

PART 1 – TWO PROJECTS OF POWERFULL PANEL SOLAR COOKERS – DIY



Project 1: Jumbo Fun Panel – from Celestino Ruivo – Portugal – bigger size

*Modelo funil- “faça você mesmo”*

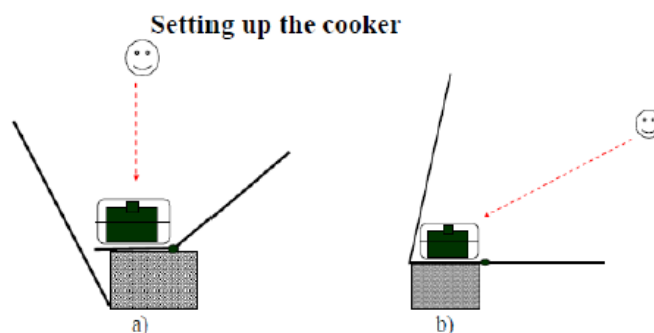
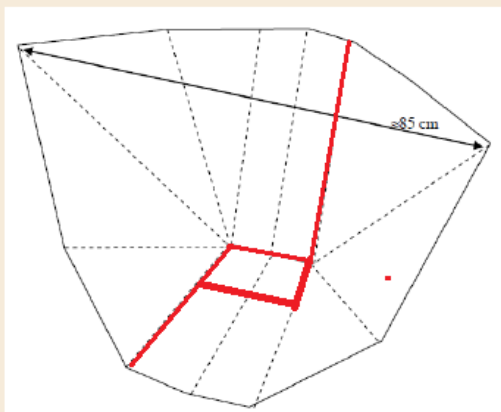
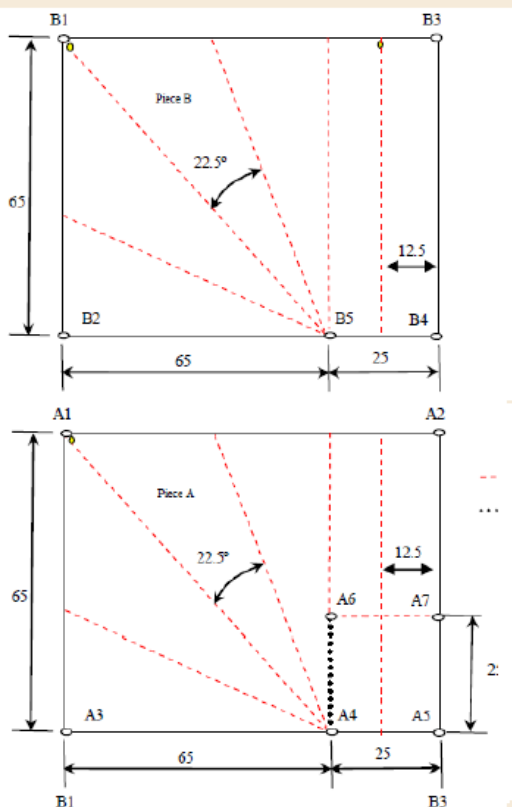
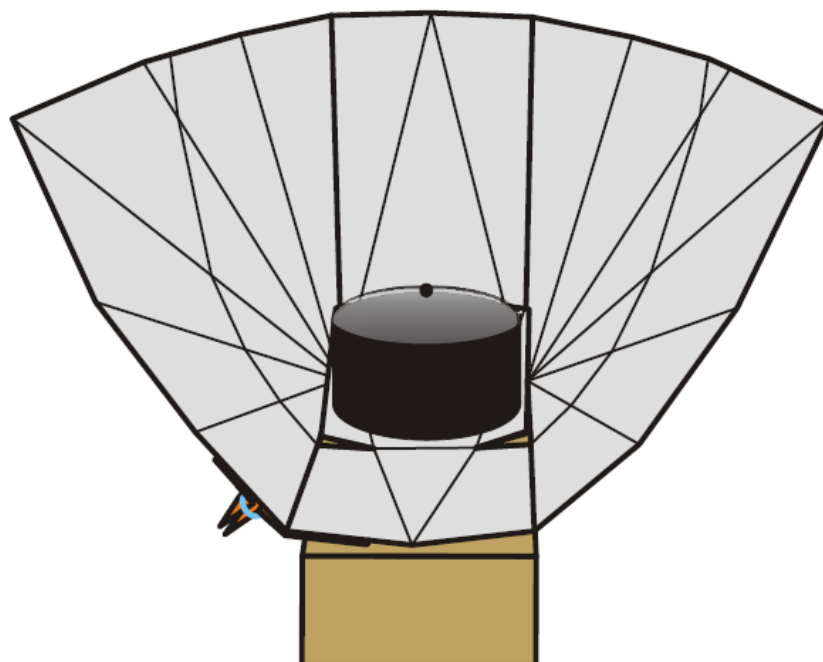
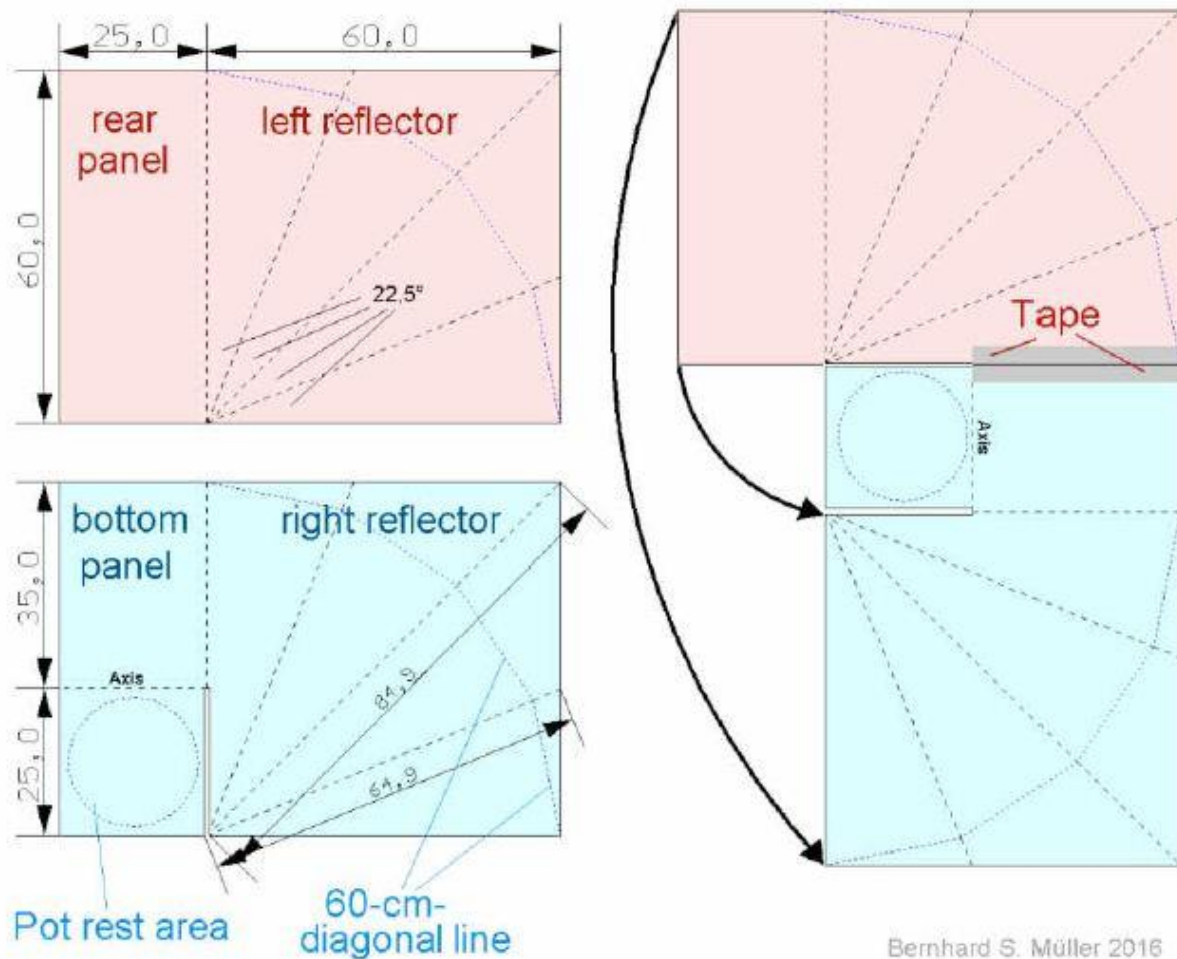


