Poultry: Equipment for Alternative Production

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This publication describes some of the basic equipment needed for small-scale chicken flocks, especially flocks on range. Major topics are addressed in detail, including watering and feeding equipment, fencing considerations, and roosting and nesting boxes. References and resources are embedded in the narrative.

Contents

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Introduction

Allowing poultry access to the outdoors provides challenges not encountered in indoor production. The roof and walls of a confinement house protect both the equipment and the chickens. With the chickens and equipment outdoors, there will be new problems from weather, predators, interaction with other livestock, and sheer distance. The equipment for an indoor flock doesn't need to be strong enough for goats to jump on, for example.

Working on a small scale also calls for different management decisions than modern large-scale operation. You probably won't be adding a pair of diesel backup generators or drilling new wells just for your pastured chickens, though this is common enough in conventional broiler farms. Some of the equipment used by the big boys is great for small-scale operations, and some isn't. This publication helps you figure out which is which.

Each issue (water, feed, fencing, roosts, and nest boxes) has a variety of solutions. Sometimes equally good solutions are almost opposite in approach, such as setting up a pressurized water system vs. having your chickens drink from a brook. I will try to be clear about which considerations steer you towards one or the other, and which ideas I have actually tried, and which I've only heard about.

Some of the larger manufacturers offer equipment not detailed in this publication. Those considering a larger operation might find the following sites useful. Check out:

- Big Dutchman
  http://bigdutchmanusa.com/products/alternative.html
- SKA
  www.ska.it/uk/index.html
- Gillis Agricultural Systems
  www.gillisag.com

Waterers

> *The labor of watering poultry by carrying water in buckets is tremendous and not to be considered in any up-to-date poultry plant. Watering must be accomplished by some artificial piping system or from spring-fed brooks.*
>
> -- Milo Hastings, *The Dollar Hen*, 1909, p. 62.

The issue of waterers is far more important than people realize. A poorly conceived watering system will stunt or kill your birds while at the same time consuming an enormous amount of labor. On hot days, a failure in the water supply will start killing broilers almost at once. A reliable source of water is absolutely essential.

General Issues

The water needs to be drinkable to begin with, and needs to stay that way once it's poured into the vessel that the chickens drink from. This can present problems on both ends.

Cleanliness

The chickens themselves are part of the problem. They poop in the water and scratch litter into it when given the opportunity. Don't give them the opportunity. Provide some kind of guard to prevent them

from getting where they shouldn't be. Many commercial waterers provide this by design. Bell waterers, vacuum founts, and many other designs have a narrow water bowl and a large, roost-proof central dome. But with other models you may have to roll your own.

Because a chicken's crop doesn't have a valve at the top, if they have to bend down to drink, some of their crop's contents will run into the water. Yuck! Keep the waterers high enough that the water is above crop level. (In poultry publications, this is rather misleadingly called "as high as the chickens' backs.")

Chickens do not appreciate clean water and will drink from manure-soaked puddles if it saves them a single step.

Source Water Quality

It's popular these days to say that you should never give livestock water that you wouldn't drink yourself. I don't go that far, since I won't drink from streams myself, but don't mind if my livestock do. But, at a minimum, your water should be as uncontaminated as springs or creeks ever are.

Obviously, some contaminants are worse than others. The chickens don't care if the water supply has sand or newts in it, but arsenic or high bacteria levels are another story. It wouldn't hurt to get your water tested, wherever it comes from. It might be instructive to make two tests; one filled at the water source and one filled from a waterer. If the waterer is loaded with bacteria and the source is clean, you'll know you have some work to do with the waterers and distribution system!

Many farmers have reported improved results with low levels of disinfectants in the drinking water (such as using chlorinated city water), presumably because the residual chlorine kills bacteria in the waterers and prevents transmission from one chicken to another. Adding chemicals to the water sounds like too much work to me, but it drives home the point that waterers can be reservoirs of infection if you're not careful.

Puddles and Wet Spots

Chickens do not appreciate clean water and will drink from manure-soaked puddles if it saves them a single step. Thus, one aspect of providing clean drinking water for your chickens is to prevent puddles where possible. Often, these puddles are caused by spillage from the waterers themselves. They provide a nasty disease vector, since waterers get a lot of traffic and are the ideal spot to exchange pathogens. Also, most pathogens prefer damp environments to dry ones. So take that spillage seriously.

This installation from the 1930s uses a simple wire-covered platform to prevent wet spots.

This is much less of a problem for daily-move pens or any method which involves moving the waterers frequently (unless the leakage is really large), because the waterer moves and the wet spot dries out before the pathogens really get established. It's an enormous problem inside permanently sited houses. With permanent installations, it's a good idea to think about some kind of drainage system, especially if you can come up with one that can handle the total failure of an automatic watering system and prevent the house from flooding.

Many such systems basically involve having some kind of porch or alcove outside the chicken house proper, with a wire floor. Spilled water thus falls harmlessly outside. Another system is to have a pit with a drain inside the house. Litter can clog the drain in the latter case. Keeping litter out can be

tricky, though keeping the area higher than the litter (and providing access ramps for broilers, who don't hop well) can work.

Freezing

Winter is a nasty time for the water supply. People keep telling me that chickens will eat snow, and I suppose that's true, if you happen to have snow. But can they eat enough snow to be highly productive? I doubt it.

There are two basic approaches to dealing with freezing. One is to have a system that can freeze solid, but will work again when it thaws. The other is to prevent freezing.

Freezable Water Systems

I have seen plastic pans split from freezing, but not galvanized ones. A simple freezable watering system consists of two sets of galvanized pans or (for full-sized birds) buckets. You take warm water out to the chickens in one set, and bring the other set back home with you, allowing whatever ice is at the bottom to thaw before it's time to water the chickens again. This is simple, reliable, and far too much work! But it's the traditional "if all else fails" backup system.

Freezing is a nuisance for all types of automatic waterers, but it is especially hard on low-pressure waterers with valve assemblies that **are** at least partly plastic. These tend to split if they freeze solid, resulting in a flood when they thaw. Bell waterers, nipple waterers, and cup waterers generally fall into this category.

Waterers with all-metal valve assemblies tend to survive freeze/thaw cycles without any ill effects.

PVC piping tends to split when frozen. I have had excellent results with ordinary garden hose, which never seems to fail from mere freezing. I believe the elasticity of the hose absorbs the swelling in the system as it freezes, preventing damage to other components. I have much less experience with poly irrigation tubing. So far, the tubing has always survived, as have plastic T-fittings, but plastic ball valves split in hard freezes.

Freezable systems work best in areas where daytime temperatures are generally above freezing, so the system will thaw and start working sometime during the day without any attention from the farmer. This is my situation. But freezable systems are useful in any climate, as a way of preventing equipment damage if the system freezes up in spite of your best freeze-proofing methods.

Freeze-Proof Systems

To prevent freezing altogether, you need some combination of water flow, insulation, or heat. One method is to put your waterers in a house that never drops below freezing inside, and supply it from buried pipes. Or you can use heating tape to prevent the system from freezing, even in a cold house. If you can't use outdoor piping, a reservoir inside a warm house could provide water.

It is not very difficult to build chicken houses that never fall below freezing, provided that they have an insulated roof and controlled ventilation. Normal stocking densities will ensure that the hens themselves provide most or all of the needed heat, and the deep-litter system will generate more through composting. However, this works best with relatively large flocks; it's much easier to get this effect with five hundred chickens than with fifty. With small flocks, the problem is that a house large enough for the farmer to work in comfortably is too large for the flock to heat. In this case, using electricity to heat the water pipes rather than the house will be most efficient.

I have used two kinds of heat for watering systems: heating tape and bucket heaters. Heating tape (available at any hardware or plumbing supply store) is an electric cable that runs off AC power and is designed to keep pipes from freezing. Make sure you buy an outdoor-rated product, even if you are using it indoors, because chicken houses are a harsh environment, and follow the instructions. In some cases, such as Little Giant bowl waterers, the warmed pipes will heat the valve portion of the waterer and prevent the system from freezing at this critical point.

Freezable systems work best in areas where daytime temperatures are generally above freezing, so the system will thaw and start working sometime during the day without any attention from the farmer.

Bucket heaters (and their smaller cousins, birdbath heaters) are immersion heaters that go right into the water. These aren't suited to any kind of poultry waterer that I know of, but they work fine on big pan waterers like the Little Giant Everfull Bowl waterer, which is just a galvanized pan with a float valve. Bucket heaters need to be grounded to prevent stray voltages that will keep the chickens from drinking. This is no place to use the old extension cord with the missing ground pin! (More about stray voltages later.)

