American intensive solar gardening

Two homesteaders take European cold framing one step better and double their yields in less space.

by Leandre Poisson

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When we began homesteading, one of the hardest things we had to do was to change the habits we had developed in our consumer lifestyle. Our question changed from what do we want for dinner to what do we have for dinner. We must confess that, toward the end of our first winter, our enthusiasm waned when the answer continued to be "root crops." We wanted to develop a gardening system that would enable us to have the food we like - fresh produce available throughout the year. Today, having enough of the kinds of food we really like to eat is a concept that has become thoroughly ingrained in our self-reliant lifestyle. We have gotten into the habit of having what we like - fresh, great-tasting, healthy food - because we now possess the necessary skills and tools to be truly self-reliant.

Intensive gardening

When we first decided to homestead at the end of the 1960s, Lea's motivation was purely instinctive. I was raised in the country, in a family that grew the bulk of its own foodstuffs. Fate must have smiled on Lea when he bought our property, because almost every bit of it sloped southward, making it ideal for both solar living and gardening. It had been a working farm less than one hundred years before, though by the time we moved there it had long since reverted to forest.

Lea cut the large second-growth pine trees that inhabited the site where we decided to locate the garden. A neighbor pulled out the stumps with his backhoe. By the time he finished, the ground that remained was a mixture of hardpan and rocks, with a pH of 4.5 and no humus or any other suggestion of fertility. We began to build up our soil organically by adding hundreds of pounds of rock minerals and by raking up leaves and topping them with mulch hay to keep them from blowing away.

That first spring of 1970, when it came time to plant, we laid out our garden in traditional rows, since that was all we knew how to do - all except for the potatoes. We decided to plant the potatoes in the way a local friend described. Fairly late in the spring, we cut up five pounds of supermarket potatoes and planted them on top of the soil in a six-by-10 foot area and covered them with rotted mulch hay. As the plants grew, we settled more hay around them. When we harvested in the fall, that little patch yielded 70 pounds of potatoes. We recognized that something special had happened in our potato patch. It was our first intensive bed.

The next year we shaped random, free-form beds and planted vegetables in clusters rather than in rows - a method of planting Lea had observed in France in the 1950s. Then we noticed something strange. We had planted the same amount of vegetables as in the previous year, but in only a little over half the garden space. We began looking for different things to grow, branched out into mangels (sugar beets) for our pigs, and started planning crops of soy and other dried beans and flint corn for the following year. This was our first experience with an intensive gardening system.

Indigenous solutions

Meantime, we had started an association of homesteaders in our county. At one of our meetings someone brought in a film about organic gardening in Japan. One scene showed a farmer walking along a high, mounded bed on a board and then reaching down to pull out (with some effort) a diakon radish the size of a baseball bat. That one image in the film impressed itself indelibly on our minds.

We began to research how indigenous peoples fed themselves, both historically and in the present. Indigenous solutions evolve when people live in one place over a long period of time, working with an area's resources and limitations to provide shelter, food, fuel, clothing, and transportation. We discovered that most preindustrial indigenous growing systems consisted of mounds, terraces, or beds. Gardening in rows is a relatively recent phenomenon, closely linked to the rise of mechanized agriculture. Clearly intensive agriculture was not a new fad but an ancient and efficient method of growing crops in many climates and cultures.

The following year we converted our garden into 18 five-by-50-foot raised beds. We made the beds 50 feet long because that distance represented half of the garden's length. Four feet seemed to be the most useful width because we could easily reach the middle of the bed from either side. The beds were two feet apart from crown to crown and the paths between the beds were one foot wide. An opened newspaper fit exactly from edge to edge and two flakes of mulch hay placed side by side perfectly covered the newspaper.

At first our idea of bed building involved simply adding humus material and fluffing the beds into shape. Then it became obvious that if we took the useful dirt from the pathways and piled it onto the beds, we could raise the beds by lowering the pathways and make use of every bit of our valuable soil. That fall we began to experiment with crude seasonal extenders made by surrounding part of a bed with hay bales and stretching polyethylene sheeting across the top of the bales.

We left several of these seasonal extenders in place and the next spring we got a jump on planting peas and members of the cabbage family. We began to mulch carrots, beets, turnips, and parsnips for midwinter harvest and discovered that carrots and parsnips kept growing underneath the snow. Attention was soon directed toward our unusual garden, and even the county extension agent dropped by to see what we were up to.

In 1974, we built permanent wooden sides for our raised beds. These board-sided beds concentrated the humus-building material we added to the garden, prevented rainwater from running off the beds, and kept the sides neat. We had already been edging and mulching the dirt-sided beds, but the boards were more effective.

