



Project Name: Sunfresh EcoSmart Compact Dryer

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Learning Links Foundation IndusInd Bank flagship program, Government Higher Secondary School - Sundarapandiam , Virudhunagar

1. Background & Community Need Assessment

Community Visit Documentation

Project Title:	Solar Dryer for Food Preservation
Visit Date:	21-08-2025
Location / Area:	Sundarapandiam Village
Community Name / Group:	Farmers & Household Women Group

Conducted By: Balaji (IC), Bhagavathi Muthu 11th, Muthumanikandan 11th, Siva 11th, Vinoth 8th, Duthiyath 8th, Kavibharathi 6th

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1. Define a Problem Statement

In rural areas, farmers and household women rely on traditional sun-drying methods for preserving vegetables, fruits, spices, and herbs. However, open sun drying exposes food to dust, insects, animals, and unpredictable weather conditions. This leads to contamination, spoilage, uneven drying, and poor quality of dried products. Sudden rains or cloudy days further cause losses. Therefore, a safe, hygienic, faster, and weather-independent drying method is needed to improve food preservation and income generation.

2. Observations from Community Visit

Sl No.	Observations	Frequency of Issue	Severity (Low/Med/High)	Related Incidents
1	Food gets contaminated with dust, insects, flies during open sun drying	Frequent	High	Spoilage, contamination, health complaints
2	Drying is slow due to cloudy weather and low sunlight	Frequent	High	Low productivity, delayed processing
3	Sudden rains destroy the half-dried products	Occasional	High	Economic loss for farmers
4	Uneven drying reduces product quality and shelf-life	Frequent	Medium	Fungal growth, color change

3. Impact Analysis

Traditional open sun drying causes major losses for farmers and households who depend on preserved foods for daily cooking, selling at markets, and small-scale businesses. Unhygienic drying leads to contamination and poor product quality, affecting health and reducing market value. Weather dependency slows down the process and often results in wastage during rains. Because drying takes too long, people cannot dry large quantities, reducing income opportunities. A proper solar drying system can improve hygiene, speed, product quality, and economic benefits for rural communities.

4. Existing Coping Methods

Currently, people spread food items on mats, tarpaulins, or rooftops for drying. To protect from insects and dust, they use cloth coverings, but this slows drying and still doesn't prevent contamination fully. During cloudy days, drying stops completely. People must rush to collect items when it rains, often losing large portions. Some communities use electrical dryers, but high electricity costs and power cuts make them unreliable and expensive for rural households.

5. Proposed Solution

Solution Description:

The Solar Dryer System provides a protected, hygienic, and efficient method to dry fruits, vegetables, spices, and herbs using natural sunlight. It uses a transparent cover and solar chimney/collector to trap heat and circulate warm air through the drying chamber. This increases temperature and airflow, enabling faster and uniform drying. The enclosed design prevents dust, insects, and animals from entering. The dryer operates without electricity, making it ideal for rural communities.

Expected Benefits:

Faster and uniform drying compared to open sun drying

Hygienic drying with no dust, insects, or contamination

Weather-resistant—drying continues even in low sunlight

Improves shelf-life and quality of dried products

Enables farmers and women to preserve surplus produce and earn income

No electricity required—eco-friendly and low cost

Reduces overall wastage and economic loss

Challenges:

Ensuring proper ventilation and optimal temperature inside the dryer

Selecting low-cost materials without compromising durability

Providing enough drying trays for high-volume users

Ensuring community acceptance and willingness to shift from traditional methods

Maintenance of transparent sheets and dust removal

6. Community Feedback on Proposed Solution

Community members expressed strong interest in adopting the solar dryer as it would improve hygiene and reduce food wastage. Women felt it would help them dry masalas, herbs, chillies, and vegetables safely. Farmers reported that the solar dryer could help preserve tomatoes, coconuts, bananas, and other perishable crops for selling at a better price. Some requested a larger-capacity model, while others suggested making it lightweight and portable. A few expressed concern about the initial cost but agreed that a durable and affordable model would be widely accepted.

7. Photographs / Evidence



2. Product Concept & Design Documentation

Field of the Invention

This project is about a solar-powered food dryer. It dries fruits, vegetables, spices, and fish using sunlight and electricity from a solar panel. It is safe, easy to use, and works without grid electricity.

Problem Statement

In many villages, food gets spoiled because people cannot dry it properly. Sun drying is slow and can get dirty, while electric dryers are expensive and need electricity. There is a need for a cheap, safe, and easy way to dry food without wasting it.



