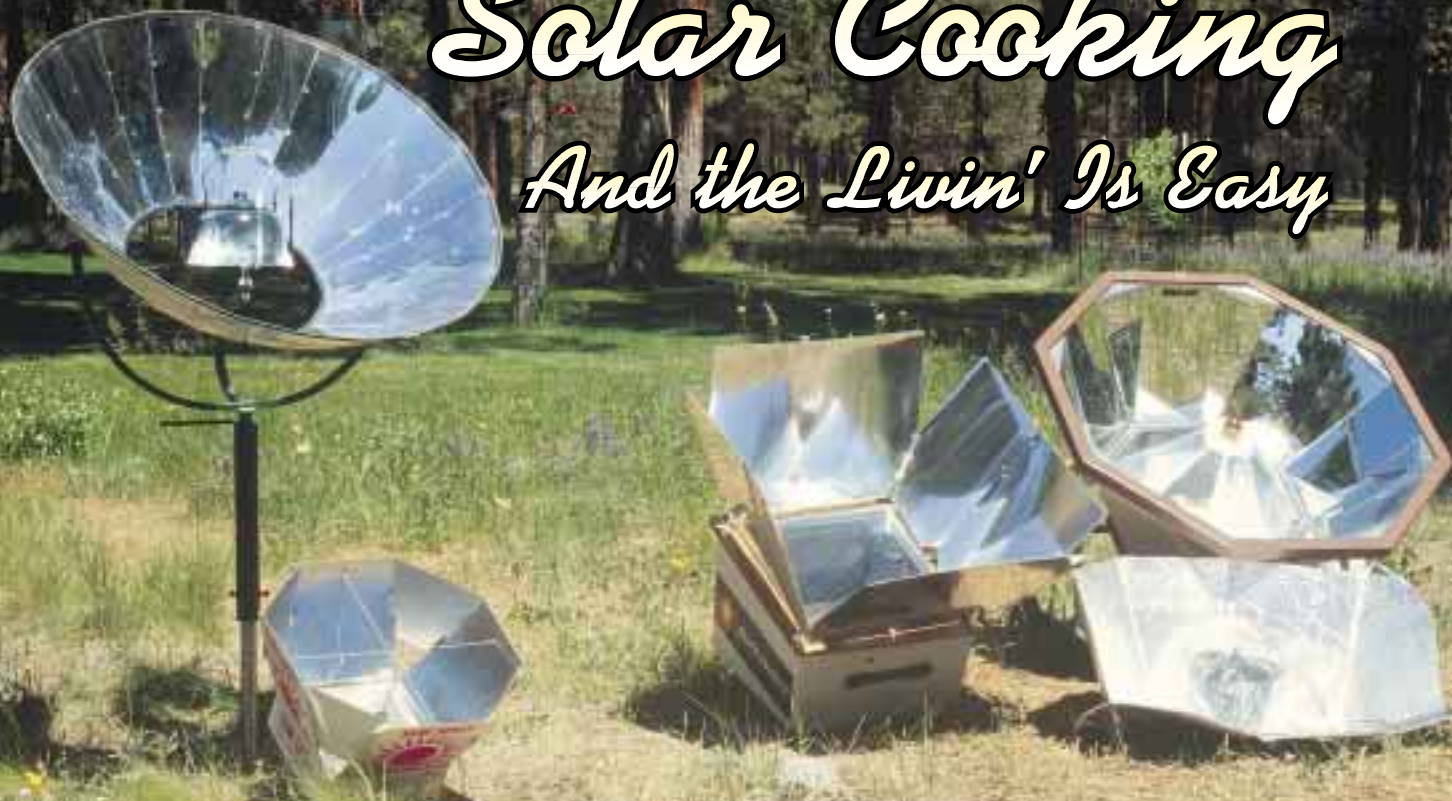


Solar Cooking

And the Livin' Is Easy



Jennifer Stein Barker

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The solar cooking assortment (left to right): Zomeworks SunFlash parabolic cooker, Sunspot, Sun Oven, Suntoys (in front), and Solar Chef (in back).

