Manure: Turning a potential problem into a valuable resource

Tips for manure management and composting

Proper management of manure from livestock, poultry, and other animals has a host of benefits including controlling flies and parasites spread through manure and protecting your water quality. Properly handled, manure can be a resource rather than a problem.

The first step in manure management is to decide where to place your corrals, chicken coops, and other animal pens as well as the manure storage areas.

Try to locate any corrals, pens, or manure storage areas on a dry upland site. Watch how water moves across your property, and do not locate these facilities in areas where the water runs off or in low-lying areas near water. Keep all manure sources and storage or application areas at least 100 feet from any water body (irrigation ditches, ponds, streams, wellheads, etc.), and farther away if they are located on a slope.

It is a good idea to keep a vegetated strip around manure sources (corrals, storage areas). This vegetated area can help capture any manure or runoff. The width of this area varies with soil type and with the slope of the area. Suggested widths for a loamy soil:

- 25-50 feet for 0-3% slopes
- 50-100 feet for 3-8% slopes
- more than 100 feet for steeper slopes

Try to keep the clean rainwater landing on the roofs of buildings clean. Do this by using gutters and directing the downspouts away from areas containing manure.

Know where your water table is and what your soil types are. If your soils are very permeable due to being sandy or gravely and the water in your well is close to the surface, it is easier for contaminants such a nitrogen or *E. coli* to reach your water source. Those with soils containing more clay should be extra vigilant about controlling runoff from the soil surface as water takes longer to soak into these soils.

You can spread manure or composted manure on fields. Amounts that can be applied depend on the nutrient amounts in the manure, soil type, the plants growing in the application area, and other factors. Do not apply uncomposted manure to vegetable gardens. Manure must reach high temperatures during the composting process to kill off potential pathogens. See the reference below for more information, or consult your local University of Wyoming Extension, conservation district, or Natural Resources Conservation Service office.

Good composting helps decrease the spread of parasites and weeds (through live weed seeds in the manure) and convert the nutrients in the manure to slow releasing, beneficial forms. Apply manure or composted manure to fields in the spring when plants can use the nutrients. Don't apply it to frozen or snow-covered ground as it is more likely to run off or blow off the area. Remember to keep application areas at least 100 feet away from water bodies and sources.

Composting Livestock Manure

Composting livestock manure on a rural acreage in Wyoming can be challenging yet 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. Adding the right kinds and

For more information about manure management, the following resources may be useful:

Managing small-acreage horse farms in central and eastern Oregon – Oregon State University Extension Service, http://extension.oregonstate.edu/catalog/pdf/ec/ec1610.pdf

Manure management for small hobby farms – Northeast Recycling Council, Inc., *http://www.nerc.org/documents/manure_management/manure_management_handbook.pdf*

"The scoop on manure management" – *Barnyards and Backyards* magazine, Summer 2007. This article is online at barnyardsandbackyards.com.

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. A preferred location might be in an area that's relatively out of view, such as the backyard. A small compost pile can be contained on three sides with three wooden pallets to form a U shape. This sized 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 larger piles much 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, old hay, wood shavings, sawdust, shredded paper, shredded cardboard, dry grass (to the point that it's brown in color), and dry leaves. Common nitrogen-rich ingredients are fresh livestock manure, green grass clippings, green leaves, green plant wastes from the garden, and fruit and vegetable scraps. Another common material on rural acreages is used horse and other livestock bedding material, which is typically comprised of both high carbon (straw or sawdust, for example) and high nitrogen (manure) materials.

Dog, cat, or pig manures can contain parasites that can infect humans. These parasites can survive a long time when these manures are applied to the soil. Compost piles must reach high temperatures to destroy these parasites. Don't use them for compost that will be applied to areas growing crops for human consumption. Other manures (beef, dairy, goat, chicken, etc.) can contain pathogenic strains of *Salmonella sp.* and *E. coli* bacteria. As the manure ages the bacteria decline but they can still be a potential threat to your health if applied uncomposted to food crop areas within certain time periods. The present USDA Organic Standards (http://www.ams.usda.gov/AMSv1.0/nop) require that after aged uncomposted manure application, you must wait 90-120 days depending on the crop grown before harvesting crops for human consumption. The 120-day wait applies to anything grown in a vegetable garden. The 90-day wait would apply to fruit trees. You can compost these manures to minimize the risk of disease organisms, but it is hard to maintain the appropriate conditions throughout the compost pile. The USDA Organic Standards require that the compost pile must be maintained at 131 F to 170 F for 3 days using an in-vessel or static aerated pile. If anyone with a compromised immune system will be eating produce from your garden, you shouldn't apply any form of manure (composted or uncomposted) to it.

Things to eliminate from compost materials are plastic twine or any other plastic. Do not compost meat, bones, dog and cat feces, or fatty foods such as cheese, salad dressing, and cooking oil, as these materials tend to attract unwanted visitors. If you know the compost is going into a vegetable garden, avoid adding plant materials that have been treated with herbicides. It's also not recommended to add plants containing weed seeds unless you are sure high temperatures can be reached.

C:N ratios of 20:1 (20 parts carbon to 1 part nitrogen) to 40:1 are acceptable. 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 wheelbarrow full of straw is a lot lighter than a wheelbarrow full of fresh manure. If using leaves as a carbon source in the mix, use twice as many leaves as straw.

Occasionally sprinkle some good garden soil or previously made compost on the layers to introduce microorganisms, which will speed the process.

The following table 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 online compost calculators that will help take the guesswork out of having the correct ratios.

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

Water – Another Key Ingredient

Water will need to be added to a compost pile, especially during hot, dry, summer months. For best results, water the pile as you stack materials instead of waiting until the end. The contents should have a feel similar to the feel of good lightly moist 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.

Oxygen – The Breath of Life

The size and density of particles affect the composting process rate. Large chunks of wood take longer to decompose than sawdust or wood shavings. 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°F) and thermophilic (more than 105°). Mesophilic temperatures allow for effective composting, but, at thermophilic temperatures, more pathogens are killed, more weed seed is destroyed, and fewer fly larvae survive (110° to 150°F is ideal). Having the right C:N ratio and moisture content, along with turning it once a week to incorporate oxygen, will help achieve a higher temperature.

The ideal thermometer for composting includes some basic features: 1-3/4 inch, easy-to-read dial, 20-inch stem, and a waterproof plastic lens. A compost thermometer is highly accurate, 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, or longer. The rate at which a compost pile matures 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 create compost more quickly.

Commercial in-vessel composting can produce compost in as little as 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 do1/3-yard of material a day and can cost about $8,910.

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. When complete, the compost will smell, feel, and look similar to rich, dark topsoil.

Application Rate

The amount of compost applied depends on the plants being grown. Consider applying ¾ to 1 inch of compost and then tilling it in for a vegetable garden. For plants in flowerbeds, use about half as much, mix it in, water it once to wash out the salts that may be present, and then plant. Compost can be tilled into the ground as is or screened if it's being used in flower pots or raised vegetable gardens, if desired. For new and existing lawns, you can apply ¼ of an inch in the spring and ¼ inch late summer if the lawn appears to need more nitrogen. Adding compost is a great way to add organic matter to Wyoming's often poor soils. This organic matter will provide food to the plants that may be feeding your body or soul!

For more information on composting, visit barnyardsandbackyards.com.

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