Fig. 1 Cooking with: a) high sun angle; and b) low sun angle

## Project 2: Jumbo Fun Panel – Bernhard Müller from Germany – smaller size

### The materials you need to build a funnel cooker are:

- 2 cardboard or polypropylene (PP) sheets of 85 cm x 60 cm
- 2 reflective sheets of the same size, like aluminium, Mylar, S-Reflect or similar
- 95 cm of rigid textile reinforced tape to connect both halves
- glue (or double-sided adhesive tape) to stick the reflective sheets onto the cardboard or PP.



## Material needed to make solar cookers:

Cardboard – from waste – used cardboard box



Reflexive material: can be:

- 1- Aluminum foil – available in supermarkets, stores... OR



- 2- Plastic metalized gifts bags – available in school material stores



Glue – white PVA glue (used in school). Can be homemade also with flour and water. Also double sided tape (better results).



## Details of how to make a panel solar cooker – First... The easier way...

The following pages are photos and the sequence of steps taken during the construction of my Sun-Funnel cooker



Obtain two pieces of cardboard from a used cardboard box. Cut them to the dimensions specified in the plan.



Glue aluminum foil on the two pieces of cardboard. First lay the foil on a clean flat surface, then spread the glue on the foil. Align and lower the cardboard on the glued foil. Press down to make foil stick to cardboard. Trim off any excess foil around the edges of the cardboard.





Draw the fold lines on the two pieces of cardboard and crease the fold lines with a straight edge. I use a small piece of metal angle to press down on the fold lines to make sharp and deep creases.



This photo shows the properly creased cardboard. Deep and sharp crease lines produce much better and cleaner folds.



