

# Manure Management

By Dr. Kirk Steehler

*Managing horse manure? You are not alone. Most state universities that have agricultural departments have set up University Extension Units to help farmers with this perpetual problem. The information presented in this article comes from the Penn State Extension Unit, Virginia Cooperative Extension, Rutgers Equine Science Center, and the University of Minnesota Extension. All of these educational resources give hands-on advice to developing a Manure Management Plan for your facility.*

## Reasons for Plan

There are multiple reasons for having a management plan, but one of the biggest reasons might be because it's the law. In Pennsylvania, for instance, the Pennsylvania Nutrient Management Act states that "concentrated animal operations" (CAO) are required to develop and maintain a nutrient management plan that has been approved by the state. Concentrated animal operations are defined as areas where the density of the livestock exceeds 2 animal equivalent units (AEU) per acre on an annualized basis. An AEU is 1,000 pounds of live weight of an animal. In environmentally sensitive areas, manure application or manure storage must be set back 100 feet from streams, lakes, ponds, sinkholes, and public and private drinking water sources. Manure must not be spread on fields with slopes greater than 15% grade, and all fields used for spreading manure must have a minimum 25% crop residue at all times. All stockpiling of manure must address spillage or leachate of fluid into soil, must be on land with less than 8% slope, and must respect the 100 foot setback from environmentally sensitive areas.

Why else does manure matter? From a simple aesthetics standpoint, most people think that a pile of manure is not as pretty as your horses are. The sight of a manure pile won't do much for your property value either. How about the fact that it's good for business to manage your farm well, and that includes a well-thought-out manure management plan. We have neighbors who might complain about unsightly stockpiles, and anyone looking to ride, buy, or breed with your horses will look at how you take care of your farm property, figuring that is how you take care of your horses too. So, a well run farm makes your horses look better. Not that the average Friesian horse is not already breathtakingly beautiful, but a well-run farm makes your horses look better.

Manure contains bacteria and other pathogens harmful to horses and humans. Parasitic roundworms such as *Strongyles* are harmful to your horse. *Escheria coli*, *Listeria monocytogenes*, *Salmonella species*, and *Clostridium*

*tetanicum* are bacteria that can be in horse manure and are harmful to horse and human. Protozoan pathogens such as *Giardiasis* and *Cryptosporidium* can also be in manure and are known to cause waterborne human disease. Manure sitting in a stall for long periods or in a stockpile will easily grow the fungus *Aspergillus*. This can then become a serious irritant to the eyes and lungs of horse and human.

Manure piles are prime breeding grounds for stable flies, face flies, houseflies, and other insects. It is easier to prevent the breeding of these insects than it is to get rid of them. Eliminating the manure (habitat) needed by the larvae reduces the fly population. Flies deposit eggs in the top few inches of the moist manure, and fly eggs hatch in as little as 7 days. Fly breeding season begins when spring temperatures get above 65 degrees F or 19 degrees C and ends at the first killing frost of fall.

Rodents can also be attracted to manure piles as a home. Thus, a good barn cat can be a true asset to any barn. Reducing odors to the barn or property in general is another reason to have a plan for manure.



Anniversary Gift / Our First Manure Spreader.

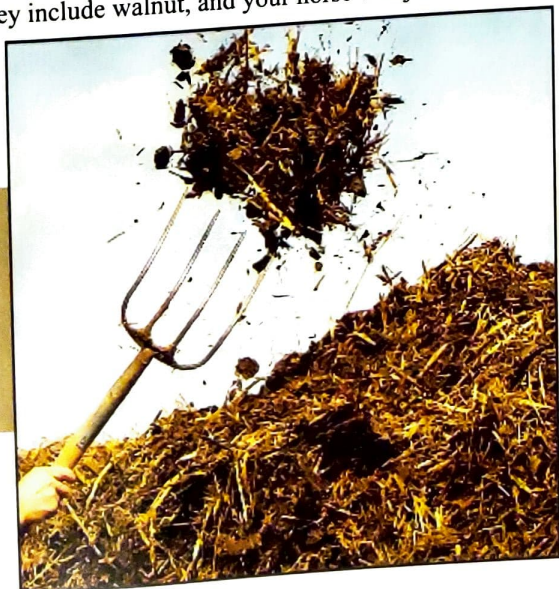


## Horse Manure Description

We have clearly explained reasons to develop a manure management plan. Now let's look closer at the "matter" of our discussion. After all the bad things mentioned about horse manure, we can still say that horse manure can be a valuable resource. A 1,000 pound horse will make about 8.5 tons of manure in a year. On any given day, the average 1,000 pound horse will produce 50 pounds of manure. If we add urine and bedding to be removed from a 12 foot by 12 foot stall, the total weight of waste approaches 60 to 70 pounds per day. That equals 12 tons of waste for that one horse per year. There is a fertilizer value of 8.5 tons of manure produced annually by that 1,000 pound horse. That average horse produces 102 pounds of nitrogen, 43 pounds of phosphate, and 77 pounds of potash. Fortunately, plants need these nutrients to grow.