These are available from pet supply stores. Personally, I think that the 1,000-watt heaters are ludicrously overpowered, and even the 200-watt units are questionable. Yes, they have a thermostat to turn them off before the water gets too hot, but if you have multiple waterers, the big heaters will overload your wiring. I think a 50-watt birdbath heater is more appropriate if the power is connected all the time. Higher wattages only make sense if you supply power intermittently.

A birdbath heater, such as this unit from K&H Manufacturing** (www.khmfg.com, **719-591-6950), is a simple way of keeping water drinkable in buckets and pans.

I don't approve of using light bulbs under waterers—too scary.

Overhead heat lamps will keep just about any waterer from freezing, and may not be too expensive if you put them on a thermostatic switch and keep the waterers in a place that isn't freezing cold all winter.

By the way, chickens don't like drinking ice-cold water, so taking the chill off will improve production.

You'll notice that all the above assumes that you have AC power available. What if you don't? Other than the possibility of using kerosene or propane space heaters, I don't know of anything very useful. Temporary freezing can be prevented to some extent with insulation.

Continuously flowing water can also prevent freezing. If you have lots of low-cost water, this is an option. The simplest version is of course a brook that runs through an area the chickens have access to.

The alternative to all this is to keep chickens only during the warmer months. This is practical with pastured broilers, but not with hens, because hens must generally be overwintered.

Too-Hot Water

If your water is too hot in the summertime, it will prevent the chickens from drinking all they need to keep cool. This will hurt production and may even lead to deaths.

I know of two effective methods to keep water cool. One is to shade the areas containing the waterers, so no matter how hot the water was when it entered the shaded area, it will have time to cool down to air temperature by the time it reaches the chickens.

This works even better if the waterers hold a lot of water, because when the valve opens and lets in a little bit of water to top things off, it is diluted by the large volume of air-temperature water already there.

When I dump the water from my hen waterers on a sunny day, the incoming water is often scalding hot, while the water I just dumped was only lukewarm.

The second method is to have the water flowing continuously, at a high enough rate that the feeder hoses can't act as a solar water heater. In hot climates, this might pay off big, because the chickens will drink more water if it's cool.

I've been told that garden hose sometimes splits when used in a hot climate. This

hasn't happened to me – but I don't live in a hot climate.

Stray Voltage

I have already mentioned stray voltage in the context of bucket heaters. They can also plague an automatic watering system for no apparent reason (though it will be related somehow to AC power or electric fencing).

You should suspect stray voltage whenever your chickens aren't thriving and there's no apparent reason for it. Try watering them with waterers that are filled by hand and are nowhere near electric fencing or anything metal. If the chickens start to drink from these and avoid your regular waterers, there's a problem—maybe a mechanical problem, maybe stray voltage.

I once had stray voltage because I used an extension cord with a missing ground pin to hook up a bucket heater. The chickens would dip their beaks in the water, squawk, and avoid the waterer from then on.

Adding a ground fault circuit interrupter (GFCI) did nothing; they don't trip until there's a lot more stray current than was present at the waterer. Fixing the ground circuit worked. The best way to fix the ground circuit turned out to be using intact cords and to place a ground rod near the waterer. To create a portable ground, I put a metal outlet box on top of a convenient length of galvanized electrical conduit, which I stick into the earth near my bucket heaters. This has worked very well for me.

Types of Watering Systems

Several general types of watering systems may be available. The following discussion addresses comparative advantages and shortcomings of the various systems.

Brooks

A brook can be the ideal watering system if you happen to have one in a convenient place. A brook is simple, free, zero-maintenance, self-filling, and self-cleaning. The water is generally cool, and, given a few trees or shrubs, it provides a very comfortable environment for chickens, who are nowhere near as fond of sunlight and wide-open spaces as you might think.

Brooks have disadvantages, though. They aren't always available, are immovable, are useless for penned birds, and may be too challenging for broilers, who can be too clumsy to manage even shallow stream banks. They also are prone to flood and tend to serve as predator highways.

If you can deal with these issues, having stream-watered poultry can be extremely satisfying. I used this method for a while, until the coyotes became bolder. But it was great while it lasted.

Buckets

Watering from buckets has its place. Its place is in the past.

True, watering from buckets has its advantages. It's simple, stone-age technology with minimal equipment costs and no fine points to learn. But it's unbelievably labor-intensive. Not only is lugging water around in buckets the worst possible use of limited time and energy, it forces you to keep a ludicrously demanding schedule. If your chickens run out of water for even a brief period on hot days, they will be stunted or killed—and it's not that much better on cool days. You must *always* return to the chickens before they run out of water, just so you can pour them another drink. On hot days, you may have to water the chickens three or four times a day, which makes poultry keeping even worse than dairying at tying you to a rigid schedule.

Buckets are okay as a fallback system when everything else has failed, but that's about it.

Watering from buckets has its place. Its place is in the past. Piped water is the most important labor-saving device for your poultry operation.

Water from Pipes

Piped water is the most important labor-saving device for your poultry operation. The chickens never run out of water on hot days; you get to have a life. It's a good deal. In addition to eliminating buckets from your life and letting you plan your own schedule,

pipe water allows you to run cleanout hoses and sprinklers should you desire.

The disadvantages of piped water systems are that they cost money and can require considerable maintenance, especially if there's a problem with the installation (such as a low-flow feed well or a brook with lots of sediment in the water). Long lengths of hose freeze easily in cold weather and can heat the water very hot in warm weather.

Garden Hose

I have at least a thousand feet of garden hose supplying water to my hens.

I like garden hose best because everything about it is easy.

Mostly I buy cheap garden hose on sale (some of it is surprisingly good and has lasted ten years; even the worst stuff is good for five). At roughly 15 cents a foot, a thousand feet of hose costs $150, which isn't too bad, in my opinion. Use only metal Y-adaptors, shut-off valve, and nozzles, because the plastic ones don't survive freezing or rough handling.

Poly Tubing

Poly tubing is a black-walled plastic pipe that's used for all kinds of agricultural uses. The half-inch tubing is often sold in the garden section as the feeder pipe for drip irrigation systems (the branch lines use smaller, highly flexible quarter-inch drip irrigation tubing). Poly tubing is cheaper than garden hose, but it isn't very flexible or convenient to work with. I have a length of three-quarter-inch tubing running about 1,500 feet to the top of our broiler hill. For long feeder pipes like this, poly tubing is a big win because it's cheap. I bought the tubing in 300-foot lengths. We connected the lengths with plastic barb or T-fittings, available anyplace that sells the tubing and at most hardware stores. At every coupling between two sections (we used plastic barb fittings), use hose clamps to prevent the sections from separating or leaking. Use hot water to soften the tubing before forcing it over a barb fitting. Dishwashing liquid makes a good lubricant.

Because of our mild climate, we just put it on top of the ground. Where it crossed in front of gates, we used lengths of garden hose, which we figure will survive vehicle traffic better.

I like garden hose best because everything about it is easy. Also, I know from experience that it survives freeze/thaw cycles (such as they are in Western Oregon) very well.

Drip Irrigation Tubing

Quarter-inch I.D. drip irrigation tubing is okay for some applications. The tubing itself is inexpensive, flexible, and very strong. It can withstand almost any pressure, though this hardly matters because the fittings available for it are weak. It's nice for connecting up hanging waterers and other applications where garden hose is too stiff and bulky.

Pressure Regulators

Low-pressure waterers require pressure regulators. Some of them don't work at household water pressures, while others break. The poultry equipment manufacturer GQF, out of Savannah, Georgia, sells low-cost regulators through its online catalog. These are essentially propane regulators with appropriate fittings. Our pressure regulators have never lasted long, but our low-pressure systems use brook water and freeze from time to time, which may be hard on them. (*www.gqfmfg.com* 912-236-0651).

Intermediate Cisterns

One way to get low-pressure water is to have a bucket, cistern, or stock tank at the right elevation compared to the waterers. This supply container is fitted with a float valve connected to the piped water system. You get the same low-pressure water you would from any bucket-fed system, but the float valve and piped water keep the bucket topped off at all times, which eliminates labor.

This also provides a reserve water supply. I like using square four-gallon

buckets because it's easy to attach a standard stock-tank float valve to one. A garden hose supplies water to the float valve. A length of drip irrigation tubing or garden hose connects the waterers to the bottom of the bucket.

