

# The Zeer pot emergency refrigerator

(Survival Manual/3. Food & Water/ Zeer pot refrigerator)

## A. Zeer pot fridge

Pasted from <<http://practicalaction.org/zeer-pot-fridge-2>>

### *How a clay pot refrigerator can help beat hunger*

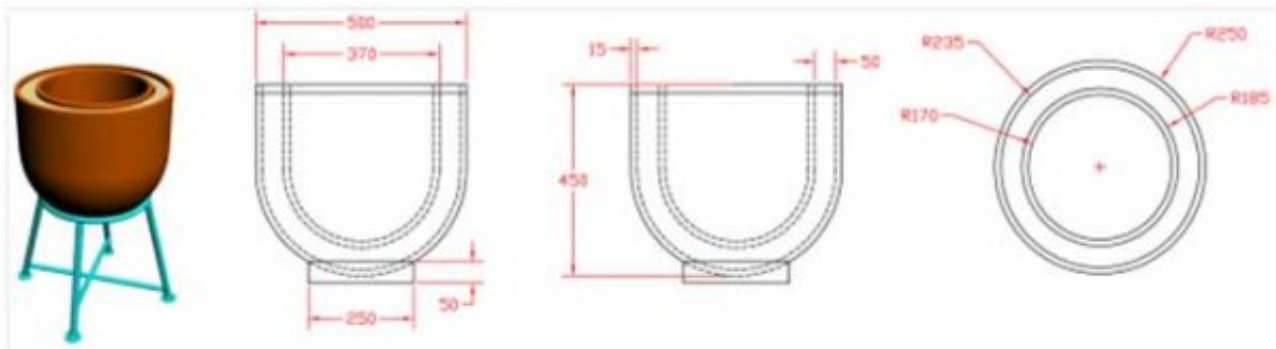
In hot climates, food doesn't stay fresh for long. Tomatoes go off in just two days. After four days carrots and okra are rotten. With no means of preserving their crops, poverty-stricken families have been battling hunger and even famine.

One ingenious solution is the zeer pot. Using this simple technology, the same vegetable can last for up to 20 days. This all natural refrigerator offers families, who already succeed in food production, their right to food preservation and really can help to improve their everyday lives; for now and for the future.

### *A simple technology that brings fresh hope*

The zeer pot is a simple fridge made of local materials. It consists of one earthenware [or metal] pot set inside a larger earthenware clay pot, with a layer of wet sand in between.

- The space between the two pots is about 2 inches (50mm) on either side.
- Moisture from a layer of wet sand allows for evaporation. As the moisture evaporates it cools the inner pot, keeping up to 26 pounds of fruit and vegetables fresher for longer.
- The pots should be covered with a ceramic lid or cloth. They should be kept in a well-ventilated area but out of direct sunlight. The pots worked best when they were stood on a metal frame that allowed air to circulate under them as well as around the sides.



**B. What: For less than \$2 for a clay pot system to refrigerate up to 12 kg of produce. [It may cost \$2.00 in Africa, but not \$2.00 in the USA, see my expense list and photos, be-**

low. Mr Larry]

Pasted from <<http://www.brinq.com/workshop/archives/2005/01/08/keeping-it-cool-clay-pot-refrigeration>>

This is a relatively old story but a great one. In 2000 Mohammed Bah Abba was awarded the Rolex Award for Enterprise for his innovative Pot-in-Pot system to provide affordable, electricity free, refrigeration in arid Nigeria. Mohammed took an old local understanding of the cooling properties of evaporating water, combined it with the ancient tradition of making clay pots, and turned into a useful, world-changing innovation: a “desert refrigerator” that helps reduce food spoilage and increases income by increasing the shelf-life of farmers’ produce for sale.

“Eggplants, for example, stayed fresh for 27 days instead of three, and tomatoes and peppers lasted for three weeks or more. African spinach, which usually spoils after a day, remained edible after 12 days in the Pot-in-Pot storage.”

