ports, two expansion ports to allow for optional accessories, fetal doppler, and battery charger or additional lights. A 40' home-run cable and all necessary installation hardware are included. Custom display and user-interface make its operation simple and intuitive.

Company details

We Care Solar
2150 Allston Way, Suite 340 Berkeley, California – 94704 USA
Phone: +1(510) 766-0206

Product specifications

Power	65–240 W
Operating voltage	11.4 to 14.4 volts
Weight	14.5 kg
Battery	20 Ah
Operating temperature	0 °C to 40 °C
Cost	INR 1,58,000

6.10 Paper plate-making machine

The demand for paper plates is likely to grow substantially in future both in urban and rural areas. Paper plates are produced by paper plate-making machine using paper boards classed in the category of industrial paper.

Company details

Tarini Enterprises
3/14 A, Vijaynagar
Double Storey, 1st Floor, New Delhi – 110 009
Phone: 011 3260 1237
Email: mtenterprises23@gmail.com

Other organisations manufacturing similar product

S S Engineering Works, Khalsa Engineering Works, Hariram Enterprises, etc.

Product specifications

Power	1.5 kW
Production capacity	1200–1800 pcs/h
Power supply	AC grid/could be DRE-powered
Cost	INR 75,000

Clusters

Ananthapur

6.11 Semi-automatic areca leaf plate-making machine

Environmentally benign disposable plates and bowls are an alternative to plastic and paper plates. The products are natural, compostable, and biodegradable yet they look stylish. Areca leaf plates are made from the naturally shed leaf sheaths of arecanut tree. Areca leaves are simply collected, pressure-washed, scrubbed, and sun-dried; then with the application of heat and pressure, the leaves are made into appropriate-shaped plates. The machine can produce plates of sizes from 4 to 12 inches.

Company details

ARG Industries
No. 82-A, Chettipalayam Road, Malumichampatti
SIDCO Industrial Estate, Coimbatore – 641 050, Tamil Nadu, India
Phone: 0 97903 34444
Email: marketing@argtraders.org.in

Other organisations manufacturing similar product

Ecogreen Unit, Omex Enterprises, Prime Machinery, etc.

Product specifications

Power	2 hp/die
Production	3000 plates/day
No. of die	5
Cost	INR 1,90,000
Power supply	AC grid/could be DRE-powered

Clusters

Mangalore, Shimoga, Uttarakhand, Tumkur, Chikmangalur

6.12 Paper cup-making machine

Paper cup finds extensive use in railways, hotels, household appliances, domestic applications, etc. The product ranges from 150 ml to 300 ml. This manufacturing activity can be set up as small-scale units. Poly coated paper is purchased from market and then cut in required sizes. The outer shell is pressed in the bottom mould and kept in the final paper cup mould.

Company details

Tarini Enterprises
3/14A, Vijaynagar
Double Storey, 1st Floor, New Delhi – 110 009
Phone: 011 3260 1237
Email: mtenterprises23@gmail.com

Product specifications

Power	3.5 kW
Production capacity	2500–3600 cups/h
Cup size	40–330 ml
Cost	INR 5,50,000
Power supply	AC grid/could be DRE-powered

Other organisations manufacturing similar product

S S Engineering Works, Khalsa Engineering Works, etc.

Clusters

Kalamassery, Karnal, Gajapati, Ananthapur

6.13 Banana sheath tea cup-making machine

Banana sheath cup machine can convert the wasted banana sheath into a good marketable product. This machine helps to prepare stronger, elegant, and uniform cups and plates of different sizes from leaves and paper at a rate much faster than the conventional method of leaf-cup making. The machine consists of the following main parts: the body frame, upper die assembly, and the lower die assembly.

Company details

Eco Green Unit
No. 21-A1, Bharathi Park
8th Cross, Saibaba Colony
Coimbatore – 641 011, Tamil Nadu, India
Phone: +91 96008 76767
Email: ecogreenunit@yahoo.co.in

Other organisations manufacturing similar product

Omex Enterprises, Prime Machinery, etc.

Product specifications

Power	5 hp
Production capacity	3500 cups/day
Cup size	100 ml
No. of die	6
Cost	INR 2,75,000
Power supply	AC grid/could be DRE-powered

Clusters

The major banana producing states of India are Tamil Nadu, Maharashtra, Karnataka, Gujarat, Andhra Pradesh, Assam, and Madhya Pradesh.

6.14 Areca spoon-making machine

Areca spoons are a good alternative to plastic spoons. Areca leaves are first dried and then tested with herbal chemical for proper cleaning and after that it is taken in the die for shape making. This machine has an in-built heater and when the pressure is applied by the press, the leaf changes its shape.

Company details

Eco Green Unit
No. 21-A1, Bharathi Park
8th Cross, Saibaba Colony
Coimbatore – 641 003, Tamil Nadu, India
Phone: +91 96008 76767

Other organisations manufacturing similar product

S S Engineering Works, Kentech, etc.

Product specifications

Power	1 hp
Production capacity	3000 spoons/day (2 at a time)
Cost	INR 1,65,000
Power supply	AC grid / could be DRE-powered

Clusters

Sethumadai Village, Salem, Vellore, Chikmagalur, Shimoga, Davangere, Dakshina Kannada, Tumkur, Chitradurga, and Uttar Kannada

6.15 Paper bag-making machine

Of late, plastic carry bags are being banned in many cities and urban centres. There is an immediate demand for paper carry bags, which can be made in different sizes and thicknesses using paper bag-making machine. Printed paper roll goes into the paper bag-making machine where it is folded, pasted, sheared and stacked.

Company details

Hanje hydrotech
167/1/2A/7, Plot No. 8,
Shivodaya Nagar, Near Factory Road
Mumbai, Maharashtra – 400 001
Phone: 0 80718 02076
Email: sanjayhanje66@gmail.com

Other organisations manufacturing similar product

Bharat Machines, Small-scale Industries, Aman Implex, etc.

