

Abstract

A team of two engineers travelled to Mysore, India arriving in the early summer of 2016 and staying for ten weeks. The engineers partnered with The Organization for the Development of the People (ODP), a local non-governmental organization to develop a technology that would improve the livelihoods of the ODP's target population. After researching the needs of the population as well as holding meetings with the leadership of ODP the engineers decided to create a passive solar dryer capable of drying and thus preserving a variety of fruits and vegetables. The technology was designed to be accessible to a small rural farmer, as fluctuations in crop prices, especially those of banana, have forced many farmers into debt. The dryer would allow the farmers to still profit off of their crops even when the market price is low or in situations where they are unable to get it to market. Using local materials, a prototype dryer was constructed by the engineers and preliminary testing was completed.

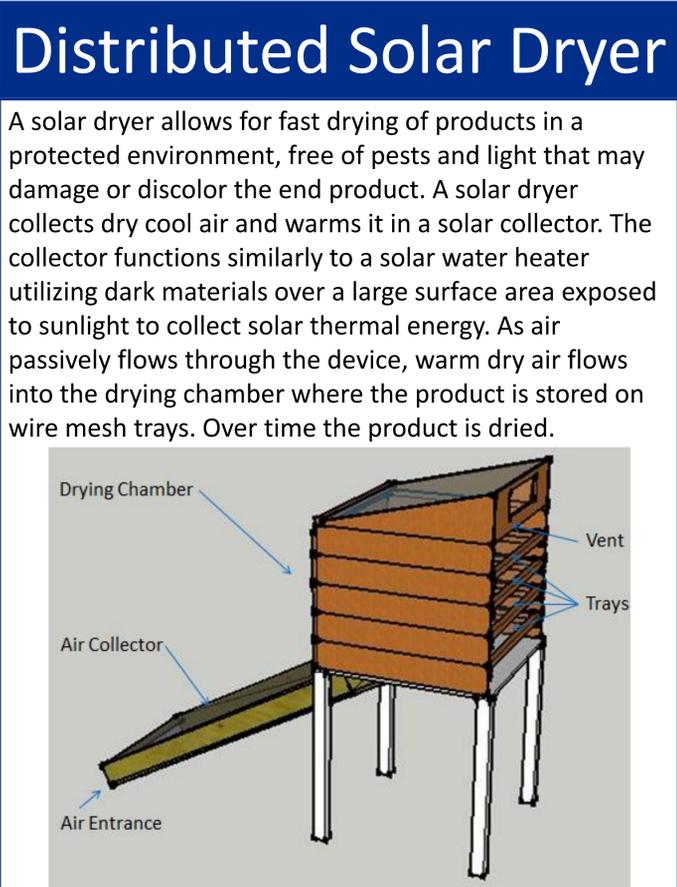


Figure 1: Computer model of initial design.

- HOW IT WORKS:
- Air flows in through the bottom at the collector.
 - As sunlight hits the black surface of the inside of the collector the air inside warms and rises to the top of the collector and enters the drying chamber.
 - As the temperature of the air increases so does its capacity to hold moisture, this moisture hungry air absorbs moisture from the fruit or produce being dried.
 - As the air is continually heated in the solar collector the density of this air decreases causing it to rise. The constant flow of rising air pushes the moist saturated air out of the drying chamber, creating a continuous process that dries the produce over time.

Results & Discussion

The engineers were able to complete construction of the dryer using recycled and locally sourced materials. The cost of the dryer amounted to approximately 60,000 INR (\$100) which is well over the target cost of 30,000 INR (\$50). Although extensive testing was not able to be completed on the dryer due to time and material constraints, the engineers were able to complete preliminary testing to qualitatively measure the dryers performance. Slices of banana at approximately 1 cm thick were able to be dried to a leathery texture over a two day period. The final product was of a higher moisture content and a lower aesthetic quality than that of those dried industrially, however with design modifications the engineers are confident that a similar moisture content and equal aesthetic quality can be achieved.



Figure 2: Demonstration of the dryer to ODP staff.



Figure 3: Banana slices after 2 days drying.

- ### Recommendations
- Aluminum is very expensive in India and proved to be an inappropriate building material. A better insulating material is recommended for the drying chamber in order to maintain high temperatures when the sun is obscured by clouds.
 - The engineers also recommend using a robust metal frame for the dryer to increase lifespan and decrease weight. Wheels may also be added to enhance portability and ease of use.
 - The testing completed by the engineers was completed during the month of July, which is in the middle of monsoon season. The season is marked by heavy rains, lower temperatures, and high humidity. These conditions are very undesirable for drying and further testing should be completed in the dry season.
 - The engineers designed the dryer to be easy to use and store, however user level testing was not completed. Interviews and demonstrations of the dryer design to potential users in the rural community need to be completed before further steps are taken with the project.



Figure 4: The ETHOS Team

Introduction

The Organization for the Development (ODP) is part of the Diocesan Social Service Society (DSSS) for Mysore. Their mission is to strive for human development of those who are socially and economically disadvantaged, the underprivileged and the marginalized sections of society, most notably women and small farmers. ODP has always worked towards bringing about positive changes in society by changing peoples unhealthy attitudes and inappropriate social values. They encourage not only the development of individuals, but of communities as well. We worked under their sustainable agriculture and natural resource management sectors to develop technology for small farmers.

Acknowledgements

Thank you to the Organization for the Development of People (ODP) and their staff for hosting us and facilitating our project! We hope this partnership remains strong and consistent for years to come! Thank you also to the ETHOS Center for making this possible and all of their help and support throughout this experience.