# Manure Usage in Edible Gardens: Best Practices for a Thriving Garden and Safe Harvest

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## MANURE USE IN GARDENS

Manure has been a trusted resource in gardening for thousands of years. Beginning in ancient Egypt, manure was used to enrich the soil for growing vegetables and fruits. This practice continued through the mid-1900s. Before World War II, manure was still one of the most used sources of soil amendments in edible gardens. Production of chemical fertilizers, particularly nitrogen, increased during war times for use as explosives. After the war, artificial nitrogen production continued but with a greater focus on agriculture to replenish food supplies. Although the production of chemical fertilizers increased after WWII, many gardeners still preferred manure for its environmental and economic benefits. Today, in the 21st century, manure remains a popular choice for both hobby and commercial gardeners. Whether you live in a rural, suburban or urban area, manure is accessible. Livestock owners often offer manure for free, especially if they do not have to transport it to your garden. Gardeners who don't have neighbors and friends raising livestock can easily purchase bagged manure products from local hardware stores and plant nurseries.

Though manure can be used in home gardens, it is important to adequately treat or compost it before use. Photo by Kathryn Fontenot

However, animal manure is one of the important potential sources of human pathogens, including *Salmonella* and *E. coli* O157:H7. The use of untreated or partially treated animal manure as a fertilizer in crop production may result in the contamination of fresh produce with enteric pathogens. Therefore, it is essential to adequately treat or compost animal manure before applying it to any areas growing edible produce (edible flowers, herbs, fruit and vegetables).

## WHY USE MANURE?

Manure is an excellent soil amendment for gardeners for many reasons as it provides:

### 1. Organic Matter

Louisiana's hot, humid weather tends to break down organic materials in the soil quickly. Replenishing organic matter helps gardeners continually improve their garden's soil structure, microorganisms and nutrition.

### 2. Soil Structure Benefits

Manure won't change the level of sand, silt or clay in your soil. But it will help sandy soils retain water and clay soils drain water. Look for manures to improve overall structure.

Earthworms add small amounts of manure to soil and open up space in the soil as they dig tiny tunnels. Photo by Kathryn Fontenot

### 3. Microorganisms

Most gardeners think of earthworms when they think of living organisms in their soil. Earthworms are wonderful because they dig tunnels, open up space in the soil for roots to grow and water to flow and they even add a little manure! Beyond earthworms, there are many microorganisms that are invisible to the naked eye. These organisms thrive in manure and can facilitate the ability of nutrients to move from the soil into your edible plants.

### 4. Nutritional Benefits

Although manures do not provide as high of levels of nitrogen, phosphorus and potassium (N-P-K) as commercial fertilizer sources, they do add to the overall macronutrients of the soil.

## HOW USING MANURE IMPROVES SOIL HEALTH

Have you ever wondered what is happening after you apply manure to the soil? Applying animal manure to gardens or vegetable plots influences soil biological properties by increasing the abundance of soil fauna, especially bacteria, fungi and earthworms. Consequently, soil respiration and nutrient mineralization increase. Nutrient mineralization is the decomposition of organic materials like dead plants and animals by soil microorganisms, which convert these materials into plant-available inorganic forms. You may have heard that the number of organisms in one teaspoon of soil can exceed nine billion. Although soil microorganisms occupy only a small portion of the soil volume, they play a very important role. The application of organic amendments, such as animal manure, to agricultural soils is an alternative practice for conventional horticulture that improves soil quality, provides nutrients and carbon, promotes microbial diversity and activity, and improves soil structure.

Manure has its own microbial communities. Adding manure to soil introduces available carbon, which boosts microbial activity and biomass, typically increasing them two to three times. Jangid et al. found that soil bacterial diversity, both species' richness and evenness, is higher in soils amended with animal manure compared to those treated with inorganic fertilizers (synthetic fertilizers). Increased quantity and diversity of microbes in the soil benefit the quality of the soil due to the critical roles microorganisms play in nutrient cycling and mineralization. Moreover, the application of animal manure increases the content of soil organic matter (SOM), which enhances soil fertility, plant nutrition, water infiltration and holding capacity, bulk density and aggregate stability. SOM acts as a slow-release fertilizer, ensuring the availability of nutrients for adequate plant growth and development throughout the production cycle.