At the 1992 Solar Energy Expo and Rally (SEER) in Willits, California, I met a man with dreadlocks who was dancing around a cardboard box with a jar of boiling beans inside. Joseph Radabaugh willingly sold me the plans for this magic box, which I went home and made for about US\$5 worth of materials. Boxes are free, and I already had a roll of aluminum foil, glue, and all the other materials, except the can of heat-tolerant black paint. Within a few days, I was cooking with the sun.

My homemade SunStar cooker did everything as well as any commercial solar cooker I've had since, except that it had a tendency to cartwheel across the lawn in a wind gust if I left it empty. (I put a rock in it to prop the pans on and hold heat, but it still wasn't heavy enough.)

I baked cakes, casseroles, and breads outdoors all summer instead of gathering firewood for the woodstove and having to look for cool mornings to do my baking.

The next year, my partner Lance bought me a Sun Oven and I increased my solar cooking. It was not a more efficient cooker, just more convenient to use. In addition to eliminating the cartwheeling problem, it was not damaged by a sprinkle of rain, so I could leave it out more of the time. It was also easier to open and access the food.

In the following years, my collection grew to include a Sunspot, a Solar Chef, and a Suntoy cooker. The most recent addition is a donated Zomeworks parabolic cooker. I'm looking forward to learning how to fry with the sun this spring!

How Solar Cookers Work

The three basic types of cookers are single-reflector box cookers, multiple-reflector solar ovens, and parabolic cookers. My experiences are with the multiple-reflector style, which I think works best for baking at northern latitudes.

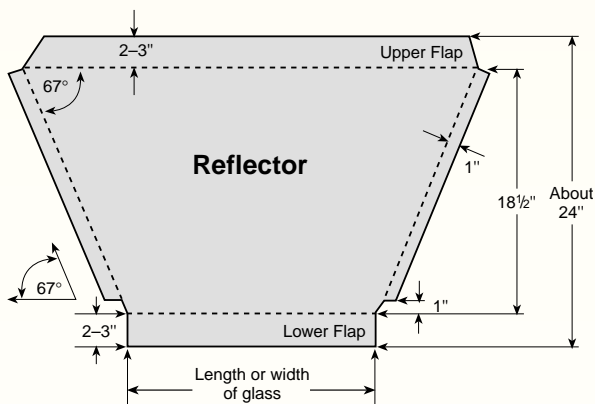
I have actually never used a single-reflector style cooker. It makes sense to me that the less sun you

Build a SunStar Solar Cooker

The SunStar solar cooker was designed to cost as little as possible and to be easily made by anyone, using commonly available materials. These instructions are adapted from the book *Heaven's Flame*, by Joseph Radabaugh.

For a medium-sized cooker, find two roughly square cardboard boxes. The inner box should be about 12 inches (30 cm) per side by 8 inches (20 cm) deep. The outer box should be 2 to 3 inches (5–8 cm) larger in all dimensions. Collect additional boxes for insulation and reflectors. Also needed are white glue, aluminum foil, flat black paint, glass, and string.

Pack layers of cardboard between the inner and outer boxes for insulation. Fold down all flaps between the boxes except the longest two on the outer box. Paint the inside of the inner box flat black. Make four reflectors based on the length and width of the glass as shown.



Fold the lower, side, and upper flaps on each reflector. Glue down the upper and lower flaps only. Lay each reflector flap-side down and cut foil to cover it. Coat the dull side of the foil with glue, and rub the foil onto the reflector from the center outwards.

Arrange the reflectors on the ground as they will fit on the oven box. Glue two diagonal sets of adjacent corner flaps together. Tie the remaining flaps together, using string through holes poked into the flaps. To hold the reflectors in place, make a slip-in piece that is attached to the bottom of the upper long reflector and pushed between the layers of insulation surrounding the inner box.

Use a dark baking tin as a rack to hold cooking vessels, or build your own rack out of wood or metal, painted black. Prop the cooker, both in front and back, with rocks to tilt it towards the sun.

