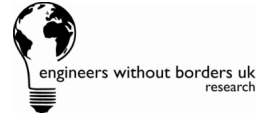


**engINDia & EWB-UK Research**

Project Proposal: Short Term Food Preservation

Full description of Problem:

In Pabal farmers use the weekly local or nearby Pune city markets to sell their produce (i.e. fruit and vegetables). If a farmer has produce remaining, because of low sales or a high yield, he will travel to a larger market. Farmers often find that their produce becomes less saleable because it deteriorates in storage and transit. During the dry season in particular, the temperatures can exceed 45°C leading to fast spoilage. A technique is required to preserve farm crops for up to one week to suit the market timing. The target internal temperature is 20°C; external highs in the 40s are not uncommon, and thus 20-25°C cooling would be necessary. Care must also be paid to the effects of humidity both on the crop being stored and on the system's ability to cool.

How the local community will use the proposed solution:

Farmers would form a cooperative and use the preservation scheme to improve the quality of their market produce. A system would be devised for tending to the preservation of the produce if manual intervention is required.

Estimate of the economic benefit anticipated and plans for training of the local community:

Refrigeration would allow farmers to demand a higher price for their fresher produce and would also limit wastage. The scheme could allow a greater time to harvest arising out the ability to store and sell the crop at a later date.

Currently electrical refrigeration is not economically viable for most farmers. Some larger companies rent refrigerator space to farmers, notably potato producers, though this practise was unavailable in Pabal.

Full description of the local situation:

The Pabal Market occurs every Friday and has in approximately 100 vendors. The goods on sale are predominately locally produced fruit and vegetables.

A lot of locally produced fruit and vegetables also goes to larger markets. For example, Mr. Eknat Pingley, a local tomato and chilli farmer chooses to sell all his produce in Pune. In Pune he gets 10 Rs./kg for his tomatoes as opposed to 5 Rs./kg in Pabal. The journey takes 3 hours by truck. The quality of produce that is demanded in Pune is higher than in Pabal.

To compete and sell his entire crop Mr. Pingley must ensure it is of the highest standard possible. Having a cool storage for his produce after harvest would improve its freshness and quality.

The solution should be low-cost and be implemented with the locally available materials, tools, skills and suit the local crops. It should also have minimal, or preferably no, reliance on electricity. Initially the aim would be to have a community refrigeration scheme for approximately 5 farmers, requiring a space of 10x10x10ft, that is cheap to run and easy to maintain.

The agricultural advisory body in India has designed a refrigeration system that passes water through a sand-filled cavity between two red brick walls. Dr. Vilas Kale, a farmer from Ghodegaon, has modified the design to make it larger and with enough headroom to stand up in it.



Fig. 1 The refrigeration rooms

The walls are made by using standard 9" long red bricks in rectangular formation (see Fig. 2). The wall is 9" thick. By constructing the wall in this manner there is a cavity in the centre of each of the rectangular formations and the offset of each brick row allows a large interconnected space inside the wall. The reason for this kind of brickwork is to increase the perpendicular, horizontal strength allowing a larger internal space. Sand is then poured from the top and fills the entire cavity. Water is intermittently pumped to the top and allowed to run through the sand. The walls are not plastered in order to maintain the wall's porosity. The wall extends 2 feet below ground level with the same brickwork design to act as foundation.

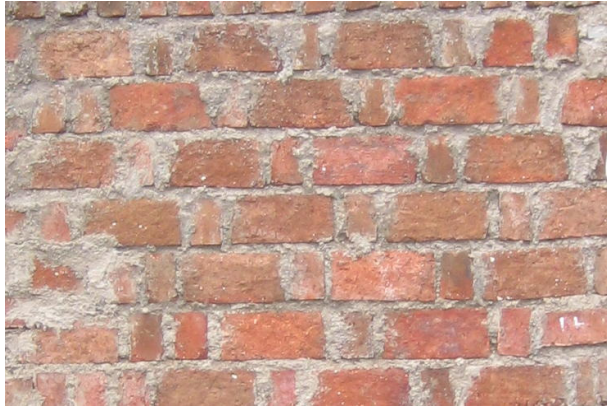


Fig. 2 Brick layout

A sloped metal corrugated roof tops the structure. In summer a polythene mesh is placed over the metal to reduce the effect of the sun's heat on the temperature of the room.

The system seems to operate by direct heat transfer and may also use evaporative cooling. Dr. Kale has found that his cold store achieves a temperature gradient of 6-8°C. Although the system works it seems very wasteful of water in a drought-prone area, making it unsuitable for the Pabal region.

Full description of relevant infrastructure and resources available locally:

Vigyan Ashram, an NGO operating just outside Pabal, will act as a test centre for any worthwhile solutions.

The engINDia Final Report contains relevant information including building materials available.

Useful background reading or resources:

See engINDia Website: <http://www.engindia.net/resources.htm>

Organisation Contact Details:

Name of Organisation	engINDia
Contact	engindia@mit.edu
Web site	www.engindia.net

Background information	<p>engINdia exists to promote appropriate and sustainable engineering solutions in developing areas. Currently the program focuses on Pabal, Maharashtra, a rural village in India located 80 miles east of Mumbai. Pabal is home to Vigyan Ashram (see details below), an educational institution that focuses on rural technologies. The existence of Vigyan Ashram and Pabal's proximity to Mumbai made it the perfect starting point for engINdia.</p> <p>engINdia is a partnership between 6 students from the University of Cambridge, Massachusetts Institute of Technology (MIT) and the Indian Institute of Technology Bombay (IITB). An expedition was conducted during the summer of 2005 to the area of Pabal, Maharastra. There, the engINdia team worked with Vigyan Ashram and the local community to gain an understanding and appreciation of the development issues faced by rural India which could be tackled through engineering.</p>
Name of Organisation	Vigyan Ashram
Web site	http://vigyanashram.com/
Background information	<p>Vigyan Ashram is an educational institution situated just outside Pabal, Maharashtra, about five hours east of Mumbai. The focus of the institution is on rural education and enabling the rural population of Pabal and the surrounding areas to learn about technology and start their own businesses. The facility includes classrooms, labs, workshops, and living quarters for students. There is also a Fab Lab installed at the site (for more information, see http://fab.cba.mit.edu/). VA is striving to become an internet service provider for the area and to that end many of the organization's activities are becoming focused on internet-related projects, such as internet kiosks for rural farmers. A few people at VA speak English, but some knowledge of Marathi or an interpreter will be needed in order to carry out work in the area.</p>