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Greenhouse Chicken Coop: Fertilize with Chicken Manure in the Garden

Keep your hens happy and healthy no matter the season,
while also boosting your garden's productivity.

By Dominic Lamontagne



Use chicken manure in garden to boost crops' productivity, while also utilizing a greenhouse chicken coop to keep your flock secure and content throughout the winter.

Waste management of pasture-raised animals is generally simple. When your herd is frequently moved around on a vigorous patch of perennial grasses, manure and urine spread thinly and evenly, making it easy for the ecosystem to absorb them. Unfortunately, in a temperate climate such as ours in Québec, animals that are kept all year long can't be raised solely on grass.

Handling the waste of animals housed in closed-up buildings is somewhat of a chore. Stalls require daily additions of fresh bedding material, generating copious amounts of litter that'll eventually need to be moved out and composted. I've always found keeping my laying hens penned up inside a small coop all winter long was less than ideal. On top of managing a lot of bedding and litter in a cramped space, it's hard to keep everything clean and the hens chirpy.



These gloomy days are gone now. Since 2016, my spouse, Amélie, and I have been overwintering our 35 to 50 laying hens inside a sunny greenhouse. We call it the "coop-house." Nov. 1 each year, our high tunnel becomes our flock's winter quarters for five months. All winter long, the birds till the carbon-rich leaf mulch spread on the greenhouse's dirt floor, adding their nitrogen-filled droppings to the mix while also providing us with fresh eggs daily. On April 1, the hens return to pasture, and we prep the garden bed for its May 1 planting. In late fall, after it has borne its fruit, the vegetable plot welcomes back its benefactors.

The Greenhouse Chicken Coop

Because we wanted to use it year-round, we constructed a heavy-duty 32-by-30-foot [“high tunnel” greenhouse](#). Its 960 square feet allow a substantial amount of fruit and vegetables to be grown in it each year. Covered with a permanently inflated double layer of 6-mil polyethylene film, our structure stands atop a 27-by-28-foot, 18-inch-deep insulated soil bed, with an in-earth hydronic heating system buried at the bottom of it.



This system isn't used to heat the greenhouse during wintertime, but to warm and ready the garden bed for crop production in spring. It's also used for a few weeks to lengthen our growing season when nights become colder around the end of August. It's comprised of a 12-kW tankless water heater; primary and secondary 1/25-horsepower hot-water circulator pumps (for the hydraulically separated boiler and emitter circuits); and an in-earth probe connected to a digital thermostat, which automatically turns the pumps on and off. When the soil temperature is below target, the thermostat activates the pumps, which circulate liquid (70% water, 30% glycol) across 1,000 linear feet of 1/2-inch oxygen barrier PEX (oxy-pex) tubing and through the powerful instant water heater that rapidly warms the liquid up to 140 degrees Fahrenheit.

Before filling the garden with topsoil, we laid 4-by-8-foot steel wire (Remesh) panels on the ground and tied the oxy-peX tubing to it (using tie wraps) in a zigzagging pattern, spaced 9 inches on center. Because we wanted our structure to sustain the weight of a substantial amount of snow, the tunnel's nine arches are planted in the ground 4 feet apart. However, we don't let snow accumulate on the greenhouse's roof. Instead, it packs up on its sides and reaches the top of the sidewalls around January, further insulating the structure without damaging the plastic films. The taut plastic film lets in a maximum amount of light while allowing snow to slide down the covering rather than cling to it, and the air trapped between the two layers of film provides extra insulation.



Though hens tolerate the cold well, the interior of the greenhouse is always much warmer than the outside temperature. When it's minus 22 degrees outside, it's about 0 degrees inside. Cooler temperatures are normally synonymous with dryer air. Add to this the fact that there's no wind in the tunnel and that the ground is always above freezing, and you can understand why our hens will roam around the greenhouse, even in the coldest part of winter.

The garden bed is protected from frost using 2-inch-thick rigid foam insulation boards. The 4-by-8-foot sheets were buried, standing horizontally, all around the planting area. They provide 4-foot-deep R10 insulation. Apart from preventing the soil from freezing, this insulation traps the heat radiating from the hydronic system when it's turned on April 1.



Automated motorized shutters and air extractors allow air to come in and be pushed out of the greenhouse when the inside temperature reaches above 78 degrees. While they're seldom needed for most of the poultry's winter stay, they do come in handy during the occasional late-March hot spells. All summer long, hand-cranked roll-up sides also help cool the interior of the greenhouse.

