

JOHN'S CORNER

Soil Amendments -Animal Manures-

By John Ferguson

Last week we talked about human manure (sewage sludge or bio-solids). So this week we will cover the other manures. For centuries farmers used animal manures to keep their fields healthy and productive. Over the years repeated studies have shown that manure produces results better than artificial fertilizers without the negative side effects. It is also a good way of recycling. However, today it is not as simple as the quality, variety, and contaminants vary greatly.

There are several main areas of uncertainty when using manures:

- nutrient content of the manure
- availability of the nutrients
- application variability
- organic matter content
- microbial diversity
- contaminates
- pathogens (salmonella, bad E. coli, etc.)
- local availability
- quality
- odors
- handling and transportation
- costs
- amount of bedding in the manure and the type (straw or wood shavings)

The source of the manure is a critical factor in its usage. Manure from CAF's (Concentrated Animal Feeding) operations tend to have far more problems than manure from the backyard or manure from



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an organic farm. One of the biggest problems is that animal feed used in CAF's have mineral salts added to them which end up in the manures. Along much of the Gulf Coast we already have a salt issue in our soils, and adding manures makes the problem worse particularly with repeated usage. Animal feeds at CAF's also have a lot of antibiotics in them that are released into the manures which lead to resistant bacteria that have many negative human health effects. Also depending on the antibiotic it may be absorbed into the plant, and if the plant is eaten it may cause an allergic reaction in sensitive people.

Bedding material used to soak up the urine and manure reduces nutrients by dilution but adds carbon which is required by microbes, but it may cause nitrogen tie-up if there is too much bedding material. Wood shavings are the worst as they have a very high C:N ratio. Straw is not as bad since it breaks down quickly. But they both add valuable organic matter if they are given time to break down (weeks to months) before plants are grown. Most often nitrogen in manures is in the ammonium form which escapes to the atmosphere and is vary water soluble, hence leaches quickly.

Fresh manure often loses much of its nitrogen if it is not incorporated immediately into the soil. However once applied into the soil the nutrients are slowly released, which contributes to more efficient plant utilization and decreased losses to surface and groundwater. Manure increases the soil's microbial activity and diversity leading to the formation of water stable aggregates that helps with soil aeration and water infiltration. Manure, if incorporated into the soil AND given enough time, will lead to a reduction in both plant and human pathogens in the soil due to increased activity of beneficial microbes. Manure incorporated into the soil reduces methane emissions, thereby reducing its contribution to global warming. Manure can be used as a mulch but works best if incorporated into the soil.

Manure should never be applied to cold wet soils as the nutrients leach out and the benefits are greatly reduced. Note: One should wait at least 120 days after application before harvesting any crop with manure applied to it.

Manure is available from horses, cows, chickens, turkeys, ducks, sheep, pigeons, rabbits, llamas, elephants and rhinos, fish, earthworms, swine, etc. all with different advantages and negatives.



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Horse - One of the easiest manures to get and the safest if from private stables where the horses are grass fed. It decomposes slowly, is a good source of beneficial microbes, has a low salt content, and it has a good organic matter content. It may contain weed seeds as a horse's digestive system does not destroy most seeds as compared to a cow.

Cow - It has a relatively low nutrient content and is high in salts and antibiotics if it comes from CAF's like feedlots. Cow manure collected from grass fed cattle is much better but labor intensive to collect. The majority (if not all) of bagged cow manure products come from CAF's. While it may be beneficial in some soils, it is a poor choice for the Gulf Coast and often causes more problems than it solves.

Pig (swine) - It has more nutrients than horse manure, has less organic matter than horse manure, is slower to decompose, has parasites like helminthes that can persist for years. Its best usage is as a feedstock in making compost.

Sheep and Goat - This is one of the best manures, with similar nutrients and benefits to horse manure.

Poultry and Bird - This type of manure has concentrated nutrients and this manure is among the highest in nitrogen and phosphorus, is quick acting, has a low amount of carbon and organic matter, and may contain arsenic, and high levels of salts. Manure from layers tends to be safer than manure from broilers as they are not fed arsenic to cause quick weight gain, and they have less antibiotics in them. The best use is in a large hot compost pile where the toxic components can be biodegraded and the salts diluted and leached out.

Rabbit and Rodent - these manures are high in nutrients but are hard to collect in quantity, they work great in a compost pile as they have good microbes and stimulate good biological activity once applied to the soil.



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Dog and Cat - often contain microbial organisms along with parasitic worms that are harmful to humans. Best if buried for a long period of time before planting or used in a large hot compost pile for a long composting period where the harmful components can be destroyed.

Earthworm - Often sold as "Worm castings" or "Vermi-compost. One of the highest quality manures one can use in the garden. It is rich in nutrients, beneficial microbes, plant growth hormones and is odorless. It helps prevent many types of soil and plant diseases.

Bat or Seabird - This is better known as guano. This type of manure is a rich source of nutrients and microbes. It's best usage is as a natural organic fertilizer rather than a soil amendment. It can be expensive unless one collects it themselves.

PROS:

- good source of organic matter
- contains essential plant micro and macro nutrients
- improves soil physical properties
- increases a soils water holding capacity
- improves a soils aggregation, porosity, tilth and reduces erosion
- relatively inexpensive
- increases microbial activity
- sequesters carbon in the soil

CONS:

- quality and risk varies greatly
- bacterial pathogens may reactivate when applied
- many endocrine disrupting chemicals
- genetically modified organisms and other mutant strains of bacteria
- many disease causing microbes
- synthetic chemicals
- antibiotics

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- high salts (yellowing and poor seed germination)
- weed seeds
- nutrient imbalance causing other nutrients to be tied up and unavailable
- toxic materials are absorbed by plants and enter the food chain (either by humans eating the plants or eating animals that ate the plants)
- fresh manure may burn plants
- increased risk of plant diseases
- potential for pollution of surface and ground water
- sometimes difficult to spread
- low nutrient content per weight and volume

Note: Most CON's occur in manures from CAF's and freshly applied manure.