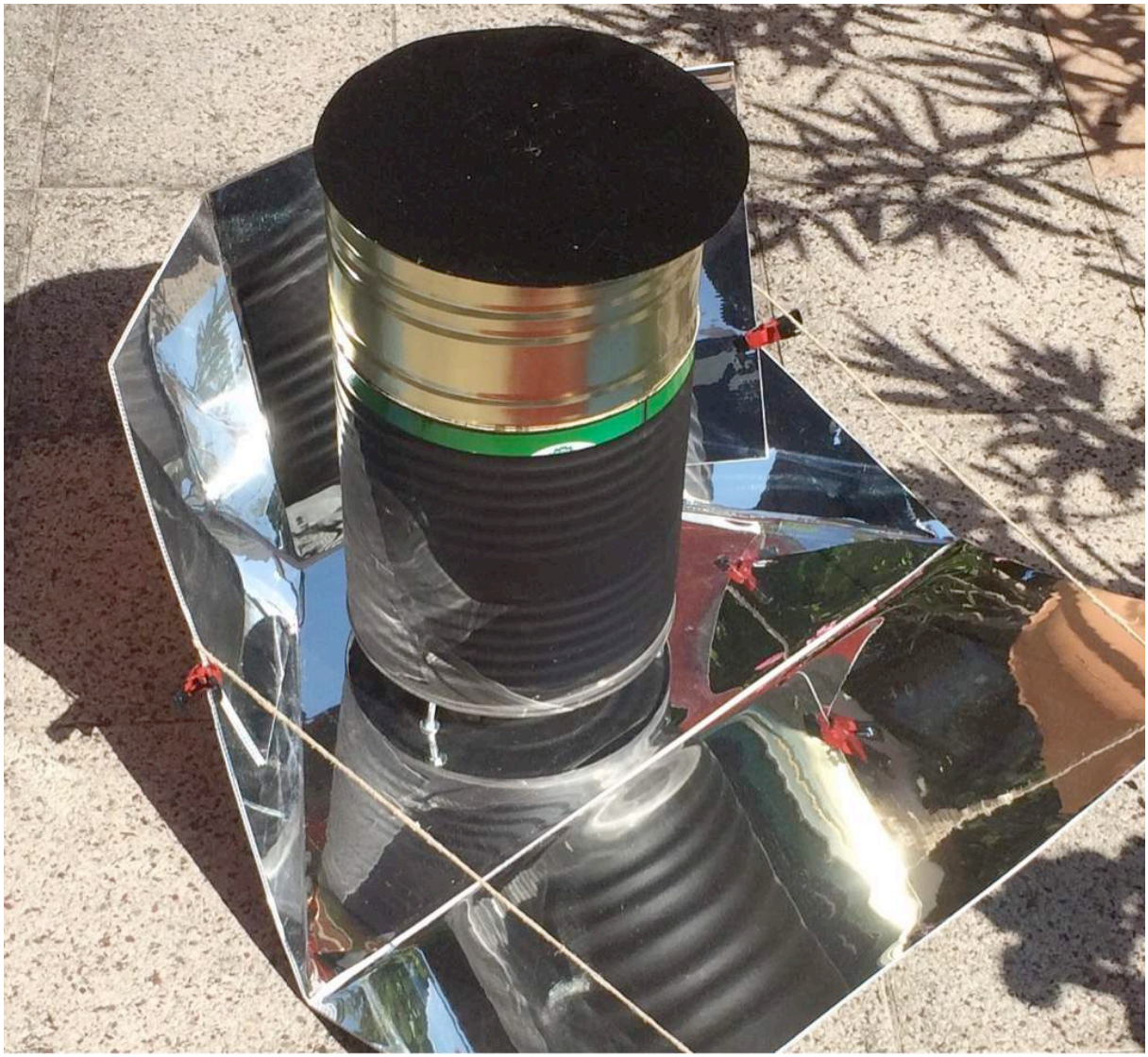
Bernhard S. Müller's cylindrical

Solar Dryer for Panel Cookers



Title photo: The reflections show that the food dryer is elevated by 3 screws to allow additional solar radiation to hit the heating compartment from underneath. The front panel of the solar cooker DIN-A-saur is attached with some cord to the rear panels. When the rear panels are tilted backwards the front panel is lifted by the cords.

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About half of the produced food is never eaten. This is due to various reasons: over-production, rodents, financial speculations, subsidies, corruption, transport, spoilage and storage damages, etc. By drying the food it is made non-perishable and can be sold or used whenever there is a demand.