The Pot-In-Pot system consists of two earthenware terracotta pots of different diameters, one placed inside the other. The space between the two pots is packed with sand, the sand is kept wet by pouring water into the sand about twice a day. Produce is placed within the inner pot and then covered with a damp cloth, and the system is left in a dry ventilated area. As the water in the sand evaporates throughout the day, the law of thermodynamics ensures the temperature in the inner pot drops. Our bodies use the same technique to keep us cool.

How well does it cool? Well, one quantitative study was performed in Ramona, CA by student Garret Rueda in his 2003 entry to the state Science Fair. Rueda found *the average daily temperature drop inside the system was 23.5 F (4 C), keeping produce at 59F (15 C), while the outside temperature is 82.4F (28 C)* .

Finally, the Rolex Awards Committee makes a great point about ideas vs. innovation in their article about the Pot-in-Pot award: “Good ideas are indeed rare, but good ideas that actually become good projects and bring lasting benefits are even rarer still,” In other words, an innovation is an idea that is brought to life and changes people’s lives.



1. First, bowl-shaped moulds are created from mud and water – and left to dry in the sun. Clay is then pressed onto the moulds to form the desired size of pot. Clay rims and bases are added and the moulds are removed. The pots are left to dry in the sun.



2. Once the pots have been fired in a pit of sticks, the Zeer pot is ready to assemble. A smaller pot is placed inside a larger one, and the space in between is filled with sand.



3. The whole structure is then placed on a large iron stand. This allows the air to flow underneath and aid the cooling process.



4. Twice a day, water is added to the sand between the pots so that it remains moist. The entire assembly is left in a dry, ventilated place.



5. Fruit, vegetables and sorghum – a type of cereal prone to fungal infestation if not preserved – are then placed in the smaller pot, which is covered with a damp cloth.



6. In the heat, the water contained in the sand evaporates towards the outer surface of the larger pot. This evaporation brings about a drop in temperature of several degrees, cooling the inner pot and extending the shelf life of the perishable food inside.

### C. Off-Grid SHTF Survival: Ancient Technology for Refrigeration

September 25th, 2011, Tess Pennington

Pasted from <[http://www.shtfplan.com/emergency-preparedness/off-grid-shtf-survival-ancient-technology-for-refrigeration\\_09252011](http://www.shtfplan.com/emergency-preparedness/off-grid-shtf-survival-ancient-technology-for-refrigeration_09252011)>

*As most of our readers understand, in a collapse, be it natural or man-made, there is a distinct possibility that we may experience a cascading power-failure from which there may be no recovery for the majority of the population for weeks or months at a time. You'll have no way of keeping short-term perishable food fresh, especially meats. But what if you were able to create a refrigerator out of just sand, water and a couple of clay pots, giving you the ability to keep meat cool*

*for a few days at a time? In our view, that could significantly alter your survival preparation plans for the better. In addition to food, for those with critical needs that require refrigeration of medicine, this could be a life saver. This ancient technique is one you'll want to consider, test, and archive in your personal planning and preparedness strategies .*

### ***SHTF Survival: Clay Pot Refrigeration***

by Tess Pennington

Have you ever wondered what our ancestors did without refrigeration? How were they able to prevent their food from spoiling? Some of our ancient civilizations did in fact have refrigeration and used simple items they had on hand to create it.



The zeer clay pot refrigerator keeps food cool (icy cold) without electricity by using evaporative cooling. Essentially, a porous outer earthenware pot, lined with wet sand, contains an inner pot (which can be glazed to prevent penetration by the liquid) within which the food is placed. The evaporation of the outer liquid draws heat from the inner pot.

In a short or long-term disaster where power is out, knowing essential skills on how to prevent foods from spoiling as quickly, will help you survive longer and stay healthier. Further, having this simple device can also help you have a diverse diet during a disaster and prolong food fatigue. The best part is that making this device is incredibly cheap, very effective, and doesn't require any electricity, which is perfect for those disasters where the power is affected and you have no fuel to power your generators.

All that is needed to create a clay pot refrigerator is two terra-cotta pots, one larger than the other, as well as some sand, water, and cloth. To make the “fridge”, you just put one pot inside the other, and fill up the spaces with wet sand, which keeps the inside of the pots cold. You will also need to put a wet towel over the top to keep the warm air and light from getting in.