Cistern Systems

A cistern system is what I call a piped-water system with a central reservoir that you fill with something other than a pump. Unlike an intermediate cistern, which is kept full with water from a pipe, a cistern system has to have water carried to it. On our broiler hill, for example, the water system relied on a stock tank filled from a tank in the back of our pickup truck. A pipe from the bottom of the stock tank went to our broiler houses.

The stock tank was at the top of a hill, so the water flowed down the pipes to the broiler houses by gravity; we didn't need a pump. On flat ground, or on ground where the cistern is on lower ground than the houses, a pump would be necessary.

The advantage of a cistern system is that you don't have to carry water around in buckets, and the chickens can be at any distance from the ultimate water source. Sometimes you just can't run water pipes, such as when the chickens are on a piece of land with no water and no access to any.

The disadvantage is that you still have to carry water around (though probably in the back of a truck). In some ways, it combines the disadvantages of the bucket system with those of a piped-water system. When we used this cistern system, I was particularly irked by the time lag between noticing that the broilers needed water and getting it to them. I had to get back to the shop, empty the pickup, put the water tank in it, fill the tank from the brook (which took a long time), and drive back to the broiler hill before the chickens saw a drop of water. And God help us if the pickup didn't start!

If you're already using a system of stock tanks for your four-footed livestock, a cistern system for your poultry will fit into your existing workflow, and no harm done. Otherwise, consider it only if you can't get piped water from here to there.

Water Sources for Piped-Water Systems

Water for piped systems can come from several general sources. The following discussion focuses on the advantages and disadvantages of these sources.

Brooks and Streams

My chickens use water pumped from a brook. Because I have AC power handy, I use an AC-powered jet pump.

Brook water tends to carry a lot of sediment, which is hard on both the pump and the waterers. If you can, pump from a quiet backwater. A fine screen around the foot valve helps, if it doesn't clog or restrict the flow too much. (I once used a string glove as a quick-and-dirty foot-valve screen. It worked great.)

A Rusco strainer prevents crud from reaching the waterers. The flush-out valve at the bottom ejects the accumulated sediment without disassembling the strainer.

To keep sediment out of the waterers, I use a Rusco sediment filter instead of the usual cartridge filter. The Rusco strainer is designed specifically for sediment and has a flush-out valve so you can get rid of the crud without taking it apart. And it has a permanent plastic-screen strainer; you never need to buy a new filter cartridge. (See *www.rusco.com* or 800-345-1033. Any pump/irrigation shop ought to have these in stock.)

I use two of these inexpensive, ready-to-use jet pumps from Harbor Freight Tools.

My jet pump is an inexpensive all-in-one jet pump with a power switch, pressure switch, gage, and pressure tank from Harbor Freight Tools (Look for "3/4 HP, 1-in. Cast Iron

Shallow Well Pump." at *www.harborfreight.com*, 805-388-3000). These pumps seem to be permanently on sale for about $100. Add a foot valve and some piping, and you have a complete pumping system. I have used three of these pumps and I like them, though obviously they can't use the highest-quality components. They're so inexpensive that I keep meaning to buy one as a spare, though I never have.

This 12V FloJet pump is designed to provide water in an RV, but I've found them useful for all kinds of on-pasture water needs.

When I pump from a more remote location, where AC power is not available, I use a 12V RV diaphragm pump with a built-in pressure switch – FloJet makes several models for under $100. (I bought mine from J.C. Whitney, *www.jcwhitney.com*, 800-603-4383). Shurflo makes similar pumps that are supposed to be at least as good.

You don't need a pressure tank with these if you use them with garden hose, which provides enough elasticity to keep the pump from short-cycling. I tried using one with just PVC tubing, which wasn't elastic enough. The pump short-cycled like mad, running for a fraction of a second, pausing for a few seconds, then running again. This is annoying and hard on the pump. When I added fifty feet of garden hose, it would run when water was being used, and shut off and stay off when it wasn't.

Diaphragm pumps are very simple and easy to work with. I ran mine from an over-the-hill car battery, and it would run the pump for weeks before discharging. This is because chickens don't drink all that much, so the pump doesn't use much electricity.

Well Water and City Water

City water can be used as-is. (If you have strong anti-chlorine views, you probably have a carbon filter inline with the water supply anyway). If your well water is good enough for you, it's good enough for the chickens—but it might have too many particulates for the valves in the waterers to work reliably. In that case, use a Rusco strainer, as described above.

Types of Waterers

Non-Automatic Waterers (buckets, pans, vacuum founts)

Use these for emergency or supplemental watering only. I particularly dislike vacuum founts. A bucket or a galvanized feed pan has many uses, while a vacuum fount doesn't.

I don't like vacuum founts, though they're okay as backup waterers.

Continuous-Flow Troughs

In many ways, the continuous-flow trough is the ideal waterer. By having water flowing through it constantly, the trough is self-cleaning. The water stays cool in summer and doesn't freeze in winter. It has no moving parts except the valve on the water spigot. Once installed, it can run for years without attention.

It takes a lot of water to do this, of course, and the concept is best-suited to permanent installations such as laying houses. Continuous troughs can be a pain if you have to adjust the height all the time, as you would for broilers, and getting rid of the wastewater can be a nuisance. Continuous-flow troughs were very common in confinement houses fifty years ago.

Float-Valve Waterers

Float-valve waterers use the same nineteenth-century technology as the fill valve on a toilet. These waterers operate at any pressure, are very difficult to clog with algae or sediment, and are freeze-proof if they have metal valve assemblies.

As you would expect from a product with all these advantages, float-valve poultry waterers are hard to find! GQF sells float-valve troughs in 18-inch and 36-inch lengths, and you can also buy just the float-valve part for use with your own trough or pan. (*www.gqfmfg.com*, 912-236-0651). Brower

and Kuhl also have float-valve trough waterers. (Brower: *www.browerequip.com*, 800-553-1791. Kuhl: *www.kuhlcorp.com*, 908-782-5696.)

A float-valve trough from Brower. (The hose fitting at the end isn't visible, but it's there.)

Although it's not a particularly good poultry waterer, I use Little Giant "Everfull Bowl Automatic Waterer," which is a fancy name for a three-gallon galvanized feed pan with a float valve. These are available in feed and pet supply stores everywhere. They're rugged and reliable. However, they have no guard to keep the chickens off them, and the water tends to be very dirty because of this.

I use them because they're available at my local feed store, so I can always get one in a hurry, and because my sheep and goats can drink from them, too. Also, these waterers are practically the only ones big enough to hold a bucket heater.

The Little Giant Everfull Bowl tends to get fouled by the chickens pooping in it, but is rugged, reliable, and available everywhere.

A homemade slotted pan cover, like the one from the 1930s shown above, would keep the chickens from perching on the waterer.

Bowl Waterers (Little Giant)

These are my favorite waterers for use indoors or with pasture pens. Unlike most of the float-valve waterers discussed so far, these can be lowered almost to floor level so little chicks can use them, and they are more compact and adjustable than float-valve waterers. You can buy them in any feed store. Though the water bowl is plastic, the working parts are brass, and these waterers can freeze solid without damage (at least, they can if you use flexible hose to hook them up with). Like float-valve waterers, these work equally well at any pressure.

The mechanism is not as crud-resistant as a float valve, and the waterer includes a fine brass screen to protect the valve. If this clogs, the waterer stops working. You need better water quality for this kind of waterer than with float-valve waterers.

These waterers have been around for more than fifty years. The old ones are identical to the new ones. Sometimes you can get a good deal on old ones.

I normally screw these waterers onto a foot-long length of half-inch galvanized pipe. The weight of the pipe helps them to hang straight. At the top of the pipe I put a barb fitting for whatever kind of hose or tubing I'm using to hook it up. You can also get brackets for attaching these waterers to the wall.

Always use two pairs of pliers when adjusting the two nuts that control the water level in the bowl. They will work loose if you don't. Similarly, you should screw the bowl tightly onto the stem, or it will eventually fall off, flooding the whole area.

Little Giant bowl waterer.

Bell Waterers

Bell waterers are all-plastic hanging waterers, similar in concept to the bowl waterer. Because they are all-plastic, they may not withstand household water pressures and can crack if frozen solid.

Bell waterers are very popular, though. They are big and provide a lot more drinking space than most other waterers. They can be used with chicks and full-sized birds. They're inexpensive. They tend to come with handy mounting kits that make it easy to do a professional job when hanging them from the roof joists.