Proposed

The Sun-fresh Eco-Smart Compact Dryer is a solar-powered, portable dryer made of GI metal and 6 mm polycarbonate sheet. It uses a DC fan powered by a solar panel to blow warm air and dry food quickly and safely. The trays inside hold food pieces evenly so they dry properly. The dryer is simple to use and works in villages or homes without electricity.

Solution**Object of the Invention**

- To make a cheap and eco-friendly dryer.
- To dry food safely and hygienically.
- To make it easy to use and durable for village households.
- To reduce food waste and keep food fresh longer.

Summary**The dryer includes:**

- A metal box with 6 mm polycarbonate sheet cover.
- Removable mesh trays to put food on.
- Solar panel powering a DC fan.
- A single switch to turn it on or off.
- Compact and portable design for safe use.

Detailed Description**Construction:**

- Strong GI metal frame with polycarbonate sheet cover.
- Mesh trays are food-safe and easy to clean.

Airflow System:

- DC fan blows warm air inside and removes humid air to dry food evenly.

Solar Power:

- Solar panel provides power to the fan.

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Optional battery backup can be used when sunlight is low.

Control:

Solar controller

Food Handling:

Removable trays make food handling and cleaning easy.

Operation

Cut fruits, vegetables, or fish into pieces and place them on the mesh trays.

Turn on the dryer. The solar panel powers the DC fan.

Warm air circulates inside and removes moisture from the food.

When the food is dry, remove it from the trays and store it.

Safety Features

Fuse protects against electrical problems.

Metal box and polycarbonate sheet keep food clean and safe.

Fan prevents overheating.

Ergonomic Benefits

Removable trays make cleaning simple.

Where to Use

Village households and farms.

Small businesses drying fruits, vegetables, or fish.

Relief camps or emergency food preservation programs.

Agricultural cooperatives.

Impact on Users

Saves time compared to sun drying.

Safe and clean food drying.

Helps farmers and small businesses reduce waste and earn more money.

Target Users

Farmers and village households.

Small businesses making dried food.

NGOs or government food programs.



Expected Feedback

Easy to use and affordable.

Reduces food waste and keeps food fresh longer.

Safe and hygienic.

Helps small businesses grow.

Conclusion

The Sunfresh EcoSmart Compact Dryer is a simple, solar-powered, and safe way to dry food. It is strong, portable, and easy to use. It helps reduce food waste, keep food fresh, and improve income for farmers and small businesses.

Abstract

The Sunfresh EcoSmart Compact Dryer uses solar power to dry fruits, vegetables, spices, and fish. It has a metal box with clear polycarbonate cover, removable mesh trays, and a DC fan powered by a solar panel. It is easy to use, portable, and safe, especially for villages, farms, and small food businesses. This dryer helps reduce food waste, save time, and improve food quality.



3. Market & Competitor Analysis

Objective: Compare existing food drying solutions to identify strengths, weaknesses, and opportunities for improvement.

Competitor	Type	Power Source	Material	Features	Pros	Cons	Notes / Opportunity
Traditional Sun Drying	Manual	Sunlight	Open trays	None	Free, no electricity	Slow, unhygienic, contamination risk	Opportunity: Hygienic, fast drying
Electric Dehydrators	Electric	Grid Power	Stainless Steel	Timer, temperature control	Fast, controlled drying	Expensive, energy-intensive, not portable	Opportunity: Solar-powered alternative
Bamboo / Wooden Solar Dryer	Solar	Sunlight	Wood, mesh	Covered trays	Eco-friendly	Fragile, less durable, small capacity	Opportunity: GI metal + polycarbonate for durability
Commercial Industrial Dryer	Electric / Gas	Grid	Stainless steel	Large capacity, automated	High efficiency	Expensive, requires training	Opportunity: Affordable small-scale solar version
Existing Solar Cabinet Dryers	Solar	Solar Panel	Sheet metal, plastic	Fan-assisted airflow	Off-grid	Limited airflow control, small capacity	Opportunity: Use DC fan + GI metal + polycarbonate + portable design

4. Functional & System Requirements

Objective: Define system features and how it should operate.

1. User Requirements - Easy to use: simple ON/OFF switch. - Portable: lightweight and movable. - Safe: prevents overheating and contamination.
2. System Requirements - Drying chamber made of GI metal with polycarbonate cover. - Food-grade mesh trays, removable and washable. - DC brushless fan powered by a solar panel. - Optional battery backup. - Continuous airflow for uniform drying.
3. Functional Requirements - Solar-powered fan circulates warm air evenly. - Trays hold sliced food for proper drying. - Humid air is removed through the fan. - No complex electronics required (no LCD). - Dryer operates under direct sunlight or optional battery support.
4. Performance Requirements - Dry fruits/vegetables/spices/fish in 4–8 hours depending on size and moisture. - Durable for daily use in rural or small business settings. - Lightweight enough for easy relocation.

