

# Black Gold

## The Lasting Legacy of Decomposition

*Compost happens: sometimes with great forethought, careful planning and controlled attention — sometimes not. But how exactly do you harness its true potential? Has compost and compost tea's full potential been realized or overestimated — or is it still waiting to be reached? What are the biggest challenges facing farmers and gardeners striving for the ultimate return from compost, and what is the next step in the evolution of compost? What techniques best aid the biological farmer? These were the questions posed by Acres U.S.A. to some of the nation's top composters and soil consultants. The following invaluable insight represents decades of knowledge and hands-on experience.*

### SABINO CORTEZ



The biggest challenge facing farmers today is the fear of composting. Too many of the self-proclaimed compost experts have succeeded in creating a sense of “my way is the only way,” thus causing the illusion that the average farmer is not skilled enough to successfully build his own compost. My old buddy Malcolm Beck says there is a lot of science in composting; but first of all, it's an art form. To put another perspective on the subject, with all the advancements in farm technology, the best farmers are still the ones who can honestly claim to have a green thumb.

Remember, everything rots and there is no such thing as bad compost. As long as the source of the feedstock is considered, so human sludge is out and crop residue with excessive amounts of broadleaf herbicide is also out. However there is the matter of applying compost before its time. Unfortunately, herein lies one of the biggest conflicts in the com-

post world. There is no universal standard test for compost maturity. Some labs attempt to read the carbon-nitrogen ratio; others attempt to read the nutrient content, NPK. I am not implying that composters would intentionally manipulate their samples to meet the criteria of these labs.

However, all it would take to change the results of a C:N test would be to add a handful of urea and a handful of sawdust, and an acceptable ratio could easily be obtained. The same thing would apply to a test based on nutrient rating. The test, or as the old saying goes, the stone that the builders rejected is now the cornerstone. Before 1940, the majority of the labs in the United States had a standard test for humus content, and today the only lab in the United States still performing this test is the Texas Plant & Soil Lab. Humus is one of the most stable elements in nature and it cannot be manipulated. A rating of 3 to 8 percent indicates that enough decomposition has occurred to consider the material compost.

I constantly hear farmers asking if their compost is good enough. My answer is always use compost that was produced as close to your own field as possible. The culturing of indigenous bacteria and fungi is a must. Next, I ask them to hold the compost in their hands and if the compost has an odor that is offensive, then reject it. If you are able to identify 50 percent of the feedstock, then reject it. Remember the most important thing when making compost tea is the quality of the compost.

As you have probably realized by now there are many schools of thought as well as a variety of consultants regarding compost and compost tea. If your concept or consultant is getting you good yields as well as reduced input costs, then stick with them. But, if you are ready to go outside the box, then there are a plethora of opportunities waiting.



### BOB SHAFFER

By our collective experience with compost and compost teas it is obvious that many significant benefits to

soil health and crop quality have been realized by farmers and gardeners alike. Much of our work with compost can be seen as lessons or trials by which we learn which path to take next. We don't know at this time how to get to the highest potential of compost but with our current knowledge we can take one step at a time with a reasonable degree of confidence that the general direction is right. Learning by experience and following our instincts will lead to discovering the higher potentials of compost and compost tea.

Soil organic matter has been destroyed in many farm soils to a degree, which prevents sustainability, compromises soil health and has resulted in poor crop quality. Compost recycles organic matter and therefore limits waste while elevating soil organic matter holistically. The potential for compost to achieve this is most notable in diverse polyculture systems where cover crops and mineral balance are also practiced. The synergism between compost, cover crops and minerals sequesters more carbon into soil than possible with any of these cultural practices used alone.

Composts and compost teas are living systems and reflect the cycles of nature. Living systems are not effectively managed by linear, rigidly engineered rules. Compost is a dynamic living material that is in a constant state of change. Our challenge to making ever better compost is deeply connected to our acceptance of change, and to using compost within a holistic system of farm cultural practices including cover crops, minerals and skillful tillage. I believe we need to constantly reinvent

compost, as simply maximizing feedstock or processes will not significantly improve the end product to provide the ultimate degree of prevention, diversity and energy to soils and crops.

Increasing the consumers' awareness of the benefits of soil health, compost and soil organic matter is crucial for the effective recycling of organic matter such as food scraps that are dense with energy for compost organisms.