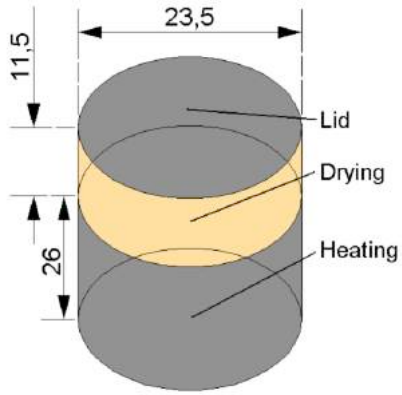
For thousands of years food has been dried to preserve it. In your kitchen you are likely to already use many items which are solar dried: salt, pepper and other spices, herbs, coffee, raisins, maize, rice, etc.

Solar drying is connected to many issues and has many benefits, such as clean indoor air, the empowerment of women, the development of small farms and businesses, and the elimination of child labour. It safes energy, reduces deforestation, and can form part of cross-curricular education. **Drying is probably the most important solar thermal food processing method.**

This cylindrical solar dryer is designed for family-size applications by using solar panel cookers. The following cookers were tested satisfactorily without any modifications:
LightOven, Copenhagen, CooKit, Rollins, Diamond, ESPaC and DIN-A-saur.
Best results and smooth operation were obtained with the "LightOven III" of Hartmut Ehmler, Germany and the "Diamond" of Andreas Fausolides, Cyprus.

Those solar cookers designed for specific latitudes only, are not considered in this paper.

There are two requirements for drying: warmed air and a draught. The air inside is heated by radiation from the absorber (a black metal cylinder) where it expands. As the warm air is less dense, it rises and the relative air humidity *(RH)* decreases. The warm and dry air flows over the food, carrying away moisture. In the process, energy is dissipated and the air becomes cooler and more humid again. For this reason the area of mesh or net where the food is dried should be of the same total surface area as the absorber.



Sketch 1: The dimensions are in cm, the sketch shows the entire system.

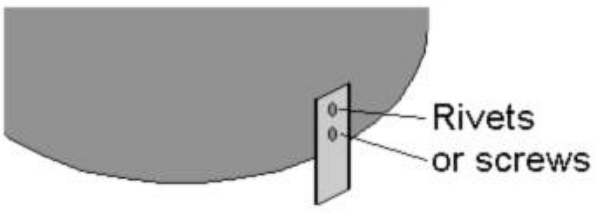
The cylindrical food containers shown here were catering size cans which contained cucumbers. Any other can of this size will be just as good. To enable you to make your own (or find a tinsmith to do it) you need two cans, with dimensions as follows:

- Heating compartment: Height: 26 cm, Diameter: 23.5 cm, Circumference: 74 cm.
- Drying compartment: Height: 11.5 cm, Diameter: 23.5 cm, Circumference: 74 cm.
- Lid: Diameter: 23.5 cm, Circumference: 74 cm.

The total absorptive area of the heating compartment is 0.23 m^2 (bottom and side). This means that the maximum total combined area of all the net/mesh trays can be up to 0.23 m^2 - it should not exceed the external area of the heating compartment. Therefore the dryer can have a maximum of 5 layers of drying trays.

The heating compartment and the lid must be painted black on the outside to absorb the sunlight and transform it into heat. The metal radiates this heat (infrared radiation), creating a draught of dry and warm air in the space inside.

The bottom of the food dryer must be elevated to gain additional energy by reflecting sunlight to the base. The example shows 3 screws with a length of 6 cm, mounted on the bottom of the food dryer. Another option is to mount 3 to 5 bars on the outside of the heating compartment can at the bottom to obtain the same results.



Sketch 2 (right) shows how to attach the support bars to the body of the dryer.

Photo 2: The dryer from underneath. The picture shows one of the support screws and the centred mosquito mesh.

Photo 2 shows the base with one of the screws which are used to support and elevate the dryer. Cut a square hole of about 5 by 5 cm in the centre of the bottom and fix a sturdy mosquito mesh of aluminium or steel there. This will stop insects getting into the dryer. Fix the mesh by beading or riveting.

Photo 3: the original cans (right) compared to the finished one on the left.