In summertime, crop watering is accomplished automatically using a drip irrigation system connected to a timer-controlled 1/2-horsepower sump pump embedded inside a 275-gallon IBC tank that sits in the middle of the high tunnel. The fans, irrigation pumps, and hydronic system consume between 5,500 and 7,500 kWh of electricity each year.

Timeline for Overwintering Chickens in a Greenhouse

Between April 1 and Oct. 31



We keep our hens contained on pasture using a poultry net. Their mobile coop (featured in this article about [how to teach homesteading classes](#)) sits inside this fenced-in area. It resembles a classic, rectangular, bottomless meat-bird chicken tractor. In addition to the usual access points found on these tractors, I added a hinged door on the front to let the hens in and out of the cage, and a sliding panel in the back to access the eggs. The 8-by-8-foot structure has six straw-filled nesting boxes at the back and five roosting bars throughout. Hens need about 12 inches of roosting space each, so five 8-foot-long perches is plenty for 30 or so birds. While we move the coop every other day, we move the 160-foot-long portable fence once a week.

Meanwhile, our fruits-and-vegetables garden is booming inside the greenhouse. While we start harvesting lettuce and other early vegetables as soon as late May, we reap most of our bounty in July and August. Thanks to the hydronic system, tomatoes continue to ripen on the vine up to the last minute.

Nov. 1



We turn the greenhouse into a greenhouse chicken coop for the next 20 weeks. We turn off the hydronic system, which kept plants going through the colder fall season, and we bring the mobile coop inside. Then, we situate it atop four 12-inch-high milk crates, which allow a 10-by-10-foot tarp (I use a piece of 6-mil clear vapor barrier cut from a roll) covered with wood chips and chopped-up dried leaves to sit under it. The hens have no trouble reaching the structure's perches to roost. Since the birds will spend about half of their time in this coop, about half of their droppings can be harvested there and moved out of the greenhouse, composted, and used elsewhere as a potent fertilizer. The trick is to add the proper amount of carbon to the mix.



After hanging a heated poultry fountain and two 48-inch reel-top poultry feeders from the greenhouse roof trusses, we guide our flock inside the building. Waiting for them are heaps of freshly cut tomato vines bearing green fruits; long kale stems with lush, leafy tops; and a jumble of verdant, pulled-out plants, yellowing cucumbers, and weeds ready for pecking. These plentiful leftovers provide the hens with a thick, edible litter that'll last them for weeks.

Every Friday morning, the same ritual takes place: I come in, pull out the tarp from under the coop, make a bundle of it, and drag it outside. I always dump it in the same spot, close to the greenhouse, right in the middle of a large tarp, all four corners of which have been staked using 6-foot-long poles so I don't lose track of the tarp's perimeter under the snow. I could also leave the bundle right there in the snow, tied closed with a string, and use a new tarp each week. April 1, I'd accumulate 20 bundles, light and easily dragged elsewhere for composting. But I prefer amassing the stuff outside on my tarp, because in-between the additions of fresh litter, snow will fall on the pile. When spring comes, the alternating layers of snow and litter will mix, wetting the manure heap throughout and kick-starting the composting process. The mound will then shrink and can be transported someplace to sit and compost some more.



Back inside the greenhouse, I lay my discharged tarp on the ground in front of the coop, cover it back up with wood chips and chopped-up dried leaves, and then pull it back under the coop. Finally, I scatter chopped-up dried leaves all over the greenhouse floor.

April 1

Time to move the hens back out. Depending on how hasty spring has been, the poultry net is either planted in the ground or in the snow. Whichever it is, I set up the fence, coop, feeders, and waterer on a patch of land that I cleared of snow all winter long in preparation for this early spring migration, and the hens return to pasture.

Back in the greenhouse, I turn on the hydronic system and set its temperature controller to 70 degrees. At this point, the controller's probe, inserted 3 inches deep into the garden bed, indicates a soil temperature of around 40 degrees. The pumps engage, pushing cold liquid through the in-earth tubing and the instant water heater. The fluid warms up quickly. Within 12 hours, the water-glycol mix is circulating in the pipes at a temperature of about 105 degrees. Within 36 hours, the soil is at temperature. The warmed earth awakens soil life, which in turn jump-starts the decomposition of all the chicken manure in garden and dried leaves accumulated during the past five months.

April 3

I rake the whole area using a [broadfork](#), breaking up the lightly compacted top layer of mulchy litter, loosening and aerating the dirt under it. Earthworms abound, a telltale sign my soil is alive and well. Then, I drench the garden bed using a sprinkler. The rough, chopped-up leaves on the surface of the beds help suppress weeds and retain moisture in the ground, and working with drip irrigation further reduces the amount of weeds we have to deal with.

