

A DOOR INTO SUMMER

By Gwen O'Reilly

“Can’t be done, huh?” That was Carol Ford and Chuck Waibel’s response when they were told they couldn’t grow vegetables in winter in windy, west central Minnesota without incurring prohibitive fuel costs.

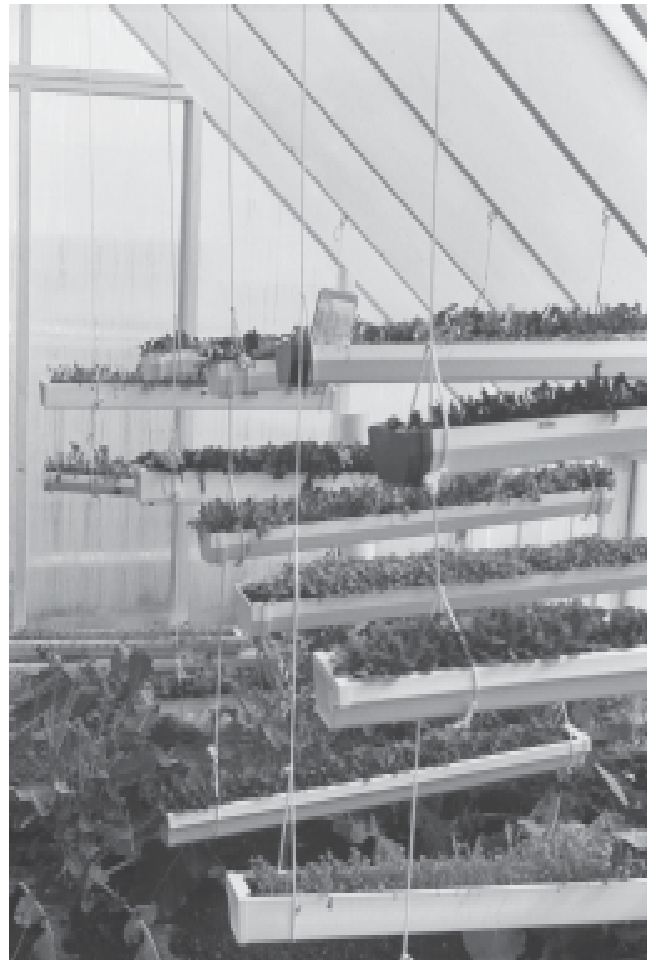
One fall, after the CSA program they had belonged to had ended, Carol and Chuck thought, “Somebody needs to do something about fresh vegetables in the winter!” The project started when the pronoun shifted to **“We”** need to do something.

Carol is a Master Gardener and had seen many greenhouse designs in her horticultural career; Chuck had taught courses such as “Social and Ethical Implications of Technology.” They considered the demand for local food in the context of existing energy technology and asked themselves why wasn’t anyone doing this. They took a Farm Beginnings course from a local Land Stewardship Project, developed a business plan and got a loan.

Now, they run a **winter** CSA. That’s right. They decided that a CSA was too good an idea to use only part of the year. They had considered Eliot Coleman’s four season approach, but realized a hoop house was unlikely to withstand the -40°C wind chill of their prairie home. So, they came up with a design for a passive solar greenhouse to grow greens and cool season crops throughout the winter. They started Garden Goddess Produce, an 18-member CSA, and now grow storage vegetables throughout the summer months to supplement the star attraction: a wide variety of fresh greens and brassicas.

Chuck and Carol had several goals in mind when they designed their 16 by 22 foot (roughly 5 by 7 metre) greenhouse. Foremost, of course, it had to withstand winters in northern Minnesota. It had to use very little energy and require only minimal supplemental heat. At least part of their motivation was to address concerns about climate change and Peak Oil, while producing good food and supporting the local economy.

The greenhouse had to be easy and relatively inexpensive to duplicate using “off the shelf” materials,



Crops are grown in a series of suspended eaves-troughs that make efficient use of the vertical space.

because they embarked on this project with the intention to share their model with other northern communities. A business advisor cautioned them to patent or trademark their ideas, but Chuck explained that everything they’ve done is a creative combination of information in the public domain, and they’d like it to

stay that way. He says he's a Schumacher (*Small is Beautiful*) kind of guy.

