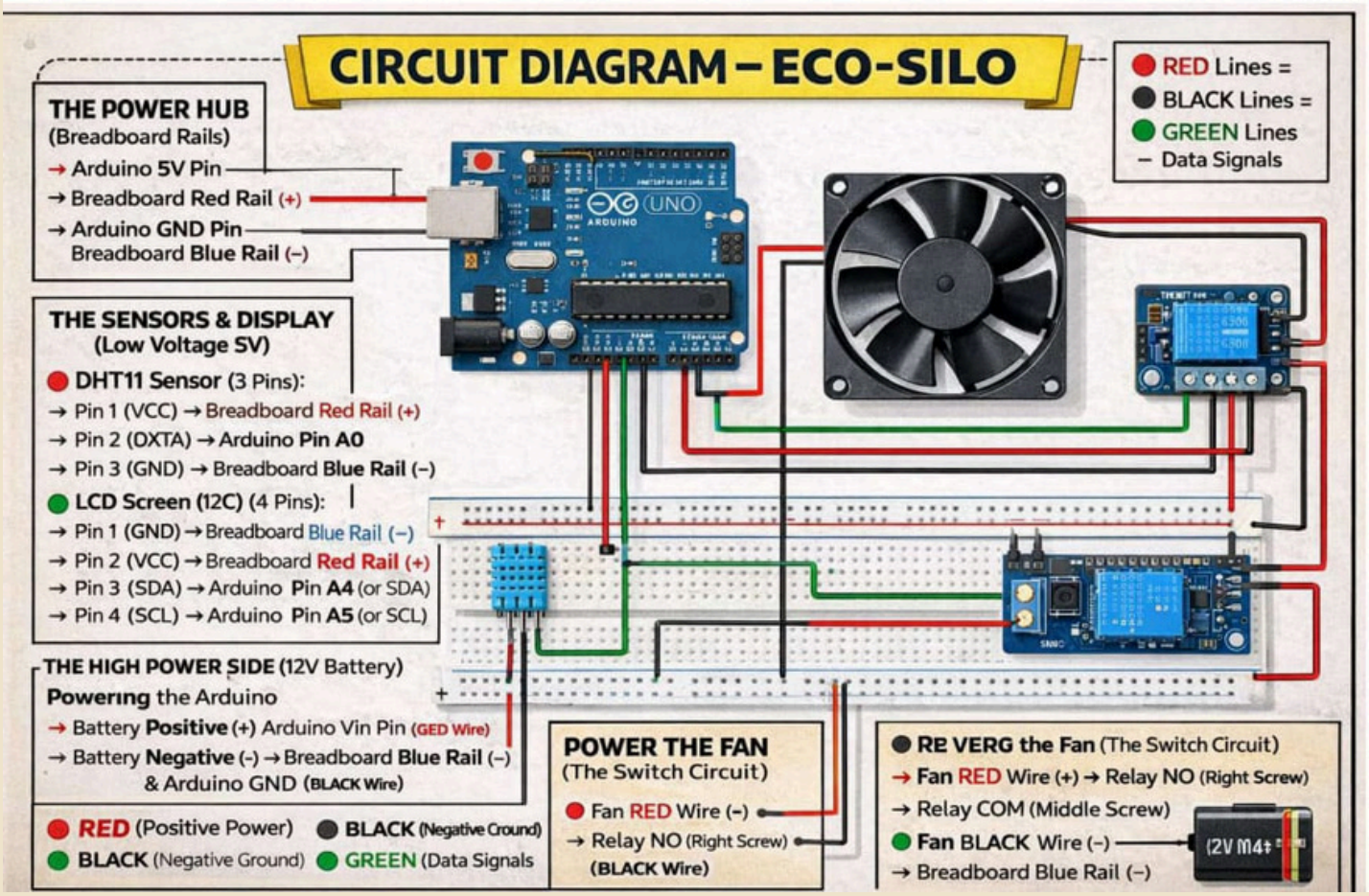
ECO-SILO:

SMART GRAIN SAVER

Circuit details



Color Key:

- Red lines = Positive power(+)
- Black lines = Negative Ground(-)
- Green lines= Data signals