Product specifications

Power	3 hp
Speed	1440
Motor type	AC induction
Production capacity	3000–6000 bags/h
Cost	INR 4,40,000
Power supply	AC grid/could be DRE-powered

Clusters

Rudrapur, Muzzafarnagar

6.16 Automatic sambrani dhoop cup-making machine

Sambrani dhoop cup machine is useful for making round-shaped sambrani dhoop cups, which is used in temples. It is a fully automatic machine, which exerts hydraulic pressure for making dhoop cups. This machine can make 25 cups at a time. These cups are made from oudh, coal, spices, and natural fragrances.

Company details

Shri Hari Traders
Mavdi, Plot No. 8, Anand Bangla Chowk
Near Ashok Garden, Suraj Beshan Street
Industrial Area, Rajkot – 360 004, Gujarat, India
Phone: 080487 62561
Web: https://www.shreeharitraders.in/

Other organisations manufacturing similar product

Bannariamman Traders, Soham Industrial Machinery, etc.

Product specifications

Power	1 hp
Machine speed	100–150 strokes/min
Production capacity	5000–6000 cups/day
Cavity mould	25
Price	INR 1,55,000
Power supply	AC grid/could be DRE-powered

Clusters

Puri, Tirumala, Rameswaram, Haridwar, and Banaras.

6.17 Coir pot-making machine

Coir pots are made of natural coconut fibre. They are produced for use in horticultural farms, flower gardens, greenhouses, and nurseries. This machine contains hydraulic-operated motor with automatic setting operation. This machine can produce pots of size 10 inches and 12 inches.

Company details

Eco Green Unit
21-a1, Alagesan Road, Bharathi Park
8th cross, Saibaba Colony
Coimbatore, Tamil Nadu – 641 003
Phone: +91 96008 76767
Email: ecogreenunit@yahoo.co.in

Other organisations manufacturing similar product

Green India Products, S S Engineering Works, etc.

Product specifications

Power	1 hp
Heater coil	2500 W
Production	500 pots/day
Die	10, 12 interchangeable
Price	INR 2,60,000
Power supply	AC grid/could be DRE-powered

Clusters

The major states producing coconut raw waste are Tamil Nadu, Kerala, Karnataka, and Andhra Pradesh and if these machines are put on these locations then the production can be enhanced.

6.18 Two ply coir yarn spinning machine (double head)

Automatic coir yarn spinning machine units are capable of producing yarns of runnage varying from 50 to 300 metres/kg and twists from 10 to 30 twists/feet. Coir fibre in the form of bales is the raw material for the unit. These fibres are entwined on to the thread and are twisted by the grip nozzles/ rollers.

Company details

Sukumar Engineers
Arachalur Post, Erode, Tamil Nadu
Phone: 099422 22123

Other organisations manufacturing similar product

VKS Industries, Vendaxo, etc.

Product specifications

Power	1.5 hp
Voltage	240 V
Capacity	9.3 kg/h
Price	INR 1,70,000
Power supply	AC grid/could be DRE-powered

Clusters

The major states and areas producing coconut raw wastes are Tamil Nadu, Kerala, Karnataka, and Andhra Pradesh, Adivalla, Pattarahalli, Chitradurga, and Hiriyur.

CHAPTER 7-COOKSTOVES

Lot of people in India rely on coal and solid biomass fuels to cook daily meals. Open fire cooking using chullahs produce high levels of toxic pollutants. Breathing in toxic pollutants on a daily basis can lead to number of ailments. In addition to that, women spend a lot of time collecting fuel (firewood) for cooking. Improvements in well-being result by switching to clean cooking solutions such as improved biomass cookstoves. Improved biomass cookstoves have faster cooking time and they emit less pollutants. The additional savings in cooking time can be invested in education or leisure activities.

7.1 Mud chullah

Company details

Smokeless Cookstove Foundation
202 C Wing, Sai Simran, Opp Metal Box
Deonar, Mumbai – 400 088
Email: admin@smokelesscookstovefoundation.org

Women cooking in mud chullah

Product specifications

Draft type	Natural draft
Fuel type	Wood
Thermal efficiency	Not measured
Size (diametre)	5” and 7”
Feeding capacity	5” - feeds 6 or 7 7” - feeds up to 25 people
Cost	Free
After sales service	Training provided for operation and maintenance

7.2 Biomass Agneeka Eco(nd) Stove

Compared to a mud chullah, biomass stove emits less smoke, saves up to 50% of fuel, is portable and does not need continuous air blowing. Wood can be loaded in the front side of cookstove, thereby eliminating the need to chop.

Company details

Swami Samarth Electronics
M-63, M I D C, Ambad, Nashik, Maharashtra – 422 010
Email: swamisamarthm63@gmail.com

Agneeka ECO ND Cook-stove

Product specifications

Draft type	Natural draft and Forced draft
Fuel type	Biomass (chopped wood, agro waste, etc.)
Thermal efficiency	38%
Dimensions	260 × 260 × 248 mm
Feeding capacity	Feeds 2 people
Cost	Natural draft - INR 1,500 Forced draft - INR 2,700
After sales service	Available

7.3 ECO1 Rocket stove

Company details

Himalayan Rocket Stove
181-182 Sector 8C, Chandigarh – 160 009
Phone: +91 98054 32176

Himalayan Rocket stove

Product specifications

Draft type	Natural draft Rocket stove technology
Fuel type	Biomass pellets, Chopped firewood
Thermal efficiency	33%
Dimensions	700 × 450 × 825 mm
Feeding capacity	Feeds 7–8 people
Cost	INR 18,500
After sales service	Service available in North-east, Bhutan, Himachal Pradesh, Nepal, Manali, Leh, and Kargil