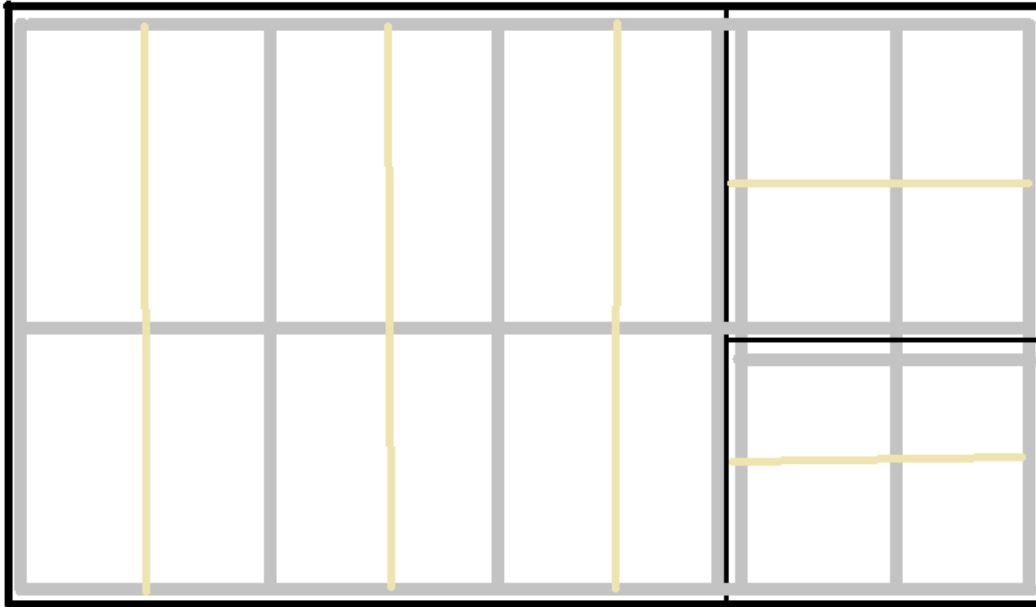




**Now, an important tip:**

**If you want a better result, don't glue! Use double sided tape, and a little of glue vertical lines (not spread)**

### **Side of panel solar cooker**



- Double sided tape
- PVA glue line



**Panel Solar cooker made with double sided tape... see the difference!!! Good Luck!!!**



**SOLAR COOKERS – EASY PROJECTS FOR POOR COMUNITYS – Prof. Elmo Dutra Filho**

**PART 2: BLACK PANS AND GREENHOUSE EFFECT – TO MAKE PANEL SOLAR COOKING POSSIBLE AND MORE POWERFULL! VERY IMPORTANT TO BE MORE EFFICIENT!**

**1 – BLACK PANS – ABSORBS HEAT BETTER. NEVER USE COMMON ALUMINUM POTS!  
Aluminum pans can be outside black painted! It's easy and cheap to paint it black outside!**



**It's easy and cheap to paint black outside common aluminum pans. It's necessary!**

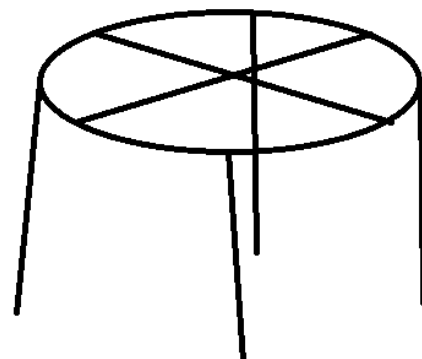


**2 – GREENHOUSE EFFECT – IMPORTANT TO RETAIN HEAT – IMPROVE EFFICIENCY.**

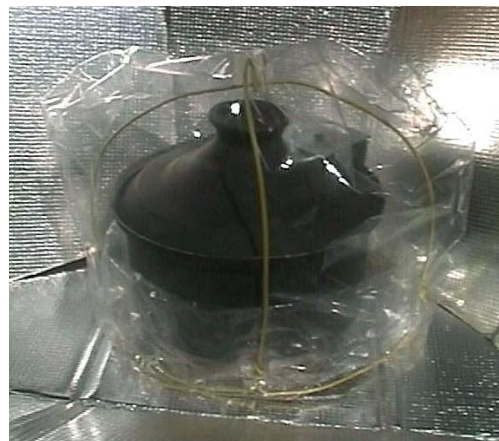
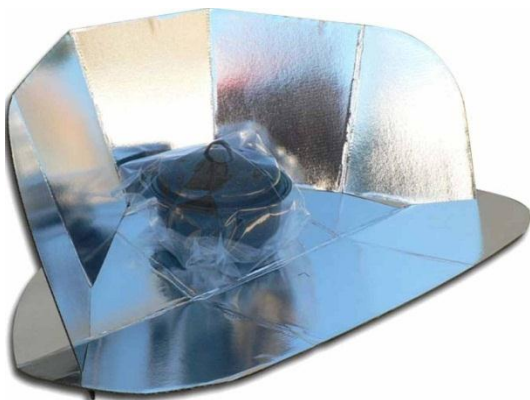
**Better to use glass bowls, retains heat better.**



