

Living Energy Farm
April - May 2020 Newsletter

Projects at Living Energy Farm

We have been busy. Here's the list of current projects:

- 1) Spreading the LEF Solar Energy Model**
- 2) Running a Tractor on Pine Sap**
- 3) Simplified Combine Harvester**
- 4) Community Biogas for Temperate Climates**
- 5) Media Outreach**
- 6) Living Energy Lights Solar Lighting Kits**
- 7) A Book About Living Energy Farm**
- 8) Taking Magnolia House Off-Grid**
- 9) Farm Improvement Barn**
- 10) Farm Update**

1) Spreading the Living Energy Farm Model

We managed to complete our solar installations in Arizona (over 50 houses, including the equipment installed by local folks there) just before the COVID-19 lockdowns began. We taught folks how to assemble durable solar equipment, and made plans to do more training. We have been heartbroken to learn that COVID-19 has hit the Navajo Nation since then, which now has the highest per-capita outbreak in the U.S.. We hope that the solar equipment we have offered will be of some help in the quality of life for people in the Navajo and Hopi Nations. (Photos from that project are here, <http://livingenergyfarm.org/solar-installations-2020/>)

As we head to press, we are send 10 kits to The Source Farm in Jamaica. They tell us the same story we hear from many others -- low income people all over the world need durable solar equipment. We continue to look for opportunities and funding to carry our durable solar lighting and charging equipment to new locales. Our solar kits are the only durable equipment on the market, and provide services with a much, much lower environmental footprint. Any support you can offer is welcomed.

2) Running a Tractor on Pine Sap

Since the beginning of LEF, we have been trying to find a way we could grow fuel to power small tractors at LEF. We built two different wood gasifiers, and ran several different tractors off of them. It was not as easy and effective as we had hoped. All along we have been benefitting enormously, on that project and many others, from consultations with our machinist friend from from Missouri, Kris Ward. He has a lot of experience and wisdom about machines, which ones work well with renewable energy, and which are sustainable and repairable. Years ago Kris had told



Running a Tuff Bilt tractor on turpentine from pine sap. Turpentine is much, much easier to use than woodgas, which we had tried to use previously.

us about the many options for running an engine. One of the most intriguing was turpentine, or "turps" as we call it, made from pine sap. Turps could be a sustainable fuel, if used in a very moderate fashion. We have designed our entire agricultural operation toward the goal of minimizing fuel use and then powering the farm on fuel we grow here. Starting a few years ago, we started rebuilding a Tuff-Bilt tractor with an old engine that we hoped would work well on turps.

A couple of weeks ago, we finally go to the point where we could test our one row Tuff-Bilt tractor, re-powered with an old Wisconsin engine that was made in the day when engine makers expected engines to run on kerosene. Turps and kerosene burn in a very similar fashion. We ran the Wisconsin a while on gasoline to make sure it was fully operational. Then it was time to try the turps. Firing up the Tuff-Bilt on turps was a momentous occasion, the culmination of years of work. We got it all on film. I fired up the little tractor on gas, and let it warm up just a couple of minutes. Then I switched over to turpentine. Back when we tried woodgas, getting an engine to run steadily was a challenge. With the turps, the engine ran smooth as silk when I turned off the gas and turned on the turps. The only way you could notice the difference was the strong piney smell coming out of the exhaust.

Turps will only run on a pre-heated engine. I had to take it easy at first, but once the engine was fully warmed up, I took the little Tuff-Bilt out to the field and sunk a potato plow in the ground. The tractor plowed along, as pretty as you please. Compared to woodgas, turpentine is effective and very easy to use, *once you have the turps*. We have some sap buckets out now collecting sap. The pine trees on the farm I grew up on in Georgia had "cat faces" on them, the old scraps made by the sap collectors. Those trees at least seemed unharmed by the process. We will see how little fuel we can get by with, if we can make it from pine sap, if we can collect that sap as we need it.

We are also going to try running an engine straight from gasified sap. The big advantage of turps as a farm-grown fuel could be that it would encourage people to plant and tap trees. With woodgas, you have to cut and burn the trees. It's hard to say at this point how "scalable" turps might be. Can many small farms all over the place run on turps? We will see. For now, it's really fun preparing garden land with that piney smell all around. And again we have to thank Kris. Without him, LEF would not exist in its current form.