7.4 Greenway smart stove

Company details

Greenway Grameen
501 - 502, Makani Centre 35th Road, T.P.S. III
Bandra (West)
Mumbai – 400 050
Tel: +91-22-6052 2638

Greenway Jumbo stove

Greenway smart stove

Product specifications

Draft type	Natural draft
Fuel type	Firewood, farm waste
Thermal efficiency	32% (Smart stove) 31.17% (Jumbo stove)
Dimensions	Smart stove (249 × 193 × 295 mm) Jumbo stove (314 × 269 × 295 mm)
Feeding capacity	Smart stove feeds 4–6 people Jumbo can be used for bulk cooking
Cost	INR 1,799 (Smart stove) INR 2,999 (Jumbo stove)
After sales service	1-year warranty for Smart stove 2-year warranty for Jumbo stove

7.5 Samuchit cookstoves

Company details

Samuchit Enviro Tech
6, Ekta Park, Law College Road, Pune – 411 004
Phone: 020 2546 0138
Email: samuchit@samuchit.com

Household steam cooker

Commercial steam cooker

Sampada gasifier stove

Product specifications

Draft type	Natural draft + Retained heat cooking
Fuel type	Charcoal Biomass briquettes (Gasifier stove)
Thermal efficiency	50% (households) 35% (Gasifier stove)
Dimensions	Smart stove (249 × 193 × 295 mm) Jumbo stove (314 × 269 × 295 mm)
Feeding capacity	1 kg of food (Household steam cooker) 3 kg of food (Commercial stove) 1 kg of food (Gasifier stove)
Cost	INR 5,000 (Household steam cooker) INR 7,500 (Commercial steam cooker) INR 3,000 (Sampada gasifier stove)
After sales service	3-month warranty, service available with payment after 3 months

7.6 FUELNZEL cookstoves

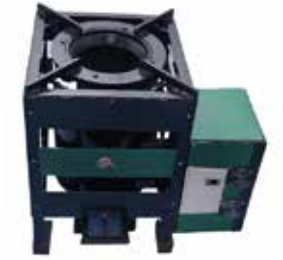
Ravi Engineering & Chemical Works
L-166, Ground & 1st Floor, Sector-3, DSIDC Bawana, Delhi – 110 039
Phone: 99117 73887
Email: recwfire@gmail.com

FUELNZEL ND No1

FUELNZEL SS-19

FUELNZEL CRS-23

Fuelnzel Kitchen King AF



FUELNZEL Kitchen King MF

Household cookstove specifications

	FUELNZEL ND No-1	**FUELNZEL CRS-23**	**FUELNZEL SS-19**
Type	Natural draft	Natural draft	Natural draft
Fuel	Wood	Wood	Wood
Feeding capacity	5–10 persons	5–10 persons	5–10 persons
Thermal efficiency	25.39%	32%	31.19%
Cost (MRP)	INR 2985	INR 2890	INR 2999
Availability of after sales service	Available	Available	Available
Size- Household/ Commercial	Household	Household	Household

Commercial cookstove specifications

	FUELNZEL Kitchen King MF	**FUELNZEL Kitchen King AF**
Type	Forced draft	Forced draft
Fuel	Pellet	Pellet
Feeding capacity	250–300 persons	250–300 persons
Thermal efficiency	40.18%	40.18%
Cost	INR 36000	INR 46000
After sales service	Yes	Yes
Size Household/Commercial	Commercial	Commercial

7.7 Phoenix cookstoves

Company details

Phoenix Products
D-87, Industrial Estate
Near KPTCL Sub Station Udyambag
Belgaum – 590 008, Karnataka, India
Phone: +91 94484 80724
Email: phoenix_bgm@hotmail.com

Turbo stove

CCD stove

2 Panstove

Phoenix CCD stove

Phoenix Saral stove

Product specifications

Draft type	Natural draft (Phoenix Sarala stove) Forced draft (Remaining three)
Fuel type	Biomass pellets, briquettes, coconut shell, wood chips Firewood (Phoenix CCD stove, Phoenix Sarala stove)
Thermal efficiency	35% (Turbo, CCD, Pan stoves) 40% (Phoenix Sarala stove)
Feeding capacity	50 (Turbo, CCD stove) 250 (2 pan stove) 4 (Phoenix stove) 10 (Phoenix CCD stove)
Cost	INR 16,500 (Turbo stove) INR 38,000 (CCD stove) INR 68,000 (2 PAN STOVE) INR 1800 (Phoenix Sarala stove) INR 6800 (Phoenix CCD stove)
After sales service	Available
Size	Commercial (Turbo stove, CCD stove) Household (Phoenix Sarala stove, Phoenix CCD stove)

7.8 Adarsh cookstoves

Company details

Adarsh Plant Protect Ltd
604, GIDC, Vitthal Udyognar, Anand, Gujarat
Mr. Sreekanth
Pooja Horti & Herbal Farms (P) Ltd
A-102, Anee Circle, Ganesh Chowkdi
Anand – 388 001, Gujarat
Phone: 02692, 262278, 0 98251 56796
Email: poojahorti@yahoo.co.in

Product specifications

Draft type	Natural draft
Fuel type	Wood and Biomass
Thermal efficiency	26.7%
Feeding capacity	5 to 8 people
Cost	INR 1500
Availability of after sales service	Available
Size	Household

7.9 Supernova technologies

Company details

Supernova Technologies Pvt. Ltd Gujarat
Phone: +91 2692 237037
Email: sntgstove@yahoo.com

Forced draft cookstoves

Forced draft household gasification stove

Forced draft commercial gasification stove

Natural draft cookstoves

Natural draft stove

Type	Forced draft	Forced draft
Fuel type	Any natural bio waste	Any natural bio waste
Feeding capacity	2–25 people	50–200 people
Thermal efficiency	31.93%	36.10%
Cost	INR 2,500	INR 7,930
After sales service	Available	Available
Size	Household	Commercial

