Living Energy Farm

March - April 2017 Newsletter

Upcoming Workshops

Please RSVP livingenergyfarm@gmail.com if you plan to attend. All workshops begin at 1PM and are held at 1022 Bibb Store Rd, Louisa VA, 23093 (at LEF) unless otherwise indicated.

Small Farm Planting and Cultivation

We have put a lot of work into developing efficient means of planting and cultivating on our small farm. We have developed tools and techniques that help us run our farm with a minimum amount of hand labor. Come see how we do it. May 27, starting at 1 PM.

Perennial Food Land Walk

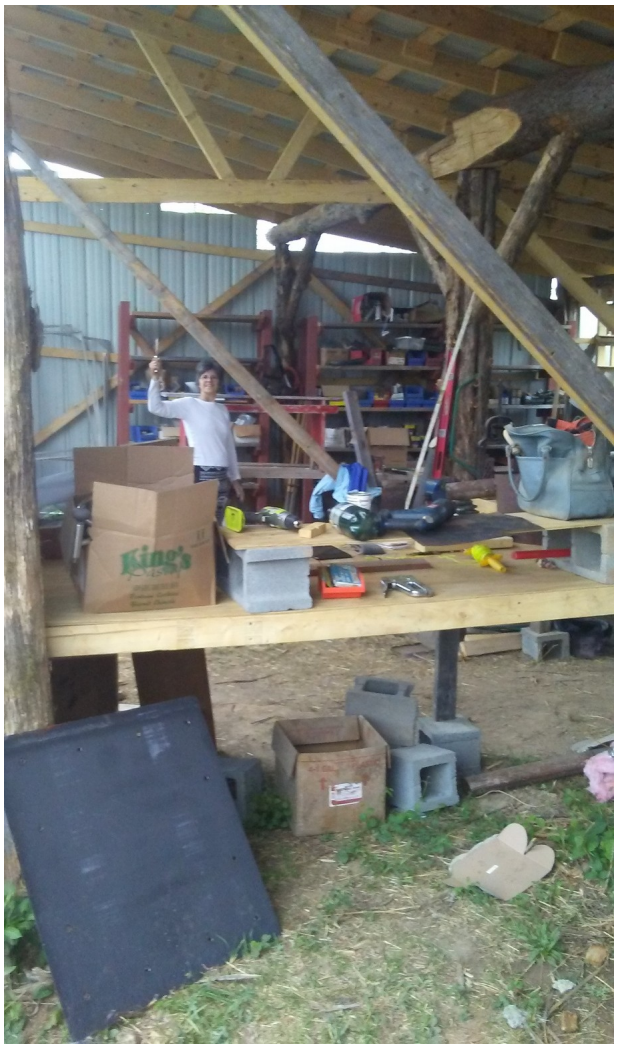
Alexis and Connor will take you on a tour of our orchards as well as looking at wild edibles. Never seen a persimmon tree, kiwi vine, or filbert bush? Here's your chance! Note: this walk will be somewhat physically demanding. Bring a water bottle and come prepared for the sun. Saturday, June 3, starting at 1 PM.

Fossil Free Food Processing

Think it's possible to eat out of your garden and orchard 365 days a year without a freezer, or even a refrigerator? See how we do it at LEF. Season extension, root cellaring, fermenting, drying, canning- we do it all, without any fossil fuel or grid electricity. This workshop will be taught by Debbie, who manages the seed growing and, some LEFers say, is one of the best cooks on the farm. Saturday June 10, starting at 1 PM.

