Southern Gardens Series

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Fertilizing and Composting in 1850

Historically, as long as frontier land was available, farmers preferred to move to unused land rather than invest money in fertilizers. But even in primitive agriculture, before the chemistry of soil and crops was understood, farmers used ground bones, wood ash, dried blood, saltpeter, guano, and fish as fertilizers. The Romans, as early as 200 B.C. knew about crop rotations, liming acid soils, adding manure, and growing legumes to fix nitrogen from the air. But trained chemist didn't begin to study plant nutrition until 1750, and it wasn't until 1834 that the first field experiments were conducted. By 1850 both advocates and detractors called the new scientific methods "book farming."

In 1850 planters from Georgia and Alabama met in Columbus, Georgia to establish an agricultural journal. Their monthly, The Soil of the South, began in January of 1851. In its first year it included nine letters written by John P. Norton of the Yale College laboratory on the current scientific farming practices. Sensitive to the doubters, Norton's first two columns diplomatically defended "book farming." In 1856 William N. White of Athens, Georgia published the first major book which specifically addressed Southern horticulture. In his Gardening for the South White drew from Norton's Yale columns. Besides offering the first reference I have found so far on mulching, it includes several sections on fertilizing practices in the south during the 1850s.

White classified all fertilizers broadly as manures, both organic (animal and vegetable) and inorganic (mineral).

Manures had six different functions. The first was to ameliorate soil by absorbing and maintaining moisture from the atmosphere. The so-called hot manures--guano, horse, and pig--were high in nitrogen, quick to ferment, and liable to burn plants by direct contact. But when turned under, they helped clay soils absorb and retain water. The cold manures--of ruminating animals and of vegetable compost--worked best in loam and sandy soils. Rating them for their power to retain moisture, he recommended pig manure, horse manure, salt, and soot, in that order. Not only was soot a soil builder and a fertilizer rich in ammonia, it was also an insecticide that could be applied to cabbages and other plants infested with insects. A second function was to provide ammonia (hydrogen and nitrogen) to the plant roots. In fact the value of any manure was measured by the amount of ammonia it contained. Third, certain manures could destroy weeds and vermin. Fourth, manures could decompose stubborn organic substances in the soil. Fifth, both mulches and manures they could protect plants from sudden changes in temperature, freezing or scorching. And finally, they could improve the texture of the soil.

White then surveyed what manures were available in the South. Interestingly, he noted that animal manures were relatively unplentiful in the South because of the small proportion of animals relative to acres cultivated. However, White devotes considerable discussion to the use of animal manures. The manures of horses, hogs, oxen, and cows, in that order, were valuable for ammonia content. Pig manure used alone was pernicious to the growth of cabbage and turnip and gave an unpleasant taste to many others. All these animal manures did best if fully composted. In addition, animal urine diluted to 1/3 strength and allowed to grow stale could be applied directly to plants at night or in moist weather, or it could be absorbed in barns, stables, and animal pens with leaf mould, swamp muck, or gypsum and cast as fertilizer.

Of imported animal manures, the richest in phosphates and nitrogen was guano, the manure of tropical sea birds which fed exclusively on fish. Dehydrated, guano cost $3 to $3.50 per hundred weight in 1856. It could be applied at a rate of two hundred weight per acre mixed with one hundred weight of other animal manure. While Peruvian and Bolivian guano was the best, the manure of domesticated birds--chickens, turkeys, pigeons, etc.--was acceptable. Three to four hundred weight of bird manure was equal to 14-18 hundred weight of animal manure and was especially excellent to form liquid manures. One pound per gallon of water could be applied once a week to the roots of plants, but not directly to leaves or collars. Or, like other animal manures, bird manures could be composted with leaf mould or swamp muck. Guano was the most effective fertilizer to use in setting out new orchard trees.

Besides animal manures, White's survey covers various other sources of fertilizers. Wood ashes, for example, contained potash, phosphoric acid, sulfuric acid, manganese, chlorine, soda, magnesia, carbonate of lime, and soluble silica. Ashes could be applied directly to plants or composted with swamp muck, earth, or vegetable matter. Lime was an invaluable fertilizer. For coastal gardeners, oyster shell lime was abundant. Inland, convenient sources of lime were rubbish from old brick walls and old plastering. Lime absorbed nitrogen from air to form nitrate of lime, which was then applied at a rate of one ton per acre. If used alone, it was not to be plowed under but mixed at the surface. To yield phosphorus, bones could be broken into small bits with a sledge hammer, crowbar, or large wooden mortar lined at bottom with thick iron plate then thrown in heaps to ferment for months. But it was best to dissolve bones in sulfuric acid diluted to 1/3 strength with water. The bones would dissolve into a paste, then, mixed with 30 times the volume of water, could be used as liquid manure or mixed with ashes, sawdust, or charcoal and applied three bushels per acre. Animal hair and bristles were high in nitrogen and could be applied directly to crops. Charcoal was good to absorb carbonic acid gas and supply it to roots as acid. Refuse salt used for bacon contained blood and juices of meat and could be applied directly to asparagus at 6-8 bushels per acre in autumn, though it benefited all garden crops. Of vegetable manures, hulled and dried cotton seed was scarcely inferior to guano. Tanbark could be applied directly to strawberries and to Irish potatoes.

Among the more unique sources of manure in the 1850s, White rated several other materials that were higher in nitrogen than most animal and vegetable manures. These included dried muscular flesh (14% nitrogen), feathers (17%), cow hair (15%), woolen rags (20%), and horn shavings (16%).

As for composting practices, White advocated that the most valuable agent in decomposing organic substances was a salt and lime mixture. He instructed readers to mix three bushels of slacked lime to one bushel of salt dissolved in as little water as possible. Once the lime had taken up all the brine, the mixture had a number of beneficial applications. It would destroy the odor of putrefying animal matters and retain ammonia. It supplied plants with chlorine, lime, and soda. It helped decompose vegetable refuse of leaf mould, turf, straw, chips, and tanbark. And it could absorb pig urine in pig pens.

A number of vegetable materials could be composted. Leaves or pine straw could be thrown into stable yards, moistened, sprinkled with the lime and salt mixture, keep damp, and turned once or twice to yield good compost. Swamp muck mixed with the lime and salt mixture and keep moist would compost in thirty days if covered with stable manure to make up a four-foot pile, turned and mixed. The general rule for all composting piles was to "keep moist but never leech." Animal manures needed to be covered to prevent rain from leeching out nutrients.

Other animal matter could be composted as well. Offal of slaughterhouses and even whole dead farm animals could be buried in a deep pit layered top and bottom with muck or loam and composted in a year. Night soil and chamber slop could composted with charcoal, black wood mould, and gypsum.

In addition to these fertilizing practices, White advocated using green manures, what we call winter cover crops, which included spinach and could be turned under in the spring. Finally, crop rotation and succession, or planting crops at staggered dates, were practices available to the "book farmer" of the 1850s.