They work very well if you filter the water, protect them from freezing, and keep the pressure within specification (which varies according to manufacturer, but five pounds per square inch is common).

A Plasson bell waterer

Many different manufacturers make bell waterers: Plasson, Kuhl, and others.

Nipple Waterers


Nipple waterer

Nipple waterers are standard now in the confinement industry. They are very simple, with a stainless steel trigger sticking straight down from the bottom of the waterer. When a chicken pecks at the trigger, a drop of water rolls down and into the chicken's mouth.

Because they have no bowl, there's nothing to clean. The trigger is self-cleaning because it's washed by the water rolling down it.

Birds naturally tilt their heads up to drink, so nipple drinkers have a behavioral advantage.

Installing nipple waterers is easy; there are kits for gluing adapters to PVC pipe. Many installations use a weird kind of PVC pipe with a square cross-section; others use ordinary half-inch PVC pipe.

Nipple waterers must be set at the correct height—high enough for the chickens to peck upwards at them. They are also finicky about water pressure and are not freeze-proof.

I don't like nipple waterers for small-farm work. The payoff is not enough to outweigh persnickity height requirements and pressure adjustments.

Nipple waterers leak sometimes, especially if your water quality isn't perfect. You need more filtering to prevent this. Like other waterers, it's best to use nipple waterers in an environment where wetness under the water doesn't translate to wet litter or wet chickens.

FarmTek has a line of nipple waterers and accessories. (*www.farmtek.com*, 800-327-6835).

Cup Waterers

GQF has a good line of low-pressure watering cups. Cup waterers have tiny bowls that hold only a couple of tablespoons of water. Instead of a float valve, they have a yellow trigger arm that lets water in when the chickens peck at it. It takes the chickens zero time to figure out how to use these waterers.

I like these better than nipple waterers, though I wouldn't use them where litter might get into them, because I wouldn't want to be cleaning them all the time. These are great waterers for brooder or hospital cages. (*www.gqfmfg.com*, 912-234-9978.)

How Many Waterers?


Cup waterer

Having enough waterers is crucial. It's best to have more than you need, because they fail sometimes. Every group of chickens should have a minimum of two waterers. When using the traditional "pasture pen with a bucket of water on top," there should be two buckets as well as two waterers. Also, if the chickens ever run out of water, you can limit the mob scene when the water returns by having space for all the chickens to drink at once.

(Hint: if the water runs out, put out some pans of water temporarily to reduce fighting.)

The following table gives the amount of waterer space recommended for hens and broilers:

	Number of Chickens Per Waterer		
Type	**8-foot Troughs**	**Bell or Bowl**	**Cups or Nipples**
Layers	200	25	8
Broilers	200	60	9

Waterer recommendations from North & Bell's Commercial Chicken Production Manual.

Feeders

When I collect eggs, I start by scattering a bucketful of whole wheat on the pasture for

the hens. The same pasture has four huge range feeders that hold six hundred pounds of feed each. Why use feeders at all if you can just scatter feed on the ground? Why scatter feed on the ground when you have these nice feeders?

Feeders aren't necessary for feeds with a large particle size, that won't dissolve in moderate wetness, and when you have a place that's not too wet or filthy where you can scatter the feed.

But, realistically, scattering feed on the ground is best left for whole or coarsely cracked grain fed in small enough amounts that the chickens eat it quickly. That way, all the grain is actually eaten by the chickens. If you feed too much, wild birds and rodents will get a lot of it, or it may spoil. Feeders keep the feed clean, dry, and unspoiled.

Scattering scratch feed helps make the hens friendlier, and they come running out for the treat, giving you a good look at them. This is especially useful at egg-collecting time, since the hens who were loitering around the nests get out of your way. Also, it helps identify sick hens who can't work up any enthusiasm for a treat, and stay in the chicken house instead.

Issues With Feeders on Range

Weather

Obviously, outdoor feeders are subjected to more weather than indoor feeders, and this can lead to trouble. In fact, the feeders don't actually have to be outdoors to have these problems—many pasture pens and range houses let in enough weather for the same issues to apply:

- Feed with a small particle size can blow away in a strong wind.
- Wet feed will ferment and mold.
- Frozen or snow-covered feed is unavailable to the chickens.
- Chickens don't like walking on snow, and may refuse to go outside unless you shovel the snow or cover it with straw or some other familiar footing.
- Hot sun, heavy rain, and strong winds will keep the chickens indoors.

It surprises people that chickens aren't big fans of sunshine in hot weather, but it's true. In warm sunny weather, they will do most of their foraging and feeding early in the morning and late in the afternoon. With hens, this twice-a-day feeding is okay, and all your feeders can be outside. Broilers, though, need to eat more often than this.

Accessibility

Snow, ice, and mud may make it difficult to bring feed to the outdoor feeders. I live in Western Oregon, which has a very mild climate, but once in a while we have snow on the ground for a week or two. This happened to us a couple of years ago. Our henhouses were scattered all over the farm, and the labor required to pull feed from house to house in a child's toboggan was indescribable. Outdoor feeding has its place, but its place wasn't then and there!

Similarly, our two-wheel-drive pickup is convenient for moving feed in the dry months, but we can't take it onto the pasture during the wet season. Outdoor feeding may have to be seasonal, or you may need to keep the chickens closer to home during the winter to shorten travel distances.

Wastage

Feed is easily wasted from shallow feeders or from deep feeders that are overfilled. Chickens will scatter feed in all directions, but won't eat the dropped feed unless it's relatively clean. If the feed is in large particles (pellets, whole grains), more feed will be picked up off the ground.

The rule of thumb is to keep the feed pan at the level of the chickens' backs, and to fill the feed pans no more than one-third full. The latter rule is hard to follow with a lot of equipment, which is sized for chicks, not full-sized birds. More about that later.

The rule of thumb is to keep the feed pan at the level of the chickens' backs, and to fill the feed pans no more than one-third full.

Wastage also happens when finely ground feed blows away in the wind, or when feed gets wet. Chickens like wet feed, but if more wet feed is put in front of them than they can eat, it goes bad quickly, especially in hot weather.

Thus, feeders with a deep pan, kept only one-third full of large-particle feed, with some kind of shield or roof overhead to keep the rain off, provide the recipe for low feed wastage.

The other method is to feed only as much as the chickens will eat at once. This minimizes wastage, but tends to result in underfeeding.

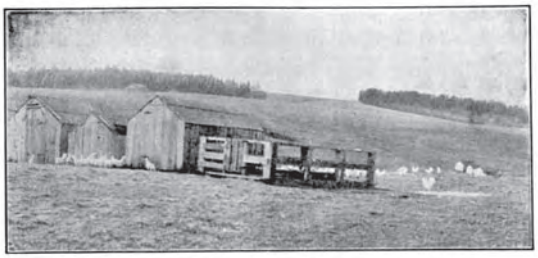
Keeping Other Livestock Out

Horses, cows, sheep, goats, and pigs all love chicken feed. They should be excluded for a variety of reasons.

Horses, cows, sheep, goats, and pigs all love chicken feed. They should be excluded for a variety of reasons. Giving free-choice chicken feed to ruminants isn't good for them, and you can't afford it, anyway.

Excluding other livestock can be difficult. Goats will jump perimeter fences, while sheep will often just plow right through. More about this in the section on electric fencing.

James Dryden's classic *Poultry Breeding and Management* (Orange Judd Publishing, 1916) shows a chicken feeding area surrounded by a portable corral made of boards and mounted on skids.



The cattle in the upper photo are kept out of the feed through the simple corral shown in the lower photo. The corral presents no barrier to the chickens. The farmer enters through a gate.

I've noticed that full-grown chickens can walk right through the mesh in lightweight galvanized cattle panels. Four such panels, a little framing, and a pair of skids would give a feed area sixteen feet square. I leave the issues of adding a gate and even a roof to you.

Another way of excluding larger livestock is with some kind of barrier on the feeder. A chicken can easily reach its head and neck through a two-inch gap, but four-footed livestock can't. An arrangement of slats or strips of welded-wire fencing can keep out other livestock, but the feeder must be heavy or rigidly attached to something that is, or the livestock might push it over.

I toyed briefly with electrifying feeders. I had a tall metal trough feeder that stood on legs about 18-inches high. Hens would hop up to the perches on the sides of the feeder and eat. I put each leg in a five-gallon bucket by way of insulation, and hooked the metal feeder up to an electric fence. The hens didn't care (they were up off the ground, just like a bird on a high-tension wire, which is what gave me the idea), but the goats really hated that feeder. But I gave up on the concept because I kept shocking myself on it.