Green Remodeling

Rebuilding old buildings is often more challenging than starting from scratch. This Green Building workshop will focus on how to reconstruct existing buildings to make them more energy efficient, and to prepare them to operate without fossil fuel. This workshop will be Saturday, June 24, starting at 1 PM at 217 Fredericksburg Ave, Louisa VA, 23093. That location is **NOT AT LEF.**



Paula in our new workshop

Lots of New People at LEF

We have lots of good energy at LEF these days. Connor is making great progress on our our new you-pick berry operation and horticultural food growing. Gilgamesh is finishing out the new shop, which is now one of the most popular spots on site. How did we ever live without it? Misha is

working on finishing out our main house. Deanna has brought our first bee hives to the farm and is setting up an herb garden next to the kitchen. We have been joined by Paula, who is taking care of our new crew of ducks. Bobby has been instrumental in getting the woodgas tractor running again. Eddie has built something that looks a lot like a solar boiler. Dan and Erica have moved into Magnolia House (1 mile away from LEF) with their kids Jesse and Mason. They hope to move to LEF later in the year. The LEF kids -- Rosa, Nika, Sunnelin and Olan -- are doing great.

Living Energy Global Initiative -- Taking LEF Around the World

Life is very full at Living Energy Farm these days. We are working on a model of sustainable living that we hope can spread around the world. As we mentioned in the last newsletter, we had plans to use our package of sustainable technologies to support lighting and water pumping in a small hospital in Kenya. We were relying on support from some of the staff of other NGOs to travel there and provide information. Unfortunately, there are more people at risk of famine right now than at any time in the last 60 years. The African NGOs have their hands full. They have not been able to work with us on our project. Such is the ongoing price of climate change. We wish them good progress in their work.

In the meantime, we have been networking with people and organizations that might help move this idea forward. Eddie, our technical intern at LEF, just left to return to Pittsburgh. He hopes to build an LEF-style community there. We have also had a couple of meetings with the New Community Project in Harrisonburg VA. They have put together an amazing community of people around a neighborhood of houses that offer both an ecological vision and hospitality for people trying to get on their feet. We have a plan to take their main community house off-grid using the LEF approach. We will work on design and funding in the coming months, and begin work on reconfiguring their community house later this year or next.

Tom Benevento is one of the lead organizers of the New Community project (Vine and Fig) in Harrisonburg. He has also done support work for sustainable development projects in Guatemala and the Dominican Republic. He will be traveling down there next winter. We will probably send someone to travel with him and assess the options for setting up LEF-style communities in the Dominican Republic. We have friends in Nicaragua with whom are discussing the possibility of setting up similar communities there.

Millions of people around the world do not have access to electricity, or farm traction. The integrated village renewable energy systems we have at LEF are, we hope, both sustainable and economically viable. As we spread this model, we intend to advocate an ideology that holds the Earth as sacred. We hope that our model, once more people understand it, will be able to spread on its own.

Do you have friends in non-industrial countries? We are looking for people who have connections in communities where establishing LEF-style energy systems would be welcome. Such communities would need to have a sufficient level of social organization to be able to take advantage of energy supplies that tie numerous households together. Do you want to help us spread this model? Please talk to us.

Low-Density Nickel Iron Batteries?

We have been continuing our research and work with Nickel-Iron (NiFe) batteries. NiFe batteries are non-toxic, extremely durable, and very tough. Lead-acid batteries are fragile, toxic, and short-lived. Lead-acid batteries dominate the off-grid market, and have largely destroyed it because they die so quickly.

All of the research and development of batteries, NiFes included, has focused on power density- storing a

lot of energy in a small space. Thomas Edison made and sold NiFe batteries, intending them for use in electric vehicles and other portable uses where high power density is very desirable. For such uses, short recharge times are also desirable. NiFe batteries have lower power density and longer recharge times than lead-acid. Modern research on NiFe technology has continued to focus on these issues. (There is one substantial research project underway at Stanford University.)