The greatest potential for developing higher quality in compost is in working and understanding its life forms. Compost microorganisms create humus, secondary metabolites and complex mineral forms all of which benefit soil and plants in multiple ways. By developing greater awareness of the life in compost and soils farmers will be empowered to develop the skills needed to elevate the quality of compost to its highest potential. The capacity of compost to elevate the essential functions of soil, create high quality food and to provide plants and soil with disease-suppressive teas is most inspiring and gives me deep satisfaction when applying it to farm soils.

## MICHAEL MARTIN MELÉNDREZ



My experience dates back 25 years producing compost tea, and I've built every conceivable prototype compost tea-making machine from the highest-tech aeration device to stainless-steel extractors. In 1974 I wrote a paper titled "Soil Ecology and the Soil Food Web," in which I described a model still used today. I've always been a believer in observing the natural process of nature and copying that model, which has been instrumental in my mission of using biomimicry as the method and the goal in everything we do at Soil Secrets.

At one point, I was a strong advocate of compost tea. For a five-year period I had over 500 residential clients who allowed us to spray their landscapes with our various concentrations and formulations of compost tea as part of an organic lawn

care business we ran out of our commercial nursery. We also applied this service on many farms in our valley, including our own farm. We were looking and hoping for the many benefits often claimed by many promoters of compost tea such as improved soil structure, increased humus content, reduced disease pressure on plants and overall better looking lawns. However, I discovered that I was not seeing the results expected by me or my clients. This taught me that there must be more than one tool in the toolbox in order to address the many issues and objectives we were claiming with compost tea. We needed more because everything was indeed looking like a nail and our hammer was not getting the job done. We've stopped making or selling compost tea as we've concentrated on what we believe are more effective products that are the true foundation of improved plant and soil health.

Remember this, garbage in always equals garbage out and compost made from bulk ingredients that are not a rich source of amino acids, minerals and the proper ratio of carbon to nitrogen simply cannot make a good compost. If the bulk ingredients are coming from soil depleted of minerals, the bulk ingredients will also be depleted, resulting in poor compost. If you are making compost tea from a poor compost, you will make a poor compost tea. And since it is already so diluted of mineral value, I question its efficacy when applying only a few gallons per acre. As for the microbiology content, while there are certainly the microbes of decomposition involved in composting which will extract into the tea, the total biomass and diversity of that microbiology is small compared to what you will find in all but the most sterile of soils.

Finally, if you are trying to build up a poor soil by applying compost made from bulk ingredients grown on that same poor soil, you will fail. You must find a way to fortify that poor soil with the mineral and humic substance ingredients that are low or missing. You must also get mutualistic mycorrhizae into the equation, as they are almost always missing and they are essential to the process of integrated soil building.

## NEAL KINSEY



Like all materials that contribute to soil fertility and plant growth, using compost correctly can be of tremendous benefit. The effectiveness of applying compost to accurately supply the required nutrients for excellent production is still being underestimated. All of the benefits provided to the biological life in the soil provide one example. Release of nutrients that have been there in unavailable forms by stimulating that biological life is often far underestimated. Detailed soil analysis will show how effective each compost material really is, because some work better than others.

But using compost without testing the needs of the soil and the content of the compost to be used to build overall soil fertility can be greatly underestimated as to the benefits that compost will actually provide for each individual soil. Moderate amounts of compost will likely benefit any poor soil. However, even moderate amounts can cause problems for good producing soils that have the maximum level of one or more nutrients, meaning adding more will possibly tie up other nutrients that are just as necessary — especially the trace elements.

The point here is do not guess. Measure what the soil needs. Measure what the compost can supply. Then each year, at least on key fields, measure what the compost has actually done for that soil.

For more than 15 years we have done soil samples on several hundred acres every year for one certified-organic client. They build their own composts and have each one analyzed each year before applications are made. The maximum amount is applied to each different area based on the soil tests and the nutrient content of each compost material. The desire is to use only their own compost to build up their soils. The soil tests indicated this would not be possible based on the soil needs and the nutrient make-up of available compost materials. Tests were set up to measure whether that was

true. After 10 years using only compost as the control and applying all the needed nutrients not supplied by the compost in the test area, there was little progress in building deficiencies where only compost was used. Not only were the levels increased in the test area where all nutrients shown to be needed but not sufficiently supplied by the compost had been added, but root systems were 50 percent greater there as compared to using just the compost. In addition, nutrient levels where only the maximum amount of compost was used without exceeding the amount that would tie up other nutrients were not increased below the first 6 inches, but when compost plus the additional nutrients it did not supply were added, nutrient levels were significantly increased to a depth of three feet.

