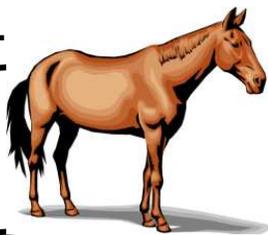


Notes from....



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One of the on-going challenges of stabling horses in Orange County is that there are fewer and fewer means of disposing of horse manure. Land that previously grew strawberries and could accept manure, instead now sprouts new housing. Coupled with this is a whole array of new regulations from a plethora of government agencies that regulate air, water, and land; all is not sunny on this horizon. For example any new composting facility of any size must now capture emissions from the piles, as these are considered contributors to smog.

As a descendent of Adam Smith (well, more truthfully -just studied economics), it just seemed wrong that our manure which in the rest of the world is a valuable asset, is viewed as a waste product here. In India, as well as throughout the world, there is a class of entrepreneurs that make their living by collecting the dung of the cattle that roam the streets and selling it for fertilizer or fuel.

Under the current arrangement, our manure is hauled to Hemet where it is composted and then sold to wholesalers who bag it and put it on the shelves of your local nursery store. As diesel prices rose dramatically in the last years, and legal disposal sites plummeted, we were *offered* only a 40% increase in hauling rates. This is still a bargain over straight land filling cost through the local waste hauler who bid the effort at a 260% increase!

In keeping with modern marketing techniques I will now use a quote from a great leader to associate my safe, pedestrian effort with the real accomplishment that he / she achieved.

[The ultimate measure of a man is not where he stands in moments of comfort and convenience, but where he stands at times of challenge and controversy.](#)

[Martin Luther King Jr. \(1929 - 1968\),
Strength to Love, 1963](#)

So the 40% increase was my: battle cry, rallying cry, call to arms, rebel yell, war cry, banzai, war dance. . . Matt, get on with it, it's just a newsletter.

Our first step was to verify that the trucks that were headed for Hemet were in fact fully loaded. For many years, Fernando would load 18 tractor scoops per trailer, for a total of 36. We were told by the hauler that this was a full load. Under California Vehicle Code, the truck is allowed to carry 80,000 pounds total weight. If one is caught with more weight than that, the fine is as high as \$2,500. Plus the truck is parked until the weight is reduced to 80,000. So there is a real incentive to err on the side of caution when it comes to weight. A truck can be weighed at truck scales that are along the freeways. But they can also be weighed with portable scales that are carried in the trunks of police cruisers.

But one can be too cautious about weight. So we purchased a set of portable scales, similar to ones that the CHP uses to weigh trucks. And lo and behold we discovered that the trucks were leaving SCR considerably underweight. Still leaving a safety margin from possible scale error, we were able to increase the amount hauled per load by 10,000 pounds. The scales are not cheap (\$2,500), but will pay for themselves in good time. While the truck now carried more material, there was still some carrying capacity that could not be utilized because of the weight limit.

A quick spin on the internet showed that dry wood shavings weigh 450 pounds per cubic yard (c.y.). And fresh manure (measured at let's say euphemistically *at the well head*) weighs 1,200 pounds /c.y.). Since dry hay and dry shavings are about the same weight, the moisture content of the manure is 750 pounds / c.y. or 2/3 of the total weight. It doesn't take a rocket scientist, (but maybe an economist) to figure out that most of what's being hauled to Hemet isn't manure, but water.

On the day I started writing this article, the temperature is 61° and the relative humidity is 63%. Relative humidity is the ratio between the current amount of water vapor in the air divided by the maximum potential water that could be held in the air at a given temperature. As the temperature rises, the capacity for the air to hold more water vapor rises. For a given amount of water vapor, raising the air temperature lowers the percentage of water that is held in the air, i.e. relative humidity falls. If the air is heated, it can hold more water, and conversely if it is cooled, it can hold less.

Stopping at the National Weather Service web site, one finds that the Dew Point is 48°. This means if one put today's air in a container, and lowered it below 48 degrees, the air in that container would produce liquid water. This is why dew forms at night. Now if I took that same container and heated it up to 90 degrees, not only would the liquid water evaporate, but I could add more water and that would also evaporate. This is because the relative humidity would go from 100% (at 48°) to 16% (at 90°). There are many websites that do the complicated calculations for relative humidity for you.

So why is this important? As the bacteria breaks down the material in the manure pile, heat is a by-product. As a result, the pile of shavings and manure heats up to 160° during the composting process. Air that is drawn blown into the pile with the fans mounted on top of the pipes (today is 61° with 63% relative humidity), is heated to 160 degrees. At that temperature the air has a relative humidity of just 3%. This means that there is still 97% capacity for carrying more water vapor. As the air travels through the pile it becomes saturated with water vapor from the manure. This hot air exits the pile, super saturated and then dissipates in the atmosphere. The steam you see is the air cooling, losing its water holding capacity, and in effect raining.

