

# Integrating Livestock in the Garden

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Vegetables and livestock on a farm can complement each other in many ways. They help spread production risk between very different enterprises, the combination of fresh vegetables and frozen meat can allow a farm to sell product over a longer portion of a year, waste from one system can be an important input to the other, and they can work together in a marketing system.

At Bluebird farm we grow about 2 acres of market vegetables using organic/ecological practices. We incorporate several combinations of cover crops, vegetable rotation, and integrated on-farm livestock fertility in our methods. We raise a variety of livestock in high density, rotational, grass-based systems. We feed certified organic grains. Each year we graze in multi-species systems with a grass finished sheep flock, pastured broiler chickens, a pet horse (a grazing machine!), a large pastured layer flock in a wagon coop, forest-garden-pastured pigs, and livestock guardian dogs. We market the vegetables and meat through CSA, farmers markets, and several restaurants.

All ecosystems consist of plants, animals, and microorganisms competing with, assisting each other, and coexisting. In organic vegetable farming the action of beneficial micro fauna-insects, fungi, and bacteria are typically enlisted to create a more diverse and stable ecosystem. The farmer is attempting to take advantage of naturally occurring relationships instead of fighting or destroying them. It is also typical to leave larger animals out of the equation.

Most mammals are considered pests in a garden situation - deer, ground hogs, and mice all cause tremendous damage. But it is possible on a vegetable farm to combine livestock and vegetables in a way that is mutually beneficial. Each species of livestock has specific benefits for vegetable production from insect control to fertility management. Layering animals and vegetables can create positively reinforcing systems while producing more food through increased fertility and layered production systems.

## Livestock Basics: Keeping Livestock Happy and Healthy

Raising livestock presents its own set of challenges. The animals don't always stay where you want them to, they can get sick, and they can always find new and creative ways to get in trouble. We once had a pig get stuck head first in a 55 gallon water barrel the pig herd had knocked over. One important consideration when managing livestock and vegetables is that **livestock emergencies tend to jump to the top of the to-do list, sometimes to the detriment of a vegetable crop.**

When considering livestock, you should read all you can on the animal. Ideally, you should also seek experience around live animals of whatever type you want to raise. Then start small. It is easy to have a big problem when you start big. If you start small, problems will stay small. Each species of livestock has its own cultural requirements. But there are six major areas to think about when researching raising livestock.

**Shelter and fencing:** Vegetable fields are typically open and without any shade to offer to the animals. Each animal will have its own particular shelter and fencing needs that vary with each season. Making sure that your fencing is adequate to keep your animals in and predators out is very important. Gallivanting pigs and sheep can destroy hundreds of dollars of vegetables in a few minutes. Poultry can ruin many low vegetables with their droppings. Neighbor's dogs and wandering dogs are a larger concern than most wild animals. For animal shelter in North Carolina, shade will be the primary concern

for almost all livestock from March to October. Protection from rain will be a secondary concern and wind a distant third unless you are rotating animals in the winter months.

**Water:** All livestock require a constant source of clean water. Animals should never run out of water at any time. The only exception would be for a brief period after dawn during a cold winter when the water is frozen over and needs to be broken up. Livestock, especially pigs, are very good at destroying makeshift waterers like open pans, buckets or lightweight tubs, so make sure you can provide adequate water in a sturdy, species appropriate water container.

**Feed:** Feed requirements depend on the animal. In the case of grain eating omnivores - poultry and hogs primarily - they will need unlimited access to a species specific, balanced ration that includes minerals. This grain ration can be heavily supplemented by utilizing pasture and cover crops with a carefully planned *and* executed grazing program. Ruminant species like sheep, goats, and cattle can receive their entire diet with on farm resources like cover crops and pastures.

**On farm movement:** In order to integrate livestock into a vegetable system you will have to move the animals. Plan ahead for pathways, scout potential obstacles, and think like a pig (or cow or sheep)! Dr. Temple Grandin has many useful articles and books on low stress animal handling methods.

**Butcher and transport:** If you raise animals (except layer hens), you will have to a plan for butchering or selling live animals. It is a good idea to have a plan *before* you have the animals. Livestock can be difficult to load and transport, so it is worth building good handling areas (though they can be simple and inexpensive). Also keep in mind that livestock will make your vehicles highly unsanitary. Have a plan to clean and sanitize your vehicles and trailers before using them for anything edible.