## USING MANURES FOR SOIL FERTILITY NEEDS

Fertilization is a key management practice for home gardens, small farms and commercial operations alike. External sources of nutrients boost crop yields by improving soil fertility indicators such as soil carbon, available nutrients and soil pH. The application of animal manure is an easy practice for hobby gardeners to use to reduce the use of synthetic fertilizers. Many people who grow edible crops do so because they want to:

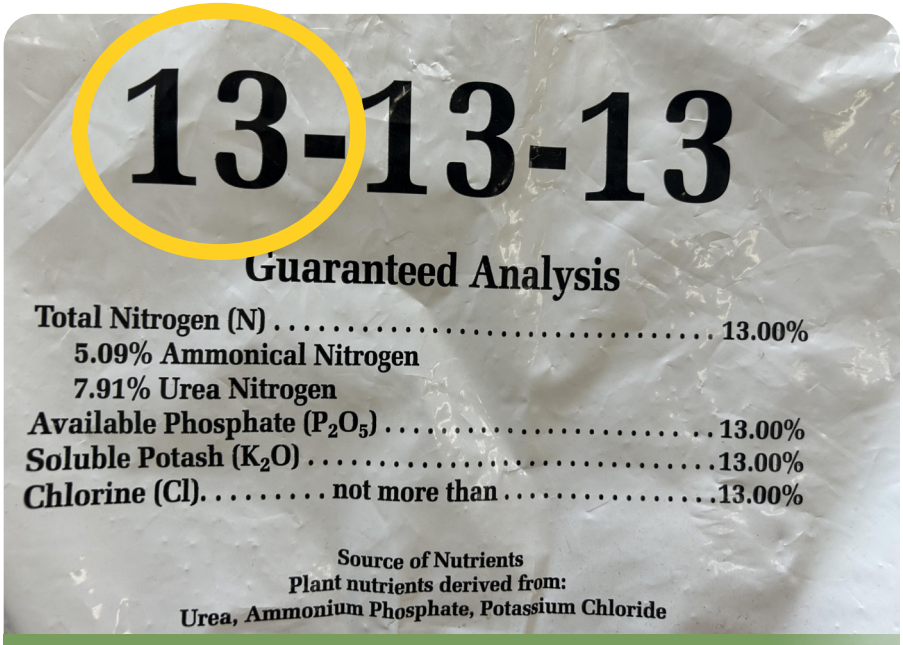
1. Reduce the amount of chemicals, especially nitrates that get into their food.
2. Lower production costs. Who does not like saving a couple of bucks?
3. Mitigate the environmental impact of agriculture by reducing the use of chemical fertilizers and accidentally releasing too much fertilizer into the environment.

Animal manure's nutritional content can partially fulfill a portion of your crop's nitrogen, phosphorus, potassium and micronutrient demands. However, manure's nutritional content will depend on numerous factors, including the source of the manure, the animal the manure came from, the animal's diet composition, the age of the manure and how the manure was handled and stored prior to application in the garden. If you want to know exactly what percentage of nitrogen (N), phosphorus (P) and potassium (K) is in your manure source, you'll need to have it tested.

A complete nutrient content analysis of the manure being used can be submitted to the LSU AgCenter's Agricultural Chemistry Lab at www.lsuagcenter.com/portals/our_offices/departments/ag-chemistry. Testing typically takes a few weeks to complete. See the website for the cost, up-to-date forms and sample fees.

## NOT INTERESTED IN THE EXACT PERCENTAGE OF NUTRIENTS IN YOUR MANURE?

Just looking at manure, even the most experienced gardener cannot guess how much nitrogen, phosphorus and potassium are present. But over many years scientists have been studying and analyzing manures and have been able to conclude an average amount of nitrogen in most manures. Nitrogen is one of the macronutrients gardeners typically add to their fruits and vegetables annually. Most animal manures have between 1.7% and 4.6% total nitrogen by dry weight. When you purchase bagged fertilizers, the nitrogen percentage is what is indicated by the first number on the bag. While manure may not provide all the nitrogen you need to grow edible crops, it is a great additive.




The first number shown on a bag of fertilizer indicates what percentage of it is nitrogen. Photo by Kathryn Fontenot

## SOURCES OF MANURE

Manure types best suited for edible crops are those from animals with herbivore or omnivore diets. These animals include rabbits, chickens, goats, sheep, horses and cows. It is best to stay away from manure from animals that are primarily carnivores such as dogs and cats. Gardeners should also avoid using human manure in gardens. Human manure may contain harmful bacteria, pathogens and viruses. If the edible crops are not cooked, these pathogens can make the consumer sick. No matter what animal provides the manure for your garden, make sure the manure you apply is aged, If you are uncertain of how old manure is, use it in gardens with ornamental plants only. Manures should be at least 6 months old or properly composted before using them in edible gardens. When in doubt, use bagged manure products in the fruit and vegetable garden.

