PROJECT ABSTRACT

Solar Cabinet Dryer for Agricultural Produce

A working solar cabinet dryer — glazed cabinet, black absorber collector, mesh trays, temperature display and fan — with a full drying-experiment procedure. Delivered built-to-order with dryer, experiment manual, report, PPT and viva kit.

01. Title

Solar Cabinet Dryer for Agricultural Produce

02. Introduction / Background

A significant share of harvested fruit and vegetables is lost between farm and market, and a major reason is drying: open sun drying — produce spread on the ground — is slow, invites dust, insects and animals, and one rain shower ruins the batch. A solar cabinet dryer fixes this with simple physics: a black absorber plate converts sunlight to heat, the glazed cabinet traps it like a greenhouse, and warm air rising through stacked mesh trays carries moisture away from the produce. This project builds a working cabinet dryer as a student prototype and pairs it with a real drying experiment: the student measures moisture loss over time and plots the drying curve.

03. Problem Statement

Solar dryer projects are often built as static display models with no experiment, leaving the student with nothing measured to report. The project addresses this by delivering the dryer together with a complete drying-experiment procedure — sample preparation, hourly weighing schedule, moisture-content calculations and drying-curve plotting — so every number in the report is measured by the student.

04. Objectives

- Fabricate a glazed wooden drying cabinet with a black finned absorber collector.
- Provide three removable food-grade mesh trays for single-layer produce loading.
- Instrument the chamber with a digital temperature display.
- Support natural-convection and fan-assisted forced-convection modes.
- Provide a complete drying-experiment procedure with weighing schedules.
- Deliver the complete student kit: dryer, experiment manual, report, PPT and viva Q&A.;

05. Proposed Methodology

The dryer is fabricated from wood with a glass front door, a finned black absorber at the base, mesh trays and top/side vents; a digital probe and a small DC fan complete it. The experiment runs in three stages. (1) Preparation: a produce batch (e.g. mango slices) is cut to uniform thickness and weighed. (2) Drying: trays load in a single layer, the dryer faces the sun, and the student logs chamber/ambient temperature and batch weight hourly. (3) Analysis: moisture content is computed on wet and dry basis and the drying

curve is plotted, optionally repeated in fan-assisted mode for comparison.

06. System Architecture / Working

Sunlight heats the black absorber; the glazed cabinet traps the heat and warm air rises naturally through the mesh trays, carrying moisture out through the top vent. In forced mode the DC fan drives air through the collector and trays for faster drying. The temperature display gives live chamber readings for the hourly log, and the weighing sheets feed the moisture-content templates that produce the report's drying curves.

07. Hardware / Software Requirements

- Wooden cabinet (approx. 600 x 450 x 450 mm) with glazed glass door
- Black finned absorber collector plate
- 3 x food-grade mesh drying trays
- Digital temperature probe with display
- 12 V DC exhaust fan (solar/battery option)
- Weighing scale (student-provided per manual)
- Drying-experiment manual with calculation templates

08. Expected Outcomes

- A working solar cabinet dryer operating in natural and forced-convection modes.
- A student-measured drying curve with moisture-content calculations.
- A natural-vs-forced convection comparison run.
- A complete report, PPT and viva Q&A; on solar thermal drying and drying kinetics.

09. Applications

- Teaching heat transfer and solar thermal engineering in mechanical labs.
- Demonstrating food-preservation technology for rural/agricultural contexts.
- A base for comparative studies across produce types or tray configurations.

10. Future Scope

- Thermal storage (pebble bed) for extended drying hours.
- Backup heater for cloudy-day operation.
- Humidity-logging upgrade with a DHT22 sensor.
- Scaled-up multi-cabinet community dryer design study.