



Construction manual tunnel solar food dryer



Notice

These instructions show how a solar tunnel dryer *is built*. The information how to use it can be found in the document «Experiment Prepare dried snacks with the sun».

Solar drying is the oldest food conservation method ever. Many centuries ago, our ancestors found out that they can keep a fish or a fruit for a longer period of time if they let it dry in the sun. It is still a useful and widely used method today. Let's try to make our own healthy snacks for the next hike or camping trip by drying fruit in a simple solar food dryer!



Safety note

Be cautious when handling sharp objects and tools. Electric tools should only be used by adults or adolescents under adult supervision.



Material

You will need the following materials for the construction:

- Plywood¹, 9mm thick², 1.22m x 0.82m (one third of a sheet of 1.22m x 2.44m)
- A large piece of transparent (or white) greenhouse plastic film (about 1.2m x 1.2m)
- Mosquito net (about 0.7m x 0.3m)
- Wooden lath of 15mm x 15mm, total length 4.3m (3 bits of 1.2m, 3 bits of 32cm)
- Food-save³ fine mesh/net (nylon, silicon, cotton, etc.), mesh size of 2-5mm, 2 bits of 0.6m x 0.7m
- Nylon string or thin stainless steel wire (28 m)
- A desktop computer fan (12V)
- A solar panel of 24 cells in series (12V, about 300mA) *or*
- A transformer producing 12V DC current
- 'Non smelly' black acrylic paint
- Screws
- White glue



Tools

For the construction, you will need the following tools:

- Jigsaw
- Drill

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- 1 If you want to replace the plywood by a sheet of another material, choose one that does not emit any gases (i.e. does not smell) and that is reasonably resistant to humidity.
 - 2 You can use thinner plywood (6mm) if you add a wooden lath inside all the angles where two sheets join. In this case, you will need another 3.6m of lath.
 - 3 Choose a certified «food grade» mesh (silicon or stainless steel), if you can find one. Else choose a mesh made of a material which is not «smelly» and wash it well before its first use. This can be cotton, nylon or stainless steel. Do not use any other metal mesh than one made of stainless steel.

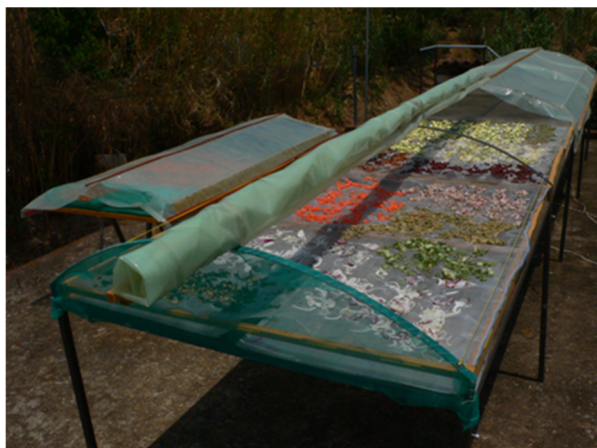
- Drills
- File
- Screw driver
- Sand paper
- Paint brush
- Scissors
- Stapler/staple gun
- Insulating tape



Step by step instruction

Remark: This model is a reduced size model of commercial dryers of sizes up to 18m x 2m. The large models have been installed worldwide for more than 30 years now.

The dimensions in these construction plans were chosen to make the best use of one third of a standard plywood sheet of 1.22m x 2.44m size, i.e to make 3 dryers with one sheet. You might adapt the plans to the plywood sizes available in your country OR make a larger unit OR even use an old wooden table as base and adapt all other measurements to the size of the table.



A 5m x 1,2m model filled with vegetables
(Plastic film is open for the picture).



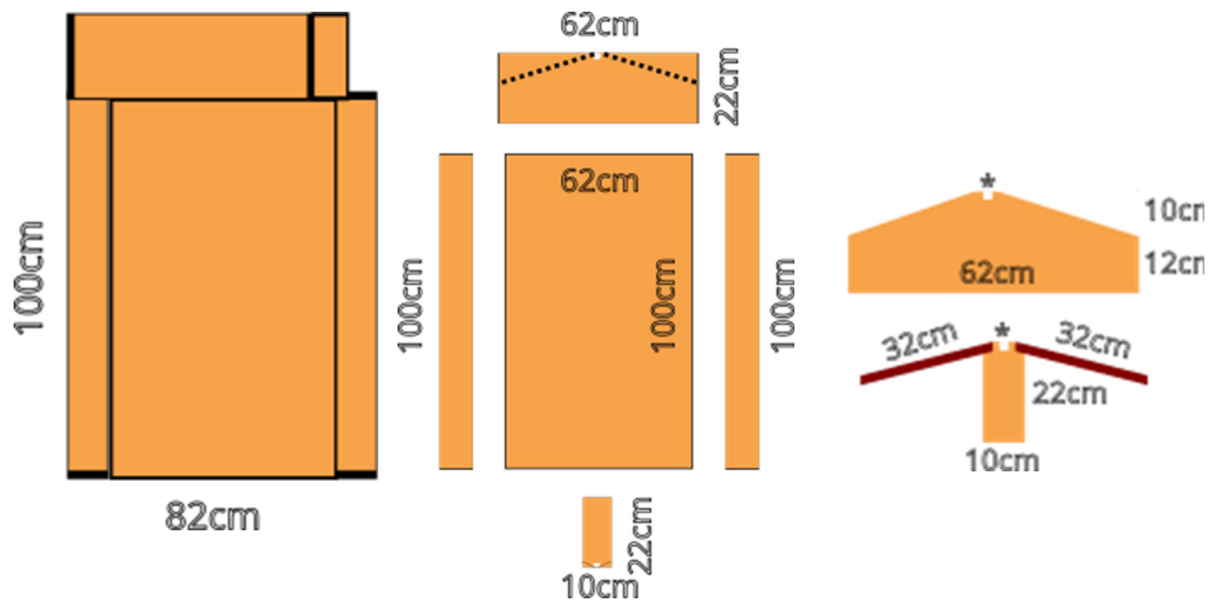
A 2m x 1m model.