Vermin Problems

Outdoor feeders attract mice, rats, wild birds, raccoons, and other freeloaders.

My biggest problems to date come from rats. To keep the area around my range feeders mud-free, I put them up on wooden pallets. This worked so well that I stopped moving the feeders every time I refilled them. Soon the area under the pallets was swarming with rats. It was disgusting.

I discarded the pallets and resumed my practice of moving the feeders every time I refilled them—and I moved them a lot further than before. This exposed the tunnels under the feeders every time they were moved, and forced rats to trek to a new location and dig again each time. There must have been some kind of predator waiting, because it wasn't long before I didn't see rats anymore.

Rats are the main reason why I don't like putting feeders in range houses unless they

are moved frequently. This isn't a problem with daily-move pens, but I only move my henhouses a few times a year. Feed would be a rat magnet. (I'm told that this is especially bad with houses with wooden floors. The area between the floor and the ground, like the area under my pallets, is a safe haven for rats. If the feed is in outdoor feeders, the rats are always at risk from owls.)

Kinds of Feeders

There are really only three kinds of feeders:

1. No feeder (feeding on the ground, which we have already discussed).
2. Troughs and other kinds of shallow pans.
3. Hopper-type feeders with a feed reserve that empties into a pan. Examples are tube feeders and range feeders.

There are also automatic feeders that use an electric motor to run an augur or chain to move feed around, but I don't think these are practical for outdoor use.

Troughs

The simple trough feeder is poorly understood by modern farmers. Hopper-type feeders are so common that people have forgotten what trough feeders are about.

The advantage of a trough is that, when it comes right down to it, it's just a pan that you pour feed into. Nothing could be simpler.

You can put just about any kind of feed into a trough, including liquids. A trough is the universal feeder. Because of this, it should be easy to clean!

Troughs need to hold enough feed to get the chickens from one feeding to another without running empty (or just barely running empty). Most troughs on the market are too shallow and too narrow for this. I can't imagine what the manufacturers are thinking. I have some ancient hen troughs that are eight feet long, ten inches wide, and six inches deep. That's a great size when feeding full-sized birds.

As mentioned before, the top of the trough should be even with the chickens' backs. If the height isn't adjustable, you end up having to keep several sets of troughs for birds of different ages. To some extent you need to do this anyway, because a pan deep enough to prevent feed waste with larger birds is too deep for chicks.

Traditionally, chicken troughs have some kind of guard, reel, or wire across the top to keep the chickens from perching on the troughs or dust-bathing in them. These aren't strictly necessary, but they help. They tend to make filling the trough a nuisance, though.

Troughs are often built with an inward-facing lip at the top to help keep the chickens from flipping feed out, and may have a grille, like the one shown earlier on the Brower trough waterer, which both reduces wastage and helps prevent feed loss.

A traditional wooden hen trough.

Types of Troughs

Commercial troughs are generally made out of galvanized steel or plastic. As I have already mentioned, I don't know of any commercial troughs that are big enough for full-sized chickens.

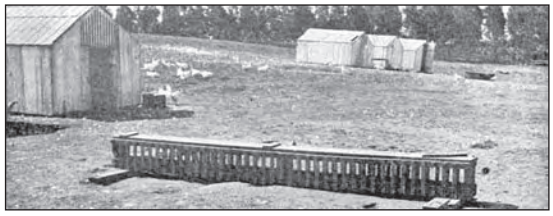
The best materials for home-made troughs are wood or large-diameter PVC pipe.

Wooden troughs are easy to make but are heavy. My experience is that non-galvanized nails don't have enough holding power. In fact, if I were to build any more wooden troughs, I'd use screws instead.

You can put just about any kind of feed into a trough, including liquids. A trough is the universal feeder.

There are any number of wooden trough designs, some quite strange. Most don't have any kind of rain shield, which is fine if the trough is used for supplemental feeding, but is a problem if you want to use it to keep feed in front of the chickens all the time.

My favorite rain shield for a wooden trough is single sheet of corrugated roofing, laid flat. The water will drip off whichever end is lowest, and the sheet is wide enough to give some shelter to the chickens. The roof should have some means of attaching it securely to the trough, which should be heavy enough to keep everything from blowing away in strong winds.



This range feeder from 90 years ago uses slats to keep the chickens from dust-bathing inside. The use of a plank roof instead of something more weatherproof tells you that this farm was in California.

A traditional range feeder from the 1930s. The roof lifts off for refilling. Internal partitions allow different kinds of feed to be used. Note that rats will take up residence under the wire platform unless the feeder is moved between fillings.

Troughs made from PVC pipe are the coming thing. I haven't built any myself, and I haven't figured out all the mechanical issues. The basic concept for a trough that you're going to hang from chains at either end is:

- Take a length of large-diameter PVC pipe (most people use 4-inch pipe, which may be too small) and glue caps to both ends.
- Remove about one-third of the diameter of the pipe, starting a little way past the cap.
- Add eyebolts to hang the trough from.
- Attach chains (or ropes, or baling twine) to the eyebolts and hang the trough.

My only real concern about this design is that a long trough might sag in the middle.

Maybe you get extra credit if you don't simply glue caps on the end, but glue on threaded adaptors and have screw-on end caps. That way, you can unscrew the ends and hose out the trough more easily.

One final note: it used to be fairly common for poultry houses to have feed troughs attached on the outside of the houses, even though the chickens were inside. A length of two-inch by four-inch welded wire allowed the chickens to reach the troughs from inside the houses. The advantage of this system is that the farmer can fill the trough without going inside the house. This is worth considering if you're tired of removing and replacing the feeders in your pasture pens with each daily move. It's the same concept as nest boxes that are accessible from the outside, but applied to feeders.

Hoppers

Hoppers are just a feed bin that empties into a trough or pan. Tube feeders are like that.

The point of hoppers is that you don't have to fill them as often as troughs. They might hold feed for a day or for a month. Arguably, the sweet spot is when they hold at least a week's worth of feed, so you can fill the feeders on Saturday and have only light chores the rest of the week.

Managing feed hoppers is practically the same as troughs. The differences are:

- Feed flows differently depending on its particle size and weight. A tube feeder that does great with feed pellets might leave most of the feed on the ground if filled with light oats. Most hoppers have some way of adjusting the opening between the reservoir and the pan. Getting this right can be a nuisance. Lightweight feeds need a much narrower opening than heavier ones.

- There's more feed in a hopper. This means that any kind of accident is more expensive.
- The feed is around longer. An amount of rain and condensation that wouldn't matter in a trough that's emptied twice a day might lead to a serious mold problem with a hopper that holds a week's feed.
- The hopper is heavier. If suspended from a chicken house, it can strain the structure—or your back.

A tarp-covered cattle panel provides shade for two ancient galvanized range feeders on my farm. Note the waterproof lid and rain shield. Modern versions are generally made of plastic, but look pretty much the same.

Tube feeders in a cattle-panel hoophouse.

In *Pastured Poultry Profits*, Joel Salatin reports poor results with tube feeders, because the feed gets wet and refuses to flow. I live in an area with over 60 inches of rainfall, mostly in the winter, and I have this problem only when there's a problem with the lid or rain shield on a range feeder. So it's not black and white; the devil is in the details, as usual.

It may be easier to get good results with a range feeder sitting out in the weather than with a tube feeder in a pasture pen. It can get pretty damp in a pasture pen, and the lack of lids and rain shields on tube feeders can be a real liability.

Types of Hopper

These days, you basically have your choice of tube feeders and range feeders, both of which have a round feed pan on the bottom and a cylindrical feed reservoir on top. The difference between the two is that a range feeder sits on the ground and has a lid and rain shield to keep the weather out, while a tube feeder is suspended from above and lacks the weather protection.

A range feeder sits on the ground and has a lid and rain shield to keep the weather out, while a tube feeder is suspended from above and lacks the weather protection.

In the old days there were many different rectangular hoppers, all of which looked more or less like hog feeders or creep feeders.

My local feed stores have two kinds of tube feeders; smaller ones for chicks and larger ones for older birds. The smaller ones hold ten to fifteen pounds of feed, while the larger ones hold roughly thirty pounds of feed. So it takes two of the larger feeders to hold a fifty-pound sack of feed.