3) A Simplified Combine Harvester

Another backburner project that has moved its way to the front burner is designing and making a simplified combine harvester. Grains are the backbone of modern agriculture. As a primary source of calories, animal products, grass fed or otherwise, can only feed a very small number of privileged people. All the grains we eat in the industrial world are harvested by very large, very expensive combines. Even the older combines in this country are still large, not easily moved from field to field, and not well suited to very small farms. In Asia, China in particular, there are a lot more small farms. There are some small Asian combines. We imported one a few years ago with a three foot wide cutting head. It works, but it is far more complex than it should be for the work it does. It has about a dozen spinning shafts, two conveyors, thresher, blower -- lots and lots of moving parts.

Studying the Asian and American combines, we have been trying to come up with a much simpler



A radically simplified small grain harvester. If it works, it could have global impacts.

machine that could harvest small grain. The only options for small farmers all over the world are the Asian combines or cutting grain by hand. The Asian combines are not particularly cheap, and would be very difficult to maintain in a non-industrial country.

Step by step as I lay awake at night, I have been eliminating one part after another. Reconfiguring the machine to make this conveyor unnecessary, then that shaft -- simplify, simplify, simplify. Conceptually, I had it down to three spinning shafts about three years ago. Then two shafts, one machine in front cutting the grain and another behind threshing and separating. Then we moved the second stage up beside the first, re-scaled the components so they could all spin at the same speed, and put it all on one shaft, one machine about 6 feet wide. One shaft! But could it work? Maybe, but it still just didn't seem right. Not there yet.

Then about a couple of months ago, I was working on it again. Smaller, simpler. Then it clicked. Two foot intake, open-faced thresher, separator, blower, all scaled to work at the same RPM (speed). That was it! It had a better chance of working than any of the previous designs, and was a huge simplification over any other harvesting machine I have ever seen. With any invention, at best there will need to be some modification. And it may not work very well at all. If it does, it will be the simplest harvester available by a wide, wide margin. At best, it will have a higher waste rate and produce a product with more detritus than a half million dollar John Deere, but the same is true of the small Asian combines. Our prototype is about 90% complete, and we are going to try it in a few weeks when we harvest wheat. If this works, it will be a game changer for small farmers everywhere. The uncertainties with this machine are higher than with some of our other projects, but we are very excited to be building it. Wish us luck.

4) Community Biogas for Temperate Climates

We have become accidental inventors. When we started LEF, the plan was to use tools developed by other people. Our role was simply to configure them to see if we could build a community that was comfortable without fossil fuel, and do so at a modest cost so it could be generalized to as many people as possible. Then it became clear that we could not buy what we needed, and inventors we have become. Our DC Microgrid has performed beyond our wildest dreams. Cooking has been far more challenging. Solar cookers are great, when the sun shines and you are standing next to the cooker.

We built a biogas setup in the early days. It was made of several 55 gallon drums. It worked, but gas output was modest. We spent an embarrassing amount of time and money trying to make high temperature solar storage work. About a year ago, we returned to the pursuit of biogas, setting up a system about six times bigger than the first one we did years ago.

Intern Jessie named our second digester Seymour, and has been monitoring him closely, checking temperature, feed rate, and output, for months. That's just what we needed. We have learned that:

1) Keeping a community scale biogas



Intern Jessie has put a lot of work into figuring out how to better make biogas. She is standing next to the Honorable Seymour III, the next biogas digester.

digester warm is critical, and difficult in winter. There are industrial biogas systems in many places, and indeed national and state biogas associations. As for community scale biogas systems in cold climates, there are almost none. The difficulty of keeping temperature stable in smaller operations is not easy.

2) Consistency of temperature is critical, but you would be hard pressed to overheat it. The bugs that make the gas (archaea) can handle heat over 150 F. That's hot! When we set up the current unit, I put a solar heating coil under it. I wanted to heat the tank gently based on an unfounded fear that we could overheat it. The solar heating coil should be *inside* the tank, not under it.

3) Consistency of feeding is important.

4) If you are going to use human waste, you have to make sure that the waste does not move through the digester too quickly. That's a problem with the current digester.

Having learned all of these things, we are now beginning construction of our third digester. Here's what we are doing to make it work.