**It is possible also to use plastic turkey bag – the plastic bag can't touch the pan! Use wire stand**



**Armação de arame rígido para saco de retenção de calor de fogão solar de painel**





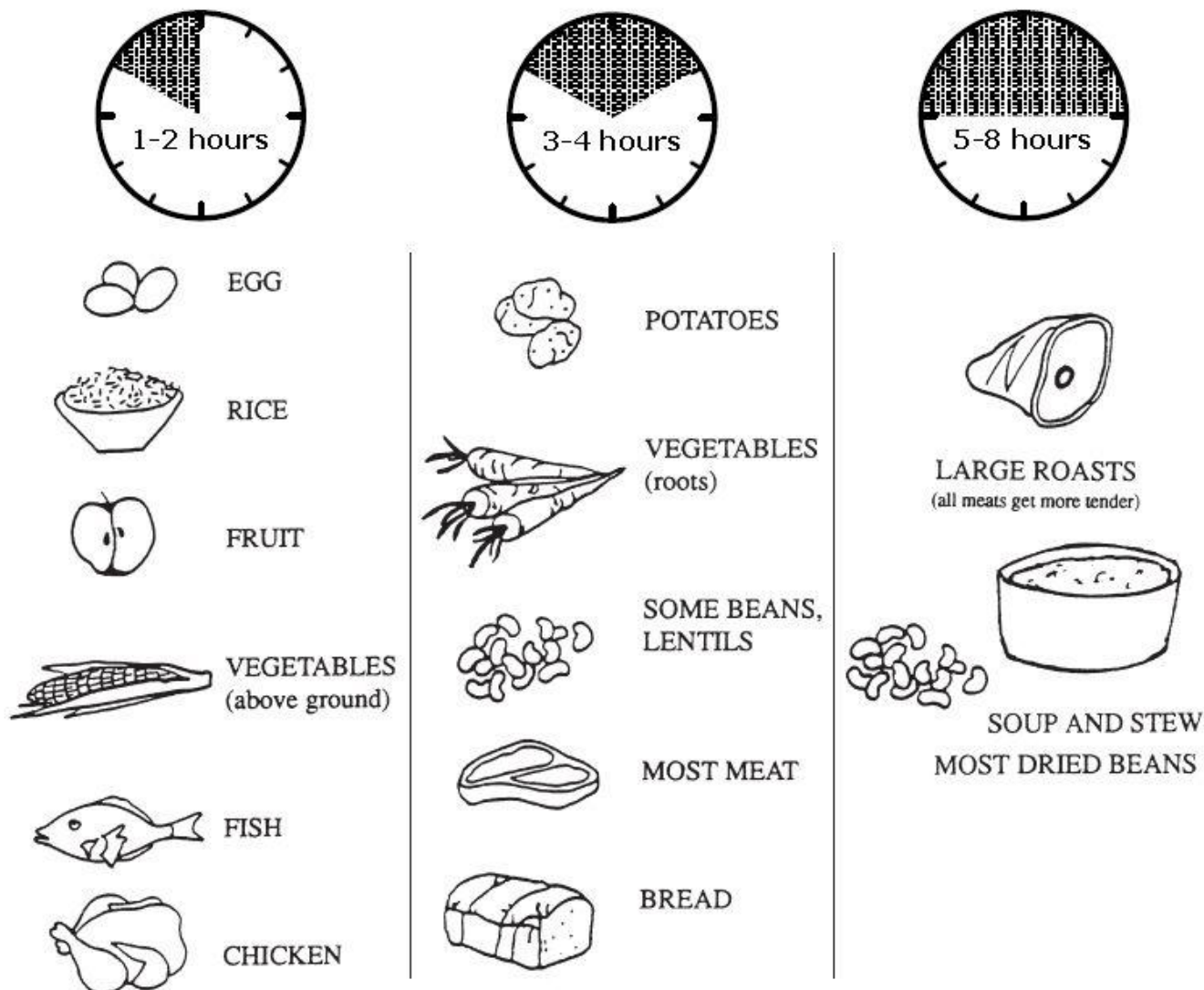




**PART 3: HOW TO COOK EASILY WITH THE SUN IN PANEL SOLAR COOKERS**

**Table of cooking times to panel solar cookers – simple reference times**

Here are some typical cooking times for 4 pounds (2 kilograms) of food on a sunny day:



**White Rice** – one part of rice and one part of water, salt. Use black pan and greenhouse effect. Time: more or less one hour. It depends in greenhouse effect. Plastic bags need a little bit more.