Step 1: Cut the plywood parts

Prepare the «tunnel» of the dryer by cutting the plywood parts: base, two sides, one end plate. Cut a circular hole in the end plate of the diameter of your fan and cut it to the shape shown below. Attach the sides to the base (white glue and screws). Attach the end plate to one end of the 'U' formed by the base and the two sides (white glue and screws).

Cut all laths to their corresponding length. Make a frame for the mosquito net at the other end of the dryer using the narrow end part (10 x 22 cm) and two bits of lath of 32cm length each. See the third drawing below and the picture in step 3 for details.

Both ends also carry the upper wooden lath which forms the 'gable' of the transparent «roof» (greenhouse plastic film).



Plywood parts (cutting layout).

Plywood parts as they will be assembled .

Details of the plywood end parts. Cut out a square (slightly larger than the lath size) in the centre of the top end – marked by a *. The ‘gable’ will fit in this square later. The darker parts are bits of lath.

Step 2: Paint it black

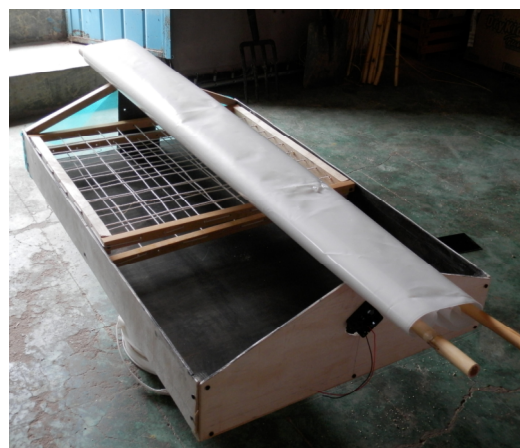
Paint the inside of the ‘tunnel’ using a non-smelly black paint (typically an acrylic paint as is also used in schools).

Step 3: Attach the mosquito net

Install the mosquito net at one end of the tunnel. You can attach it using staples, nails, etc. Screw the fan to the outside of the other end, in a way that it blows the air towards the inside.



The frame to which the mosquito net is attached and which carries the ‘gable’ of the dryer.



The end plate with the hole for the fan. The fan is attached by screws on the outside.

Step 4: Prepare the protective cover

Cut the greenhouse plastic film to a size that it covers the complete solar dryer. Attach a wooden lath on both long ends of the plastic as a weight (using staples), to hold the plastic in place.



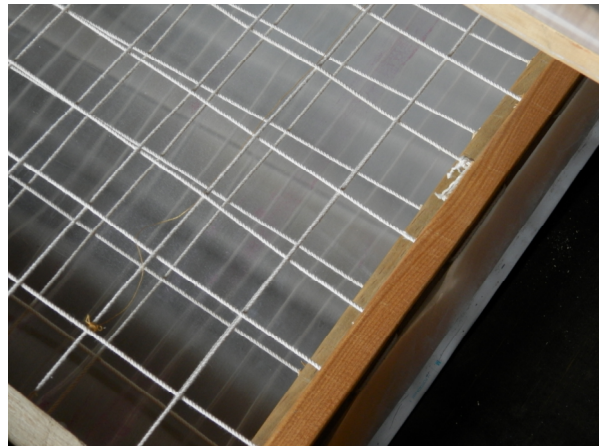
The greenhouse plastic film with a wooden lath as «gable» and two at the sides as weight.

Step 5: Build the frame for the food

Prepare a frame of the size of a little more than one half of the inner area (up to 60%). Drill holes in the frame every 5 cm on all sides. Weave a coarse net out of nylon string – or better: very thin stainless steel wire. Cut a rectangle of the food-safe fine mesh/net you chose.



The wooden frame will hold the coarse net.



Weave a coarse net of nylon string or thin stainless steel wire.

When in use, the frame is placed in the second half of the dryer, towards the air outlet (away from the fan). It will be covered with the rectangle of food grade mesh. In order to make it easier for cleaning, do not attach this fine mesh/net, but just place it on top of the coarse net. Place the fruit on top of the fine mesh/net. Connect the fan to the solar panel or the 12V DC transformer.



The dryer is ready to use: A fine mesh/net covers the coarse net; the fan on the left side blows air into the dryer which is heated in the first 40% of its way.

Bits of banana are spread out on the fine mesh/net.

Maintenance

The solar dryer suffers more from rain and storms than from heat and sunlight. The outside of the wood might be painted or treated with some protective oil as protection against humidity. Better store the dryer in a rainproof place during rainy season, when storms are announced or if it is not to be used for some time.

Clean stains of juice from the fruit (inside) with a wet cloth and remove small bits of dried food using a small brush.



Practical information

Time needed

2 to 5 hours for making a dryer, 1/2 hour for preparing the fruit, 1 to 3 sunny days to dry the fruit

Age range

Constructing the dryer: 11 and above, using the dryer: 7 and above

Useful links

Inspiration for the tunnel dryer: https://innotech-ing.com/site/en/tunnel_dryer.php

The manual **how to use it** can be found in the document *«Experiment Prepare dried snacks with the sun»*.