Joseph Radabaugh, PO Box 111, Mt. Shasta, CA 96067 • SunStar solar cooker noncopyrighted, one-page plans. Enclose US\$1 or more contribution and SASE

have, and the lower the angle, the more reflectors you need to concentrate the sun. I do find that the more reflector area there is on my cooker (in relation to the container volume and other efficiency factors), the hotter that cooker gets. Parabolic cookers focus the sun's heat intensely on a spot, allowing stovetop-like cooking. I'm just starting to play with a parabolic cooker, so I can't tell you much about them.

Solar cooking requires three basic components:

- A cooking vessel for food (preferably dark to absorb sunlight as heat, and often covered to keep heat and steam in with the food);
- An outer container to hold the heat next to the cooking vessel's surface; and
- Reflectors to concentrate the sun's heating power into the containers.

Many variations on these themes can be found. The outer container can be completely transparent or partially lined with black or silver. The solar window can

The solar cookers are part of an overall energy scheme at the Barkers' homestead.





Solar feast: risotto casserole, chocolate-mint ricotta mousse, crusty bread, and green salad.

be made of glass or plastic. When it comes to the reflectors, they come in all styles—from one flat reflector on one side, to four flat reflectors surrounding the cooking chamber, to many beveled ones, all the way to a complete, curved parabola. Efficiency depends on the performance of all aspects together. Sacrifice any one, and performance suffers.

My cookers will reach temperatures between 350 and 450°F (175–230°C) when empty. When food is placed in them, the temperature immediately drops due to the cold mass, but rises again as the food heats up and cooks. Any temperature above boiling will cook food, but baking requires hotter temperatures to get the rising food cooked before it falls. Food may cook a little slower when the ambient temperature is colder, but the intensity of the sun is far more important than the ambient temperature. Cooking in snow is possible because the snow reflects and intensifies the sun's rays, usually making up for the colder ambient air temperature.

Cooking Tips

To use a cooker, place your food in the cooking vessel, put the vessel in the outer container, close the outer container, and aim a transparent side of the outer container towards the sun. The reflectors will then be arranged to direct the sun's reflection through the transparent plane of the outer container onto the surface of

the inner container. Sometimes (as in some parabolic cookers) there is no outer container. Then the reflectors will be arranged to permit the sun's reflection to directly strike the surface of the cooking vessel.

Two general types of dishes cook well in solar ovens—casseroles and loaves. Each type has its own particular cooking characteristics. Any recipe designed for a slow cooker will do very well in a solar oven.

Casseroles

Casserole recipes for solar cookery have more water in them to allow the pastas, grains, and legumes to cook. They can be put into a cold oven, and the whole thing can come to boiling temperature together. Once the contents come to a boil, cooking time will be the same as in a conventional oven. But it may take quite a while to get the whole mass up to boiling temperature.

If you are assured of a clear day, and your casserole doesn't require more than a half hour of boiling time, you can place it in the solar oven, turn it to where the sun will be at 3 PM, and go away. Dinner will be ready

Main Dish

Risotto

This is a baked rice dish in the Italian style. If you cannot get fresh oregano and lovage, follow the substitutions for Winter Risotto.

Serves 4:

- 1²/₃ cups raw brown rice
- 2 Tbsp. lentils
- 1¹/₂ cups chopped or ground tomatoes
- 2²/₃ cups stock or water
- 1 small onion, sliced thin
- 2 cloves garlic, minced
- 1 small turnip, coarsely grated
- 1/3 cup chopped fresh oregano
- 2 tsp. finely chopped fresh lovage leaf
- dash Tabasco
- 1/4 tsp. ground cumin
- 1 Tbsp. olive oil
- 1 Tbsp. tamari

Winter Risotto

For the fresh oregano and lovage substitute:

- 2 tsp. dried oregano, crushed
- 1/2 tsp. fennel seed, crushed or ground

Combine ingredients in a 2 quart or larger casserole. Stir to mix. Bake, covered, in sun oven until all liquid is absorbed. The rice and lentils should be tender (if not, add more liquid next time). When it is done, the herbs will be on the top. Stir everything together before serving. Serve with a crusty bread and green salad.



and warm at 5:30 PM. (Don't do this with meat or any other potentially dangerous food that spoils easily.) For longer cooking times, you must turn the solar oven at least every half hour or so to keep the contents boiling.