5. Safety and Hygiene Requirements - Fuse to prevent electrical overload. - Mesh trays prevent contamination. - Polycarbonate cover prevents dust, insects, and dirt.

5. Technical Specifications

Sunfresh EcoSmart Compact Dryer – Technical Specification

Feature	Specification
Material	GI Metal (chamber), 6 mm Polycarbonate sheet (cover)
Fan Type	DC Brushless Fan
Power Source	50–100 W Solar Panel, optional battery backup
Trays	Removable food-grade mesh trays
Capacity	5–10 kg per drying cycle (depends on food type)
Dimensions	Approx. 60 cm x 40 cm x 40 cm (can be customized)
Airflow	Fan-assisted circulation for uniform drying
Control	Single toggle switch (ON/OFF)
Safety	Inline fuse, stable base, polycarbonate cover for hygiene
Portability	Lightweight and compact for easy relocation
Operation	Off-grid solar operation, manual food placement
Maintenance	Easy to clean trays, wipe metal and polycarbonate surfaces

6. Product Development Timeline

Project Duration: August – November (All Weeks Included)

Month	Week	Activity	Description
August	Week 1	Initial Idea & Problem Study	Identified food spoilage issues and explored need for solar dryer.
August	Week 2	Project Planning & Research	Studied solar dryers, drying mechanisms, and listed objectives.
August	Week 3	Project Planning & Research (Community visit Plan)	Created sketches and finalized materials (GI metal, polycarbonate, DC fan, trays). Community visit plans and execution
August	Week 4	Pre-Procurement Check	Verified dimensions, cost estimation, and availability of materials.
September	Week 1	Material Procurement – Part 1	Purchased GI sheets, polycarbonate, mesh trays.
September	Week 2	Material Procurement – Part 2	Bought DC fan, solar panel, hinges, screws, paint, wires.
September	Week 3	Fabrication – Frame Construction	Cut GI metal sheets and assembled the basic structure.
September	Week 4	Fabrication – Component Fitting	Installed polycarbonate cover and mounted DC fan with wiring.
October	Week 1	Tray Arrangement	Installed and aligned mesh trays for balanced airflow.
October	Week 2	Testing – Airflow & Heat	Tested solar fan performance and temperature rise.
October	Week 3	Drying Trials	Tested fruits/vegetables and recorded drying time & moisture loss.

October	Week 4	Improvement & Calibration	Adjusted tray spacing, improved airflow, and sealed heat leakage.
November	Week 1	Final Testing	Performed continuous-day drying test for accuracy.
November	Week 2	Documentation Work	Prepared diagrams, observations, result tables.
November	Week 3	Final Report Drafting	Compiled full project report and student notes.
November	Last Week	Final Review & Completion	Checked all results, prepared presentation, and completed project.

7. Product Testing

Product testing of the **Solar Compact Dryer** was conducted at **Government Higher Secondary School (GHSS), Sundarapandiam** to check its performance under real-time conditions. The testing was carried out with the support of **5 students**.

Place of **Testing:** GHSS, Sundarapandiam
Date: January 6, 2026

The solar dryer was tested using the **totomot** to understand how it works during different time periods. The main focus of the testing was to observe the drying process and the performance of the solar and battery system.

During the **daytime**, the dryer worked well using solar power. The drying process was smooth and effective when sufficient sunlight was available.

However, during the **night-time**, the dryer did not work properly. Since there was no solar power, the system depended on the battery. The battery drained quickly, which affected the functioning of the dryer and interrupted the drying process.

Feedback:

- The battery capacity is not sufficient for night-time operation.
- A higher-capacity battery is required for continuous and reliable drying.

This testing helped identify areas for improvement and provided valuable inputs to enhance the performance of the solar dryer in future stages.



7. Overall Product Impact & Outcomes

The Sunfresh EcoSmart Compact Dryer addresses critical challenges in traditional food drying methods. By providing a hygienic, solar-powered, and affordable solution, the product reduces food wastage, improves drying efficiency, and supports income generation for farmers and rural households. The design aligns with community needs, functional requirements, and market gaps identified during the development process.

Product making Pictures



Students working picture



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Product Pictures