Their growing schedule, which they squeeze in between other employment, now competes with numerous requests for tours and talks, which they willingly provide. The challenge? To find time to expand their enterprise to include aquaculture, a larger greenhouse, and a cold storage unit to accommodate their needs, as well as those of other local growers. Oh, and maybe a publishing house for local food resources.

They built the structure off the back of their garage which protects its north wall, and also makes it easy to load produce into their vehicle. The surfaces with direct and maximum exposure to the sun are glazed with double-walled polycarbonate panels, and all other walls are well insulated. The glazing is angled steeply enough to capture most of the winter sun's radiation at as close to a 90 degree angle as possible. Everything is painted flat white for maximum reflection.



"The door into summer" leads to a growing season no matter what month it is.

The foundation is excavated four feet (1.2 m) into the ground to bring it below the frost line and is insulated with Styrofoam. Growing temperatures are maintained by a simple solar heat pump, which consists of loops of perforated drainage pipe buried in several feet of large gravel and rock that acts as thermal mass. Growing beds have been built on top. Lengths of black stovepipe run through the topside of the greenhouse and a couple of small fans blow hot air from the stovepipe into the drainage pipe in the rock mass during warm days. The stored warmth in the rock slowly makes its way up through the floor at night.

Chuck and Carol use a few water barrels to moderate tempera-

tures, and use fans and vents for ventilation. In the coldest or greyest weather, they use a propane heater to keep the temperature up, but burn less than \$100 of fuel in a season. The supplementary heat comes on at 40°F (6°C), primarily to keep the water pipes from freezing. The crops are actually able to withstand lower temperatures.

Crops are grown in beds and in a series of suspended eaves-troughs that make efficient use of the vertical space.

Carol says they wanted to see what they could produce with as few inputs as possible, which eliminated the idea of fruiting vegetables which need higher temperatures and longer day lengths. They didn't want to use supplemental lighting because it would increase energy use, cost and technological complexity. They discovered that many varieties of vegetables will grow in a cool greenhouse without artificial lights and that winter greens are superior to those grown in summer. These brassicas and dark greens are most beneficial in our winter diets.

Carol worries about lower light levels causing increased nitrate levels in the winter crops. To compensate, she adjusts soil nitrogen levels by changing the organic fertilizer in the planters' soil mix. During mid-winter seeding, Carol uses half the regular amount of



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bloodmeal* in the fertilizer mix. After spring equinox, she uses the full amount. She says cutting back the bloodmeal “has not affected yields, but hopefully cuts down on the amount of nitrogen the plants have to respire, so on cloudy days it’s less likely they’ll get a nitrate build-up in their leaves.”

She is looking for a research chemist to assess if there is any difference, better or worse, between her produce and that in the grocery store.

Their only inputs are organic soil amendments and parasitic wasps for aphid control, but Chuck and Carol feel it is too expensive to certify such a small operation. Their CSA members are primarily interested in local food, and also trust that the couple will not be heavy handed with any pesticide, organic or otherwise.

Carol has found that winter growing is best divided into three seasons: diminishment; solstice and expansion. She has found dif-

* The Canadian organic standards allow blood meal only if it is sterilized.

ferent suites of varieties work best for each phase of the colder months.

The greenhouse is so energy-efficient that it is not really usable in summer—it is just too hot.

A high-temperature fallow season keeps down the insect population and lets Carol and Chuck concentrate on their outdoor garden.

Carol takes advantage of this by letting the soil dry out and solarize. A high-temperature fallow season keeps down the insect population and lets Carol and Chuck concentrate on their outdoor garden which is filled with winter vegetables for the CSA. Carol says she has tried growing every root crop available to “keep it interesting” over the winter storage months, and distributes a newsletter with recipes to help customers make use of novel items. Even so, her customers report that some roots are just too unfamiliar—salsify, scorzonera and winter radishes have not been big hits. But she cites her newly developed

addiction to kale, collards and chard as evidence that people are “just one recipe away from being converts.”