**Marketing and product storage:** Make sure you have adequate freezer storage for meat or allow customers to order the meat on the butcher date and carefully arrange the pickup to coincide with the return of the meat from the butcher. Have a plan for getting your product to market and back-coolers can take up a lot of room in a market vehicle. In North Carolina you are required to get a meat handler's license to sell meat. It is easy, free and keeps you out of trouble.

## Diversity on the Farm

### Production Diversity

The old adage to not put one's eggs all in one basket is one of the reasons we decided early on to raise livestock and vegetables. A diverse vegetable garden helps to spread risk. In any given year peppers might do spectacularly, making up for a so-so chard harvest. However, there are many ways the *entire* garden might suffer a setback: flood, drought, insects, herbicide drift, and any number of other disasters. Livestock tend to not be *as susceptible* to some of the same problems as vegetables. Provided you have a steady, safe water supply, can purchase feed from elsewhere, and can provide adequate shelter, livestock are unlikely to suffer the same sorts of catastrophic losses from a flood or drought. This isn't to say that they are easy or immune to such problems, but they do offer a further level of diversity to an agro-ecosystem.

The differences between livestock and vegetable production cycles can also help spread limited labor resources. Our daily animal chores for animals take only about two hours of labor in the summer. On any given day we will be taking care of two herds of 12 pigs each, one flock of 250 broiler chicks in

the brooder, one flock of 250 broiler chickens in the pasture, one flock of 20 sheep, and one large flock of hens. Those two hours per day produce a lot of food value.

Trying to balance the needs of livestock and vegetables can also present challenges. As mentioned, livestock emergencies almost always jump ahead of slower moving vegetable disasters. It is easy for us to see a row of tomatoes that needs attention and not feel too bad putting it off, especially if what we're doing instead is taking care of an injured pig or escaped sheep. But sometimes the tomatoes did really need to be taken care of that day, and by giving the livestock precedent we sacrifice the health and ultimately the entire yield of a crop. Livestock also do best when managed with a routine. While most animals are not nearly as picky as dairy animals, they do require a daily check in. Taking a full day away from the farm during peak season vegetable production can be difficult, but leaving livestock for a full day is even harder. The animals always seem to know the most inappropriate time to cause an emergency.

### **Marketing Diversity**

The combination of livestock and vegetables can offer advantages at market as well. A wider diversity of products at our market stand helps bring customers in. Someone who might not buy kale will try it because it goes well with the bratwurst she just bought, or vice versa. We enjoy being able to offer a wide range of products to our customers. In addition, while meat production can be very seasonal, freezer space will allow you to have year round sales. This may or may not be practical in your case, but year round sales can be a tremendous benefit of livestock.

Even the seemingly easy task of selling meat and vegetables together at markets can pose challenges. Vegetables are big, bright, flashy, and take up most of a market table. A cooler full of meat is not. Making sure customers are aware of all of our products has been our biggest challenge. Regular customers of 2 seasons will occasionally be surprised to know that, yes, we also raise chicken. Display and education at market are more of a fun puzzle than a serious problem, though. A more important concern is meat and vegetable handling to prevent cross contamination. Insulated freezer gloves are great to slip on and off at market for meat handling, keeping your hands warm and even better - clean.

### **Integrating livestock in the garden**

Production and marketing diversity are two of the reasons to consider livestock and crop production, but the specific benefits the two systems can provide each other are perhaps the most compelling. Farmers may choose to integrate livestock and vegetables for any number of reasons including fertility, feed for livestock, pest control, weed control, or general garden clean-up. In all cases the particular goal of the livestock-garden combination will affect the specific management choices chosen. For example, hogs might be fed a full grain diet and left for a long period (2-5 weeks) in an area if they are being used to provide fertility and field tilling, but rotated quickly (a few days to 1 week) and fed a reduced ration if the farmer is trying to provide feed for hogs with leftover vegetables and plants in the field. We also bring the lowest quality vegetables of crops like tomatoes to the pigs as a disposal of these crops. We find that this is easier than composting the small amounts of waste vegetables.

