

# Composting and using backyard poultry waste in the home garden

by Lance Ellis, Stephen Love, Amber Moore, and Mario E. de Haro-Martí



## Introduction

Backyard poultry ownership provides a great opportunity for improved self-reliance and small-scale agricultural sustainability through home egg and meat production. One issue with backyard poultry ownership is managing the waste products of your birds, particularly the manure and bedding mixture (termed “litter”) that builds up in the coop. If not managed properly, this waste material can create odors and attract flies. Composted poultry waste, on the other hand, can be an excellent resource for amending and fertilizing garden soils.

For the backyard agriculturist, proper composting of poultry waste has no downsides. It is a convenient method for eliminating problematic waste, provides a good source of nutrients for the garden, improves soil texture, and creates the opportunity for sustainable home food production. It is a worthwhile process to learn and employ.

This publication provides basic information on how to properly process backyard-poultry waste and use it in your garden. In urban settings, the proper procedures for composting poultry litter are critical

for maintaining sanitary conditions and positive neighborly relations. Before starting a compost pile, check with your local city or county government to find out if there are any regulations or ordinances governing poultry waste disposal in your area.

## Managing safety issues

Harmful bacteria, particularly *E. coli* and *Salmonella*, may be present in poultry manure. Not all poultry waste is contaminated with these bacteria, but all poultry waste should be treated and handled as though it might contain these pathogens.

Be sure to take precautions when handling poultry litter to minimize potential health risks. First, wash your hands and clothing thoroughly after handling the birds or their waste. Second, if using litter as a source of organic matter and fertility in the garden, employ a minimum 120-day waiting period between application of the litter and harvest of the produce.

The 120-day curing period is needed to allow time for the natural death of harmful bacteria. The waiting period can occur while the litter is in the compost pile, or it can occur after its application in the garden. The

critical safety factor is the 120-day interval between the time poultry litter is added to the compost pile or garden and the time the vegetables are harvested and consumed.

In practice, poultry manure composted for a minimum of 120 days can be applied to the garden in either fall or spring with fewer health safety concerns. Raw manure should not be applied to seedlings or growing plants because it is a possible source of contamination to edible crops. If applying raw manure to the garden through sheet composting, it is essential that 120 days are allowed to pass between its application and the harvest of vegetables from the garden. If a garden is planted on a typical seasonal schedule, this safety requirement cannot be met with spring applications of raw poultry waste. Consequently, for reasons of personal safety, direct applications of non-composted poultry manure should be made only in the fall.

If applying composted poultry litter to the garden, do so prior to planting time. It is not recommended to apply composted litter when plants are sprouted and growing. It is best applied in either the fall or early spring.

## Composting methods

Using conventional methods of composting poultry litter is not absolutely essential. If proper consideration is given to safety concerns, raw poultry manure can be applied directly to the garden through sheet composting with successful outcomes.

Other methods of composting, especially active pile composting, however, provide a number of distinct advantages, including better control of quality in the

final product, minimization of weed seeds and pathogenic organisms, and reduction of salts and other factors potentially detrimental to garden plants. For these reasons, conventional composting is recommended and information on using raw manure in the garden is limited in this publication. If you choose to apply raw manure, use the recommendations provided for sheet composting.

Two methods are commonly used for composting poultry litter, the active pile method and sheet composting. Each has advantages and disadvantages depending on the individual circumstances of each poultry owner. For full descriptions and a guide to composting, see the University of Idaho Extension publication *Composting at Home*.

### Active pile composting

This traditional, common method of composting is done by making a large pile of litter, adding and maintaining sufficient water to make the pile moist throughout, and turning the pile regularly to add oxygen until it has completely decomposed. The length of time to complete composting depends on pile temperature and the attention given to the composting process (frequency of turning, moisture levels in the pile, and the initial makeup of the pile's components). Active pile composting takes effort but results in a high-quality product that can be added to the garden with confidence. There are several ways to do active pile composting, as demonstrated in figure 1.

The active pile composting method can work well for poultry litter with a proper carbon to nitrogen



**Figure 1.** Backyard composting systems. From left to right: three bin composter, tumbler composter, enclosed static bin. At far right is the start of a pile.

ratio. Some adjustments in the process may be needed if poultry manure makes up more than 50% of the initial litter mixture. In this case, you may notice the development of strong ammonia fumes. You can remedy this situation by adding more carbon to the mixture. This is done through adding “brown” waste (additional straw, dried leaves, dried grass clippings, pine shavings, or shredded paper, etc.) to the compost pile.

Deciding when the compost is ready for use is subject to personal judgment, but there are a few important signs of adequate aging. Fully composted poultry litter will have no offensive odor and no recognizable particles of straw or bedding (figure 2).