Lea was working at the time as a consultant to the Kalwall Corporation, a manufacturer of building products. At Lea's urging, Kalwall developed a solar-friendly, fiberglass-reinforced plastic sheet glazing material that he dubbed Sunlite. This Sunlite material was dramatically lighter than glass per square foot, and it turned out to have many applications for Lea's designs and for the solar industry as a whole.

Lea began thinking about how to build the smallest and simplest solar greenhouse possible. Standard freestanding greenhouses provide no net energy gain when the net energy of the food produced is compared to the cost of heating the unit in wintertime. Add-on solar greenhouses or sun spaces create an energy deficit when you compare the amount of food produced in them to the resources and energy used in their construction.

In 1976 Lea conceived of a gardening device that met all of his design requirements: it was inexpensive, easy to build, and used resources and energy wisely. We christened this device the Solar Pod. That fall we prepared a bed and planted it with lettuce, but we didn't place the Pod on the bed until February. When we shoveled off the snow and uncovered the bed, which we had protected with a scrap of fiberglass, to our surprise the lettuce still looked green and edible underneath all that snow.

After we set the Pod in place, we were amazed by how the soil under it heated up and how the lettuce grew . . . and grew, and grew. It was quite possible the most photographed lettuce in history. Friends came to see the experiment, and they mentioned to us that the Pod reminded them of intensive gardens in France. The following winter we discovered several books on French intensive gardening, or what the French call the Marais system.

marais practitioners placed bell-shaped glass jars, or cloches, over individual plants or groups of seedlings to provide heat and protection and to create a microclimate underneath the glass. They also used extended cloches, which looked like what we would call cold frames. The cloches were used to preheat soil for planting and to cover seedlings and small plants; the glass-topped frames were set over plants that would be grown to maturity. In cold weather, woven straw mats placed over the glass at night provided a limited amount of insulation.

Solar appliances

During the 1970s we lectured extensively all over New England on passive solar use and on our gardening methods. At that time we thought of our system as a translation of French intensive methods. We had replaced the heat-assisting methods of fermenting manure, glass-topped frames, and straw mats with our passive solar Pods constructed with modern materials. The improved heating function of our double-sized, insulated devices, which trap sunlight and make its radiant heat available to plants even in the dead of winter, proved to be better and more versatile than traditional glass frames and cloches, which don't work in our cold climate because of their relatively poor insulation value.

Inspired by the concept of the original cloche, Lea set to work in an attempt to bring these, too, into the late twentieth century. Glass cloches had all the disadvantages one would expect with glass. They were heavy (weighing about 5 1/2 pounds apiece), hard to move around, and expensive even in their heyday. They had to be whitewashed to prevent the so-called lens effect of clear glass, which would focus the sun's direct rays and burn plants under the glass. And cloches had to be opened and closed every day.

Lea wanted to make a cloche from a flat sheet of Sunlite that would create a simple, protective environment for growing plants. He also wanted to provide an alternative to the short-lived, throwaway products like "hot caps" already on the market. The shape that made the most sense was the cone, but Lea found he couldn't close the material completely at the top without cracking it. He decided to leave the hole on top, figuring it would be easy to plug with mulch hay or cap with a circle of glazing material if necessary to prevent heat loss.

Lea experimented with many different cone profiles and found that steeper cones acted like chimneys, while the structure of flatter ones wasn't strong enough. The best and final configuration, coincidentally or not, resembles the profile of the great pyramids. We christened this lightweight modern cloche the Solar Cone.

With the previously unwanted hole on top and its base settled into the ground, the Cone acted as if it were a terrarium. The solar heating inside the Cone accelerated the transpiration rate of plants, which in turn accelerated their growth rate. The Cone's sloped sides recaptured moisture as condensation, which rolled down the sides and returned to the plants. The hole on the top permitted the necessary gas exchange of carbon dioxide and oxygen, but inside each cone the environment resembled a miniature rain forest. As long as the ground remained moist and the Cone was set firmly, plants would not wilt, no matter how hot it got inside.

In all of our experimentation with Cones and Pods, we kept in mind that these solar appliances had to work thermally, had to be simple to build and maintain, and had to be well within the economical reach of the average gardener. We designed the appliances to make the most of the building materials used (plywood, glazing, insulation), with as little waste as possible. In turn, the assembled appliances optimize growing conditions in any climate - from far north to deep south - and provide functions as varied as heating and shading, as well as wind and insect protection. The multiple functions and portability of the appliances encourage gardeners to use them creatively and move them around the garden as needed.