From the perspective of how we do things at LEF, power density and recharge time are irrelevant. At LEF, we store energy in various ways that allow us to minimize the need for stored electricity. We store water in pressurized tanks, so we don't have to run a water pump at night. Our buildings have massive thermal mass, so we don't have to run a heating system at night. We will pump irrigation water through the house while the sun is shining, getting free air-conditioning in the summer from solar pumped irrigation water. We use high voltage DC motors when the sun is out. We use stored electricity for lighting, nothing else. Our NiFe batteries charge all day long from our solar electric panels. It would not matter if their recharge times were slow or if their power density was abysmally low. Big, cheap batteries would be just fine.

A few people have tried “out in the garage” experiments with homemade NiFe batteries. The basic ingredients -- nickel, iron, potassium hydroxide (aka potash) -- are easily available. We have been looking over Edison's original manufacturing processes, as well as the documentation of various homemade NiFe attempts. From his shop in Pittsburgh, Eddie is going to continue the research and try to build low-density NiFes in mason jars. We are not so presumptuous as to imagine that we could outsmart the many well-endowed entities that have worked on high-tech batteries over the years. But it is very possible that low-density NiFes have been ignored simply because there is no immediate profit to be made.

If we can make cheap, low-density NiFes, it would be revolutionary. A very small solar electric panel could be wired straight to the batteries. Small houses in villages all over the world could have light with small LED flashlight bulbs designed to run on low voltage. That could be a cheap, very durable way to provide lighting to millions and millions of the world's poorest peoples. Wish us luck. If the mason jar NiFes fail, we will continue our overseas efforts using purchased NiFes.

Solar Boiler?

Finding a clean, sustainable way to cook food each and every day has proven to be the most challenging aspect of our project. A defining characteristic of LEF is that everything we do has to be as cheap and simple as possible. That is embedded in our definition of sustainability. Finding tools and machines that are accessible to most of humanity is not easy. At LEF, we are using a combination of solar cookers (parabolic and ovens), and wood stoves. Our rocket stoves are very

Solar boiler is operational, but not adequately effective (yet). New shop in the background.

efficient, using about one-tenth of the wood of an old-fashioned wood cook stove. There are numerous organizations working to spread rocket stoves around the world. That's a good thing.

The rocket stoves work, but they are an outdoor technology. They are a fire hazard. They mean that some ash and soot get into the food, and some smoke gets in the face of the cook. We built a biogas system at LEF a few years ago. (Biogas = methane = natural gas.) It worked, but there are limitations. The gasifier needs to be kept warm. In cold climates, sometimes they are buried. It needs to be of considerable size. It needs to be fed biomass each and every day.

Seeing the limitations of biogas, we have built a prototype solar boiler. We designed a tracking collector that followed the sun, but decided to use a simpler trough system that needs no tracking. The collector reflects light onto a pipe which contains water. The water boils and the steam collects in a storage tank. The steam could be then piped into a steam-jacket kettle in the kitchen to cook our food. Cooking would be as simple as opening a valve leading to the kettle.

We have been making solar steam, but so far, not enough to make it an effective heat source for cooking. We have some design modifications under way that should improve performance substantially. At LEF, we live with these technologies. We are currently eating small amounts of ash and soot in our food almost every day. Such is unavoidable when cooking with wood, and unacceptable in the long run, especially for our kids. The fact that we live with the technologies we espouse gives us a very different perspective than just experimenting with them.

Another advantage of developing the solar boiler is that we need the exact same parabolic trough setup for a solar ammonia ice maker, a super low-tech refrigeration system. We have thus given ourselves a head-start on that project. And we decided we are also going to look at biogas again. It could be a good bridge fuel for times when the weather does not support the solar boiler. Can we do it and still keep it simple and economical? Methane is a potent greenhouse gas. Can we control leakage? What is the impact of that on a larger scale? We will be seeking to answer these questions in the coming months.

We Are Running a Woodgas Tractor!

A couple of months ago, we finally got a woodgas tractor running. It ran well until we loaded the engine heavily, at which point we learned that our gasifier was too small for the tractor on which it was mounted. (See our Dec - Jan newsletter.) Since then we have rebuilt the melted woodgas reactor chamber, and mounted the gasifier on a smaller tractor.