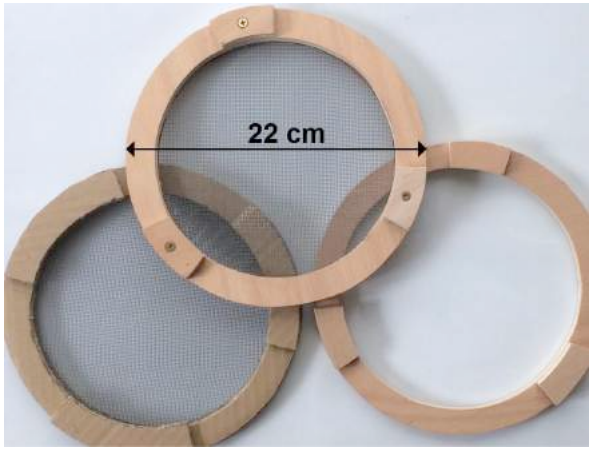


Photo 4: Three trays, the left one made of cardboard, the other ones of plywood. The right tray is still without mosquito mesh.

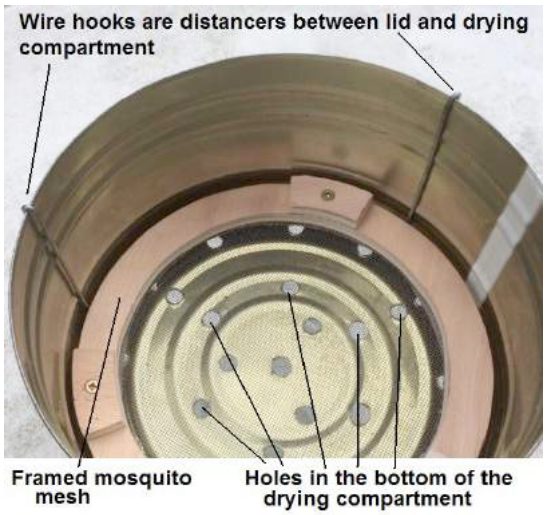
The trays (maximum 5) have a diameter of 22 cm. They can be made of cardboard, wood or anything you like. Add spacers because the fruit slices will not remain flat during the drying process. The mesh can be of anything you can obtain, but not of stainless steel, which can corrode quickly due to the acidity of most vegetables and fruits.

However, please keep in mind that only food-save materials can be used inside the solar food dryer system.

Note: some of the photos show differently constructed trays. You are encouraged to design them the most convenient way and to share your experience with the author.

When preparing the second can for the drying compartment, drill plenty of holes all over the bottom of the can to let in air jets and allow the circulation of the warmed air for drying. Put three hooks, preferably made of coat hangers, over the rim to give some space for the air to escape. Put a black lid on top to gain additional infrared radiation from the top (see title photo). Keep the original lid of the food tin for this purpose.

Photo 5 (right): View into the drying compartment from top. One empty tray with mosquito mesh is inserted.



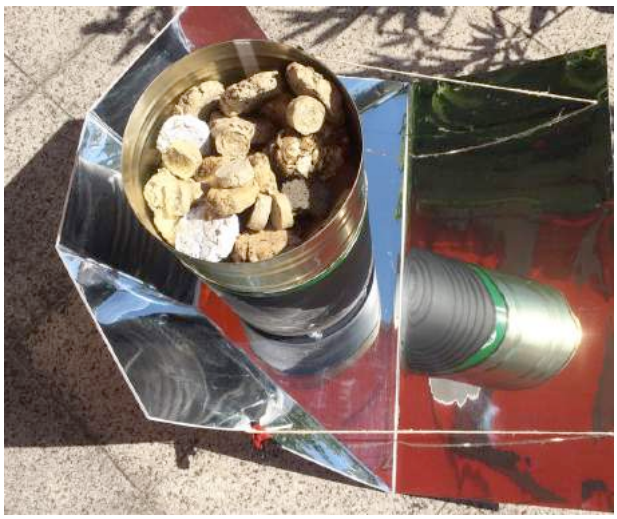


Photo 6 (left): This unit can also be used to dry other materials; in this case briquettes.

Photo 7 (right): The dryer for solar panel cookers is mainly designed as a food processing unit for fruits and vegetables.

This information has been compiled 2016 according to the "Faro Declaration of Intent", to serve multiplicators and grass-roots workers in the field of poverty-oriented energy solutions by Bernhard S. Müller, Eschborn, Germany, member of the Organisations Lernen-Helfen-Leben, Natural Resources and Waste Management Alliance, EG-Solar, SCI Association, ISES and the CONSOLFOOD organising committee.