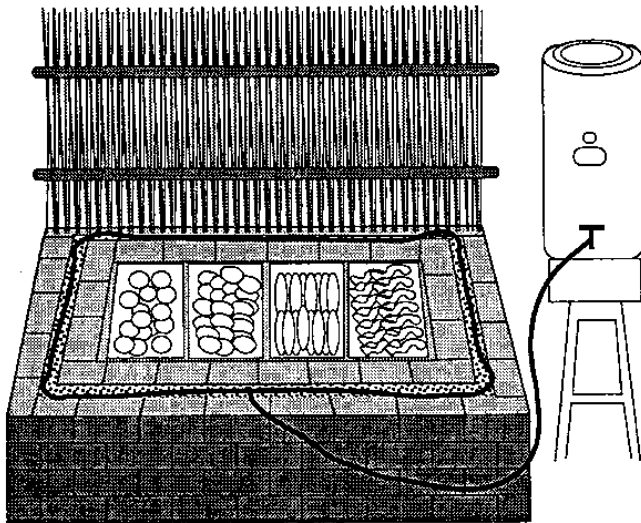


ZERO ENERGY COOL CHAMBER (100 kg model)

Introduction: The original developers of this technology in India (S.K. Roy and his team at IARI) called it an Improved "Zero-Energy Cool Chamber" (ZECC) because it uses no external energy. The low cost cooling chamber is constructed from porous clay bricks. The cavity between the walls is filled with clean sand and the bricks and sand are kept saturated with water. Fruits and vegetables are loaded inside, and the entire chamber is covered with a bamboo or rush mat, which is also kept moist. During the hot summer months in India, this chamber can maintain an inside temperature between 15 and 18 °C (59 and 65 °F) and a relative humidity of about 95% (Roy 1989). Results are best when the relative humidity conditions outside the ZECC are low, as during the dry season or in semi-arid regions. In theory, the lowest possible temperature that can be achieved is equal to the wet bulb temperature.

Design Options & Materials Needed



Construction Instructions (400 bricks, fine sand)

- Make floor with brick 165 cm x 115 cm.
- Erect the double wall of bricks to a height of 67.5 cm leaving a cavity of 7.5 cm.
- Drench the chamber with water. Soak the fine river bed sand with water.
- Fill the 7.5 cm cavity between the double walls with this wet sand.
- Make top cover with a bamboo frame (165 cm x115 cm) and reeds, straw or dry grass.
- A thatch or tin roof made over the chamber will provide protection from direct sun or rain or snow.
- Store fresh produce in plastic crates inside the chamber (6 to 8 crates, depending on size).
- Cover the top of the crates loosely with a sheet of plastic to protect from dust and free moisture
- Keep the sand, bricks and cover wet (water twice per day or set up a gravity fed drip system)

<http://ucce.ucdavis.edu/files/datastore/234-2143.pdf>



WATERING OF COOL CHAMBER



CLOSEUP VIEW

India 2009

Postharvest Innovations Plan Series

Number 6

Low cost, small-scale practices for reducing postharvest food losses

Nov 2017

Costs & Benefits

	Immediate sale, vegetables packed in sacks or baskets	Temporary cool storage in ZECC, packed in plastic crates
COSTS		
Zero energy cool chamber small model (100kg size ZECC)		\$100
Containers (5 sacks)	\$2.50	
Reusable Plastic crates (6)		\$ 60
Relative cost	\$2.50	\$160
EXPECTED BENEFITS		
% losses	30%	10%
Amount for sale	70 kg	90 kg
Value/kg	\$1.00	\$1.20
Total market value of one load	\$70	\$108
Market value – recurring costs	$\$70 - \$2.50 = 67.50$	\$108
Relative profit		+ \$40.50
Time required to repay the investment in the ZECC		$\$160 / \$40.50 = 4$ The investment pays for itself in about 4 weeks (4 uses) if used at full capacity.
Return on Investment (ROI)		Each subsequent 100kg load provides a \$40.50 premium compared to the traditional practice.

References cited

Roy S.K. 1989. Postharvest technology of vegetable crops in India. Indian Horticulture Jan-June: 76-78.

For further information

Small-scale postharvest handling practices: A manual for horticultural crops (Chapter 6; 5th edition 2015)

http://ucanr.edu/sites/Postharvest_Technology_Center_/files/231952.pdf

Postharvest Technology Center (UC Davis)

<http://postharvest.ucdavis.edu>

The Postharvest Education Foundation

<http://www.postharvest.org>

Postharvest Innovations LLC <http://www.postharvestinnovations.com>

Citation: PI LLC (2017): PI Plan Series 6: Zero Energy Cool Chamber. Postharvest Innovations LLC. 2 pp.