One-row Power King tractor running woodgas and pulling an old mule-drawn Cole planter

The tractor we are running now is an old Power King, which has an engine that is a better match for the gasifier. We have had some frustration in figuring out the best filtration system, but so far the tractor seems to run well. The Power King engine is 1/2 the size of the Ford 661 we tried it on the first time. There is definitely a learning curve with woodgas. You need very dry fuel. The gasifier needs to be hot. We will keep you posted as we learn more about this technology. Power performance seems at least adequate, though starting and stabilizing the engine takes some figuring out.

Running a Tractor on Pine Sap?

If you have ever dug a garden by hand, you can appreciate the amount of effort it takes to pull a plow or a cultivator through a field. At LEF, we do as much as we can with organic no till, and growing food on trees. But at the end of the day, being able to move things around or till the soil is hugely helpful on a farm. Our woodgas tractor is operational again. Perhaps it is a good solution for a post fossil fuel world, but the expense, weight and complexity of having a gasifier bolted to a small tractor is noteworthy.

We have been doing research about a different and intriguing option for motive power. A friend of ours who lives out in Missouri by the name of Kris Ward is an unsung hero of LEF. Without him, I am not sure what this project would look like, but it would be different than what it is. Kris is an old-school machinist of the highest caliber. My shorthand description of Kris when I am talking to other people about him is that he knows more about old machines than God. He donated some equipment when we were starting LEF, and introduced us to Nickel Iron batteries. (Which are working miraculously well for us.) He has answered countless questions about things mechanical for us.

Some time ago, I asked Kris to describe to me all the ways people have made machines move in the past. Steam, draft animals, some of it is obvious. Hot air engines? Some of it is not obvious. The most intriguing answer was turpentine. For those of you not from the south, turpentine is a distillate product of tree resin. You can make it from pine sap, as was quite common on the old south. Turns out turpentine burns very similarly to kerosene. Compared to gasoline, it burns slowly, and does not vaporize easily.

Back before World War II, the process for refining gasoline was less sophisticated, which meant that refineries sold more lower-grade kerosene fuels. These fuels cost one-third as much as gasoline, and some of the tractor companies made tractors (a lot of them) to run on these low-grade fuels. Also, these old tractors were like lawnmowers in the sense that the only electrical system they had was to send a small charge to the spark plug to make a spark. They had no battery and no lights. They were designed to be easily and safely hand-cranked. As much as I dislike lead-acid batteries, it has remained an outstanding question as to how we would start a woodgas tractor without one. These old hand-crank tractors have low-rpm engines (they turn slowly), making them well suited to low-octane fuels that burn slowly (woodgas or turpetine). They are also very, very durable compared to modern engines.

Small one-row Tuff-Bilt tractor, more efficient farming with less fuel.

We chose woodgas to run our tractors because it seemed like it made the most sense. Woodgas prevented mass

starvation in Europe in the 1940s. People have asked us why we don't use ethanol or biodiesel. The answer is that those are precious fuels that are derived from high-grade feedstock. They compete with humans for food. With woodgas, the fuel is all around us. That being said, both woodgas and turpentine need a warm engine to work well, so a small amount of ethanol would be really useful as a starter fuel.

Woodgas is not necessarily easy to work with. Liquid fuels have some big advantages. Now we have a new project. In the next couple years, we will set up a turpentine tractor and see how it works. Kris summed up the situation in a recent email. “I'm thinking what we will need to do for traction in these villages we envision is a variety of fuels, depending on what is available in the particular bioregion. ie, turps [turpentine] in the pine forest, wood gas in hardwood, steam in straw (yes, they made special straw burners for the flat lands), etc. Perhaps combine one or more of these with animal power from time to time.” Couldn't have said it better myself. (If you are a farmer and you care, the old John Deere models A, B, and D are some of the ones designed to run on “tractor fuel” and are easily hand-started.)