Horse manure mixed with hay, straw or paper products can be readily used as raw manure to be spread on crops. Horse manure mixed with sawdust presents some problems, however. Sawdust or wood shavings spread on crops are thought to stunt crops because it is said that they have less nitrogen available to plants. Even though there is nitrogen available, the sawdust manure robs the nitrogen in the soil. Microorganisms in the soil break down the wood chips, and the microorganisms use the carbon in the wood chips for energy and are not left with enough nitrogen to build protein. If this manure is spread on fields, it may be necessary to add extra nitrogen fertilizer. The other option is to compost this type product to neutralize the sawdust or wood shavings problem. The LSU AG Center has recommended using a half cup of nitrogen fertilizer thrown into the manure after cleaning a 12ft. by 12ft. stall of the average 1,000 pound horse. They recommend picking the stall clean and adding half a cup of nitrogen to the stall's manure. It could then be used as fertilizer on crops without stunting the crops' growth.

While we are describing stall materials, I want to remind everyone not to use stall bedding made of flax straw, oat straw, black cherry shavings, or walnut wood products. All hardwood shavings should be avoided because they may cause founder if they include walnut, and your horse will just eat oat straw.



## Management Plan Choices

1. Spreading raw manure over land and crops has been associated with livestock farming for as long as farming has been a human undertaking. It has been looked down upon in recent years, but for those of you who have a lot of land for crops and unused pastures, it is clearly an option. Most Equine Centers do not have that luxury, so you might look to other options. One rule of thumb found in the Penn State Extension Manure Management Manual is that if you have two average sized horses of 1,000 pounds each per acre of land, then it would be safe to use this on that unused land or crops. Another factor might be that if your Equine Facility is essentially a closed stable with little change over in livestock, and you have an aggressive deworming program, then you will have less trouble spreading manure on your property. This would give you more liberty to spread that manure onto open land since the horses are known and cared for in regimented fashion towards their health needs. The advantages are that there are fewer steps in the disposal process, fewer man hours in completing the task, and the real advantage of having 30% more nitrogen available when it is tilled into the soil. There is greater nitrogen loss when the manure is left spread on the surface. On the downside, spreading raw manure does not deactivate weed seeds nor does it attack pathogens in the manure. Egg-type parasites can live for years in the soil. Manure should be spread uniformly and evenly. If there are piles not spread, it will kill the grass or crop it sits on. A spike tooth harrow or a drag can even those piles if needed. It might be a good time to mention that manure management needs are different for pastured horses than stabled horses. The field-deposited manure can be good fertilizer, but substantial amounts of manure can pile up around gates, waterers, feeders, and shelters. These areas need to be cleaned weekly for better pasture management.

Opinions differ on when horses can be turned out on pastures with spread manure. The general rule is that 6 months is enough for sunlight, temperature, and surface microbial activity to deactivate most pathogens, says Professor Thomas Halbach, State Specialist-Waste Management, University of Minnesota.

One last tip is that it is easy to see and even calculate how efficient or effective your manure spreader is working. You just put down a tarp and run your tractor with the manure spreader over the top of the tarp. If you really want to know what you are doing, weigh the tarp before and after you spread so you now have the weight of manure over the size of the tarp. This gives you a measurement of spreading over the land. You can adjust your spreader based on that measurement.

2. Burning manure is a viable option in some areas. It is quick and efficient. Spread out the manure to dry and then pile it back up to burn. It burns like starting charcoal. Smoke is the problem if you have neighbors since the smoke has a definite foul odor. An interesting new development is that furnaces have been invented to burn manure as fuel. These furnaces can be used to heat buildings and heat water and can even be used for generating electricity stored in batteries. I have not been able to find out if burning the manure in these furnaces



makes a difference to reducing the smoke and odor of the burn process.

3. Hauling is an option for people without the time or the land to compost, spread, or burn. Commercial removal of waste is the least labor intensive and the most expensive. Commercial hauling can be more cost effective if there is a local nursery who can use the manure or if the manure is already composted and ready for use in local gardening stores or farms. If you are the least bit ecologically concerned, it is very likely that your commercial hauler will be taking your manure to the local landfill. This certainly disposes of your manure, but the opportunity to recycle this material in a more useful fashion will be lost.