Rather than re-inventing the wheel, perhaps we could learn a thing or two from our ancient ancestors. Using what they had available to them, our ancestors seemed to have many of the modern-day conveniences we have today.

#### **D. Impact of the Zeer pot**

Pasted from <[http://en.wikipedia.org/wiki/Pot-in-pot\\_refrigerator](http://en.wikipedia.org/wiki/Pot-in-pot_refrigerator)>

##### ***Construction***

A *zeer* is constructed by placing a clay pot within a larger clay pot with wet sand in between the pots and a wet cloth on top. The device cools as the water evaporates, allowing food stored in the inner pot to be kept fresh for much longer in a hot, dry climate. It must be placed in a dry, ventilated space for the water to evaporate effectively towards the outside. Evaporative coolers tend to perform poorly or not at all in climates with high ambient humidity, since the water is not able to evaporate well under these conditions.

If there is an impermeable separation layer between the food and the porous pots, undrinkable water such as seawater can be used to drive the cooling process, without contaminating the food. This is useful in arid locations near the ocean where drinkable water is a limited commodity, and can be accomplished by using a pot that is glazed on the inner wall where the food is stored.

Extended operation is possible if the pots are able to draw water from a storage container, such as an inverted airtight jar, or if the pots are placed in a shallow pool of water.

Pot-in-pot refrigeration has had multiple positive impacts on the population that uses them beyond the simple ability to keep food fresh for longer periods of time and decreasing instances of food-related disease.

- Increased profits from food sales: As there is no rush to sell food to avoid spoilage, farmers are able to sell their produce on demand and can command higher prices.
- Increased opportunities for women: Women can sell food directly from their homes, decreasing their dependence on their husbands as sole providers. Also, because girls traditionally take food to market to sell, and because food in the *zeer* stays fresh long enough that they can go to market once a week rather than once a day, there is more

time for them to attend school.

- Rural employment opportunities: Farmers are able to support themselves with their increased profits at market, slowing the move into cities. Also, the creation of the pots themselves generates job opportunities.
- Increased diet variety because food is available for longer into the year.

### *Effectiveness*

#### **Food - Refrigerated shelf life - Shelf life with *zeer***

Carrots	4 days	20 days
Eggplant	1-2 days	21 days
Guava	2 days	20 days
Meat	1 day	~14 days
Okra	4 days	17 days
Rocket	1 day	5 days
Tomatoes	2 days	20 days

#### **E. Mr. Larry's Zeer pot emergency refrigerator**

##### ***Parts list:***

- 1) 16" terra cotta clay pot, Home Depot, \$19.98.
- 2) stock pot, IMUSA, aluminum, 16 qt covered pot with tempered glass lid, Wal-Mart, \$19.94
- 3) plastic 'cover' Lowes Garden center, \$14.04 (this was an 18" tray that normally sits under a pot)
- 4) bath towel, Wal-Mart, \$2.97
- 5) Quikrete Play sand, #50 lbs, Lowes, \$3.28



(Photos above: (L) My zeer pot. I'm using an aluminum interior pot. It's felt that a thin metal interior pot will cool your perishables faster and maintain a lower temperature than a terra-cotta interior pot. Also shown is a 50 lb bag of sand and a cheap towel that would be wetted and used to cover the pot when in use. The aluminum pot came with a glass top and I bought an 18" plastic flower-pot base which is being used as a cover. (R) My zeer set up along side the house. To a passer-by who happens to see it, the zeer pot looks like a simple planter that's being used as a 'table' for a smaller planter. Meanwhile, my zeer is set up and ready for use. The frig is currently sitting on three bricks, raised a couple of inches off the ground. On my next trip to Lowes or Home Depot, I'll buy a short metal planter stand to set it 6-12 above the ground to increase the opportunity for draft, hence evaporation, across the bottom of the pot.



Photo above: (L) A home-made zeer pot using two nested terra-cotta pots. (R) A native zeer showing a quantity of tomatoes and green string beans being cooled.

The following YouTube video link demonstrates the construction of a zeer pot frig and



goes on to test the temperature drop within the interior pot:

<http://www.youtube.com/watch?v=vcuSlaecvIw&feature=related>

(end of article)

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