1) It will be much larger, about five times larger than the current digester. We have a water tank for fire suppression we can use. (Fire trucks cannot reach our house in winter. Hopefully we can replace the tank by fall when our finances improve. Plastic tanks are pretty cheap. Interestingly, almost all of the material being used in our current technology push is material in-stock. We have a lot of junk laying around.)

2) This digester will be carefully and intensely insulated with 2 layers of straw bales, thick insulation under the tank, and careful covering of inlets and outlets.

3) We will move the solar heating coil inside the tank where the heat exchange will be more efficient, and make sure the coil is large enough in case we want to add more solar heating panels.

4) We will go back to using human waste, but with baffles in the tank so the waste has a long transit time between inlet and outlet.

We are hoping that with Seymour III, incorporating necessary modifications as it does, and the use of daylight drive solar electric cooking in the warmer months (that's where we use high voltage DC electricity to run hot plates and an electric oven, but not with any batteries involved), we will be able to stop using firewood entirely. With Seymour II (the current digester which is still running), gas output has ramped up with sunnier days and Jessie's management. Some days we need no firewood to cook with at all.

We have another need for biogas as well. The turps tractor is going to need a warm-up fuel. The biogas will be useful for that as well. We have expanded our seeds barn to make room for Seymour III, and placed the tank. We should be able to finish the other modifications in the next two or three months. This project, as with so many others, demonstrates the critical relationship between village-scale design and renewable energy. You just could not manage this on a household level.

5) Media Outreach

Debbie did a great presentation, just in time for spring, entitled **How to Plan a Garden**. It's at <https://www.youtube.com/watch?v=JT0qXD3m2AE>

Our firewood saw at LEF runs daylight drive directly from a set of PV panels. It's a very powerful and useful tool. It has been shown in a couple of videos, but not actually cutting wood. We created a short video to show that machine at full tilt. It's at



Eric, Jessie and Oliver gathered poles and put up a new barn for our grain drill and other equipment. Needs a roof now...

<https://www.youtube.com/watch?v=mMwwZj8DxjE>

If you buy an LEF solar kit, we can ship the batteries wet or dry. If you need to know how to mix your own electrolyte for nickel iron batteries, we created a short video for that. It's here

https://www.youtube.com/watch?v=ZAjlHN4oL_E

We have a few more videos coming out shortly. Stay tuned.

6) Living Energy Lights Solar Lighting Kits

We continue to improve our website and outreach for Living Energy Lights. All the conferences and events we had planned to attend have been cancelled, so we are doing what we can in a virtual fashion. Check out livingenergylights.com

7) A Book About Living Energy Farm

Many times we have been asked if we have a book that describes how the systems at LEF work. Alexis has put together the first draft of a book to do just that. And why should it be boring? So it's also a very personal story as well.

8) Taking Magnolia House Off Grid

Magnolia House is a house in the town of Louisa one mile away from LEF. It was originally purchased by a supporter of LEF, but LEF has control of it now. It was at the time of purchase the cheapest house in Louisa, with a leaky roof and other issues. We have fixed it up some. The plan is to wrap straw bales around it for insulation, and take it off grid so it can server as a front door for LEF. At this point, we have gotten a building permit approved. It looks like we have some good people lined up to start in earnest in July (we hope).

At LEF, our main house is a half mile off the main road. Once it is fixed up a bit, Magnolia House will be an energy self-sufficient homestead that is physically and psychologically more accessible for the general public. We had planned to make the process of insulating and taking Magnolia House off-grid a public education project. Now we will do that with cameras. Retrofitting strawbale insulation seems intimidating or uncertain to most people. We hope to demystify that process.



Nika saw us hoeing tomatoes and had to help. As we were taking the picture, he was asking, "Momma, is this a weed?"

9) Farm Improvement Barn

To help with grain self-sufficiency, we recently purchased a very old, small grain drill. The grain drill needed a new home, and so did the trash cans, bicycles, and some other items currently living in our seed processing barn. Interns Eric, Jessie, and Oliver gathered poles and built a small barn. Nicely done!

10) Update, Living Energy Farm in the Time of Pandemic

We are doing well at Living Energy Farm. The kids have each other and lots of room to play in spite of the pandemic. Rosa started writing stories online cooperatively with one of her friends. Xander found a friend to do the same. And now Nika, who is just learning how to read, did not want to be left out, so he is doing so as well (with some help, of course). They have having fun with it. We have been home schooling at home instead of at the cooperative home school in which we were participating. We have begun shop classes. The kids have started "distance visits" with their friends. They play imagination games at 10 feet apart.

