CONSTRUCTING A ZERO ENERGY COOLING CHAMBER

The shelf-life of vegetables as well as their quality can be increased by keeping them in a cool environment. This reduces the rate of deterioration, allows more time for marketing the crop, and allows higher quality produce to reach consumers.

WHAT IS A ZECC?

A Zero Energy Cooling Chamber (ZECC), originally developed in India, is a small chamber made out of bricks and sand where farmers can store freshly harvested produce before it is transported to market. The ZECC works on evaporative cooling principles that can be used to provide a cool environment.

ZECC: A simple brick and sand structure constructed using a double brick wall with the space between the two walls filled with moist sand.

MATERIALS NEEDED

Size: ***1.5 m wide x 2.15 m long (interior dimensions about 0.7 m wide x 1.40 m long)***

Capacity: ***A ZECC this size can store 6 crates of vegetables or up to 120 kg of produce***

- **800 to 1000 bricks** (should be burnt bricks (even local or farm bricks will work)
- **4 m^3 coarse sand** (or two handcarts)
- **Tools:** Hoe, rake, shovel, watering can, measuring tape

SITE PREPARATION

1. The site needs to be on flat ground, under shade and near a water source.
2. Level it with a rake and clear away any debris.
3. Add a layer of sand, raked flat. This is the foundation and helps with drainage.

MAKING THE FLOOR

1. Mark out the dimensions of your ZECC by measuring tape.
2. Or, place three empty crates on the floor and place bricks at corners to show where walls will start (a good method if you do not have a measuring tape)

MAKING THE WALLS

3. Start by building the inner wall. This wall should be 4 fingers (or about 7 – 8 cm) distance from the crates that will sit inside the ZECC.
4. Place bricks in a staggered/overlapping method (as per normal building practice) but no need to use cement.
5. Use the width of your 4 fingers (or about 7 – 8 cm) to measure the gap between the inner and outer walls.
6. Stack the crates two high so that you know how high to build the ZECC.
7. Build part of the inner wall, then part of the outer wall. As you go along, fill the space between the two walls with sand (Tip: Apply water using the watering can to help settle the sand).
8. The inner wall can be one layer of bricks higher than the outer wall so that the cover can sit on this.

MAKING THE COVER & SHADE STRUCTURE

9. Choose a convenient material to make a cover that is light and easy to handle, such as a woven mat made from reeds.

You can place a moist hessian cloth on the top to help with the cooling as well. When using the ZECC, you should apply water at least 3 to 4 times a day to the sand for effective cooling.

Benefits

A ZECC can reduce the temperature by 10-15ºC but it keeps humidity high. These are perfect conditions to store produce. Traders can also use ZECCs to store produce at markets so that the produce doesn't waste away under the sun all day.

Vegetable	Weight Loss (%)		Shelf life (days)	
	ZECC	Ambient	ZECC	Ambient
Green Pepper	2 - 3	14 - 18	7	3
African Nightshade	1 - 4	4 - 12	3	1
Tomato	1 - 7	5 - 23	12 - 15	7 - 9
Eggplant	1	6	4	2
Cucumber	3	10	4	2
Cauliflower	18	44	9	7

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