Figure 2. Fully composted poultry litter.

### Sheet composting

The second method for composting poultry manure is commonly referred to as sheet composting. This is done directly in the garden by applying a layer of raw (uncomposted) poultry litter to the soil and either leaving it on the surface to decompose or lightly tilling it in.

Sheet composting is easy, but control over product quality is low. Also, it creates a situation where it is difficult to manage harmful bacteria. Lastly, the litter may introduce unwanted weed seeds. Litter applied directly to garden soil does not heat up the way it does in a compost pile. Without the heating process to kill weed seeds and pathogens, the litter may introduce these unwanted contaminants to the garden.

Proper timing is essential for the sheet composting method to be safe and successful. Apply the poultry waste during the fall after the garden has been harvested. This will allow ample time for the raw manure to decompose and for nutrients to be converted into a more usable form for optimal uptake by garden plants the following spring. It

also allows undesirable salts to leach away. Lastly, this allows you to meet the 120-day application-to-harvest safety rule.

If you use sheet composting, poultry waste will need to be stockpiled after regular coop cleanings and held until fall. In reality, the waste may as well be composted in piles rather than stockpiled to prevent odor and fly issues.

### Managing waste to optimize the composting process

Proper poultry waste management begins in the coop. Poultry houses should have adequate ventilation to allow the moisture in the manure to evaporate. This not only reduces odors and provides healthier conditions for the birds, but also reduces the overall weight of the litter, making it easier to lift and remove from the coop.

Routine cleaning of the chicken coop is the next step in managing waste. The frequency of cleaning poultry housing has a direct effect on the nutrient content of composted litter. Frequency of cleaning affects the end ratios of manure to bedding, the end total nutrient content, and the biological processes that take place during composting.

The frequency of cleaning poultry housing depends on the number of birds inside and the size of the coop area. Having fewer chickens or a larger coop area results in less waste buildup, while a higher number of chickens in a smaller area will create conditions that require cleaning more often. Although cleaning is best scheduled based on the amount and composition of the litter, it is expected that a heavily populated coop area will need to be cleaned every 2 weeks, while a less-populated space will be able to go without cleaning for around 3 to 4 weeks.

After cleaning, bedding should be applied as a 2- to 3-inch layer on the coop floor. This provides better living conditions for the birds while also mixing manure with bedding to create a superior litter mixture for the composting process. Bedding sources may include wheat or barley straw, grass hay, alfalfa hay, and pine shavings.

Poultry litter that is going to be composted should have a ratio of manure to bedding anywhere from 20:80 to 40:60. If you schedule coop cleaning so that the litter has 20% to 40% manure and 80% to 60% bedding (the preferred method of management), this may alter the rule-of-thumb cleaning schedule recommended above.

## How poultry litter makeup impacts composting

The amount of manure relative to the amount of bedding in the litter influences the biological processes that take place during composting, the nutrient content in the final compost, and the quantity of potentially damaging salts that the compost could contain. Dry straw, hay, and other bedding products are great sources of carbon, which in the composting process is needed to help balance the high nitrogen content of poultry manure.

Compost made from a mixture of straw and poultry manure that is 75% straw and 25% manure has less available nitrogen than the reverse mixture of 25% straw and 75% manure. An excessively high proportion of bedding in the litter (more than 80 percent) can cause problems during composting. The low levels of nitrogen relative to carbon in the mixture will reduce bacterial activity and slow the composting process.

If litter containing a high percentage of bedding is applied directly to the garden, rather than composted, less nitrogen may be available for plant growth during decomposition of the litter, which can cause nutrient deficiencies during the critical early growing season. Once the composting or decomposition process is complete, the bound-up nitrogen will be available for use by plants in your garden.

To avoid problems with low nitrogen content, seek or create an ideal litter composition that requires no additions or modifications before starting the composting process. Such a mixture has a ratio of approximately 25 percent manure to 75 percent bedding. For photographs that will help with visualizing manure to bedding percentages see figures 3–7. For information on carbon to nitrogen ratios in composting see the University of Idaho Extension publication *Composting at Home*.



**Figure 3.** Poultry litter that is almost 100% dry poultry manure. This litter has a very high nutrient and salt content and should be applied to the garden in minimal amounts to prevent plant damage. Adding bedding that is high in carbon will help to reduce the overall nitrogen concentration.



**Figure 4.** Poultry litter consisting of more than 75% dry poultry manure. This litter is still too high in manure to compost properly.



**Figure 5.** Poultry litter consisting of 50% to 75% manure. This mixture would probably compost without major issues, but it would compost better with added straw, hay, or dry leaves.



**Figure 6.** Poultry litter consisting of 25% to 50% dry manure. This is within the ideal range, but the lower end of the range is preferable.