Best of all, no matter how blustery the day, it is always lush and green inside their invention. Chuck and Carol call the entrance into the greenhouse “the door into summer.” The name comes from the title of a Robert Heinlein novel about a cat who, one winter, kept insisting his owner let him out the particular door that leads to pleasant weather. Chuck says they’ve also been checking untried doors, but unlike the cat, have found the one that does lead to summer. Or, at least a taste of it.

You can find out more about Chuck and Carol and their greenhouse at their website: www.gardengoddessenterprises.com. You can also find information about their inspiring book: *The Northlands Winter Greenhouse Manual: a low-tech solution to vegetable production in cold climates*. Carol Ford and Chuck Waibel. Garden Goddess Publications. 2009.

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WHY LET WINTER STOP YOU?

By Gwen O'Reilly

Hey, we're Canadian, right? We're not afraid of a little cold weather, especially here in the winter sunshine capital of Canada. Sure, lows in the minus 30s and even 40s are common, but that shouldn't stop a truly intrepid gardener.

When Leo Hunnako read that Northwestern Ontario receives 340 hours of sunshine in December, January and February, he wondered why there weren't solar collectors all around the area. He started to research the



The south-facing wall, angled at 36 degrees, is glazed with argon-filled double pane glass windows.

design of cold climate, year-round solar thermal greenhouses, and found very few resources. He decided to undertake a feasibility study to see if it was possible to operate a year-round greenhouse using only supplementary heat and minimal electrical consumption.

Leo developed a solar greenhouse design, in consultation with various experts and with funding from the National Research Council and the Northern Ontario Heritage Fund. The prototype of the year-

The greenhouse has a series of solar water heaters on the roof that heat liquid which then runs through a hot water tank.

round greenhouse, aptly named "GH365," was built in the summer and fall of 2009 on property in Nolalu, Ontario, that his family homesteaded in the 1930s.

He plants various crops throughout the winter (greens, radishes, onions, broccoli, tomatoes and peppers). One morning, he was planting in the greenhouse while the outdoor temperature was -34°C .

Leo considers himself an organic gardener, and draws inspiration from the self sufficiency of his parents' generation. He remembers that his family stored root vegetables and preserves made from gathered fruit in a root cellar, and relied on a vegetable garden in the summer. They kept milking cows and chickens. His father hunted for moose and deer, while he and his brothers caught speckled trout in a nearby creek. Leo sees his greenhouse as a way of

returning to this tradition of self reliance.

The 18 by 22 foot (5.5 by 6.7 m) structure has a series of solar water heaters on the roof that heat liquid which then runs through a hot water tank. Hot liquid is circulated through tubes in the floor, root zones and the north wall, which is filled with sand. Thermostats regulate circulating pumps and the water tank has an electric back-up that will kick in after several overcast days, or on excessively cold nights. He has also installed a couple of baseboard heaters (just in case) and a large commercial fan for ventilation.

Leo has been impressed by last winter's tomato crop, but notes that cold-sensitive crops require careful maintenance of temperature range. It is a balancing act to do this and keep electrical consumption low. In March, the GH365 used 168 kWh of power, at a cost of \$20.16.

The building is well insulated, and the south-facing wall, angled



The greenhouse is home to various crops throughout the winter, including greens, radishes, onions, broccoli, tomatoes and peppers.

at 36 degrees, is glazed with argon-filled double pane glass windows, purchased second-hand from a commercial greenhouse operator. Thermal blinds are used to keep the heat in on long winter nights. Leo is already designing a

second version, and would eventually like to see his greenhouse used in First Nations and other rural and remote communities to improve their local food security. But in the mean time, there's spring salsa to be made!

You can see pictures of the greenhouse and the construction process at Leo's website at www.greenhouse365.ca.

Gwen O'Reilly had to tear down her beloved greenhouse this year to make way for house renovations, but serendipity (and a food security conference) brought her to workshops presented by Leo Hunnukka, and Carol Ford and Chuck Waibel. She hopes to start digging the new foundation by fall, and thinks her writing may suffer when she has her own "Door into summer."

Photos courtesy of Leo Hunnukka.



One morning, Leo Hunnukka was planting in the greenhouse while the outdoor temperature was -34°C .