The spring weather was horrible from a farming perspective. March was warmer than April. In April, we had one late frost after another, and heavy rains. In May, we saw yet another series of frosts well beyond the

date that such a thing is normal. All of that pushed back planting a bit. But there is no recovery for the fruit trees damaged by the weird weather. We will have a lean fruit year. We have a good wheat crop this year. We have doubled our seeds plantings over last year, which means more work, more money and more food.

We took on packaging sweet potato slips (little live sweet potato plants) in cooperation with Southern Exposure Seed Exchange. In our last newsletter, we mentioned that the work in Arizona had left us in poor shape financially. We received some welcomed donations in response (thanks!). The work with shipping sweet potato slips has brought an even larger flow of much needed funds, though it has also been some arduous work. The more support we get, the better able we are to spread this model. We work hard, but we also have limits.

We have a good crew of people here -- our social life remains lively and enjoyable in spite of being under quarantine. No one knows where the coronavirus is going at this point, but it looks like it may get worse before it gets better. For us, it's not bad, and we know how very fortunate we are. The pandemic we now face was created by an unhealthy relationship we humans have with the animal world, and a form of globalization that has spread the virus rapidly. We look forward to a world where self-determined communities are more common, our relationship with the animal kingdom is wiser and healthier, and rapid global travel is unnecessary.

We have a lot projects, as you can see. LEF is doing the work of finding out how the world could work if we simplified our lives some, and focused on sustainability and renewable energy as first priorities, not just in passing. All of our problems get easier if we are willing to live lives of moderation and community. For all of the expensive, high-tech solutions to environmental and social problems, there is a tremendous need for a more sober approach. We very much want to see the tools we are developing at LEF spread widely. Any help you can offer in that regard would be very much appreciated.

Living Energy Farm is a project to build a demonstration farm, community, and education center in Louisa County that uses no fossil fuels. For more information see our website www.livingenergyfarm.org, or contact us at livingenergyfarm@gmail.com or Living Energy Farm, 1022 Bibb Store Rd, Louisa VA, 23093. Donations to the Living Energy Farm Education Fund are tax deductible.

Articles and videos about LEF:

How to Never Pay an Electric Bill

<https://www.youtube.com/watch?v=N5Wk7inoIxI&t=201s>

This video is a walk-through of our energy systems at Living Energy Farm. It is a concise summary of how these systems work, and why they are not in common use already.

Solar Installations In The Navajo (Dine') And Hopi Reservations, March 2020

<http://livingenergyfarm.org/solar-installations-2020/>

This is a photo essay about our project to bring durable solar energy systems to the Dine' and Hopi Reservations, where thousands of people live without grid power involuntarily.

Support Living Energy Farm's Climate Justice Campaign, and Bring DC Microgrids to People Who Need Them

<http://livingenergyfarm.org/support-our-climate-justice-campaign/>

This is an updated web page describing our broader social justice ambitions.

How to Live Without Fossil Fuel (Introductory Video) <https://www.youtube.com/watch?v=Ri2U6u8p65E>

Powering a Community with Solar Electricity (LEF has the only DC powered community that we know of, here's how it works) <https://www.youtube.com/watch?v=FvdExgvHnRI&t=23s>

The Best Way to Store Off-Grid Energy <https://www.youtube.com/watch?v=2wOxQ3sL9zc>

Batteries that Last (almost) Forever <https://www.youtube.com/watch?v=dfrgLsyFs0E>

Virginia Homegrown created a program at LEF (the LEF part starts at the 29 minute mark in the program)
<https://www.youtube.com/watch?v=MDGP0C9MIzU>

International Permaculture has done 2 articles on LEF. One is in issue #93, Autumn 2017, and the second is in issue #94, Winter 2017. See <https://www.permaculture.co.uk/>

Article about LEF at the Atlantic Online Magazine

<https://www.theatlantic.com/politics/archive/2017/01/anarchism-intentional-communities-trump/513086/>

Article about LEF in The Central Virginian

<http://www.livingenergyfarm.org/cvarticle.pdf>

LEF on CNN

<http://www.cnn.com/interactive/2015/09/us/communes-american-story/>

Cville weekly in Charlottesville VA

<http://www.c-ville.com/off-grid-model-environmentalism-made-easy/#.VcHobF054yo>