**Figure 7.** Poultry litter with less than 25% dry manure. Waste with around 25% manure is a very good starting material in the production of high-quality compost for garden use.

## Using composted litter in the garden

Composted poultry litter is a natural slow-release fertilizer. One application tilled into the top 6 to 10 inches of soil will provide a nutrient source for plant roots and feed them throughout the growing season.

Poultry compost not only supplies nutrients to plants, but also gives many other benefits to the garden. In many parts of Idaho the soils are compacted (have poor soil structure), mostly mineral, very calcareous, and contain little organic matter (figure 8).



**Figure 8.** Example of a soil low in organic matter. The soil has a light calcareous color.

Adding composted poultry litter to a garden soil improves the soil's structure, overall health, water-holding capacity, and nutrient availability. By improving these soil characteristics, our landscapes and gardens can be healthier and more productive. Soils enhanced with poultry compost will have a darker color, be less compacted, and grow healthier plants compared with unimproved native soils (figures 9 and 10).



**Figure 9.** Soil improved with one application of poultry litter using the sheet method after 5 months.



**Figure 10.** Soil improved with two applications of poultry litter using the sheet method 1 ½ years after the first application and 6 months after the second.

There is no exact formula for computing the appropriate amount of poultry litter to apply to a garden or landscape. The amount to apply depends on whether the litter is raw or composted and on the ratio of poultry manure to bedding in the pre-composted litter.

### Application rates

As the ratio of manure to bedding differs from one compost batch to the next—and consequently each batch differs in total nutrient content—it is difficult to identify the exact amount of available nutrients in each batch. For this reason it is also difficult to pinpoint an exact numerical amount of compost to apply in a garden to meet plant nutrient demands. If you want to be precise in determining application values, you can send compost samples to a reputable lab for nutrient analysis. If exact calculations are not a concern, you can make approximate applications of compost based on values in table 1.

**Table 1.** Application rates for composted poultry litter containing different levels of bedding.

	Low-nutrient requirement crops <sup>1</sup>	High-nutrient requirement crops <sup>2</sup>
Poultry litter containing little bedding	0.5 inches	1.5 inches
Poultry litter containing 50% or more bedding	1.5 inches	3.0 inches

<sup>1</sup>Perennials, shrubs, trees, and low nitrogen usage vegetables (carrots, peas, beans, radishes).

<sup>2</sup>Corn, cole crops, onions, garlic, peppers, eggplant, annual flowers, and vine crops.

Over repeated years of compost applications, you may want to reduce the rates at which you apply raw litter in the fall or composted material in the spring below the levels indicated in table 1. This will prevent a buildup of excessive nutrients that previous crops have not used. Be watchful of plant growth and production habits, and adjust your application rates as experience dictates.

### **Salt injury**

Poultry manure naturally has a high salt content, and if applied in its raw form in the spring just prior to planting it can burn and damage seedlings (problems over and above the safety concerns). Fall application of raw litter will help to leach away many of these damaging salts. However, if spring application is your only option, use only composted litter and incorporate the compost as deeply (6 to 10 inches) as possible into the soil profile to help reduce the potential for salt damage.

Although you may attempt to standardize manure content in poultry litter, the ratios of bedding to manure will still vary from batch to batch. Knowing this should influence your decision as to how much compost or raw litter to apply to the garden. Higher ratios of manure to bedding in the compost increase the potential for salt injury. Therefore, compost consisting of high levels of manure should be applied at lower rates. For example, mixes made up of 70% bedding and 30% poultry manure could be applied at a higher rate than a compost mix of 60% poultry manure and 40% bedding.

### **Nitrogen burning (overfertilization)**

Raw poultry litter that is fresh, wet, and not composted will contain a higher quantity of nitrogen in the form of ammonia nitrogen. If this litter is immediately applied and tilled into the soil, much of the ammonia nitrogen could be trapped and converted into organic nitrogen. This will increase the damage potential of the already salty litter, resulting in conditions that will either not allow seedling growth or will cause plants to burn as their roots expand and start to pull in the excessive nitrogen and other salts. This is another reason that raw manure application is the least preferred method of application. It is safer from a nutrient standpoint to apply dry poultry litter through the sheet composting process or to use finished dry compost.

### **Further reading**

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**The authors** — Lance Ellis, Extension Educator, University of Idaho Extension, Fremont County; Stephen Love, Community Horticulture Specialist, Aberdeen Research and Extension Center, University of Idaho; Amber Moore, Soil Specialist, Twin Falls Research and Extension Center, University of Idaho; Mario E. de Haro-Martí, Extension Educator, University of Idaho Extension, Gooding County.

**Photos** — Figure 1 by Mario E. de Haro-Martí. All others by Lance Ellis.

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