The issues with pan height are the same as with troughs. Height is easy to adjust with hanging tube feeders. Range feeders are generally non-adjustable. Mine are Big Dutchman turkey feeders that are probably fifty years old. They work fine with hens and older pullets. In fact, smaller pullets do okay, too, since they climb right into the feed pan to eat.

Pan fullness issues are also the same as with troughs. As already described, most of the larger hoppers have some kind of adjustment (though tube feeders for chicks may not).

I don't know if anyone still makes steel range feeders. What I see in the catalogs

are plastic range feeders from Kuhl, which I've heard good things about but haven't used myself. I'm very pleased with the durability of my antique steel range feeders. I can back my pickup too far and whack them with my tailgate, and they don't care. The plastic ones probably require more TLC.

The ideal size for a large range feeder is one where you can stand on the tailgate of a pickup and tip feed sacks into the feeder. If you have to hoist the sacks so you can pour them into the feeder, it's too tall. Also, you want the range feeder to be short enough that you don't have to climb inside to remove caked feed from the bottom.

The flock is healthier, more uniform, and more productive if there's plenty of feeder space.

On a big farm, you'd want to invest in a feed wagon with (for example) a power take off-driven feed augur. Then you could use bulk rather than bagged feed. I knew a farmer who did this. He used an elderly grain wagon, which was a trailer used originally as a way of shuttling grain between a combine and the granary. It held a ton or two of feed. The PTO-driven augur would send the feed up a tube that looked like a length of stovepipe and was mounted so it could be positioned where you wanted it.

He would hitch the grain wagon to his tractor, back it under his free-standing outdoor grain bin, fill it, and then tow it to each range feeder in turn, positioning the feed tube over the top of the feeder and engaging the PTO to start the flow of feed into the range feeder. He got all of this equipment (grain bin, grain wagon, and range feeders) at a nominal price because it was considered obsolete or too small for modern farming. His outdoor feed bin was filled directly from the feed mill's bulk feed truck, which had its own feed-augur rig.

How Many Feeders?

As with waterers, the amount of feeder space you need depends partly on how likely the chickens are to run out of feed. If you ever let them run out of feed on purpose, you need to provide enough feeder space that all the chickens can eat at the same time (or scatter some of the feed on the ground to prevent pile-ups). Otherwise follow the guidelines in the following table:

	Number of Chickens per Feeder		
	8-foot Troughs	**Range Feeders**	**Tube Feeders**
Layers	50	50	15
Broilers	66	66	33

Recommendations from North & Bell's Commercial Chicken Production Manual.

The table specifies a lot more feeder space than most farmers provide. Lack of feeder space causes subtle problems, where the weaker or more timid chickens are excluded from the feeders by their more aggressive flockmates. The flock is healthier, more uniform, and more productive if there's plenty of feeder space.

Fencing

Chickens were rarely fenced in the old days; it would have kept them from foraging, which was their sole source of feed. In those far-off days, pigs and chickens roamed the streets, and you would fence areas to keep livestock *out*, not in.

Eventually, poultry keeping's focus shifted from scavenger chickens to chickens that are actually fed real feed, and where foraging is less important.

Later, increasing environmental consciousness caused governments to stop paying a bounty on everything that moved, and predator populations soared. A hundred years ago, the most serious predator was human chicken thieves, because the predatory animals were practically extinct. Now the animal predators have multiplied enormously, and they're hungry.

So for today's poultry keeper, fencing is mostly to keep predators out, and only partly to keep chickens in. On many farms, there's no need to keep chickens in at all, because sheer distance takes care of that.

Do electric fences work with chickens? Yes, they do. Although chickens aren't easily zapped by fences, because their feathers

are good insulators, they don't like getting zapped and will avoid electric fences.

There are two kinds of electric fence used for chickens. One is a simple one- or two-wire fence, and the other is electronetting.

One- and Two-Wire Electric Fences

The oldest kind of electric chicken fence is a single wire about five inches off the ground, or a pair of wires, one at five inches and another at ten inches. I've seen several references to such fences from sources between 1950 and 1960, but the practice was largely forgotten when commercial poultry went to 100 percent confinement. However, these simple low fences are still common to keep raccoons out of sweet corn.

Hens confined by a single electric fence wire.

I have two extensive fences of this kind, each enclosing several acres. They are very inexpensive. I put lightweight T-posts at the corners and use step-in fence posts everywhere else (I also have some fiberglass fence posts, but the step-in posts are better). Use doughnut insulators at the corners; snap-on T-post insulators will pull off.

I use aluminum fence wire because it's highly visible and easy to work with. Polywire (plastic rope with stainless steel conductors woven in) also works, but it's not as easy to work with, and it sags more. It's stronger, though, which sometimes matters if you're trying to keep sheep or pigs from stampeding through your fences.

I recommend using two wires everywhere except where you drive onto the pasture, where you should see if you can get away with a single wire. You can drive over a one-wire fence without bothering to turn it off.

Don't make the wire too tight when you first install it. With several feet of slack, you can bow the fence in one direction or the other and mow along the line where it used to be. Tensioning the fence is just a matter of pulling up a step-in fencepost and moving it out of line far enough that the fence becomes tight.

Buy lots of fenceposts. Buy them by the case. Anywhere the ground is uneven and the wire touches the ground, put in another post. Otherwise, you have to raise the fence too high, and predators will squeeze underneath.

Do these low fences really work? They do! My dog is terrified of them. I once watched a coyote chase a hen that was outside the fence. The hen raced past the fence, but the coyote stopped so fast that I swear I heard tires squeal. Even in the heat of the chase, there was no way he was going near that fence!

Raccoons aren't afraid of fences the way dogs and coyotes are, and apparently will prowl around them looking for a way to squeeze through without touching the wire. And if the voltage drops, they'll be inside.

I've had trouble with bobcats going over the wire, but I'm not sure that even a high fence would deter them.

The behavior of the chickens themselves is worth noting here. Chickens usually don't realize that they ought to fly over things they can see through, so they rarely fly over one of these fences. They don't like the fences, but if it starts getting dark and they're outside the fence, they'll go right through it to get home.

A panicky chicken will pop right through this kind of fence. This means that a fox in the henyard will scatter the flock to the four winds and will only kill one or two. With ordinary chicken-wire fences, the chickens

The oldest kind of electric chicken fence is a single wire about five inches off the ground, or a pair of wires, one at five inches and another at ten inches.

end up with their heads stuck through the mesh and are easy pickings. Electronetting has a similar problem, though the electrified chickens are less fun for the fox.

Electronetting

Electronetting is basically a net made of polywire. It comes in different heights, from garden fencing that's 16 to 18 inches high, up to 48 inches or more.

Electronetting.

Electronetting is a better barrier to fence-wise predators.

Why use electronetting? Remember, the more tightly you fence your chickens, the better the fencing has to be. If you enclose multiple acres, a one-wire fence will contain your chickens. If you enclose just a small area, such a fence may not hold them.

Similarly, electronetting is a better barrier to fence-wise predators. On our broiler hill, we switched from a two-wire fence to electronetting when predators were somehow getting past the two-wire fence. Maybe a coyote had learned to jump the wires; I don't know.

The taller lengths of electronetting are also better at keeping out your other livestock (such as goats) than a low fence.

Electronetting isn't a panacea. It shorts out easily against the grass, and raccoons and other predators will squeeze under the fence if there are any gaps. If you leave the fence in one place for any length of time, the grass will grow up around the bottom strand, and it will be difficult to remove. It's also quite expensive.

My main gripe about full-height electronetting is, "Where's the gate?" It's as much a barrier for the farmer as it is for anything else. Garden netting is great in this regard because you can step over it.

My favorite use of electronetting is to surround a pasture house when I put pullet chicks out on pasture. There are predators that will kill six-week-old pullet chicks that won't attack a full-grown hen, and the extra protection is worth it. Hens also like to bully half-grown chicks, and this keeps them away. Garden netting is adequate for this.

Lots of people make electronetting. My wife Karen swears by Premier (*www.premier1supplies.com*, 800-282-6631).

Permanent Perimeter Fencing

I have no experience with permanent, high-tension wire fencing. Such a fence, if electrified, should be very effective (make it taller if it's near a busy road). The heavy galvanized wires should prove very tough, so using a weed-whacker to keep the bottom wire clear should be safe and easy.