**Brest Chicken**, in slices, 700 g. One hour is sufficient. Can put together onions, cut in half. It depends in greenhouse effect. Plastic bags need a little bit more.

**Chicken**, half part, 1,5 Kg: Two or three hours. It depends in greenhouse effect. Plastic bags need a little bit more.

**Beans 250g**: four or five hours cooking. It depends in greenhouse effect. Plastic bags need a little bit more.

**Breads and Cakes**: usually one hour. It depends in greenhouse effect. Plastic bags need a little bit more.

**Vegetables: add no water. Suggestion time: one hour. It depends in greenhouse effect. Plastic bags need a little bit more.**

## **Guidelines and cooking tips – taken from Solar Cooking wikia.com**

**COOKED DRIED CEREALS AND GRAINS** - (barley, corn, millet, oats, quinoa, rice, wheat) : 2 hours. Start with usual amount of water. Next time adjust to your taste. If your sky conditions are less than ideal, you may have better luck if you preheat the water and grain separately, as suggested for pasta. This is especially helpful if the grain is either very slow to tenderize (brown rice, hulled but not pearled barley) or gets mushy easily (quinoa, millet). To learn about using barely-sprouted grains and beans, which take to sun cooking very well,

**VEGETABLES** - Add no water. Artichokes: 2 1/2 hours; Asparagus: 1 1/2 - 2 hours; Other fresh green vegetables: 1-1 1/2 hours. If cooked longer they will taste fine but lose their nice green color. Beans - dried: 3-5 hours. Usual amount of water, can be soaked ahead of time; Beets, Carrots, Potatoes and other root vegetables: 3 hours. Cabbage, eggplant: 1 1/2 hours if cut up. Eggplant turns brownish, like a cut apple, but the flavor is good; Corn on the cob: 1 - 1 1/2 hours. The corn kernels will fade slightly if left longer in direct sunlight. The husk will hold the moisture in and protect the kernels naturally. A clean black sock can be put over an ear of corn to help absorb heat for faster cooking time. Squash, zucchini: 1 hour. Will turn mushy if left longer.

**EGGS** - Add no water. Two hours for hard yolks. If cooked longer the whites turn brownish, but the flavor is the same.

**MEATS** - Add no water. If cooked longer they just get more tender. Fish: 1-2 hours; Chicken: 2 hours cut up, 3 hours whole; Beef, pork, etc.: 2 hours cut up, 3 - 5 hours for large pieces; Turkey, large, whole: all day

**PASTA** - Heat water in one pot and put dry pasta with a small amount of cooking oil in another pot, and heat until water is near boiling. Add hot pasta to hot water, stir, and cook about 10 minutes more.

**BAKING** - is best done in the middle of the day (9 or 10 am - 2 or 3 pm) Breads: Whole loaves - 3 hours; Cakes: 1 1/2 hours; Cookies: 1 - 1 1/2 hours and do not need to be covered. Avoid bottom crusts - they get soggy. Black socks can also be used to cover foil-wrapped garlic/herb breads. Takes awhile for the heat to work through, but with the sock to dull the foil it eventually will, and the sun makes wonderful fresh garlic bread.

**SAUCES & GRAVIES MADE WITH FLOUR OR STARCH** - Heat juices and flour separately, with or without a little cooking oil in the flour. Then combine and stir. It will be ready quickly.