As we distilled and further refined our gardening system over the next decade, we began to realize that we were not longer translating the French system to America. We were in the process of developing our own unique system - a simple, state-of-the-art, flexible, and continuously productive method of growing food on very little land - which we named "American intensive gardening."

We define "American intensive gardening" as a continuous food producing system, one that provides an ideal growing environment for the entire plant. By creating and maintaining a deep, well-balanced, fertile soil, the system optimizes growing conditions below the ground. By using heat-assisting devices to create beneficial microclimates for seedlings and mature plants, it ensures optimum growing conditions above the ground.

Open beds

Everything in life has its pluses and minuses. In our second decade of gardening, the minuses associated with raised beds started to outweight the pluses. We began keeping track of how much time we spent landscaping the beds; edging, siding, mulching, and smoothing and evening them after adding horse manure. We spent some 20 or 30 hours a season just mulching the rows between beds.

Sure the beds looked great, but was all this landscaping work really necessary for food production? Also, since our goal was to not step on the garden soil, tasks like trellising became awkward with the raised beds. Maybe we were just getting older and lazier, but we decided we needed another system, one that would be easier, simpler, and better than raised-bed gardening.

Another factor that changed the way we wanted to garden was the flexibility of our solar appliances. Since moving plants always sets them back, no matter how carefully they're transplanted, it made more sense to move the appliances than to move the plants. More and more we found our selves planting beds of vegetables in formations that could accommodate the appliances we would later set over them.

We also kept exploring new ways to use the appliances in different seasons, with definite goals in mind: First, we wanted to create a gardening system that would give us greater flexibility than our four-foot by 50-foot raised beds, which were locked up in a military-like formation. Second, we wanted to grow more in less space.

We realized we needed portable bases we could easily place over crops when they needed Pod protection. So Lea built six simple four-by-eight-foot rectangular bases out of pressure-treated two-by-six inch boards to go under the Pods. We called the bases "drop frames."

These simple, humble devices became the catalyst for a whole new way of thinking about bed gardening.

The drop frames proved to be inexpensive to build and easy to move around. They represented an immediate and obvious improvement over our network of permanent board-sided raised beds. Used by themselves, the drop frames were wonderful to sit on while planting or weeding, especially with a board set over the top that could slide along, making a most comfortable seating arrangement. Two or three drop frames could be piled on tope of each other to provide quick wind protection for seedlings. With screening or netting set over the drop frames, insects and birds could not damage the crops. What we loved most about them was the way in which the frames defined planting areas into standard four-by-eight-foot or (placing two side by side) eight-by-eight-foot beds.

In 1979 we started an experimental and demonstration garden that measured 40 by 40 feet. Instead of building several raised beds, we made the entire surface a raised bed. Instead of limiting growing areas to strips of beds, the whole garden became a potential growing space. When needed, eight-inch-wide boards provided temporary pathways between planted areas. The growing areas could be any length or width needed. Trellising plants became more of an aesthetic option than an awkward dilemma. We planted most of the garden in the basic four-by-eight-foot areas to accommodate our standard appliances.

Since the whole garden was now open for cultivation, we called this new system "open-bed gardening." Our old raised beds had eliminated some of the wasted space we had when gardening in conventional rows, but with the open-bed approach we found we could grow on virtually the entire surface of the garden. IN the fall, we could top the whole surface with horse manure and rototill the entire garden. That constituted most the landscaping needed for the year. If we got started early in the spring, we did a shallow tilling to turn under annual weeds. Then we set up our trellises, dropped our frames and boards to use as walkways, placed the Cones or Pods over the beds, and away we'd go into the main growing season.

This new system was a piece of cake! We happily decided that in our older age we weren't getting lazier, just smarter. And we were achieving our goal of growing more food with less work and less space.

Layout and size

American intensive gardening will accommodate almost any gardener's goals. Different gardeners can achieve different objectives simply because, within the framework of the system, there are so many possibilities as to when and where a particular crop can be grown. Since you c an lay out an open bed into any configuration of intensively planted crops, the system offers flexibility.

Setting down drop frames is the easiest way to define individual growing areas. If you place two drop frames on the ground, 4 feet apart, they will define three separate 4-by-8 foot growing areas. Another way to define individual growing areas or beds if with boards that are at least 8 inches wide and 8 feet long. Laying down these boards creates temporary pathways between growing areas. We call these movable wooden paths "boardwalks." In addition to delineating bed size, they give us access to all parts of the open-bed garden, spreading gout our weight as we step on them and reducing soil compaction. Using boardwalks, we can divide the open bed into growing areas of any size.