My farm has an old, decrepit perimeter fence using field fencing with a couple of strands of barbed wire at the top. Where this is intact, it holds the chickens in quite well, because the mesh at the bottom of the field fencing is tight enough to keep them from squeezing through. The whole fence is only about 48 inches tall, and if I had poultry pens right up against the fence, I'd want it to be taller. Instead, I keep my chicken houses some distance back, inside a two-wire electric fence. This seems adequate for our gravel country road. If I were on a highway, I'd want better fences or more distance.

Fence Energizers

If you have the choice, use the most powerful AC energizer you can get your hands on, preferably one with a built-in voltmeter. A wire 5 inches off the ground will constantly be shorted out by grass, molehills, and such, and the fence won't have any zap to it unless you use a powerful charger. I like the Parmak Super Energizer 3 (*www.parmak.com*)—which is almost frighteningly

powerful—until you hook it up to a pasture fence, which robs it of much of its strength. The Maxi-Power Mark 6 is also good, but not as powerful.

The Parmak Super Energizer 3. Note the prominent voltmeter.

If you must use a battery-powered unit, the Parmak Magnum 12 isn't bad, but I don't think it has anywhere near the power of the Super Energizer 3. All of the Parmak models I've mentioned have built-in voltmeters.

My wife, Karen, likes Premier energizers, and I think they're good units, but I won't use an energizer that doesn't have a built-in meter. If there's a meter, I'll glance at it frequently, and will often see trouble developing before it's too bad. Without a built-in meter, I don't notice anything is wrong until predators start killing my chickens.

Hand-held meters do the same job, and they work fine, but I find that I don't use them consistently. Maybe you're more methodical and they'll work for you.

A solar energizer is just a battery-powered energizer with a solar panel. I like solar energizers, but the presence or absence of the solar panel is not that important in this application. The reason is that the high load on the energizer is likely to be more than the solar panel can provide, so you will need to be prepared to swap batteries in any case. You still need to monitor the voltage and be prepared to swap or recharge batteries as soon as the fence becomes less effective.

Regular AC energizers are probably used less often than they could be. It's not very hard to run a couple of thousand feet of feeder wire over the top of your existing perimeter fences, and it offers a more reliable setup. To get past gates, I like to attach poles a few feet on either side of the gate, and run my wire overhead. You can run heavily insulated feeder wires underground if you want to, but that seems like too much work to me.

Grounds

A good ground is half the battle. Netting with alternating hot and ground wires makes this less of a problem. Pounding in ground rods along your permanent fence line is a good idea. Premier sells galvanized T-posts, which might be handy. I keep meaning to try them. Ordinary T-posts are supposed to provide a terrible ground.

The instructions that come with fence energizers are usually quite thorough in what you need to do to get the most out of the product in terms of grounding and wiring. Follow the instructions and you won't go far wrong.

Predator Issues

A good electrical ground is half the battle.

Baiting Fences

A method to discourage predators is known as fence baiting. Take a predator-killed or naturally deceased chicken and lash them to hot wires on the fence. This teaches predators that chicken tastes even worse than porcupines, toads, and skunks. I like to put bait at the point where I guess the predator enters the field. Anything that slows them down is likely to zap them.

Traps and Fences

Unbaited leg-hold traps are recommended by Joel Salatin and others for catching predators that attack broilers in pasture pens, but in an unfenced field they might catch anything—your dog, the sheep, anything. Using them *inside* the perimeter fence should catch nothing but predators that sneak past the fence (assuming the chickens in the pasture pens can't escape). Predators tend to circle the houses before deciding where to strike. See *Pastured Poultry Profits* for details. This has never worked for us, but maybe you'll be luckier. We have had better luck with live traps, but the results are still uncertain.

Electrified Houses

My original use of electric fence wire was on the individual houses themselves. My

pasture houses are mounted on skids, and have a low front which the hens hop to the top of when entering and leaving the house. Predators climb rather than hop, so fence wire along the front of the house and between the skids should keep them out.

This works pretty well, actually, but I switched to a system of perimeter fencing once I realized that a coyote had learned to howl right outside a henhouse at night, causing the hens to fly out in blind panic. (I discovered this by pitching a tent and camping on the pasture to figure out what was happening to my hens.) Once the predators learned to use the houses as a hen dispenser, I figured that perimeter fencing was the way to go.

In the old days, there was a bounty on everything that moved. Now the focus is on the individual predators that actually prey on livestock.

Salatin-style pasture pens are easy to electrify; just nail insulators on the corners and surround the house with a hot wire a few inches above ground level. Predators nosing around the pen will get a nasty shock. I recommend using a mast (a ten-foot-long two-by-four is good) to get the feeder wire high enough that you aren't constantly running into it.

Be careful to electrify just the wire, not the poultry netting on the sides of the house. The chickens don't appreciate electrified walls.

An electrified house. There are insulators near ground level. Chickens hop up to the top of the low front to get inside; predators have to climb. The mast at the back of the house allows the hot wire to come from overhead.

USDA-APHIS (Federal Trapper)

The replacement for having a federal bounty on predators is the USDA-APHIS Wildlife Services Program, better known as "the federal trapper."

When predators attack my livestock, I call the local federal trapper, and he tries to kill them for me. He has access to some specialized trapping equipment, is very skilled at using game calls to lure predators into shooting distance, and knows where to set snares so they will catch predators and not every other kind of wildlife.

The program depends on local matching funds, which means that your predator problem is likely the fault of your county government's stinginess. Vote for someone else next time.

This is the kinder, gentler form of federal predator control. In the old days, there was a bounty on everything that moved. Now the focus is on the individual predators that actually prey on livestock. I like this ecological soundness; I wish more programs were like this!

See *www.aphis.usda.gov/ws/* for more information, or call Wildlife Services toll-free at (866) 4-USDA-WS. I strongly recommend that you use this service as fully as you can. We'd be out of business if it weren't for the Federal trapper.

Roosts

Chickens want to perch up in the air, and doing so can keep them clean, dry, and safe. As long as the roof is tight, the roosts tend to be nice and dry, which is more than can be said for the floor sometimes. Pasture houses, in particular, are subject to dampness and even flooding, and it's good for the chickens to be up on a nice dry perch.

Baby chicks lack a roosting instinct, which is just as well, since they live on the ground. The urge to roost develops slowly, but eventually the chicks get the idea and want to sleep as high up in the air as they can get.

Broilers are butchered before they're old enough to develop a full-blown roosting instinct. In any event, modern hybrids are soon too heavy to fly up to a perch.

I don't recommend even low roosts for broilers because early roosting tends to develop crooked keel bones in broilers. The keel is mostly cartilage in a young bird, and it's

easily misshapen if the chicken sleeps on a roost, where the keelbone may be supporting much of its weight. Apparently this corrects itself in older birds.

Egg-type chickens are another matter. They have no difficulty in using roosts eight feet off the ground, and may decide to roost even higher, abandoning the henhouse altogether for the branches of nearby trees.

It's helpful to encourage chickens to start roosting at an early age, because they seem to lose the desire to huddle and smother each other once they've learned to roost. This is done with "practice perches," miniature roosts near ground level that the chicks can get to without any difficulty. My brooder houses are so small that it's difficult to shoehorn practice perches into them, but maybe you have such space.

Regular roosts should be built simply out of ordinary two-by-fours. I like to nail a pair to the walls of the henhouse, running from front to back, and then lay two-by-fours on top of these rails. These aren't nailed down; they can simply be lifted out. You can lay the two-by-fours flat or put them up on edge. Laying them flat is the easiest, so that's what I do. Eight-foot roosts supported at the ends will sag if you lay them flat, but they won't break even when crammed with full-sized hens. If you install them on edge, they won't sag.

I've recently decided that my roosts are far too low in my taller henhouses. I have a number of henhouses with a roofline between six and eight feet high. In these, the roosts should be at least four feet off the ground. My reasoning is that this is high enough that I can duck underneath the roosts if I have to retrieve an egg from the back corner. If the roosts are any lower, I have to crawl, or remove the roosts, or something. Too much work. Besides, the hens like high roosts. High roosts prevent them from roosting in lower places, such as nest boxes.

As a general rule, roosts should be about a foot apart, and you should figure that there will be two to three chickens per foot of roost. It's useful to give them more roost space than they need, so they can pick and choose according to the weather.

I suspect that high roosts can prevent some predator losses. Roosts that are nestled right under the roof make it impossible for an owl to dive-bomb a sleeping hen. If you suspend the roosts from the ceiling, raccoons won't be able to climb up and grab a hen.