1. The Power Hub (Breadboard Rails)
(Think of this as your power strip)

🔴 Arduino 5V Pin → Breadboard Red Rail (+)

⚫ Arduino GND Pin → Breadboard Blue Rail (–)

2.The sensors and display (low voltage 5V)
(These plug into the breadboard rails you just powered)

A. DHT11 Sensor (3 Pins)

🔴 Pin 1 (VCC) → Breadboard Red Rail (+)

🟢 Pin 2 (DATA) → Arduino Pin A0

⚫ Pin 3 (GND) → Breadboard Blue Rail (–)

B. LCD Screen (I2C) (4 Pins)

⚫ Pin 1 (GND) → Breadboard Blue Rail (–)

🔴 Pin 2 (VCC) → Breadboard Red Rail (+)

🟢 Pin 3 (SDA) → Arduino Pin A4 (or SDA)

🟢 Pin 4 (SCL) → Arduino Pin A5 (or SCL)

C. Relay Module Input

🔴(3 Pins on the small side)

⚫VCC → Breadboard Red Rail (+)

🟢GND → Breadboard Blue Rail (–)

IN → Arduino Pin D7

3. The High Power Side (12V Battery)

(This is the critical part)

A. Powering the Arduino

🔴Battery Positive (+) → Arduino Vin Pin

⚫Battery Negative (–) → Breadboard Blue Rail(-)

(This connects Battery GND to Arduino GND)

B. Powering the Fan (The Switch Circuit)

🔴Battery Positive (+) → Relay COM (Middle Screw Terminal)

🔴Relay NO (Right Screw) → Fan Red Wire (+)

⚫Fan BLACK wire(-)->Breadboard blue rail(-)

HOW DOES IT WORK?

- Battery sends 12V to Arduino Vin (Arduino turns on).
- Arduino sends 5V to the Breadboard Red Rail (LCD & Sensor turn on).
- Battery sends 12V to the Relay COM port (Waiting at the door).
- When code says Go, Relay closes the gate.
- 12V flows from COM -> NO -> Fan. Fan spins!

ABOUT THE SMART SILO!

PROBLEM:Traditional silos and godowns suffer from problems like moisture damage,fungal growth, and human error, leading to heavy food grain losses.

SOLUTION:A Smart Silo uses sensors, automation, and real-time monitoring to overcome these problems,ensuring safe storage, reduced wastage and sustainable development.It automatically detect humidity inside the grain jar.If it gets too wet,a fan turns to dry it out.

HOW IT HELPS?

By protecting grains for a longer time, it ensures that farmers do not lose their hard-earned produce and get better returns for their crops

For people, it means a steady supply of safe and good-quality food at affordable prices.

In situations like floods, droughts, pandemics, or emergencies, when food supply chains are disturbed, a Smart Silo feels like a god-gifted system because it preserves food securely and prevents wastage.

Scientific Principle:

Respiration: Grains are seeds. They “breathe” like humans, releasing heat and moisture.

Hot Spot Effect: If this moisture gets trapped, fungus grows.

Convection: The project uses a fan to push fresh air through the grain, removing moisture before fungus can start.

ABOUT THE MODEL

Materials required:
Arduino Uno R3.

DHT 22 OR DHT 11(3 PINS)

16 X 2 LCD WITH I2C MODULE

RELAY MODULE 5V, 1
CHANNEL WITH HIGH LOW LEVEL TRIGGER

12V DC BRUSHLESS(CPU FAN) SIZE:120 MM
JUMPER WIRES: M-M & M-F: 20 EACH.

BREADBOARD -1

12V BATTERY OR ADAPTER

BLADE TYPE 2 AMP FUSE

Working Model:

Jar A (The “Smart” Silo): A plastic jar filled with rice/wheat. It has a DHT11 sensor inside and a fan on top.
Jar B (The “Dumb” Silo): A completely sealed jar with rice (passive control).
To simulate “bad weather” or wet grain during the demo, we place a small piece of damp sponge or wet bread inside both jars.

Observation:

Jar B: The humidity rises and stays high (trapped). The bread inside gets moldy after 3–4 days.
Jar A: The sensor detects moisture from the wet sponge. The red light turns ON → the fan starts spinning → the LCD shows humidity dropping → the green light turns ON. The bread stays dry and fresh.