### **Fertility**

The most obvious potential fertility benefit of livestock is directly through their manure. Instead of importing 100% of a vegetable's fertility directly we import feed and pass it through the pigs and chickens. What comes out contains much of the nutritional value for plants as what went in because animals are highly inefficient at extracting nutrients( See this link for more details: <http://www.news.cornell.edu/releases/aug97/livestock.hrs.html>. ) At the same time, delicious meat or

an egg has been produced. However, it is difficult to fully capture animal nutrients. If they are left on the soil surface too long most of the fertility value, especially of nitrogen, will be lost. When relying on livestock as a nutrient source, timing and good management are important. It is best to disc or chisel plow an area within 48 hours to capture most of the nitrogen from nitrogen heavy manures from poultry and hogs. ( Link to learn more:

[http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1138&context=biosysengfacpub&sei-redir=1&referer=http%3A%2F%2Fscholar.google.com%2Fscholar\\_url%3Fhl%3Den%26q%3Dhttp%3A%2F%2Fdigitalcommons.unl.edu%2Fcgi%2Fviewcontent.cgi%253Farticle%253D1138%2526context%253Dbiosysengfacpub%26sa%3DX%26scisig%3DAAGBfm0A8iEthMA\\_grLURx-IgRFDSGf45A%26oi%3Dscholarr#search=%22http%3A%2F%2Fdigitalcommons.unl.edu%2Fcgi%2Fviewcontent.cgi%3Farticle%3D1138%26context%3Dbiosysengfacpub%22](http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1138&context=biosysengfacpub&sei-redir=1&referer=http%3A%2F%2Fscholar.google.com%2Fscholar_url%3Fhl%3Den%26q%3Dhttp%3A%2F%2Fdigitalcommons.unl.edu%2Fcgi%2Fviewcontent.cgi%253Farticle%253D1138%2526context%253Dbiosysengfacpub%26sa%3DX%26scisig%3DAAGBfm0A8iEthMA_grLURx-IgRFDSGf45A%26oi%3Dscholarr#search=%22http%3A%2F%2Fdigitalcommons.unl.edu%2Fcgi%2Fviewcontent.cgi%3Farticle%3D1138%26context%3Dbiosysengfacpub%22) )

We chisel plow a vegetable crop field that has been gleaned by pigs or poultry as soon as possible to capture the fertility passed along from grains through the manure. When sheep or pigs graze a cover crop like cow peas and millet, the resulting stubble from sheep or shreds of mulch from pigs is usually an adequate cover for the nutrients for a short time period (1 or 2 weeks), until the bare field can be disc or chisel plowed.

## Manure

If you are not feeding a complete ration to pigs or chickens then they will not really *add* nutrients to a field. Instead they will become a piece of a cycle from soil to plant to animal and back to soil, only cycling what is currently present. At Bluebird Farm we feed all of our hogs and chickens complete grain rations. We do raise sheep that we do not feed supplemental feed. Ruminants perform best with access to minerals or kelp and will spread these nutrients across fields and pastures in their manure. Sheep, goats and cattle won't provide many additional nutrients if they are only grazing. However, there are other good reasons for ruminants in the garden. Our garden soil is very sandy. It drains quickly and is low in biological activity. When we mow a cover crop it takes forever to break down in our soil. If we rotate sheep into an area their rumens act as a friendly environment for microorganisms that break down the plant matter. The resulting manure is much more readily available to the next crop of plants. In addition we have now used a living system to harvest our cover crop instead of a fuel burning mower.

**Resource:** The Center for Environmental Farming Systems (CEFS) has a great article that includes specific, practical information on stocking rates, cover types, and nutrient management.

[http://www.cefs.ncsu.edu/publications/conservation\\_practices\\_2012.pdf](http://www.cefs.ncsu.edu/publications/conservation_practices_2012.pdf)

**Note:** manure is a source of fertility and soil organic matter. **It is also a potential source for pathogens.** Use caution, planning, and common sense when working near animals and vegetables. Organic standards cite 120 days from raw manure to time of vegetable harvest.