Type	Natural draft
Fuel type	Natural bio waste
Feeding capacity	2–25 people
Thermal efficiency	30.10%
Cost	INR 2500
After sales service	Available
Size	Household

7.10 Eco chullah

Company details

Ecosense Appliances Pvt. Ltd
C/o Sanjay Techno Products Pvt. Ltd
K-151, Waluj MIDC
Aurangabad – 431 136, Maharashtra, India
Phone: 0240-255 3800
Email: sales@ecosense.asia

Domestic cookstoves

Commercial cookstoves

Product specifications

Draft type	Forced draft (Eco Pro-1, Eco Pro-2, Eco chullah 2.5)
Fuel type	Biomass pellets
Thermal efficiency	39.28% (Eco chullah 2.5)
Dimension	210 × 270 × 270 mm (Domestic) 350 × 350 × 375 mm (Eco Pro-1) 350 × 350 × 650 mm (Eco Pro-2)

Feeding capacity	20–25 people (Eco chullah Pro1)
Cost	Not available
After sales service	Available
Size	Domestic stoves (Eco chullah) Commercial stoves (Eco Pro-1, Eco Pro- 2)

7.11 Supersaver and Smartsaver stoves

Company details

Envirofit India Private Ltd
Flat No 203, Jagannath Dham
Survey No.47/16 Dagade Colony, Off Paud Road
Opp Ambrosia Resort Bavdhan Khurd
Pune – 411 021, Maharashtra, India
Phone: +91 8956 443 443

Supersaver GL wood stove

Smartsaver wood stove

Supersaver AI stove

Supersaver charcoal stove

Smartsaver charcoal stove

Draft type	Natural draft
Fuel type	Wood (Wood stoves) Charcoal (Charcoal stoves)
Thermal efficiency	Not available
Feeding capacity	Up to 8 people (Supersaver GL and Supersaver AI stove) Up to 12 people (Smart saver and Supersaver charcoal stove, Smart saver wood stove)
Cost	INR 2,600 (Supersaver AI stove)
After sales service	Available

7.12 NEERDHUR cookstoves

Company details

Ankit Gupta Scientist Gr IV (2)
Energy and Resource Management Division/Director's Research Cell
CSIR-National Environmental Engineering Research Institute (CSIR-NEERI)
Nagpur – 440 020, Maharashtra
Phone: +91 89280 22126/83292 34378
Email: a1_gupta@neeri.res.in / vit.ankit@gmail.com

Multi fuel domestic improved stove

Multi fuel community improved stove

Product specifications

Draft type	Natural draft
Fuel type	Wood logs, wood chips, charcoal, coal
Thermal efficiency	33.33% (Domestic stove) 28.37% (Community stove)
Feeding capacity	4–5 people
After sales service	Available
Cost	INR 1,500 INR 4,000
Size	Household (Domestic improved stove) Commercial (Community improved stove)

7.13 Bluematch cookstove

Company details

Bluematch Impact Solutions Pvt. Ltd
F. No. 6305, 3rd Floor
Prestige Monte-Carlo Apts, D B Pura Main Road
Yelahanka, Bangalore – 560 064, Karnataka, India

Production specifications

Draft type	Forced draft
Fuel type	Biomass pellets, dry leaves, wood waste
Thermal efficiency	40%
Feeding capacity	45–50 people
Battery capacity	2600 mAh 5 hours (2 hours grid, 3 hours solar panel)
Solar panel capacity	10 Wp
Cost	INR 7,500
After sales service	Door-to-door service
Size	Household

7.14 PYRO cookstove

Company details

Sustaintech
22/74A, 2nd Street
Deputy Collector Colony, K K Nagar, (behind Rajadhane Hotel)
Madurai – 625 020
Madurai: 0452 420 0562
Bangalore: 080 2331 5656
Email: info@sustaintech.in, svati.bhogle@gmail.com, s.babu@sustaintech.in

PYRO Multiuse stove

PYRO Loose biofuel stove

PYRO Mini stove

Product specifications

Draft type	Forced draft
Fuel type	Harvested firewood, fixed agro residue
Thermal efficiency	31% (Pyro mini)
Feeding capacity	121–200 (Multiuse stove-2.0 ft diametre) 181–200 persons (Loose biofuel stove - 2.4 ft diameter)
Cost	INR 2,700 (PYRO Mini) INR 18,000 (Multiuse stove) INR 20,000 (Loose biofuel stove)
After sales service	Available
Size	Commercial Domestic (Pyro mini)

7.15 AGNI Saki cookstove

Company details

N Ravi Kumar Harith Avani Technologies
C-80, 3rd Stage
Peenya Industrial Area Bengaluru – 560 058
Phone: 98860 27952 / 080 – 4117 1640
Email: ravi.nkumar11@gmail.com

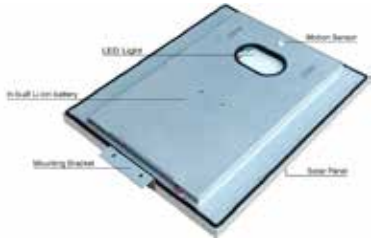
Agni saki stove

Product specifications

Draft type	Forced draft
Fuel type	Agro residue
Thermal efficiency	40.7%
Feeding capacity	4–5 people
Cost	INR 4,500
After sales service	Available
Size	Domestic
Power for primary and secondary air	Power pack provided to operate the fan, Power pack capacity 12 V 4.5 hp, Fan capacity DC Fan 12 V 0.3A

CHAPTER 8-Lights

In areas with limited grid connectivity, solar lighting can improve the accessibility of markets and health centres. Solar-powered streetlighting can create a sense of security among rural women. By replacing the traditional kerosene lamps with solar lanterns, indoor air pollution and eye irritation resulting from long-time exposure are eliminated. This can have a positive effect on health and children's study hours.