Breads & Cakes

Loaves, like breads and cakes, do not have as much moisture in them as a casserole. They will come up to temperature much more quickly. You must put them in a preheated solar oven because rising dough must be cooked, or it will fall again. Watch your preheating oven carefully, because an empty solar cooker may quickly get hot enough to smoke the paint off the inside.

It is the mass of food inside the cooker that controls the temperature. A rock placed to heat in the empty cooker will provide mass to help hold the heat whenever you open the door to put in food. For breads and cakes, preheat the cooker to 300 to 400°F (150–200°C). Being precise isn't necessary, because as soon as you put your loaf in, the temperature will fall to 300°F or less. Don't worry—raised or quick breads and cakes will still cook just fine.

Turn the cooker as frequently as you can to keep it facing into the sun. Cooking time will only be about 15 to 20 percent longer than in a conventional oven. When your bread or cake looks done, open the cooker and check it. If it isn't quite done, then 5 minutes more will usually do the job. Don't overload your oven with food that needs quick heat to rise. If your loaf or cake falls, you need to put less food in next time.



Winter is not an impediment to solar cooking. This pan of soup is steaming away in the sun of a 0° F winter-solstice day!

Dessert

Chocolate-Mint Ricotta Mousse

A velvety-smooth mousse with a secret!
Serves 6:

- 2½ squares unsweetened chocolate
- ½ cup honey
- 1, 15 oz. container low-fat ricotta cheese
- ¼ cup spearmint leaves, packed

Measure the honey in a heat-proof cup. Break up the chocolate squares and add them to the honey, pushing the chocolate down so it's covered. Heat honey and chocolate in a solar oven just until the chocolate melts.

Scrape the honey and chocolate into a blender. Add the ricotta cheese and mint leaves. Blend until liquid and smooth. You may have to stop the blender frequently and scrape down the sides, pushing the cheese down onto the blender blades.

When smooth, pour into a serving dish or individual cups. Chill for at least two hours before serving. Garnish with fresh mint leaves.



I have burned baked goods in my Solar Chef. This is possible because it has a wide "angle of acceptance" for the sun's rays. With the Sun Oven, if I neglect to check the food, I also neglect to turn the oven and the sun passes by its angle of acceptance, making it harder to burn food—but still possible. I have burned brownies, which cook very quickly.

More Hot Tips

Dark pans and casseroles absorb more heat and help food to cook more quickly. My favorite cookware for solar cookery is an amber glass Corning Ware covered casserole, because I can see what's happening in it. Dark graniteware works well, too. Always cover a casserole to keep as much steam in the dish as you can. A steamed up glass seems

Solar Cooker Comparison

<i>Cooker</i>	<i>Cost (US\$)</i>	<i>Characteristics</i>	<i>Uses</i>	<i>Advantages</i>	<i>Disadvantages</i>
SunStar (Radabaugh design)	\$5	Multiple reflector, homemade, cardboard	Baking, casseroles	Efficient heating, low cost	Can't leave out in rain, less convenient to open and close
Other home-made cookers	5–50	Purchased or found materials	Various	Low cost, fun, can be highly efficient	Have to construct, often heavier than commercial cookers
Suntoy	18	Multiple reflector, foil bubble pack	Boiling, baking, casseroles, meal-in-a-bag	Lightweight, portable	Longer cooking times, fairly small food volume
Sunspot	41	Multiple reflector	Mini loaves, meal-in-a-bag	Lightweight, portable	Longer cooking times, very small food volume
Sun Oven	275	Multiple reflector	Baking, casseroles	Efficient heating, easy to use	Moderate food volume
Solar Chef (No longer available)	425	Multiple reflector	Baking, casseroles	Highest efficiency, quickest cooking times	Won't hold a 9x13 inch baking pan, gets hot: must watch to avoid burning food
SunFlash (Zomeworks)	425	Parabolic	Boiling, frying	Can't fry in any other cooker type, high heat output	Small (or no) enclosed cooking chamber, blindingly bright reflectors

to transmit plenty of light, but it is harder to tell that your cooker is facing the sun perfectly if you can't see the shadows inside. When food is done, cover the cooker with its reflectors or a thick blanket to keep it warm until needed.