Don't build ladder roosts (A-frames with roosts on various levels). The hens will fight over the highest perches, and ladder roosts turn your henhouse into an obstacle course.

An alternative to high roosts is low roosts, of course. These are often done over a droppings pit, which just means that the hens are denied access to the area under the roosts by building the roosts on top of an open-topped box with chicken wire under the roosts. The advantage of a droppings pit is that you don't have to manage the manure much, since it's not in contact with the chickens. Throwing in some superphosphate fertilizer once in a while to keep the smell and flies down about covers it. If you also put the waterers over the droppings pit, the litter will stay drier. Please note that superphosphate is synthetic, and therefore a prohibited material if the manure is to be used by a certified organic operation.

It's helpful to encourage chickens to start roosting at an early age.

In the 1950s, when egg profits plummeted, desperate farmers built three-story roosts; three identical decks of roosts, one on top of the other. It worked. You'd think the hens on the bottom tier would get pretty messy, but apparently this was not a problem. Go figure. I haven't tried this, but I think it would be useful to have a deck of high roosts at the back of the house for the hens to sleep on, and a deck of low roosts, nailed across the skids of the henhouse, for a daytime floor. This keeps mud and manure from being a problem in a litterless pasture house in wet weather.

Where there are roosts, mites are sometimes associated with them. There are many types of mites that affect poultry, including red mites, northern fowl mites,

and scaly leg mites. Mites travel slowly from one bird to another and may be found in cracks, crevices, nests, and roosts. While many poultry resources recommend pesticides or synthetic oils to control mites, these materials are prohibited for use in certified organic production systems. An integrated approach would include the poultry expressing natural behaviors to control mites—dust baths in dry soil and preening—and treating roosts with natural oils such as linseed oil. Any vegetable oil has the physical effect of suffocating and killing mites. However, some oils are more desirable because they do not dry or go rancid as quickly. All oils would need to be reapplied periodically, but some much less frequently than others. Avoid materials that have been used traditionally, such as kerosene, used motor oil, or synthetic turpentine, as these are prohibited by organic standards. Raw linseed oil is presumably better than boiled, since it takes a very long time to dry but I had six months of mite-free roosts with boiled linseed oil.

This photo from the 1930s shows a farmer painting a set of removable roosts to prevent mite infestation.

Roost mites can also be controlled with natural insecticides that are allowed under organic standards. Pyrethrum or its components, known as pyrethrins, are natural botanical extracts and their use is allowed in organic production. Its synthetic substitutes, pyrethroids, are prohibited. Many other insecticides are effective, but most are more toxic than other methods, have a withdrawal period, and are prohibited for use in organic production. If you are not an organic producer, then other "less-toxic" materials are an option. For example, lime-sulfur spray smells like rotten eggs but really gets the job done. Lime-sulfur is not listed as an allowed synthetic for use in organic livestock production (see National Organic Program National List 205.603). You might note, though, that it is allowed for disease and mite control in crops (see National List 205.601). Certified organic producers must list all materials they use or plan to use in the organic system plan submitted for approval to their certifier. Organic producers should not use any synthetic material without prior approval of its specific use by the certifier.

Roosts are not absolutely necessary—most hens kept in high-density floor confinement are not provided with roosts—but a set of properly placed high roosts will keep the hens dry and happy, and they'll sleep where you want them to.

Nest Boxes

I'm going to tell you a secret. The best nest boxes have a floor that's made out of half-inch hardware cloth covered with straw. These nest boxes never get disgusting inside because the crud falls through. You get less egg breakage because the floor has some give to it. The straw stays drier because it has air circulation from underneath and because broken egg contents drip through the bottom. The eggs cool down faster because of the increased air circulation.

I don't know why everyone doesn't use such nests. Since, as far as I know, no one makes these commercially, you'll have to build yours yourself. They're a little more difficult to build, since hardware cloth is a pain to work with compared to nailing boards together. Other than that, they're ideal.

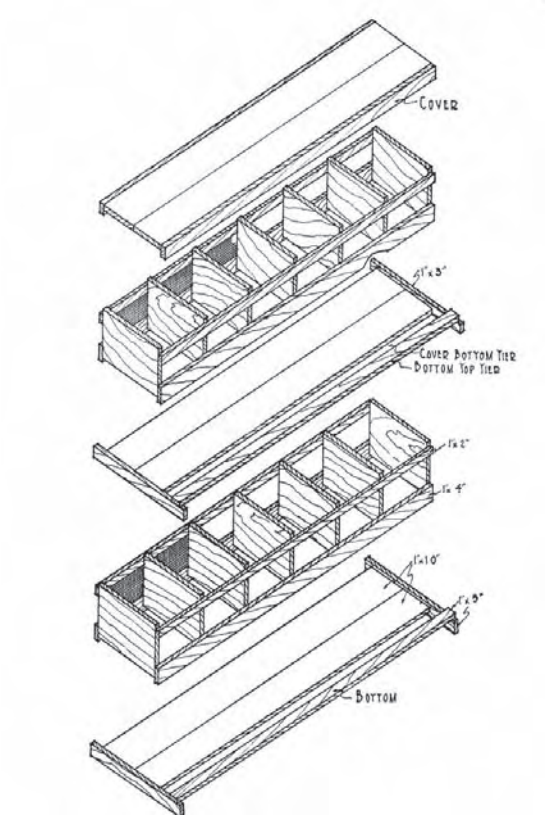
Types of Nest Box

Individual Nests

The traditional individual nest is a foot deep, a foot wide, and something less than a foot tall.

With board floors, an enormous amount of litter in the box helps to cushion the eggs. The front board should be a one-by-six or even a one-by-eight. With hardware cloth floors, I don't think this matters. A one-by-four is plenty. Such a nest is good for four to five hens. Of course, individual nests aren't really made individually. Wooden ones are built in units four to eight feet long containing four to eight nests, and metal ones are typically five feet wide and have two rows of five nests.

I have discovered that what hens really like is not individual nests, exactly. They mostly like having a corner to themselves. One corner will do. This means that you can remove half the partitions in a nest box and the hens won't mind a bit. The advantage of doing so is that hens are always trying to cram themselves into spaces that are already occupied, and the wider the nest, the fewer eggs get smashed in the pile-up.



Plans for a two-tier conventional nest unit. Everything is built in sections so it can be taken apart for cleaning. Wire mesh is used at the back for ventilation, but not for the bottom, though this would be easy enough to change.

Community and Tunnel Nests

Community nests work on the idea that the hens prefer to lay in darkness, but they don't *eat* in darkness. This eliminates egg-eating. The traditional community nest is a box four feet wide and two feet deep, with a doorway that's not much more than six inches wide and eight inches tall (and maybe with a flap of cloth or plastic across it). This is good for fifty hens.

Another variant is the tunnel nest, which is eight feet long, two feet wide, and has a small entrance at each end. This is good for a hundred hens.

Community and tunnel nests need to be well-ventilated without letting in much light. This is usually done by leaving the back partly open or drilling large holes in it (on the assumption that the nest will be installed to almost but not quite touch a wall of the henhouse). Sometimes they're installed at floor level, in the spots where the hens insist on laying in spite of having perfectly good nest boxes elsewhere.

Community and tunnel nests can be constructed as free-standing outdoor structures if you put a good roof on them. They'll probably need to be staked down to prevent them from blowing over in high winds.

A community nest. The lid is normally kept closed except during egg collection.

Roll-Out Nests

Roll-out nests have a sloped welded-wire floor. The eggs roll down the slope to a (hopefully) safe place to await collection. This mostly keeps them clean and prevents breakage and egg-eating.

The trick lies in getting the hens to use them. I am skeptical of their utility in range and small-farm environments, where the hens have plenty of more attractive places to lay.

Collecting the Eggs

Eggs are generally collected from the front of individual nests, though sometimes they're collected from the back, such as when the nests open on the inside of the henhouse but it's more convenient to collect them from outside. Usually there is a flap or a hinged roof to allow the back of the nest to be closed except during egg collection.

Community and tunnel nests require a special way of collecting eggs, since the tiny entrances don't allow adequate access to the inside. Access is usually through a hinged lid, though sometimes it's from a flap or hatch on the front or back side.

About the Author

Robert Plamondon is a part-time farmer and full-time writer in Blodgett, Oregon. He keeps around 500 free-range hens and his wife, Karen, butchers more than 1,000 pastured broilers annually.

Plamondon also runs Norton Creek Press, a "shoestring press" with four poultry books, including his *Success With Baby Chicks*.

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