PRACTICAL ACTION
Technology challenging poverty

EVAPORATIVE COOLING IN INDIA

stories of change

This case study highlights the work of Karthik Raman in implementing a technology that enables the rural and urban poor to preserve produce for longer periods of time. Widely referred to as the pot-in-pot or zeer, it came to be known as the small fridge or rural fridge in the local community.

Karthik Raman worked with The Women's Organisation for Rural Literacy and Development Society (WORLD) through Indicorps, January 2007. WORLD Society is a non-governmental organisation (NGO) that focuses on the development issues related to local women. Pot-in-pot was promoted in the remote villages of the Naickaneri Hills in Vellore District of Tamil Nadu.

As times have changed, the traditional Naickaneri diet has steadily deteriorated for various reasons. When asked, many villagers felt they were healthier before the drastic changes in dietary pattern. Many fruits and vegetables are sold by the villagers in the town of Ambur. Ambur is also where most vegetables are acquired during the dry season. As many cannot make this trip more than once a week, they are left with no choice but to go without the vital nutrients in fruits and vegetables for four or five days per week for as many as eight months of the year.

Three potential solutions for the food preservation issue facing those of the Naickaneri Hills were considered before opting for the pot-in-pot solution: electric refrigeration, zero energy cool chambers, and the Pot-in-Pot.

Electric refrigerators

In the Naickaneri community, a fridge is not an ideal solution, as people were not be able to make the upfront investment in one. Also, many homes did not have the space or even the access to electricity. Interruptions in access to electricity that last longer than a day occur on a monthly basis, which also makes this solution impractical for the local population.

Zero energy cool chambers

A zero energy cool chamber is an evaporative cooling system used to preserve fruit and vegetables using a double brick walled structure. The gap between the two brick walls is filled with river or lake sand. The sand is saturated with water.
Water must be poured over the sand to ensure that it remains moist. As the water evaporates, it removes the heat from within the chamber through the process of evaporative cooling.
The advantages of the cool chamber are:

- It is relatively inexpensive.
- It can be made from locally available materials.
- Its size can be fitted to the household need.
- It can be easily made and maintained.

The drawbacks are:

- Space is required outside the home for it. Many homes are built close together and this space immediately outside the home would be difficult to find.
- Even at the smallest size, it is probably too large for one family's needs.
- Needs to be watered daily.

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- Depending on the size, it may require a great deal of water. Although the community has reliable access to water, the quantities needed would require additional trips to local wells which could be seen as an undue burden.

While the cool chamber was far more suitable to the community than an electric fridge, many families did not have the space near their home, where meals are prepared, to construct such an object. Also, the size is too large for one family. Therefore, this option was kept as a backup in case the Pot-in-Pot did not prove to be successful.

The pot-in-pot

Similar to the cool chamber, the pot-in-pot relies on evaporative cooling to keep fruits and vegetables fresh for longer periods of time. Instead of a double brick walled structure though, two earthenware pots are used; one needs to be able to fit within the other. Again, the gap between the two is filled with river or lake bed sand and must remain moist.

The advantages of the pot-in-pot are:

- It is relatively inexpensive.
- It can be made from locally available materials.
- It can easily fit within a home.
- It can be easily made and maintained.
- It requires less water than the cool chambers.

The drawbacks are:

- Needs to be watered daily.
- If it needs to be transported, it can easily break.
- Potters may not have large pots readily available, and specially designed pots may be required.

The pot-in-pot has clear advantages over the other two options: it not only fitted the villagers' budgets and lifestyles, but it also fitted into their homes.

Implementation

Pilot technology

The pot-in-pot was piloted at the home of a local NGO staff member. All told, the two pots along with a small lid cost 50 rupees. The head of WORLD Society donated 1 kg of tomatoes for the trial run. The family was told how to water the sand to preserve the internal temperature of the device and it was checked everyday for approximately two weeks.

There were initial difficulties in determining how much water to use in the pot-in-pot. The first two days, the family was not using enough water. The sand was dry to the touch. Starting the third day, the family started pouring too much water in the sand. The inner pot then began to absorb some of the water. As a result, the water then lay at the bottom of the inner pot, creating the possibility that the tomatoes would spoil. The family then used a moderate amount of water but this produced no change in the excess water used by day four, so Karthik added a plastic bag to separate the tomatoes from the excess water. It was difficult to determine the exact amount of the water needed to keep the pot running at the optimum level because humidity, temperature and other climatic conditions affecting the evaporation rate of water so demand kept on changing on a daily basis. In the end, it was not able to determine the exact amount of water needed on a daily basis; instead we relied on the plastic bags to ensure the produce did not spoil from too much water.

The tomatoes lasted and came out unharmed after a total of seven days from being placed in the pot. The family then consumed the tomatoes. Initially the family only used the device to

store tomatoes but after a week, the family started to use it to store different vegetables — even carrots, which are not commonly consumed in this community.

The end of the pilot came during the monsoon festival when so many vegetables were procured by the family that they could not store them in the pot.

Lessons for Other Practitioners

- The rural poor are willing to invest in new technologies for their own benefit; though, it is difficult to determine when and where a subsidy should be offered. In this case, most of the product's price and all the associated transportation costs were not born by the beneficiaries. In hindsight, the subsidy seemed unnecessary.
- I was never able to create a sense of urgency to purchase the pot-in-pots. I have no advice on how to do this, but it would help for the product to gain a critical mass in a given community.
- It is best to think several months ahead when implementing this in a new locale. Several steps are required:

a. A potter needs to be found.
b. The potter needs to experiment with making the pot-in-pot.
c. Interest needs to be generated amongst the intended population.
d. The pots need to be prepared, boiled, and transported.
e. There should be a demonstration of how to set up the pot-in-pot.
f. Significant follow up needs to occur with each home.
4. For the above to occur in an uninterrupted manner, it is best to wait until the monsoon has finished before the production process begins. Initial contacts could be made near the end of the monsoon.

As stated in the introduction, the pot-in-pot is a viable, locally appropriate technology for addressing nutrition issues throughout the world. This statement needs to be taken with some caution, however.

This technology only saw a slow adoption by the community because it was adapted to the community's needs and available resources. Similarly, anyone attempting this in another location must have a comprehensive, grassroots understanding of the local community and how the pot-in-pot would best serve the needs of the community and adopt the pot design and implementation according to the needs.

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Evaporative Cooling Practical Action, Technical Brief
Evaporative Cooling - The Ceramic Refrigerator Practical Action, Technical Brief
Evaporative Cooling - The Clay Refrigerator Practical Action, Technical Brief
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