4. Composting manure is the best "green disposal" option. Composted manure is more readily marketable for selling or using as fertilizer than raw stall waste. Compost is also safer to handle, as any pathogens and weed seeds are killed in the process of composting. Composting is managed decomposition where aerobic oxygen and microbes break down stall waste without smelly byproducts, generating heat that kills the weed seeds and parasites. The microbes occur naturally, and the composting process harnesses that ability. Sufficient oxygen is needed for the pile, and about 50% moisture content is needed. Temperatures at the center of the manure pile should be kept between 122 -150 degrees F. The Environmental Protection Agency recommends 131 degrees F for a minimum of 21 days, turning the mixture 7 times to reduce disease pathogens, and 150 degrees F for at least 7 days to reduce weed seeds. Compost piles can be built in vertical stacks (piles), windrows, stationary facilities (bins), or something quite unique as Container (mobile) Composting.

A. Simple Vertical Piles work well for a one or two horse operation. Manure and bedding are continually added to the top of the pile until it reaches 4 to 6 feet high. There might be two or three piles in a row so that when one is finished composting the other one is still in process. Frequent turning of the pile hastens the composting process. The most labor saving process would be to build the pile once or twice a year, turn the pile two or three times then let it take a year or so to mature.

B. Windrow Composting is a variation on the simple vertical pile of manure in which the pile is 6 feet tall but 6 to 10 feet long. The process is usually for larger herds of livestock and requires more land to accomplish. These piles are generally turned by machinery rather than by hand. Other than using



machinery like a front end loader, the process is the same as a simple vertical pile.

C. Bin or Stationary Facility like a shed for composting is a three-sided building. When designing the shed, make sure that the machinery to be used in the shed fits into the building. Manure can be added to the covered shed bins one slot or bin at a time. As the bin fills to 5 to 6 feet high, you then move to the next bin. The bins are generally covered, so it helps prevent run off or leachate. The turning process involves using your front end loader to move a pile from one bin to the next bin. Weekly turning is suggested as practical, and at 3 to 4 months it can be done monthly. It is recommended that the compost be moved out of the shed in 3 to 6 months to a dry area outside the shed. It might be loosely covered with a tarp for the final drying and maturing process of the compost.



D. Container or Mobile Composting is a new process. To me, it is the reason to have written this paper. It was introduced to me by my friend Tim Shuttleworth in Erie, Pennsylvania, and he can be contacted through me if you become interested. It is done in a Waste Management "roll off" container rather than a wood shed or bricks and mortar construction. The manure is loaded into the container, and the active composting step is accomplished and finished in this container. The finished compost can also be stored, moved, or delivered to a waiting customer in this container. The container is taken from the Waste Management Industry where they are commonly used. With some clever advance design work, the container is fitted with an aeration device that can be removed from the container at the end of the composting process and then placed on another container. The composted material is never removed from the container at any point in the process. The mobile container facility opens up options and flexibility not otherwise available in the other processes.

1. First, you have the ability to scale up or down as your composting needs increase or decrease.

2. Second, the capital cost outlay is extremely diminished. The waste management business is very competitive. The containers are inexpensive and available in every community across the country to buy or rent.

3. Third, the up-front costs of most composting facilities are eliminated. There is no building, and the roll off containers are inexpensive to purchase or rent.





4. Fourth, the containers can be taken back or sold back to the company from which you got them when you are done since they are not damaged in any way.

5. Fifth, a permit is not required in any jurisdiction that we know of for these mobile containers. They are not permanent structures. Permitting and required architectural drawings are unavoidable in the county I live in in order to build a covered shed for composting. I suspect it is the same for you. The time required to go to meetings for these permits, the fees, drawings, and other requirements are reason alone to run to this mobile container process.

6. Sixth, transporting of materials and labor become a big savings because the whole process is done in this container, and it is already built to be picked up, dropped off, or moved.

7. Seventh, flexibility is inherent to the process. The roll-off container readied for composting can be placed or "spotted" at any of several convenient locations in the barn or on the property. It is not fixed to one location. If it is in several locations, workers can take less steps, less movement of wheelbarrows, or less tractor movement because they can go to the closest composting location. This might work really well with one placed near an outdoor arena. Once a roll-off bin is filled, it can be moved to any location on the property without concern of permitting or contamination of environmentally sensitive areas. For that matter, the roll-off can be moved entirely off the horse facility to become composted somewhere else.

8. Eighth, manure disposal contracting might be a new business to consider because of this new process. It will be possible for a horse facility to have containers dropped off, filled, and removed as soon as they are full. The manure could be composted at a completely different facility or the manure contractor's location of business. The horse manure would never need to stay on location for more than a few days or a week.