## Feed for animals

Pigs and poultry require unlimited access to a balanced grain ration. Managing cover crops and forages for fresh nutritional supplementation is the simplest approach to produce healthy animals that are productive and provide beneficial nutrients for the vegetable field. It is tempting to rotate livestock through vegetable fields to provide their sole food source. This is possible in the case of grass and legume cover crops being grazed by ruminants like goats, sheep, and cattle. However, fast growing hogs and poultry have very specific dietary needs that are hard to provide through forage. Animal nutrition for fast growing farm animals is not as simple as you might think. Layer hens are better at finding forage, but egg production will almost certainly drop if a complete ration is not used.

At Bluebird Farm we think of the cover crops, pasture, forest forage, and vegetable residue as salad for the chickens and hogs. They certainly get some nutrients and they definitely benefit from eating green crops but forage does not provide the bulk of their energy or protein needs. It is more like a nutritional supplement.

Hogs and layer chickens can stay relatively healthy on forage alone. However, without unlimited access to a balanced grain ration, pigs will take longer to grow to full size and layer hen's egg productivity will diminish. The performance can suffer so dramatically that it is doubtful that any reduced feed costs can make up for production losses.

For example, reducing the amount of daily balanced grain feed to a pig's maintenance needs (to 5 lbs instead of 10 lbs of feed for a 4 month old pig) will cause the pig to not gain any weight. This slow growing can even create a meat that is completely different than an animal fed a complete ration. It is not necessarily bad, but it is very different. However, even with unlimited access to grains, pigs and poultry will eat a higher percentage of grasses and forages when rotated to fresh paddocks regularly. Pigs that are four months and older have more developed digestive systems and can digest the available nutrients from cover crops, grasses, and forages like clover, vegetables, and brewer's mash. Sows and boars have the most efficient digestive systems and can get up to 20% of their total nutrients from high protein forages like lush clover.

Fast growing, high nutrient demand broiler chickens like Freedom Rangers and Cornish Cross broilers may never reach a marketable weight without unlimited access to a balanced grain ration. These broiler chicken breeds are particularly sensitive to nutrition deficiencies and their growth is easily stunted. Broiler chickens are such a fast growing, high performance animal that they will not grow on forage alone, or even perform well on reduced rations. For them the pasture is truly only a vitamin supplement. It is possible to create highly nutritious forage mixtures that provide adequate nutrition for fast growing hogs. But creating balanced forage for hogs becomes its own crop and management system that is not easily integrated with the needs of vegetable production.

### **Clean up waste vegetable/old plants**

An excellent use of livestock, especially hogs and chickens is to clean up plant debris. This provides a supplement to the animals that they thoroughly enjoy while reducing plant debris that can harbor pests and diseases.

### **Weed control**

Livestock can help to control some weeds. When left in an area for an extended period, the rooting action of hogs can affect weeds much like a tractor tiller. Grazing animals such as sheep can help control weeds that die back when regularly mowed. Even chickens can help by finding and eating many of the small seeds from weeds that went to seed.

### **Other Considerations**

**Food Safety**-The major consideration when combining livestock production and marketing is food safety. There are many opportunities for potential contamination from field to market.

**Animal escapees** - As mentioned above it doesn't take a few pigs very long to destroy huge amounts of vegetables if they escape into the wrong area.

**Soil compaction/over impact** - Think about your soil type carefully when considering animals. Be ready to rotate when you need to based on soil moisture and impact, not when it's convenient.

**Soil Erosion** - Be careful of sloped areas. You don't want to use pigs where you wouldn't till.

**Water runoff** -This is related to food safety. But, think about animals and nearby water sources. Is the water downstream your vegetable irrigation source? Know the location of your well or your neighbors' wells.

## Putting Livestock in the Garden: Our Favorite Tools

### Fencing

We use electric fencing almost exclusively. Fencing without a charge has to be strong enough to serve as a physical barrier for livestock. It is difficult to combine the necessary strength with our desired portability. Electric fencing works as a psychological barrier. *It only works if an adequate charge is maintained and the animals are trained to the fence.* Keep a good charge by following recommendations on ground posts and checking the line daily for breaks or vegetation contact.

Livestock must be trained to electricity because on their first few encounters they don't know what the shock is. Therefore they are as likely to run through the fence as to turn around. For hogs, we set up temporary visual barriers around small electrified paddocks. Then we supervise the piglets for about three-one hour sessions, closing them in a corral after each time. They typically only escape once at the start of the first session. Very little reminding is required in the second two sessions. After that, if there have been no more breakouts, we consider them fence trained.

