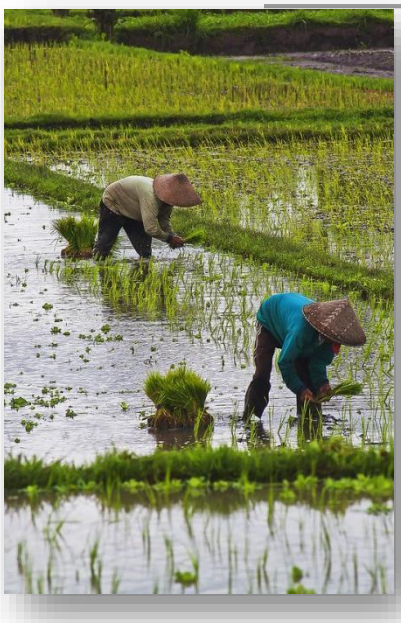
The "*Agri-Flow*" Compact Vertical Dryer

School Name: DAV Public School Unit VIII

Lead Innovator: Debabrata Das

Mentor Name: Tanmay Kumar Nayak

Team Member: Shreyan Mohanty



1. Problems Faced by Smallholder Farmers:

Farmers face critical challenges post-harvest. Crops like maize, rice, and beans, harvested with high moisture (40-60%), are wasted. This leads to:

- **Significant Losses:** Up to 40% of the harvest is lost due to Mold (including toxic aflatoxins), spoilage, and pests.
- **Health Risks:** Aflatoxins from Mold contaminate food, posing severe health threats.
- **Distress Sales:** Farmers are forced to sell wet crops immediately at low prices, losing potential income from later, higher-priced markets.
- **Weather Dependency:** Traditional sun drying is slow, unhygienic, and unreliable during adverse weather.

(2) Old Solutions That Don't Work for Small Farmers

Farmers know they need to dry their crops, but their options are bad.

1. **Sun Drying:** This is the most common method—spreading crops on the ground or a mat.
    - **It's a gamble:** What if it rains? Or it's cloudy for a week? The crop is ruined.
    - **It's dirty:** The crop gets mixed with dirt, rocks, and animal droppings.
    - **It's slow:** It can take days or even weeks, and the crop is never dried evenly.

2. **Industrial Factory Dryers:** These are the huge, expensive machines used by big corporations.
    - **They cost a fortune:** A small farmer could never afford one.
    - **They are massive:** They are built in one place and can't be moved to a farmer's field.
    - **They are too complicated:** They need special training and lots of power to run.

"Small farmers are stuck. They either risk losing their harvest to the weather or sell it for almost nothing."

3. Entry of "Agri-Flow":

The "Agri-Flow" is a compact, smart, and affordable dryer designed specifically for rural farmers. It combines mechanical efficiency with intelligent moisture control.

➢ ***How it Works:***

1.Crop Entry: Wet crops (40-60% moisture) are fed into the **Crop Inlet** (bottom left).

2.Dual-Pass Drying: An **Internal Auger Mechanism (Screw Conveyor)** lifts the crop through two vertical passes. As the crop tumbles upwards, **Hot Air** (from a low-cost heat source like biomass or electricity) enters through **Hot Air Inlets (Yellow Sockets)**, rapidly reducing moisture.

3.Smart Moisture Control: An **Auto Moisture Content Sensor & Control Unit** (integrated at the outlet) continuously monitors the drying crop. The farmer selects the crop type (e.g., Maize), and the system automatically targets and maintains the optimal moisture level for safe storage.

- **Examples of Target Moisture Content:**
  - Maize: 12-14%
  - Paddy Rice: 12-14%
  - Soybeans: 10-12%
  - Beans/Pulses: 12-14%

4.Cleaning & Separation: After drying, a **Vibratory Sieve/Separator** removes foreign particles (stones, dirt) and separates chaff, ensuring a clean, high-quality product.

5.Clean Output: Dried, clean crop (approx. 15% moisture) exits the **Dried Crop Outlet** (bottom right), ready for immediate storage.

4. Impact & Usage for Low Commoners

The "Agri-Flow" dryer offers transformative benefits:

1.Increased Income: Dramatically reduces post-harvest losses, allowing farmers to save more produce and sell it at higher market prices by storing it longer.

2.Enhanced Food Security & Health: Ensures a greater quantity of safe, aflatoxin-free food, improving family nutrition and reducing illness.

3.Weather Independence: Enables drying regardless of weather, protecting harvests from rain and humidity.

- **High Quality Produce:** Delivers uniformly dried, clean crops, fetching better market value.
- **Affordable & Accessible:** Low manufacturing cost using local materials makes it attainable for small farmers or community co-operatives. Its compact design allows for mobility.
- **User-Friendly & Intelligent:** The auto-sensor simplifies operation, guaranteeing optimal drying without complex adjustments, even for less experienced users.
- **Sustainable:** Can utilize farm waste as fuel, reducing operational costs and environmental impact.

➢ **Simple Operational Steps:**

1. **Setup:** Place the dryer on level ground.
2. **Power:** Start the heat source (e.g., biomass furnace) and motors.
3. **Crop Selection:** Use the control unit to select the crop type.
4. **Load:** Feed wet crop into the inlet.
5. **Collect:** Gather clean, perfectly dried crop from the outlet.