We are also reducing the size of the tractors we use. We have found an old Tuff-Bilt, a small, one-row tractor that will allow us to plant and cultivate more accurately. We should be able to dramatically reduce the amount of hand weeding without any increase in fuel use, just by using smaller, more precisely controlled equipment. We have acquired a ancient mule-drawn Cole planter to mate with the Tuff-Bilt. They still make this model of planter as it is ideal for precise seed spacing. Putting together old and new works best for LEF.

Oggun -- A Tractor for the Masses?

We currently have our wood gasifier on a Power King. We will build a gasifier for the Tuff-Bilt soon. Our goal is to come up with the simplest, cheapest form of post fossil fuel mechanical power for farmers around the world.

Oggun Tractor, similar to the classic Chalmers G and the Tuff-Bilt, but made to be locally produced.

We recently discovered Oggun, a new tractor on the market. The primary weakness of small tractors is that they are too light to have much traction. The Oggun puts the engine right over the rear wheels, maximizing traction. The drive train is as simple as it can be, with a hydraulic pump/ motor arrangement as is used on some heavy equipment. (There is a hydraulic motor directly attached to each wheel, which eliminates the need for a heavy mechanical drive train.) The Oggun has a front cultivator attachment point for precise cultivation, as well as an attachment point for rear implements. It's a great design. Even more amazingly, the intent of the Oggun tractor company is to help other people around the world to make Oggun tractors. Their business plan is quite unique. The intention is to set up distributors who over time become producers, substituting locally (nationally) made parts when possible. Thus the Ethiopian or Brazilian distributors will use steel, engines, and other parts made in Ethiopia and Brazil over time. This, hopefully, will make the cheapest possible (but still functional and effective) tractors for farmers all over the world. See the Business Plan at

thinkoggun.com

Industrial agriculture is going to fall apart over time. It is critically important for our survival and well-being that we replace it with sustainable methods of food production under local ownership and control. In using our one-row tractor with a gasifier on it, it is clear that even this modest level of mechanization is going to be very difficult for the poorest of the world's farmers. All along we keep asking ourselves, “what is the simplest, cheapest, most effective way to do the work we need to do.” For farm traction, the smallest tractor are walk-behind tractors. David Bradley walk-behind tractors were very popular among small farmers and home gardeners 50 years ago. They are even smaller than our small one-row tractors. The amount of work they can do per hour is limited. But the amount of work they can do compared to a draft animal is large, and the amount of support they need compared to a draft animals is very, very small. We have not pursued walk-behind tractors because of their very limited pulling power, and because of our understanding at the time that is was not practical to run an engine that small with woodgas. We have since found people making gasifiers for such small engines.

In the U.S., we have a lot of cheap, used tractors to choose from. In taking LEF around the world, we cannot rely on used equipment. What does the future hold for humanity? Millions of small farmers using Oggun-style tractors running woodgas or turpentine? Walk-behind tractors? Certainly, Kris's comments about diversified motive power sources adapted to local resources are pertinent. The difference at LEF, as compared to the many academic or “demonstration site” ecological research projects is that we rely on our tools to support us -- to grow our food, to earn our living. Many ideas that seem fantastic prove impractical in the field. We will do a lot of our farmwork with woodgas this year. In the next couple of years, we will test the practical viability of turpentine and walk-behind tractors powered with woodgas and turpentine. Perhaps we will set up an Oggun with farm-produced fuels. The big question of how we feed ourselves sustainably and equitably on a global scale is a big one. Hopefully we can do our part to answer it. Our work with putting together integrated village energy system using high and low voltage DC power is working really well. We feel like this system is well worth exporting to villages around the world. Hopefully, ongoing improvements to cooking and farm traction will enhance our efforts. Please support us if you can.

Article about LEF at the Atlantic Online Magazine
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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 and can be made via our website.