For hogs we use step-in insulated posts and two strands of 15 gauge aluminum wire. It is worth the few extra dollars to purchase a good fence reel online instead of a cheaper option in your feed store. Wire is heavy and you will reel and unreel frequently - a good tool is worth it. We string the wires about 8 and 16 inches off the ground. The number of posts will vary depending on the topography of your location, the trustworthiness of the pigs, and their age.

We use Premier One poultry netting for sheep and chickens. *We do not recommend the sheep netting with larger holes!* We don't recommend it for two reasons, first it cannot be used for poultry and sheep/layer hen combination is one of our favorites. Second, sheep try hard enough to put their heads through the small openings in poultry netting, we aren't sure they would respect a fence with larger holes. We have settled on the 48 inch high, 160 foot long poultry netting with double stakes. We switched to 48 inch height because neither sheep nor layer hens respected the 42 inch high fence. We only use the shorter fencing on broilers. We chose longer lengths because the short ones hardly provide any space at all. The double stakes add to the overall weight, but in a dry August are necessary for stepping the posts into hard ground.

**Note:** We make one important home modification to our fences. The fences have a bundle of wires running the vertical length of one of the end posts. This is where a charger connects. The bundle then carries the charge to each horizontal wire in the fence. We located and clipped the lowest horizontal strand out of the bundle. That line had the most problems grounding out in the wet grass. Once it was removed we had much higher success holding a good charge.

We also rely heavily on 8 corral panels or cattle panels, to create relatively mobile, but very strong, semi-permanent holding and loading areas. We have found that the panels with 6" square holes are far more versatile than those with larger openings. Piglets will go right through anything bigger than

the 6" square holes. We sometimes want chickens, but not adult hogs or sheep, to be able to pass through an area. The larger openings are necessary in this case. We supplement our corral panels with wooden pallets. Pallets supported by t-posts and held together with baling/rebar tie wire are extremely effective barriers.

### **Solar chargers**

We prefer solar charges to plug in for mobility reasons. We can't always make sure livestock are reachable with an extension cord. Our favorite chargers are Parmak brand ( <http://www.baygard.com> ). We use 6 V charges for the hogs because it is only charging two strands of wire. We have found that the larger 12 V is required to keep a charge on poultry/sheep netting. We successfully charge 4 lengths of netting linked together with a 12 V charger.

It is easy to make a ground post from any piece of metal driven into the ground. In our wet climate these will work most of the time. However, for best results, especially during dry seasons, our favorite ground post is a proper 8 foot, copper ground post available at any Lowes, Home Depot or other such store. We cut them in half and drive it about 18 inches into the ground.

### **Posts**

We mostly use step-in, or tread-in posts. Our favorite is Stafix heavy duty yellow posts from Agrisupply company <http://www.agrisupply.com/>. They are more expensive than most Dare brand posts that feed stores have in stock. However, the Stafix posts seem to hold up better and have easier to use wire clips.

We typically use 4 foot t-posts for corners or any turn in the fence sharper than 45 degrees. Four to six t-posts in a temporary fence line offer much needed tension support and strength.

### **Portable shelters**

Portable shelters must be cheap, strong, and *portable*. It is surprisingly easy to start out trying to make a portable structure only to find that it is too weak, too heavy, or impractical for some other reason.

1. **Hoop coop-** The hoop coop design works well for poultry of all types. We don't believe that the two foot high Salatin style pens will work well in our hot summers (Joel lives in a cooler location than the foothills of NC). They may work in the mountains, but we also don't like how they restrict the birds' movements.

We prefer the hoops only for broilers. Ours are made from a simple 2" x 4" frame with corner braces and have a 10' x 12' footprint. We used 2" x 4" welded wire fencing to form hoops with a 5-6 foot peak. We place a modified dolly under one end and move it one length per day.

We used hoop coops for layer hens for 2 years. However, because of the open bottom design, this severely limited our ability to rotate layer hens. We could only move them to a location immediately next to their old one. If we wanted to move farther we had to put them all in crates then move them at night.

