Testing solar dryers in Mozambique

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A large amount of people in Mozambique suffers a shortage of food. Our project investigates solar drying of fruit to help mitigate this problem. Drying food is one of the oldest methods of preservation. Making sure the dried food is edible from a food safety perspective is the most important part. The climate in Mozambique is characterized by large amount of solar energy. Since 80% of the population does not have access to electricity made the use of solar dryers very interesting, the combination of these factors made Mozambique look like a good country to test our dryer designs. Our focus in this study was the technical aspects of the solar dryers while also keeping in mind the social acceptance by the farmers. The drying was done with two different types of dryers: one leaning and one horizontal. The leaning dryer is completely passive, which means it is only powered by sunlight while the horizontal is active which means it has fans that are powered by a photovoltaic-cell.

Photo curtesy of Lars-Henrik Ståhl

The goal set at the beginning of the study was that the dryers should be able to dry the bags in two to three days. The tests done in Mozambique shows that the dryers decrease the time required for the juice to become jam. The fastest drying time that was reached was two and a half days. This is considered a success for the project. The temperature was higher and relative humidity was lower inside the dryers than the outside air which is better for drying the juice and also safer. During the period when we were doing the tests in Mozambique citrus fruits, such as tangerines and oranges, were ripening. That made the focus of the tests on drying citrus fruit juice and drying it into jam, although it is possible to dry other types of fruit with the dryers.

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The first step of the study was to build and test the two designs in a laboratory in Lund with a lamp that could simulate sunlight at around noon in Mozambique. After the designs were tested in Lund they

were rebuilt with locally sourced materials in Mozambique and tested there under real life conditions. In the laboratory in Lund there was no wind or clouds and the lamp was stationary while the sun moved across the sky, outside in Mozambique. The temperature inside the laboratory was more or less constant during the tests that we did. Because of the lack of wind and movement of the lamp this made it necessary to test the dryer outside.

The last part of the project was the user friendliness test, that was conducted in rural Mozambique with the local farmers. During this part of the study we got confirmation on some of the thoughts we have had during the tests in Lund and Mozambique. For example, the plastic sheet that was chosen for the dryers was not very user friendly.

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When comparing the two dryers there are a number of things that need to be considered. First of all, the active dryer is a lot more expensive than the passive one, it costs about two and a half times as much. The second consideration is the difference in drying speed between the two dryers during the dry season might not justify this extra cost and complexity. Thirdly, the dryers were tested during the dry season when the sun will be at its lowest. The difference between the dryers might justify this extra cost during the wet season when the sun will be higher in the sky and thereby justify the extra cost when taking the whole year into account when comparing the dryers.

The research project will continue to work on the project based on our results from this study and improve the designs further. The researchers in the project will also choose a final design to give to the farmers in rural Mozambique. Our part in the research project was a success. We managed to get two different designs that both dried the fruit juice in almost half the time compared to open air drying. This will potentially mean an increase in the production of jam because of a number of factors among them the decrease in drying time will increase the safety of the jam and the possibility to use more of the available fruit.