Cheese turns to leather quickly when baked in the sun. To keep your cheese tender and melting, try these techniques. Roll your pizza up, put it in a loaf pan, and then raise and bake it like a loaf of bread. Put sauce on top of the cheese. Or add the cheese a few minutes before your pizza or casserole is done, and continue cooking just till it melts and bubbles.

Use a dark graniteware teakettle or a widemouthed jar painted black to boil water in. Use tape to mask off a stripe when you paint the jar, so the contents can be viewed during cooking.

A thermometer often comes with a commercial cooker. If it does not, a regular oven thermometer works very well. I have successfully used a stovepipe thermometer, attached by its magnet to the side of a graniteware kettle, to let me know the temperature of the kettle's contents.

Safety & Care

Some things are, excuse the pun, glaringly obvious: these cookers are made to reflect a lot of light in order to create a lot of heat. Don't mess around. Protect yourself by avoiding the direct reflection, which can be blinding. Wear sunglasses. Use oven mitts or hotpads. If you have a parabolic cooker, turn the reflector away from the sun before removing a pan from the "burner."

Take good care of your cooker so it will continue to perform well for you. Even if your cooker is "waterproof" and you have no room to store it inside, it's a good idea to cover it when not in use. Waterspots and scratches diminish the effectiveness of the reflectors. If you wipe up spills and maintain the interior surface, your cooker will serve your needs for many times longer than a poorly maintained one.

Cooking Is Easy

Have a lot of things to cook in one day? Experience will show you when the earliest practical time occurs that the sun is high enough to get an oven hot in your area. At my house, that's around 8:45 AM in midsummer. If you have the next dish ready to go when one comes out of the oven, you can get several things baked in one day.

To get you started, here's an easy meal. Planning ahead is key, so before starting this, organize your day. Make dough for your favorite crusty bread first thing in the morning and set it to rise. Then make the mousse, and set it to chill for dessert. Bake the bread when it has risen, then take a few hours off. Come back early to midafternoon (the shorter the days, the earlier you must get your cooking done) and make the Risotto for dinner. Sounds like a long day, but the sun is doing most of the work for you!

Even as a hobby or novelty, solar cooking has a huge potential for saving energy and lowering your energy costs. Think about it—every time you turn the knob on that juice-sucking monster you call an electric stove, your use is immediately measured in kilowatt-hours.

And what if you live on a homestead or in a third-world country and burn organic matter (dung or wood from trees or shrubs) to cook every meal? You'd have to gather or buy every stick, and deal with an overheated house in warm weather. Compare that to just setting a reflector oven out to gather the sun's rays whenever the weather cooperates. You'll soon be singing: "Solar cookinnng... and the livin' is easy!"

Access

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www.highdesertnet.com/morninghill • *The Morning Hill Cookbook* (US\$11.95 ppd.) and *The Morning Hill Solar Cookery Book* (US\$14.95 ppd)

Heaven's Flame: A Guidebook to Solar Cookers by Joseph Radabaugh. 1998, ISBN 0962958824, Home Power Publishing, PO Box 520, Ashland, OR 97520 800-707-6585 or 541-512-0201 • Fax: 541-512-0343 hp@homepower.com • www.homepower.com
Presently out of print

Cooking with the Sun by Dan & Beth Halacy. 1992, ISBN 0962906921, US\$9.95 plus \$2 shipping, Morning Sun Press, Jack Howell, PO Box 413, Lafayette, CA 95459 • 925-932-1383 • jdhowell@ix.netcom.com
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