The bacteria that decompose manure and shavings requires oxygen as part of its metabolic process. With the right conditions (oxygen and moisture) the bacteria will multiply at geometric rates. But the trick is to make sure that there is always plenty of oxygen being supplied. Traditional methods of decomposition involved occasionally turning the pile to aerate it. Recent discoveries have shown that within in an hour the pile runs short of oxygen, and the bacteria slow down their work as well as not multiplying. In many cases the bacteria actually die back. To keep the bacteria working and

multiplying, we have installed fans that blow fresh air into the base of the pile. The heat that is generated draws the air up through the pile. As a result one week's of forced air decomposition is equivalent to months of traditional decomposition.

The benefits from this process are four fold. The constant outward flow of heated and moisture saturated air significantly reduces the weight of the material. Second that the hot pile kills the fly larvae so the overall fly population is reduced. Thirdly aerobic bacteria reduces minimal odor. When the pile is not oxygenated and these bacteria are replaced with bacteria that thrive in an non-oxygenated (anaerobic) bacteria, these bacteria make the manure pile smell very badly. And fourth is that within a week to ten days time, we have transformed the manure to compost, an asset that can be given away or possibly sold to recover our additional handling costs.

At this point please set the newsletter aside and save for tomorrow's reading when you'll be bright and eager once again.

Good Morning. Now we begin part two of the manure chronicle. So far we've reduced weight and volume. But the real excitement has yet to be reached.

Because the pile is so hot, aside from the specific bacteria and fungi that can survive the high temperatures, all else is killed. This material makes excellent compost that can't be bought in bulk anywhere around here. In the last few years I have landscaped my house and in the process have used almost a hundred cubic yards of raw manure. I began with clay that if I were a potter, I'd be in paradise. Every three to four months I'd take a few truck loads and cover all the planting beds with three to four inches. Within a short time the material turned a dark brown. Then the worms and other local folk would digest the manure and shavings into a rich humus. My yard is vibrant and healthy. I never use fertilizers or herbicides. What minimal weeding required is a breeze.

Plant health requires healthy soil. Dumping the latest miracle from chemical engineers will provide a momentary grow spurt, but in the long run accomplish nothing but enrich the boys in white lab coats. Always feed your soil before you feed your plant. Remember that plants live in soil, so soil

building is your number one job. The benefits of compost and mulching are in short:

- Reduced soil evaporation so you can water less and less often. Don't let the top of the mulch determine if you need to water. Dig down a few inches to see what going on in the soil. Over-watering is common when you begin to use mulch.
- Un-mulched soil surfaces tend to become hard and thus reduce the amount of water that can penetrate into the roots. This means more water runs off the planter and into the gutter.
- Weeds are discouraged because there is no sunlight for them to germinate.
- A soft soil keeps rain drops from pounding soils which greatly reduces soil erosion.
- Minimizes cultivation. The less disturbance of beneficial microorganisms the better. Microorganisms secrete a sticky substance that glues the soil into little crumbs, promoting better soil structure.
- Helps feed and increase the beneficial soil life at the surface. Soil microorganisms breakdown the organic mulch and provide slow release of soil nutrients through the decay of organic matter. A more fertile soil environment is conducive to growth of mycorrhizal fungi, which also increases the root zones of plants. Actively growing mycorrhizal fungi ward off root pathogens and damaging nematodes.
- Saves you time and money by reducing your water, herbicide and fertilizer use and plant replacement.
- Landscapes and beds look tidier and prettier with a mulch cover.

To make the stable more green, we have begun bagging the aged mulch / compost to provide a direct line from horse to garden. It makes little sense for this material to be hauled far away, and then hauled back. Not only is the hauling wasteful, but each unnecessary step adds more cost. By bagging or selling in bulk our own material, we hope to provide an excellent product as an inexpensive price. Typical mulches and composts sell from \$4 to \$9 per 3 cubic foot

bag. Our bagged compost will sell for \$2.50 per bag. If you purchase compost in bulk, expect to pay \$30 per cubic yard. We'll happily sell it for \$5 per cubic yard. Our shavings come in a bag that if carefully opened the first time, can be reused. If all the bags were reused, we'd save 18,000 bags per year from being land filled. To facilitate deliveries, we have purchased a small dump truck. The goal being to finally resolve our manure problem in a environmentally and economically sound manner.

The razor handle that I use came free in the mail with a few cartridges. After having used up the free cartridges, I have been buying replacements for ever since. The genius was getting me to try the razor at no cost. Using this same plan, the stable is offering free compost for the near term, knowing that after seeing the improvements in your landscaping, you too will be hooked. We counting on jealous neighbors asking you what have you done, and hopefully you'll tell them your secret! We'll keep a steady supply of bags in the trailer space across from the 24' x 24's.

And now a final pithy quote to wrap all this up and we're done!

The same soil is good for men and for trees. A man's health requires as many acres of meadow to his prospect as his farm does loads of muck.

Henry David Thoreau (1817–1862), U.S. philosopher, author, naturalist. "Walking" (1862),

