

Cooking Without Fossil Fuel

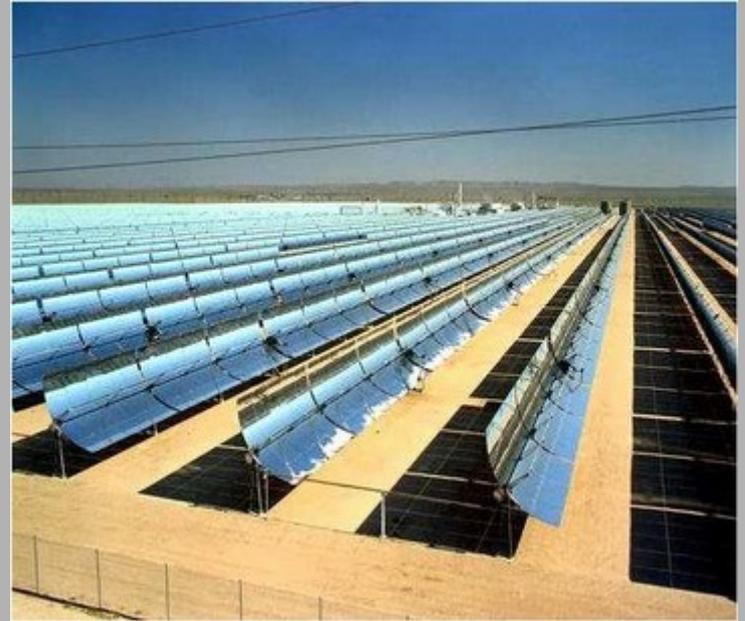
Why is this project necessary?

There are numerous people and organizations working on various approaches to cooking without fossil fuel. At Living Energy Farm, we live each and every day using the tools we espouse. We experience first hand the benefits and limitations of the ideas we advocate. Ideally, we would like to find one or more methods of cooking that would be suitable in both rural and urban environments. In starting LEF, our original intent was that we would use technologies developed by others to put together a sustainable community rather than trying to “re-invent the wheel.” We have found that many of the tools we need simply cannot be purchased, zero fossil fuel cooking systems included.

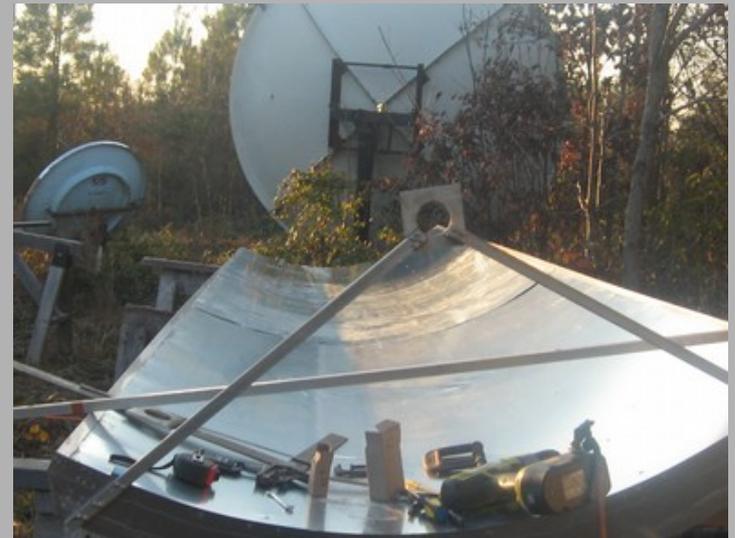
We have tried various approaches to improve our cooking systems at LEF. Currently, we are putting together a relatively inexpensive solar trough system that can generate and store high temperatures using mineral oil as a heat transfer medium. Why would we pursue this when so many other organizations, including some who are far better financially endowed than ourselves, are pursuing similar goals? First, because we need it for ourselves. And second, we find that so many of the other solutions created by other organizations are just too expensive and complex. Our “niche” in the alternative technology world, with cooking as with everything else we work with, is trying to make devices and processes that are cheap and simple, and thus accessible to a maximum number of people. Our solar trough development is an ongoing project. If it does not perform well enough to be a reliable and convenient cooking system, we will pursue other options.