8.1 Solar LED streetlight

Atlanta solar streetlight comes with a motion sensor. After full charge, this light can support one and-a-half nights. These lights come with detection distance of 12 m.

Company details

Atlanta Energy
SS Road, Fancy Bazar
Guwahati – 781 001
Phone: 011 2650 3691

Product specifications

Lumen (Max)	1500 lm
Solar panel	40 Wp
Battery	11.1 V, 13 Ah Li-ion

8.2 Solar streetlight

The LED-based solar streetlighting system is good for urban/rural and remote locations.

Company details

Anant Solar system

CB 385/B, Indira Market

Naraina Ring Road, New Delhi – 110 028

Product specifications

Cost	INR 8500
Solar panel	12 V 20 Wp
Battery	12 V, 18 Ah Sealed Battery

8.3 Solar LED streetlight

Company details

Deepa Solar System Private Limited
Nagarbhavi, Bengaluru, Karnataka
Phone: 0 99161 68955
Email: info@deepasolar.com

- Automatic dusk to dawn / Timer operation
- Highly efficient PWM/MPPT charge controller and inverter
- Three-step charging algorithm
- Temperature-compensated battery set- points
- Weatherproof luminaries

Product specifications

Solar panel	37 Wp
Battery	60 Ah
Working hours	12 hours/day
Voltage	110 V to 270 V

8.4 Rheo smart solar streetlight

DC Smart solar streetlight integrates mono-crystalline solar PV panel on the back with integrated lithium–ion phosphate (LiFePO4) battery.

Company details

Cygni Energy Private Limited
Plot No. 27, 3rd Floor, IDA Balanagar Hyderabad – 500 037,
Telangana, India
Phone: +91 40235 45001
Email: info@cygni.com

Product specifications

Model	Aluminium Rheo Smart Solar Street Light
Lumen (Max)	1500 lm
Power	15 W
Solar panel	45 Wp
Battery	12 V, 15 Ah
Price	INR 33,900

8.5 Smart LED streetlight

Solar LED streetights with in-built batteries are easy to install and have a long life due to usage of Li–ion batteries. These lights also have in-built microcontroller-based PWM charge controller with auto-dimming and dusk-to-dawn control.

Company details

Emsys Electronics Private Limited
No.36, 2nd Cross, Dr. H. Anjaneyappa Industrial Estate Govardhan Gardens, Opp to Delhi Public School Yelchenahalli, Kanakapura Road, Bengaluru – 560 062

Product specifications

Power	7 W
Voltage	12 V
Cost	INR 3,100

8.6 Solar LED streetlight

Solar LED lights have motion sensors. They automatically come on at dusk and switch off at dawn. The motion sensor enables enhanced/optimal lighting when motion is detected. This also doubles up as a security feature.

Company details

Devidayal Solar Solutions
709, 7th Floor Maker Chambers 5, Nariman Point, Mumbai – 400 021
Phone: +91 22 2284 9999
Email: customercare@ddsolar.in

Product specifications

Model	FLARE 12 W
Lumen (Max)	1200–1320 lm
Power	12 W
Solar panel	Monocrystalline 20 Wp
Battery	6 Ah
Price	INR 12,500

8.7 Sun King LED solar LED lights

Company details

Greenlight Planet India Private Limited

Nehru Center, 10th Floor,

Dr Annie Besant Road, Worli, Mumbai – 400 018

Phone: +91 22 3386 0000

Model	 Sun King Pico Plus	 Sun King Pro 400	 Sun King Solar Home System 60
Lumens	50 lm	400 lm	100 lm/lamp
Solar panel	0.35 Wp, integrated polycrystalline solar panel	5.5 Wp, polycrystalline solar panel with aluminum frame	12 Wp, 5.8-V poly- crystalline panel
Battery	425 mAh, 3.3 V, lithium Ferro-phosphate (LiFePO4) battery	4,400 mAh, 3.7 V, Lithium-NMC battery	12,000 mAh,3.3 V Lithium Ferro- phosphate battery
Power	3.3 V	3.7 V	12 V
USB Port	-	Available	Available
Cost	INR 649	INR 2,499	INR 4,999

8.8 Barefoot Go

Barefoot Go includes a 1 Amp USB output capable of charging many smartphones and other devices. The versatile design and stand make Barefoot Go perfect for any location and situation. Barefoot Go includes a 2.5W polycrystalline solar panel combined with microprocessor-controlled battery management to maximise battery performance and life.

Company details

Barefoot Power
No. 392, Ganapa Arcade, 1st Floor, 9th Main Road Behind Muniyappa Complex, HSR Layout Sector 7, Bengaluru – 560 068, Karnataka, India
Phone: 078997 60262

Product specifications

Lumens	135 lm
Solar Panel	2.5 W
Battery	3.2 V, 3.3 Ah, LiFePO4
USB Output	1 Amp
Weight	1.22 kg
Cost	INR 2,300

8.9 Solar LED emergency light

Company details

Genii Engineering & Services Pvt. Ltd
115, 9-5-9, Raniguda Farm
Rayagada, Odisha – 765 001
Phone/Fax: 06856-224109
Email: info@ges-es.com

Product specifications

Battery	3.7 V, 2600 mAh	3.7V, 2600 mAh
Input voltage	100–270 V AC	100–270 V AC
Output	3 W	3 W
Back-up time	3 hours for 100% illumination	2 hours for 100% illumination

8.10 Solar LED lantern

The USB-enabled lantern comes with mobile phone battery chargers. The unique, angled lens of the S500 reflects light at a wide-angle, allowing it to light up an entire room.