**ROASTING NUTS** - Bake uncovered. Almonds: 1 hour, Peanuts: 2 hours.

## **General guidelines**

- After a a bit of experience, you'll see how readily you can adapt your present cooking and baking to solar cooking. Using the solar cooker can actually reduce the total amount of effort in meal preparation. Also cooking outside in the summer allows you to eliminate extra heat in the house. With solar cooking, you start your meals early in the day and then relax. At lunch or later in the afternoon or evening, when you're tired after a day of work, the sun will have cooked your food.
- Most food, with the exception of cookies and open-faced cheese sandwiches, are cooked in [containers](#) with the lids on. Cooking vessels should be black or very dark in color. There are many types of black and dark pot finishes available, including some on lightweight pots for backpacking that nest. One good choice for home solar cookware is dark speckled graniteware. (The 9-inch round roaster makes a beautiful round loaf of bread). Be sure to use hot pads when removing the pots from the oven; the pot will be very hot!
- If this is your first attempt at solar cooking, start with something easy such as chicken, rice, zucchini, or quick bread such as banana bread. Baking potatoes is also easy, but don't wrap them in aluminum foil; just put them in a dark covered pot without adding any water.
- Food such as roasts, stews, casseroles, poultry, potatoes, carrots, pot roasts and rice are almost impossible to overcook; therefore, the timing on the food is not critical.
- Chicken will still be juicy and will fall off the bone when solar cooked four hours instead of the needed two hours. The major advantage of solar cooking is the flexibility in cooking times. You can remove the food any time after it is done.
- In cooking fresh fish, you can judge when the fish is cooked thoroughly when juice begins to drop. If you cook fish on a rack, it is easy to see this change. Then check to see that the fish is cooked to the bone in the thickest part.
- For best results, do not overcook the following food: green vegetables, cookies, cakes, and bread.



- Use dark covered pots or pans with tight fitting lids. With rare exceptions (e.g., cookies) the lid is kept on the pot while cooking. Dark baking pans can be purchased in pairs so one can be turned upside-down for a lid. Secure with binder clips.
- The golden rule of solar cooking is: **GET THE FOOD ON EARLY, AND DON'T WORRY ABOUT OVERCOOKING.**
- You do not need to stir food while cooking. However, it's OK to check the food if you quickly replace the lid. One exception to this rule is if you are cooking an exceptionally large mass of something very thick, in which case it can be a good idea to stir at least once after clear signs of steam appear, with the goal of moving the cooler middle of the food towards the side of the pan and the hotter food against the sides into the middle.
- Place the hard-to-cook or larger quantity items in the back of the cooker where they will receive more direct sun. When using several pots, place the easy-to-cook food in the front of the cooker.
- The solar oven will be hot! Use potholders when removing lids or pots.
- To keep the food hot after the sun goes down, add several bricks or heavy stones when you begin cooking. To maximize heat retention, lower the reflective lid onto the glass, and cover the cooker with a blanket.
- If you are unable to cook in the early morning or evening, then cook during the midday to save firewood/cooking fuel. Then used a small portion of the saved fuel to reheat the food right before eating breakfast or dinner.
- Many meals may be cooked without refocusing, and you will learn by experience. Just face the cooker so that halfway through the cooking time the sun will be right in front of the cooker with the prop stick casting a shadow on the proper stick holder. With lots of food, or on less than fully sunny days, refocus the oven once or twice.
- To bake cakes or bread in a [solar box cooker](#), preheat the cooker for at least ½ hour before adding the food.
- If you are cooking a large amount of food, it will cook more quickly if distributed between two or three smaller pots instead of one large pot.
- Several small, uncovered bowls may be placed inside a large covered pot to cook.
- Leftovers are easily reheated in the solar cooker.
- Most recipes take slightly less liquid when cooked in a solar oven.
- Time for cooking depends on the temperature of the food as it is placed in the oven, as well as the brightness of the day.
- Allow plenty of time. Foods hold well in the solar oven without scorching or drying out.
- Focus oven and check food about once an hour when you're just getting started. Later, you'll relax and tend the cooking only once every two or three hours.
- Most recipes calling for a higher temperature will do fine if you give them more time.