Solar Trough

Solar troughs are widely employed in industrial solar collection systems. (See the photo.) The question for us is whether we can miniaturize the technology and keep the cost modest. If our trough does work, it could be widely applied in rural and urban areas. It would allow a family, or a village, to cook today with heat collected yesterday. A couple of communities have tried it, including Gaviotas in Colombia and Tamera in Portugal. Both of those projects used vegetable oil as a heat transfer medium. We feel like mineral oil will be better. And in fact mineral oil has been used in some industrial systems.



Industrial Solar Troughs



LEF's Solar Trough Under Construction

The modern solar industry is using “heat transfer fluids,” or HTFs. That industry has grown so much that there are now dozens of different kinds of HTFs on the market. Some are toxic, some are non-toxic. There are different classes of HTFs, with different characteristics. The early industrial installations used mineral oil, and some of the modern HTFs are mineral oil based. Mineral oil cost about 1/3rd as much as HTF.

Another important issue in this project is controlling heat loss from the heat collector tube with inexpensive material. We have tried to find a resolution for that issue for several years. We found a substance called borosilicate. It’s old fashioned “pyrex,” a very heat tolerant kind of glass. It’s quite cheap in two inch tubes.

The questions we need to answer with our solar trough experiments are;

- * can we reliably collect temperatures high enough to cook with?
- * will the borosilicate act as an adequate insulator around the collector pipe?
- * can we store hot oil at several hundred degrees for days at a time without excessive heat loss?

The mechanics of moving heat around are not difficult. The solar trough will operate similarly to the solar hot water systems we already have. In the next few months we will know a lot more.

Other options for cooking without fossil fuel include:

1) Wood -- this is by far the most common method of cooking among the poorest people in the world. But the smoke, soot and inconvenience mean that most people avoid wood cooking if they can. At LEF, we cook with wood quite a bit, but we consider it a transitional practice until we can put something better in place. Methods for cooking with wood include:

A) Old-Fashioned Wood Cookstoves – We use one of these in winter. For the sake of getting smoke out of the house, they work, but they are not efficient.

B) Rocket Stoves – are much more efficient than traditional cook stoves, but they are still smoky and inconvenient. We use our rocket stoves a lot. They are certainly not suited to modern urban environments.



We use both parabolic cookers and solar ovens, but you need a clear sky and proper timing. Some kind of solar storage that would allow more flexibility is highly desirable.

C) Vented Rocket Stoves – LEF is not trying to improve rocket stove technology at this time. A vented rocket stove in theory captures the efficiency of a rocket stove while venting the smoke up a chimney. We have built one but we are not pursuing it further.

2) Biogas

Biogas is not particularly difficult, but it does require feedstock (organic matter to feed the digester), a large digester tank if you want to produce enough gas for a community, and warm, stable temperatures. We have used a small biogas system, and may return to this technology. We are hoping that other approaches will prove simpler and better suited to urban environments. Biogas = methane = natural gas = a potent greenhouse gas. If community-scale biogas systems became widespread, the leakage of methane could become a contributor to climate change. It is hard to quantify this concern.

3) Solar Cooking When the Sun is Bright

Solar cooking is simple and effective, but very weather contingent and not particularly convenient. There are a lot of solar cookers on the market, and we by no means profess ourselves to be experts. We are simply trying to find the cheapest, simplest way of cooking sustainably that we can use on our farm and then export to other LEF-like communities. The solar cookers we use include:

A) Solar Paraboloids – are a bit more versatile and effective than solar ovens. A parabola is not quite as sensitive as a solar oven to perfectly clear skies and warm temperatures, but strong sun is still necessary. A solar parabola looks like a satellite dish covered in reflective material. We have one and use it quite a bit. Solar paraboloids are easily available in several commercial models.

B) Solar Ovens – work well in very bright sun and warm temperatures, but are not convenient or adaptable to sub-optimal conditions. We use ours some, but overall it's simply not something we can rely on.

Right now, better cooking apparatus is our first priority. We are hoping to have a functional system in the next few months that can work not only for us, but for families and communities around the world. We are looking for support for this and other projects on which we are working.



From the early days of LEF. We have used our parabolic cooker a lot. Batch water heater works great for 3 seasons. One small PV panel provided electricity.