Company details

D light
Unit No. 102, Block B, Pegasus One
First Floor, Golf Course Road, Sector-53
Gurgaon –122 001, India
Phone: +91 124 665 1800

Company details

Solar panel	2.8 W
Lumens	240 lm
USB port	Available

8.11 Solar LED streetlight

Company details

Velnet Non-conventional Energy Systems Pvt. Ltd
No. 192/45, Kempathimmanahalli
Opposite Govt School, Sahakar Nagar
Bengaluru – 562 110, Karnataka, India
Phone: 0 80487 28411

Product specifications

Lumen	6300 lm	6300 lm
Voltage	12–24 V	AC 90–300 V
Cost	INR 20,000/unit	INR 15,500/unit

8.12 Solar LED lamp

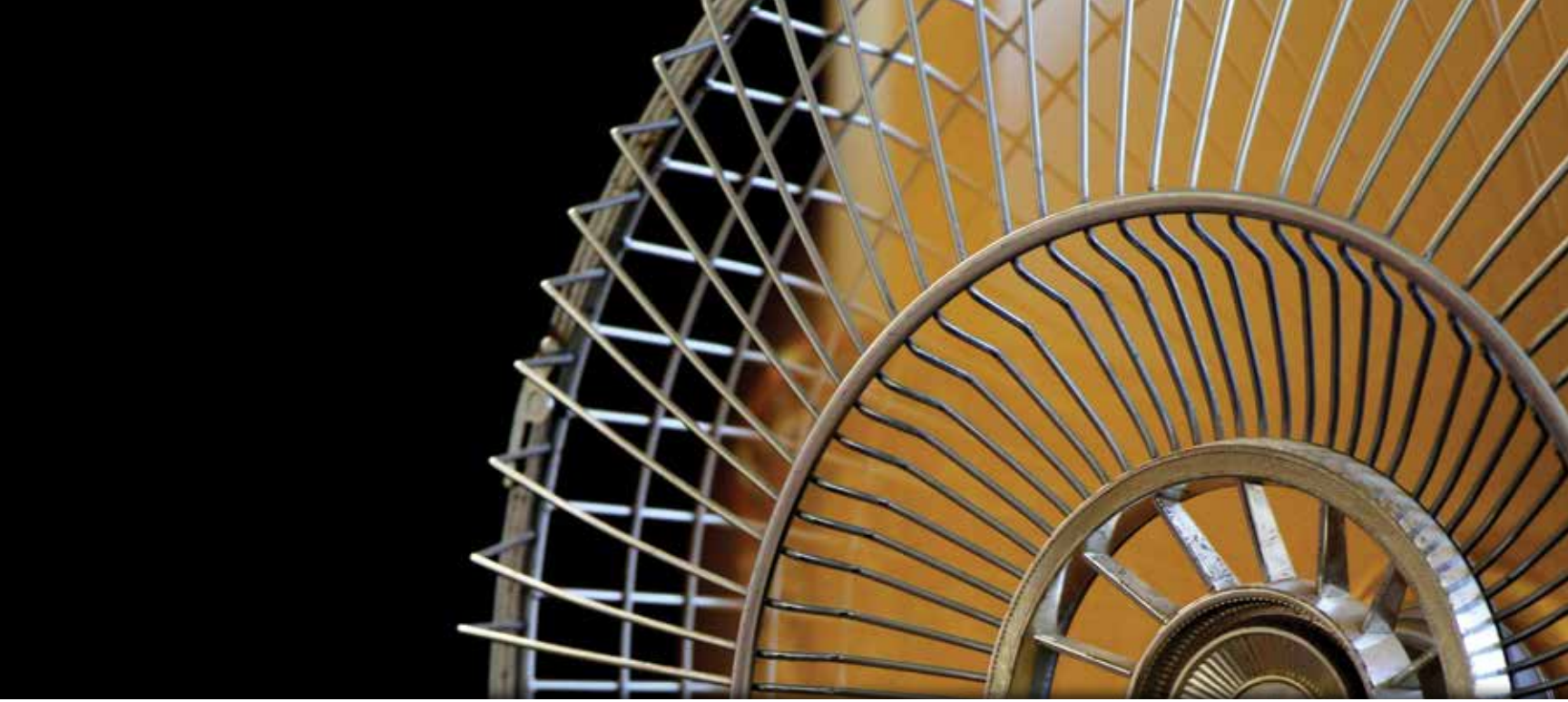
Company details

GALO Energy

D-1 & 121, Okhla Phase 1 New Delhi – 110 020, India
Phone: 011-4973 0040, +91 78279 34163
Email: info@galo.co.in

Product specifications

Types	Solid lantern	Heavy duty lantern	Study lamp
Solar panel (Wp)	3 (Wp)	10 (Wp)	2 (Wp)
Lumens/watt	150	150	150
Battery	Li–ion 3.7 V-2.2 Ah	SMF Lead–acid 12 V, 7 Ah	Lithium 2.4, 1200 mAh
Lamp wattage	3 W	4–5 W	1 W



CHAPTER 9-FANS

The energy efficiency in fans has come a long way. Traditional induction motor-based fans typically consume 70–90 W of power, whereas a BLDC fan reduces power consumption up to 65%.

Solar-powered DC fans are energy efficient, more reliable, and have a longer life. The heat generation in BLDC motors is significantly less, thus enhancing the longevity of fans.

9.1 Gorilla pedestal fan

Gorilla pedestal fan is made with a compact and powerful BLDC motor, gives 65% power saving as compared to a normal induction-motor-based fan. This fan comes with smart remote control. This fan gives consistent performance even at low voltage and power. The fan can also work in flammable areas.