Our hoop coops costs about \$150 plus labor to construct and are in their 4<sup>th</sup> season.



Hoop coop with Freedom Ranger broiler chickens. Not shade flaps and gravity water system.

2. **Layer wagon** - In 2012 we purchased an old hay wagon and constructed a completely closable and mobile layer coop on the wagon. It has greatly improved their rotation. The project cost about \$3000 by the time labor was included. While the wagon will last many years, our analysis at the end of the season showed that eggs are not very profitable and it will take many years to cover such an expense.



The layer wagon in the pasture with the sheep (in background). More photos on our blog and website (see links at the end of the article).

3. **Plywood trapezoid** - We have several easy to build, relatively cheap, plywood “trapezoid” structures. They consist of four trapezoid shaped 2” x 4” framing pieces. The base is 8’ across and the top 4’ across. These two pieces are parallel to each other about 4’ apart with the top section centered relative to the base. They are bolted together with two more pieces of 2” x 4” about 4’ long angling from the wide ends of the base, to the ends of the top piece. These four frame pieces then stand parallel to each other evenly spaced over an 8’ span. The whole thing is held together by ¼” plywood sheets on the roof and two sides creating a good shade area. In the summer we sometimes remove one side to increase air flow.



Not our shelter, but the inspiration for ours

## Water

**Whole Farm**-We use three main systems to provide water to our livestock. One is directly from our well to the animals. But it is advantageous to be able to store water and allow it to gravity feed to the livestock. At one farm we draw water from a creek and fill a 275 gallon tote that’s perched on a stack of about 12 pallets. We can run hoses from this tank to any lower area lower and fill water barrels with float valves.

Our most complicated system uses a hydraulic ram pump to draw water from a small creek and fill an 1800 gallon cistern at the top of our home farm. Hydraulic ram pumps are simple, easy to build systems that use basic plumbing parts. The pump requires no motor or outside power. It uses falling water to build pressure and lift water. Clemson University provides an easy to use guide at: <http://www.clemson.edu/irrig/equip/ram.htm> We run hoses from this tank to each livestock group where we fill waterers with float valves.

**Poultry**-We prefer Gillis broiler bell waterers ( <http://www.qcsupply.com/farm-livestock/waterers/poultry-waterers/422210-plasson-broiler-drinker.html> ). We typically connect them to a 55 gallon drum or a hanging 5 gallon bucket. When we use only a 5 gallon bucket we make sure it is connected to some other water source that constantly refills the bucket through a float valve.

**Sheep**- A 55 gallon food grade, plastic barrel cut at about 1/3 of its height makes a great sheep trough.

**Hogs-** Pigs are adept at destroying waters. We have found that Trojan brand ( <http://www.trojanlivestock.com/Waterers-Gravity%20Flow.html> ) model 63 cast iron, **gravity**, nose valves are very tough and can be attached to almost any container. We prefer 55 gallon, food grade, plastic barrels.

Note: When purchasing various waterer valves for any livestock make sure they operate on appropriate pressures. *Some valves only work on pressurized systems and will not work on a gravity flow system.*

## Feeders

**Poultry-** The layer hens have a bulk feeder built into their wagon coop. For field feeders and for the broilers we use 50 lb capacity range feeders. They are expensive, but keep feed dry and hold up well.

**Hogs-**We prefer simple two hole feeders. Their one drawback is that they require frequent refilling if you are raising more than 4 pigs per feeder. However, they are small enough to be easily mobile in rotational systems.

## Predator control

We rely on livestock guardian dogs to deter routine predator visitation to the farm. The dogs encourage predators to bypass the farm and prevent the area from becoming part of a predator's regular hunting ground. Livestock guardian dogs are an amazing tool, but require their own set of care and knowledge for proper management. Please research livestock guardian breeds, behavior, and training if considering purchasing a dog. They may not work (be a lazy porch dog), or worse, become your own home grown predator if not trained properly. Working electric fences are our second form of main predator control.