The next step for growing nutrient-dense foodstuffs will be the use of detailed soil analysis for each different soil where compost will be applied and having a complete compost analysis done on that compost to determine its suitability before it is used. Considering only NPK content is a big mistake. Just applying compost blindly is even worse!

## JERRY BRUNETTI



High-quality compost is typically produced utilizing sophisticated methods and equipment such as turners, covers and gauges to measure temperature,  $O_2$ ,  $CO_2$ , etc.

The end result is predictable, uniform and achieved within weeks. For livestock farmers that don't want to produce such a product because of either cost or time, I have always suggested that a "cold fermentation" be utilized rather than depositing raw manure on the ground, especially during the winter months. "Cold fermentation" is actually ambient; and if livestock are confined indoors on a bedding pack during winter, then this pack will actually heat up to over 140 F (60 C).

In order to create an environment that cultivates the kinds of flora that break down raw manure and bedding into a

finished product, it's important to create enough surface area (fractals) within the pile that wicks moisture, provides microbial habitat and binds or absorbs undesirable volatiles such as indoles, ammonia, skatoles and mercaptans. The best way to do this is to have enough carbon present in the form of cellulose and lignin. Straw is a good source of both, although hardwood tree bark is even better. But because tree bark is typically high in moisture, it better serves as a good base or foundation to build the stack. It's also a great medium for fungi to get established.

Livestock are creating new "wealth" daily via manure and urine, with the herdsman/woman providing the carbon (as straw, sawdust, woodchips, newspaper, etc). Many dairy producers don't utilize the bedding pack approach but rather a tie-stall or stanchion system that consists of a manure gutter cleaner, hauling the manure and some bedding out of the barn into a pile. Either system can work provided there is enough carbon and a large enough stack to insulate the ecosystem from extremes of temperature and moisture/dehydration. The outside stack should approximate at least 10- to 15-inch width and 5-inch height with a minimum of 10- to 15-inch length. Larger operations would create rows similar to compost that is turned, suitable to the farm's size.

To stabilize the volatiles and create better habitat for microbes, I suggest adding the following amendments to the pile:

- 1/4-1/2 oz. of "high-energy" clay per 1,000 lbs. of livestock daily. Montmorillonite is best, but one can also use zeolite or bentonite. If soils are low in phosphorus, one could substitute soft rock phosphate (not hard rock) which is colloidal clay.
- 1/4-1/2 oz. of finely ground leonardite (humates) per 1,000 lbs. of livestock daily.
- 1/4 oz. of finely ground high-calcium limestone (not hi-mag or dolomitic limestone) per 1,000 lbs. of livestock daily.
- 1/4-1/2 oz. of gypsum per 1,000 lbs. of livestock per day.

The clay has a huge surface area (1 cubic inch can equal 7 acres) to bind volatiles and create microbial habitat. High energy clays are loaded with available macro and micro elements that are

readily released in the acidic manure/urine environment. Soft rock phosphate also contains 18-20 percent  $P_2O_5$  which will fortify soils needing such, while the manure assists in releasing the complex calcium-phosphate molecule contained within the soft rock (clay) phosphate. Humates are a stable carbon source, not degraded by microbes for nourishment. However, they too are high in cation exchange capacity (CEC) thus being able to hold onto volatiles such as ammonia, skatoles, indoles and mercaptans. The humates are very effective chelators so can attach to both macro and micro elements (cationic and anionic) making them more available to plant roots. They also perform as bio-stimulants especially encouraging fungal populations.

The high-calcium limestone not only can be chelated by the humates, but is acted upon by the acids in manure and urine. The "free" calcium is a great deterrent to fly larvae, while providing plant-available calcium to crops. The carbonate ion ( $CO_3$ ) is readily converted in the manure to carbonic acid ( $H_2CO_3$ ) which encourages the release of complex nutrients. The gypsum supplies calcium sulfate, which readily reacts with ammonium ( $NH_4^+$ ) to create a stable form of nitrogen ammonium sulfate while releasing calcium to exchange sites on the clay or humates.

Once the suggested optimum pile dimensions are achieved, ideally put the pile to rest by blanketing it with 6-12 inches of soil, straw, spoiled hay, chopped leaves or chopped newspaper (the latter two needs to be tamed, or held down with moist soil). Let the pile hibernate for 6-12 months, checking it occasionally by pulling core plugs with a soil probe and examining the fermentation for aggregates, odors and moisture. If the pile is too dry (<50-60 percent moisture) water accordingly.