April 5

I make a single pass with a tiny cultivator to break up the crusty, uneven surface of the plot left by the broadfork. I start from the outer edge of the garden and make my way inward in a spiral path, walking backward and pulling the gasoline-powered appliance up and toward me. This way, I'm only working the first few inches of the bed.

April 7

I divide the surface of the garden into six 3-by-25-foot rectangular rows by scraping down five aisles between them with a rake and spade. These corridors, 2 feet wide and 6 inches deep, allow us to circulate easily between the garden beds.

Apart from the early vegetables, such as radishes, spinach and bok choy, whose seeds we sow directly in the soil, most of our garden is planted using 4-to-6-week-old seedlings. Among those are different varieties of tomatoes, eggplants, fennel, peppers, lettuce, and basil. Using plantlets, rather than seeds, allows us to work on a coarser surface. It's easy to move the mulch aside, dig a small hole in the soil, place the seedling in it, firm the soil around its root ball, and bring the displaced mulch back over the base of the plant.

May 1

Time to lay down the drip-irrigation system, hang trellis for the tomatoes and cucumbers, and transplant plantlets into the warm earth. We also direct-sow seeds of radishes, spinach, and bok choy.



There it is. Seven years into this, without ever having added any soil amendments other than chopped-up leaves and the chicken manure in-garden, our crop production is as spectacular as ever. One 25-foot row of tomato plants, spaced 3 feet apart, produces 200 pounds of fruit! Moreover, we never need to add topsoil; composted mulch replaces whatever soil is removed by our gardening activities. Our greenhouse provides us with eggs, fruits, vegetables, fertilizer, and topsoil, while providing the hens with shelter and ample room to roam, scratch, and roll and flap around in the dirt.

How to Optimize Your Chicken Manure In-Garden

One hen can generate about 300 grams of manure per week. Since hens produce about as much during the day as they do at night, about half of that amount will be dropped on the tarp under the coop and the other half on the garden floor.

I want the [hen droppings and chopped-up dried leaves](#) covering the 650 square feet of greenhouse floor outside the coop to compost quickly, so I aim for a rather “aggressive” 21-to-1 ratio of carbon to nitrogen. I only use chopped-up dried leaves as my carbon matter. They’re easy to gather and don’t generate a lot of dust, and I find they decompose much faster than whole leaves, straw, or wood shavings.



On the 100-square-foot tarp lying under the coop, I'm dealing with a high concentration of nitrogen dropped onto a relatively small area. So, I use wood shavings as well as leaves. Because this litter will be composted outside the greenhouse, it doesn't have to compost as fast. I use a more conventional 25-to-1 carbon-to-nitrogen ratio in this case.

Now, for the final recipe: Conservative carbon content evaluations of mature hen droppings, dried leaves, and fine softwood chips put their carbon content at around 10-to-1, 45-to-1, and 400-to-1, respectively. In real life, these numbers may vary greatly, but they're a good starting point.



To achieve my 21-to-1 ratio on the greenhouse floor, I need to add twice the amount of dried leaves than there is manure. Since each hen will drop about 150 grams of manure per week outside the coop, I need to add 300 grams of leaves to the mix in the same interval. For a flock of 35 hens, this means about 10 kilograms of leaves per week. To achieve my 25-to-1 ratio on the covered coop floor, leaves, fine softwood chips, and manure must be present in equal amounts. Since 35 hens will produce about 5 kilograms of droppings per week under the coop, I add 5 kilograms of wood shavings and 5 kilograms of chopped-up dried leaves weekly.



In total, I need about 15 kilograms of chopped-up dried leaves and 5 kilograms of shavings per week. Since I overwinter my hens in the greenhouse for 20 weeks, I fill 20 contractor-style cleanup bags with about 15 kilograms of dried leaves each and line the inside walls of the high tunnel with them. You can also use heavy-duty, brown-paper lawn and refuse bags if your leaves are bone-dry; otherwise, the bags' bottoms will become soggy.

I get my chopped-up dried leaves two ways: in late spring using a gas-powered vacuum shredder to pick up dry leaves leftover from the previous fall, and in fall when visiting our local golf course, where mountains of chopped-up dried leaves are freely available. After a prior introductory visit, I simply call ahead to let them know I'm coming and bring a dozen eggs as a token of thanks. As for the wood shavings, since I need so little, bags are store-bought as needed.

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