Animals with herbivore or omnivore diets produce manure best suited for edible crops. This includes chickens, cows, rabbits, goats, sheep and horses. Photo by Kathryn Fontenot

Some crops can be damaged due to herbicide residue that can remain in fresh manure for months. The cupped foliage on this plant is a sign of such damage. Photo by Jessie Hoover

## Questions To Consider When Collecting or Purchasing Manure for the Fruit and Vegetable Garden

1. What animal did this come from?

2. When the animal was grazing, was the field treated with herbicides that could damage my fruit and vegetable crops? Many pastures are treated with herbicides to kill broadleaf crops that are either poisonous or have low nutritional value to animals. These herbicides can remain in manure for up to 18 months and can severely damage fruit and vegetable crops that are broadleaf.

3. How old is this manure? Fresh manure may have pathogens which will hurt the human digestive system. Human pathogens are more likely to have died already in aged manures.

## Raw vs. Treated Manures – Why Does it Matter?

When selecting a source of animal manure, consider whether to use raw or treated manure. Raw or untreated animal manure naturally contains human pathogens like *Salmonella* and *E. coli* O157:H7, which can contaminate fresh produce or ornamentals if not properly handled. Raw manure is attractive for home gardeners and farmers due to its low cost and high availability; however, its usage bears a high food safety risk.

Treated manures are processed to reduce microorganisms of public health significance, such as *Listeria monocytogenes*, *Salmonella* species, *E. coli* O157:H7 and fecal coliforms, to prevent the spread of these pathogens. Composting is a common treatment process that involves providing oxygen for the growth of good microorganisms, which produces heat to destroy human pathogens and weed seeds. This process decreases the manure's water and dry matter content, reduces volume and increases bulk density, making it easier and cheaper to transport and apply. Composting also helps eliminate odors; and has been found to increase disease suppression effects. However, composting conditions must be monitored and controlled, because improperly composted manure (aged without aeration or turning) is a major source of fresh fruit and vegetable contamination.

## HOW AND WHEN TO APPLY MANURE TO EDIBLE CROPS

It is important to consider the appropriate timing and amount of manure to apply. Applying too much manure or too frequently can overload your soil with nutrients, especially ammonium (nitrogen), calcium, magnesium, potassium and sodium (salts), negatively impacting soil, plants and environmental health. Over-application can acidify your soil, increase weed pressure, cause root burning and lead to nutrient imbalances that interfere with the uptake of specific nutrients.

The USDA National Organic Program (NOP) provides guidelines for the secure handling and application of manure or compost. Follow these basic application guidelines for success:

- Animal manure should not be applied on frozen ground to prevent nutrient and pathogen runoff and leaching.
- Raw manure can be applied to land used for crops not intended for human consumption.
- Composting manure requires maintaining temperatures between 131 F and 170 F for a specified period, depending on the composting method, with accurate records of operations to demonstrate compliance with NOP requirements.
- Till the manure into the soil shortly after application to prevent nutrient and pathogen leaching or runoff. Apply manure close to periods of high nutrient demand by plants.
- In crop rotations, apply manure before the most nitrogen-demanding crop. The day before planting is considered the best time to apply manure for the strongest effect.

## If you are using manure in an edible garden, this 90/120-day rule is very important to follow!

1. Raw manure must be incorporated into the soil at least **120 days before harvest** if the edible portion has direct contact with the soil. (Ex: carrots)
2. Raw manure must be incorporated into the soil at least **90 days before harvest** if the edible portion of the crop does not come in contact with the soil. (Ex: tomatoes)

Gardeners: This rule implies that raw manures or manures of unknown age are used solely as a source of preplant fertilizer and never as a sidedress application of fertilizer.

## CONCLUSION

Using manure in edible gardens is a practice used by many gardeners. Manure enriches the soil with essential nutrients like nitrogen, phosphorus and potassium, promoting plant growth. This natural amendment improves soil structure, enhances water retention and can reduce soil erosion in some cases. Manure usage when done so safely is a gardening practice that provides an economical solution for gardeners who want to maintain a healthy and productive garden with minimum impact to the environment and wallet.

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## AUTHORS

Daniel Leiva, Graduate Student, School of Plant, Environmental and Soil Sciences
Kathryn Fontenot, Professor and Regional Director, Southwest Region
Achyut Adhikari, Associate Professor, School of Nutrition and Food Sciences


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