

How to compost livestock manure on a small acreage

By Dallen Smith

Composting livestock manure on a small acreage in Wyoming can be challenging and rewarding.

Making good compost is similar to making good cookies – you need a good recipe, and then you need to follow it carefully to get the best result. The same applies to composting – adding the right kinds and amounts of ingredients to a manure compost pile will result in a good product with minimal odor during the process.

Beginning

Where and how to compost is the first decision. I prefer to have the compost pile in the backyard and have it contained on three sides. A small compost pile can be contained with three wooden pallets to form a U shape. This size pile can be turned with a pitchfork. For larger compost piles, large square bales of straw can form a U. Having a small loader tractor makes turning the pile easier.

Carbon and Nitrogen – Getting the Mix Right

Next, decide what to put in the compost pile. Your goal is to create a good carbon:nitrogen (C:N) ratio with the ingredients you add. Common, carbon-rich ingredients that could be added are straw, wood shavings, shredded paper, shredded cardboard, and dry leaves. Common, nitrogen-rich ingredients are fresh livestock manure and green grass clippings. Materials to eliminate from

a compost pile are plastic twine or any other plastic. Do not compost meat, bones, and fatty foods such as cheese, salad dressing, and cooking oil.

C:N ratios of 20:1 (20 parts carbon to 1 part nitrogen) to 40:1 are acceptable – 30:1 is optimal. Having the C:N ratio at 30:1 is optimal for compost microbe activity and also reduces odor associated with composting. For example, this ratio can be created by combining about ½ pound of straw to 1 pound of livestock manure. On a volume basis, this would be 1 part straw to 1 part manure since a wheel barrow full of straw is a lot lighter than a wheel barrow full of fresh manure. If using leaves as a carbon source in the mix, use twice as many leaves as straw.

Table 1 (page 12) can help formulate your recipe. You can also send a sample of your mix to a laboratory to determine the C:N ratio and moisture content. There are free on-line compost calculators that will help take the guesswork out of having the correct ratios. An example of an online calculator is at www.klickitatcounty.org/solidwaste/fileshtml/organics/compostcalc.htm.

A Dash of Water

Water will need to be added to a compost pile, especially during the hot, dry, summer months. The contents should have a feel similar to that of good garden soil or silage. Moisture contents between 40 and 60 percent are acceptable. As a rule of thumb, the materials are too wet if water can be squeezed out of a handful and too dry if the handful does not feel moist to the touch. Moisture probes can be purchased to get a better estimate of moisture content.



Table 1. Carbon:Nitrogen ratio of common compost ingredients

Sawdust, wood, paper	400:1
Straw	80:1
Cornstalks	60:1
Leaves	50:1
Fruit wastes	35:1
Rotted manures	20:1
Food wastes	15:1
Grass clippings	15:1
Alfalfa hay	12:1

Oxygen – The Breath of Life

The size and density of particles affect the composting process rate. Large chunks of wood will take longer to decompose than sawdust or wood shavings. However, smaller particle size may reduce the movement of oxygen (a vital component of decomposition) within the compost pile. Optimal particle size is from 1/8 to 2 inches in diameter. Larger products can be incorporated in the pile when they have been partially decomposed. The larger the particles, the less the pile needs to be turned to incorporate oxygen.

There are two different temperature ranges that achieve composting – mesophilic (50-105° Fahrenheit) and thermophilic (more than 105°). Mesophilic temperatures allow for effective composting, but, at thermophilic temperatures, more pathogens are killed, weed seed destroyed, and fewer fly larvae survive (110° and 150° is ideal). Having the right C:N ratio, moisture content, and turning it once a week to incorporate oxygen will help achieve a higher temperature.

The ideal thermometer for composting includes some basic features: 1¾-inch, easy-to-read dial, 20-inch stem, and a waterproof plastic lens. A compost thermometer is highly accurate (+/- 1%), and everything is welded with stainless steel. You may already have a probe thermometer that will work, even though it may not have all these features.

Time

Composting raw material takes 10 to 14 weeks. The rate at which a compost pile will mature depends on the C:N ratio, moisture content, particle size, temperature, and how often it is turned. You can turn the pile as often as every five to 10 days to quickly create compost.

Commercial in-vessel composting can produce compost in three days. In-vessel composters look similar to large cement mixers. Most in-vessel composters are set up as a continuous process – material is going in as the

finished product is coming out. Arena owners, garden clubs, towns, and cities may have an interest in in-vessel composters. The small model will do one-third yard of material a day and can cost about \$8,900.

When the piles no longer reheat after turning, the curing stage begins. The curing stage takes three to four weeks. Curing provides maturity, which means the energy and nutrient-containing materials in the compost have been transformed into a stable organic mass. Mature compost has undergone decomposition, contains slow-releasing plant nutrients, is low in phytotoxins (plant-harmful substances), and no longer ties up large amounts of nitrogen and oxygen when mixed with soil.

Application Rate

The amount of compost applied depends on the plants being grown. I recommend applying ¾ to 1 inch of compost and then tilling it in for vegetable gardens. For plants in flower beds, use about half as much, mix it in, water it once to wash out the salts that may be present, and then plant. Adding compost is a great way to add organic matter to our often poor soils here in Wyoming. This organic matter will provide food to the plants that may be feeding you!

For more information on composting, visit barnyardsandbackyards.com, click on Resources and then Composting.



Dallen Smith is an extension educator based in Big Horn County and could be called a manure specialist, but he'd probably rather be known as a nutrient management specialist. He can be reached at (307) 765-2868 or at dsmith69@uwyo.edu.