These same amendments can be applied to systems that utilize manure pits, which are anaerobic and can be quite deleterious to beneficial microbes because the build up of ammonia, skatoles and mercaptans reach toxic thresholds. The evidence of these toxic additives really is proven when the pit is being emptied. Normally, such an activity produces very strong, noxious odors, often offending neighbors downwind. When this toxic



## FLETCHER SIMS

During some 50 years working with farmers in widespread areas from Mexico, to Canada, to South Africa and many parts of the world I found an ever-present interest in maintaining the soil to leave it to posterity in as good as, if not better condition than, when they received it in the first place. Diversified farmers, who largely live on the land, have taken to the chore of making compost a reality. I continue to derive considerable satisfaction from working with them in crafting an implement that is inexpensive and accomplishes the job without impinging too much on other chores and investments of the farm.

In my area of the Texas high-plains we have few diversified farmers and large acres are under control of CAFOs and industrial managers who till the soil for non-resident owners. Among these owners and managers composting is not as practical as it is for the farmer with livestock. Witnessing depletion of our soil and exhaustion of our underground water, one can safely predict the end to industrial farming. Hence it is left to our diverse farmers to maintain the way of life, the production of wholesome food and the knowledge as to how to produce it.

During the last 40 years Charles Walters and *Acres U.S.A.* have been providing a diversity of farmers with outstanding information concerning developments in the real world of farming. He took over where Dr. William Albrecht left off. I was fortunate to have studied under this world-renowned soils professor who left a lifelong impression on my views, at the University of Missouri. In my 93 years I have had the privilege to live, observe and experience the changes from when most all energy utilized in farming was generated



*This three drafthorse-powered (12-hoofpower) Moline Manure Spreader is an example of how animal power produced on our family farm in Missouri 85 years ago was valued by my father sufficiently to justify driving this very manure spreader 40 miles behind the family herd of a milch cow, an angus bull and varied other cattle that a neighbor boy and I were herding at the head of our procession.*

from animals existing on the soil to now when the energy is purchased off farm in one form or another. I'm not suggesting that one use animal energy to make compost, though a client of mine presented me with a drawing his sons-in-law made after I had explained that everything about a compost turner was ancillary to the Sims Drum, which does all the work. With detailed drawings and pictures one can salvage components of cast-off machines for serviceable parts and craft an inexpensive composting tool. For a power source perhaps a tractor on your farm, or trade a tractor you have for one that would serve dual purposes better and you could have an efficient tool which takes the laborious task of making compost into one manageable on your farm.

slurry is applied to cropland, the visible results are scores of dead earthworms where the "honey wagon" has made a pass. Incorporating the four additives discussed really makes a big difference and is evident both from sight and smell. The lagoon has better digestion, less crusting and when applying the slurry, noxious odors are either dramatically reduced or eliminated and earthworms are not annihilated following field application.

The manure-to-be-compost is fortified with calcium (+ phosphorus if needed), sulfur, dozens of trace elements and stable, reactive carbon. Want to speed up the process? Feed the clay to your livestock at 1 oz. per 250 lbs. Per body weight per day on large animals and a minimum of 1 oz. on small animals such as sheep, goats, swine; or mix 50 lbs. of clay per ton of finished feed and allow livestock to

free choice whatever else they need. We've been providing Dyna-Min Geothermic Clay to livestock free choice since 1985; it being fed since 1947. Obviously the primary reason for such was to fortify the ration, improve digestion, buffer the pH and detoxify volatiles like ammonia and mycotoxins. But digestion doesn't end in the gut — it merely begins there and continues in the dung. So animals being fortified with high energy clays such as Dyna-Min continue to create healthy digestion in the compost heap.

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Through in-depth courses provided by his company Kinsey Agricultural Services, Inc., "consultant's consultant," Neal Kinsey has trained thousands of consultants and growers in the methodology of soil element balancing utilizing cation exchange capacity. He is co-author of *Hands-on Agronomy* and lectures around the world. Contact Kinsey via [neal@kinseyag.com](mailto:neal@kinseyag.com) or [www.kinseyag.com](http://www.kinseyag.com).

*Fletcher Sims' Compost*, a book detailing Sims' early innovation in large-scale composting, is being republished in an anniversary edition. It is available from Acres U.S.A. (see page 71 for ordering information). Sims maintains an information website at [www.compostcorp.com](http://www.compostcorp.com).