Yet another method for determining the layout of growing areas within the garden involves the various solar appliances. For example, we use the Solar Cones as a germination aid to start our climbing peas and beans early in the season. Growing areas for these crops must then be 3 feet wide to allow for the width of the Cones. If we plan to use the Cones over growing plants for frost or insect protection, we plant or transplant the crop into a corresponding configuration. For example, we space our eggplant seedlings in the spring so we can set the Cones over them in early fall to provide frost protection.

The most important determining factor for figuring the size of growing areas is the amount of vegetables you plan to grow. Compare the quantity of a particular vegetable you want to harvest with the yield information in the accompanying Storage Harvest Yield Chart, then calculate the size of growing areas for various crops based on this information.

If you're starting from scratch, we recommend a ballpark size of 200 square feet (one 10-by-20-foot bed) per person. We feel this garden is the ideal size in which to learn and practice the American intensive system. To maximize yields in this modest-sized area, you would need to plant intensively and use the appropriate solar appliances to ensure a continuous capacity. As your gardening skills increase, the size of your open bed will grow proportionally.

If you're a supplemental gardener engaged in improving and augmenting your family's diet, you can easily meet the fresh harvest needs of a family of four on a 20-by-40-foot garden area. If, on the other hand, your goal is to provide food self-reliance, your garden area will need to be at least 40 by 40 feet and will require additional growing space for major staple and storage crops like potatoes, dried beans, winter squash, fruits, and grains.

If you are a reasonably skilled row gardener, by converting to an open-bed American intensive system, you can easily quadruple the yield of your growing area. One reason for this major increase in productivity is that, in the transition to an open bed, some 90 per cent or more of the pathway space in the conventional row garden is converted to growing space for vegetables. By using solar appliances, you can grow more food in succession crops and, inside the appliances, vegetables are continuously producing, easily doubling yields.

We recommend that you convert your existing growing areas to open beds one section at a time. The beds can be any comfortable square or rectangular size. Access pathways can segment larger areas within the open bed. These access paths are necessary in a larger garden for delivering humus-building materials to the growing area. One way to make access pathways is by laying down cardboard or several sheets of newspaper covered with mulch hay or straw. These materials will decompose and can later be turned into the soil.

The smaller you make each open bed area within your garden, the greater the percentage of space that will be devoted to access pathways and the smaller the area that will be available for growing. For example, an existing 60-by-60-foot garden would divide most space-efficiently into four 28-square-foot open beds, with a four-foot access pathway crisscrossing the garden. A smaller existing garden measuring, say, 20 by 50 feet would most easily be divided in half by one four-foot-wide pathway, creating two 20-by-23-foot open beds.

If you are already producing the amount of food you desire or need in an existing garden, you can downsize the garden when you convert to the American intensive system. Figure on producing the same yield as from a conventional row garden on roughly one quarter of the area. A raised-bed garden's yield can be produced in an open bed of roughly half the size. By freeing up existing garden space, you can plant green manure crops to increase soil fertility on the portion of the garden not raising vegetables, you can rotate growing areas from year to year, or you can plant new crops such as small fruits or grains in the found garden space.

The materials for the Solar Cone amount to about $25, the Pod's approximately double that. The cost of a drop frame can be anything from nothing if you have some scrap lumber to $25. Properly constructed and maintained, each solar appliance has an estimated life of 25 years or more. Our older Solar Cones, which we have left in the garden through frigid winters and blazing hot summers, are still as useful as they were some 15 years ago when we first constructed them.

We use American intensive gardening techniques to grow food year around, even in our relatively cold New Hampshire climate. Our system works well on a small personal scale, but market gardeners can also use it to grow fresh produce for local markets. Our system guarantees high returns for any labour invested in it, because it simplifies cultural care of plants by growing them in ideal conditions and in concentrated groupings, and because it spreads out garden work over the entire year, rather than cramming work into a "normal" growing season. The system requires smaller and easier outputs of labor, making gardening more of an enjoyment than a chore.

Resources:

Solar Gardening by Leandre Poisson and Gretchen Vogel Poisson, from which the above was adapted, is an all-in-one guide to American intensive gardening. The comprehensive guidebook is published by Chelsea Green Publishing Co., P.O. Box 428, White River Junction, VT 05001, 1-800-639-4099.

Kits for Solar Pods, Solar Cones, and other appliances are available from Solar Survival, P.O. Box 250, Harrisville, NH 03450, 1-603-827-3811.

Solar hardware and glazing are available from Solar Components, 88 Pine Street, Manchester, NH 03103, 1-603-668-8186.