The USDA provides a good introduction article on livestock guardian dogs.  
<http://www.nal.usda.gov/awic/companimals/guarddogs/guarddogs.htm>

Another good resource comes from the University of Nebraska  
<http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1036&context=vpc14>

## Putting Livestock in the Garden: Our Rotation

Broadly speaking our basic rotation of animals into the garden is: Crop (either an early cover crop or an early crop) to livestock followed by a cover crop then used the following year. If our goal is to till or add fertility we will use pigs combined with layer hens. In this situation we use poultry netting as a perimeter fence with an interior electric nose wire. If our goal is to mow a cover crop for regrowth or prior to mowing we use sheep. In our situation, space is not really a limiting factor. So we can use an area only once in a season before rotating it to livestock or cover crop. This is extremely advantageous, because once animals are in an area we can't harvest crop from there for 90-120 days depending on the crop in question.

### Some specific crop examples

- Fall garden cleanup by pigs then seeded to oats that will hold the nutrients deposited by the fall hogs then winter kill to make way for a spring vegetable crop

- If we don't need the area early in the spring we might use Fall garden cleanup by pigs then seed fall planted rye/peas mix (a note on: RYE: DANGER...graze ruminants and horses at your own risk. Pigs and chickens are ok.) This area can then be tilled for a summer vegetable crop.
- After a spring vegetable we will use pigs to cleanup the crop then plant summer cover crops for a long fallow period. Our favorite drought tolerant mix for summer is "iron and clay" cowpeas with "pearl millet". This combination holds the weeds down and produces a fairly large amount of biomass. This mix provides excellent pig grazing and shade. It also produces acceptable sheep forage. If sheep graze the mix it will usually regrow, producing even more biomass.
- If we have a short fallow period in the summer we use buckwheat. Unfortunately, buckwheat provides limited or NO GRAZING due to photosensitivity problems in livestock grazing on buckwheat.
- Most of these seeds are probably available at your local feed store. Even if they don't have them in stock they can probably order them. We avoid seeds treated with fungicides, but do not stick to organic cover crop seed. It is often not available or too expensive.

We are still learning to use pigs to plant the crops. Buckwheat should not be grazed, but we have used all of the other mixes as forage for sheep, pigs, or hens. The sheep do not seem to get a complete diet of the cowpea/ millet mixture. Their manure is stickier than usual (a sign like mild diarrhea, and after a week or so sometimes seem to have lost a small amount of weight. At the very least they don't seem to gain as well as when they are on the mixed grass, forb, and clover pasture. A pure stand of any type of rye should not be the full diet either (ergot poisoning). We try to make sure the sheep have access to other feeds like grass or hay. If we use rye, it is in a mixture, the animals are full on hay first , and they eat it for a short period of time, only 6 to 8 hours. Research rye yourself and graze at your own risk.

## Resources

Books and Websites we've found helpful in raising animals and vegetables together:

*Animals in Translation: Using the Mysteries of Autism to Decode Animal Behavior* Temple Grandin and Catherine Johnson. 2005

*Humane Livestock Handling: Understanding Livestock Behavior and Building Facilities for Healthier Animals.* Temple Grandin with Mark Deesing. 2008

*Fences for Pasture and Garden* Gail Damerow. 1992

*Crop Rotation on Organic Farms: A Planning Manual.* Edited by Charles L. Mohler and Sue Ellen Johnson. SARE. 2009

*Small –Scale Livestock Farming: A Grass-Based Approach for Health, Sustainability, and Profit.* Carol Ekarius. 1999

Calculations for nutrients present, lost in storage, applied, and BMP for manure handling-  
<http://ohioline.osu.edu/agf-fact/0208.html>

Center for Environmental Farming Systems (CEFS) information on swine. Articles on right hand side-<http://www.cefs.ncsu.edu/whatwedo/researchunits/alternativeswine.html>

Center for Environmental Farming Systems (CEFS)-a particularly good article that includes specific, practical information on stocking rates, cover types, and nutrient management.  
[http://www.cefs.ncsu.edu/publications/conservation\\_practices\\_2012.pdf](http://www.cefs.ncsu.edu/publications/conservation_practices_2012.pdf)

Clemson Hydraulic Ram Pump Plans. <http://www.clemson.edu/irrig/equip/ram.htm>

## Our Websites

Marketing examples and photos of the farm.

[www.BluebirdFarmNC.com](http://www.BluebirdFarmNC.com)

[www.BluebirdFarmNC.blogspot.com](http://www.BluebirdFarmNC.blogspot.com)