Company details

Atomberg
Plot No. 130 B, TTC Industrial Area
Shirawane, Navi Mumbai – 400 706
Phone: 84484 49442
Email: contact@atomberg.com

Product specifications

Power	30 W
RPM	1300
Sweep	400 mm
Air delivery	70 cmm
Cost	INR 3,960

9.2 Sun King Green light planet solar fan

Sun King fans meet the basic cooling needs of under-electrified households around the world. The Sun King Fan has 14-inch blades that provide a powerful airflow with three fan speed modes. It oscillates up to 90 degrees and features a built-in battery that charges directly from a 20-W solar panel. The Sun King Fan has a powerful brushless motor, creating a uniquely quiet, user-friendly, and flexible design.

Company details

Green Light Planet
10th Floor, Nehru Centre
Dr Annie Besant Road
Worli, Mumbai – 400 018
Phone: +91 22 3386 0000
Email: corporate@greenlightplanet.com

Product specifications

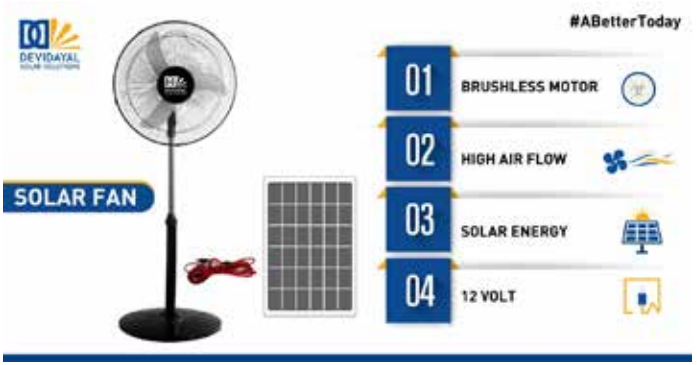
Power	30 W
Battery back-up	5100 mAh
Solar panel	20 W
Cost	INR 5,999

9.3 Solar DC fan

Solar DC fans come with a BLDC full copper winding motor and a sealed maintenance-free battery (SMF).

Company details

Devidayal Solar Solutions
709, 7th Floor Maker Chambers 5
Nariman Point, Mumbai – 400 021
Phone: +91 22 2284 9999
Email: customercare@ddsolar.in



Product specifications

Power	Up to 13 W ± 5%
RPM	3 speeds L/950 RPM, M/1100, H/1350
Solar panel	20 Wp
Battery	12 V, 12 Ah
Air delivery	42.45 m^3/min

9.4 Solar ceiling fan

The solar BLDC ceiling fans are available in 12 V, 24 V, and 48 V DC. These fans can be used in solar mini-grids, off-grid solar systems, and solar home lighting solutions. These fans come with aluminum powder-coated blades.

Company details

Alphasine Technologies Private Ltd
First Floor, B-6, Block B, Sector 88
Noida, Uttar Pradesh – 201 305
Phone: +91 96254 84823
Email: alphasine.technologies@gmail.com

Product specifications

Power consumption	25 W
Voltage	12 V
RPM	350
Air delivery	200–210 cmm
Cost	INR 1,200

9.5 Barefoot power solar pedestal fan

Company details

Barefoot Power
No. 392, 1st floor, Ganapa Arcade
9th Main Road, Behind Muniyappa Complex, HSR Layout
Sector 7 Bengaluru – 560 068, Karnataka, India
Phone: 78997 60262

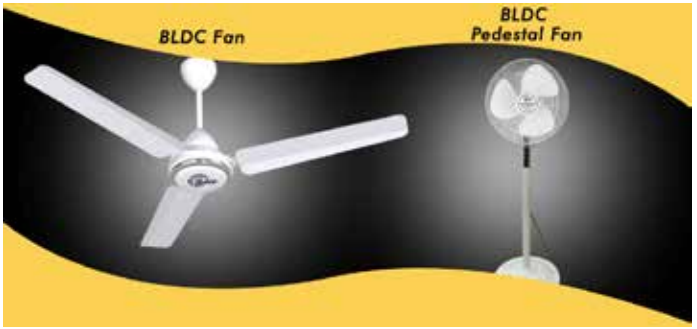
Product specifications

Power	13 W (on maximum speed)
Voltage	12 V
RPM	1300
Solar panel	30 W
Battery	26 Ah
Cost	INR 12,999

9.6 Solar BLDC Fan

Company details

Galo Energy Pvt. Ltd
D- 1 & 121, Okhla Phase 1 New Delhi – 110 020, India
Phone: 011-4973 0040, +91 78279 34163
Email: info@galo.co.in



Product specifications

Type	Ceiling Fan	Pedestal Fan
Voltage	9–15 V	9–15 V
Power	20–25 Watt	15–20 Watt
Air delivery	>150 cmm	>75 cmm
Speed	>300 rpm	>1200 rpm

CHAPTER 10-SOLAR WATER PUMPS

Millions of people around the world live with limited access to water. In most of the places, especially in agriculture fields, groundwater is extracted through electric pumps that use diesel as fuel. After years of research and technological advancement, solar water pumps are proven to be operationally, financially, and environmentally sustainable.

Longevity and reduction in prices of solar panels have made solar water pumping an extremely viable way to expand energy access across the country.

10.1 EMSYS solar pump

Type	Submersible Pumps	Surface Pumps
Power	0.5 hp	1 hp
Solar panel	600 Wp	1200 Wp
Input DC voltage	90–150 V DC	90–150 V DC
Head	25 metres	25 metres

Company details

Emsys Electronics Private Limited
No. 36, 2nd Cross, Dr H Anjaneyappa Industrial Estate
Govardhan Gardens, Opp to Delhi Public School
Yelchenahalli, Kanakapura Road
Bengaluru – 560 062

10.2 SwitchON solar pumps

Company details

Onergy
1A, D. L. Khan Road, Kolkata – 70002, India
Phone: +91 33 2223 7454, 85848 79051
Email: info@onergy.in

Solar panel size	900 Wp
Flow rate	81,000 lpd
Head range	12 metres

10.3 GALO energy solar water pumps

Company details

Galo Energy Pvt. Ltd
D-1 & 121, Okhla Phase 1
New Delhi – 110 020, India
Phone: 011-4973 0040, +91 78279 34163
Email: info@galo.co.in

Power	2.2 kW
Solar panel sizing	3 kWp
Head	50 m
Flow rate	175 litres per minute

10.4 Grundfos solar water pumps

Power savings through solar pumps have been the wider option and on the demand side. Solar water pumps help the farmers through lower pump failure rate and less maintenance and higher agricultural yield.

Head	150 m
Power	2.3 hp
Speed	1000–3600 rpm
Flow rate	32 m^3/h
Voltage supply	30–300 V DC

Company details

Grundfos Pumps India
118 Rajiv Gandhi Salai
Thoraipakkam, Chennai – 600 097
Phone: +91 44459 66800
Email: oneoffice.india@sales.grundfos.com

CHAPTER 11-Conclusion

In regions with no reliable electricity access, DRE provides opportunities for economic development, besides delivering health and environmental benefits. However, to maximise these benefits, conducive policies and innovative business models favouring DRE need to be effectively implemented.

This compendium presents a number of existing and potential DRE-based interventions to promote livelihoods in rural and remote areas. These interventions not only help in improving the economic conditions of those involved, but also make these rural areas self-reliant. The investment requirement differs from intervention to intervention, but they help in improving the earning capacity associated with the livelihood options.

In the long run, to make the list of technologies more holistic and applicable to last mile, CLEAN will be setting up an online web portal, which will have up-to-date information on new technologies in the areas of livelihood, agriculture, healthcare and education. The portal will also have the facility for CLEAN members and non-members to add or upgrade their product portfolio.

While end users are the most obvious beneficiaries of these interventions, there are a number of channels that can be tapped to promote the uptake of these interventions. These channels include social enterprises, NGOs, micro, small and medium enterprises, and local and state government departments.

A multi-pronged strategy needs to be adopted by different stakeholders to support pilots of these interventions leading to larger and scaled-up implementation of the technologies discussed. Following are the components that need to be incorporated in the strategy to build an eco-system supporting DRE interventions. CLEAN can play an important role in the implementation of the strategy, and this is discussed in the following paragraphs.

Awareness Creation and Capacity Building: The adoption of these interventions has been slow and low in number. It is important that a series of awareness programmes are organised at district, block, and village levels to create awareness and support large-scale adoption of these technologies. Universities, local agencies, and existing users are some of the stakeholders that can be tapped in creating awareness and undertaking training sessions. Where required, technical skills of the locals will also need to be strengthened to ensure uptake of these technologies. Engagement with local R&D and agricultural institutions for scaling up the DRE technologies needs to be initiated.

Entrepreneurship Incubation: Support needs to be provided to individuals who are willing to upscale these technologies. Along with training them on technical aspects, CLEAN can help in building the ecosystem to support their entrepreneurial venture. Incubation centres, such as SELCO Incubation Centre and Villgro Incubation Centre, etc. can help entrepreneurs develop the ecosystem including marketing, recruiting, fundraising, and networking. CLEAN and its members can also help in creating the network, where willing CLEAN members can adopt these individuals and train and support them to make them capable entrepreneurs. Training resources can be shared with State Rural Livelihood Mission officers for large-scale adoption of these technologies.

Access to Finance: This is a stumbling block that needs to be addressed to promote livelihoods. Typically, entrepreneurs

have limited means to raise finance for making the requisite investments in the DRE solutions discussed in this publication. They have a limitation of means and in some cases may not be considered credit worthy for availing financing, especially debt. For the technology supplier, similar concerns could exist, especially for small and medium enterprises that will be involved in developing DRE solutions for the rural livelihoods. CLEAN can help rural entrepreneurs and technology suppliers in accessing appropriate debt instruments such as loans provided by commercial banks or debt offered by non-banking financial institutions, etc. Grant funds are available from international development agencies and funds such as impact funds and government subsidies that can be tapped by the entrepreneurs. Here, CLEAN can create awareness among the possible recipients about these sources of funds, which can then be tapped by them to fund the venture. Training and awareness can be provided to banks and financial institutes to facilitate fund flow for the promotion of DRE applications in livelihood.

Building a Facilitative Environment: To support adoption of these interventions, there may be a need to undertake advocacy with various government agencies and to liaison with relevant departments, including at the state, central, and local levels. A policy mandate to implement some of these interventions can help create a facilitative environment for promoting adoption of these technologies. Clarity on the long-term vision for subsidies supporting these technologies, inclusion of these technologies in policies, support in tapping international finance, etc. are some of the areas where advocacy can be undertaken, led by CLEAN and its members, to promote DRE solutions for livelihood promotions.

There is a definite case for adoption of DRE solutions for promoting rural livelihoods. All the interventions discussed have substantial advantages and can go a long way in improving the economic well-being of rural and remote areas. The areas of action mentioned above need to be taken upon priority to support a wider adoption. CLEAN and its members have a large role to play in promoting these interventions. Carrying out proper needs assessments and piloting DRE interventions are needed to test their feasibility and viability. CLEAN will need to work closely with the stakeholders, including NRLM, to ensure that the benefits of these interventions are well-understood, and the interventions are implemented by the rural population at the earliest.

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5 ICAR,Technologies, machineries and gadgets manufactured by ICAR institutes for Post harvest processing

6 http://nif.org.in/innovation/pepper_thresher/601

7 https://nariphaltan.org/petal.pdf

For more information, contact:

Clean Energy Access Network (CLEAN)
A-23, 2nd Floor
Behind Green Park Free Church Aurobindo Marg,
Green Park Main New Delhi - 110 016

Tel.: +91-11-4160 1543
Mobile: +91 8794164691
Web: www.thecleannetwork.org