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Composting throughout History

Composting is, in broadest terms, the biological reduction of organic wastes to humus. Whenever a plant or animal dies, its remains are attacked by soil microorganisms and larger soil fauna and are eventually reduced to an earthlike substance that forms a beneficial growing environment for plant roots.

This process, repeated continuously in endless profusion and in every part of the world where plants grow, is part of the ever-recurring natural process that supports all terrestrial life. The entire composting process is difficult to contemplate in its full dimensions. Let's just say that compost and composting are, like water and air, essentials of life.

The Human Element

A different, more common, definition of compost requires human participation in the process. Ordinarily, when we speak of compost and composting, we are referring to the process by which we transform organic wastes into a soil-building substance for farm, orchard, or garden.

Even when considering this common definition, however, the origins of human composting activities quickly become buried in the sands of prehistory. The best we can surmise is that sometime after people began to cultivate food to augment hunting and food-gathering activities, they discovered the benefits of compost, probably in the form of animal manure. Noting, perhaps, that food crops grew more

vigorously in areas where manure had been deposited, they made the connection between the two phenomena and began a more selective application of the composting process.

Probably the oldest existing reference to the use of manure in agriculture is to be found on a set of clay tablets of the Akkadian Empire, which flourished in the Mesopotamian Valley 1,000 years before Moses was born. Akkadia was overthrown by Babylon, which in turn fell to Cyrus, but though empires crumbled, the knowledge and practice of organic fertilizing increased.

Compost was known to the Romans; the Greeks had a word for it, and so did the Tribes of Israel. The Bible is interspersed with references to the cultivation of the soil. The terms *dung* and *dunghill*, used by the theologians who translated the scriptural Hebrew and Greek into English, have numerous variants in the original. Dung was used as fuel and as fertilizer. Manure was sometimes spread directly onto the fields. It was also composted, along with street sweepings and organic refuse, on the dunghill outside the city wall. Sometimes straw, trampled to reduce its bulk, was soaked in liquid manure (literally "in dung water").

The Talmud tells us "they lay dung to moisten and enrich the soil; dig about the roots of trees; pluck up the suckers; take off the leaves; sprinkle ashes; and smoke under the trees to kill vermin." From other sources we learn that soil was enriched by adding ashes, straw, stubble, and chaff, as well as with the grass and brambles that sprung up in fields left fallow. Cattle were grazed upon land in need of their manure for fertilizer, and sheep manure was collected from walled-in sheepfolds and used as a fertilizer.

Another Talmud passage tells of the use of blood as fertilizer. The blood of the sacrifice, poured out before the altar, drained through an underground channel to a dump outside the city wall. Here it was sold to gardeners on payment of a trespass offering. Without this fee, its use for common purpose was prohibited, as it retained the sanctity of dedication at the altar.

According to the Talmud, raw manure was not to be handled by the truly religious because it was unclean. A Talmud commentator set down the rule for the faithful: "Do not use your manure until some time after the outcasts have used theirs," thus advocating the use of rotted or composted manure instead of fresh animal matter.

Much of the agricultural wisdom of the ancients survived the Dark Ages, to reappear—along with other fundamental scientific knowledge—in the writings of learned Arabs. Ibn al Awam, variously assigned to the tenth and twelfth centuries, goes into extensive detail on

the processing and use of compost and other manures in his *Kitab al Falahah*, or *Book of Agriculture*. He recommends blood for its fertilizing properties and casually endorses the superiority of human blood for this purpose. The manure value of crushed bones, waste wool, wood ash, and lime is recognized in other old manuscripts as well.

The medieval Church was another repository of knowledge and lore, thanks to the efforts of a few devoted monks. Within monastery enclosures, sound agricultural practices were preserved and applied and, in some instances, taught to the neighboring farmers by the abbot, acting as a sort of medieval local extension agent. It is only natural that the charters of two old English abbeys, St. Albans (1258) and the Priory of Newenham (1388), should enjoin the use of compost for soil fertility.

References to compost in Renaissance literature are numerous. William Caxton, pioneer fifteenth century printer, relates that "by which dongyng and compostyng the feldes gladeth." Three other renowned Elizabethans reveal in their writings that *compost* was a familiar word. Shakespeare's *Hamlet* advises, "Do not spread the compost on the weeds, to make them ranker." In *Timon of Athens*, Timon rages, "The earth's a thief, that feeds and breeds by a composture stolen from general excrement." Sir Francis Bacon tells in his "Natural History" that plants degenerate by "removing into worse earth, or forbearing to compost the earth." The unfortunate Sir Walter Raleigh, awaiting execution, wrote of the soil, "He shall have the dung of the cattle, to muckle or composture his land." (Our word *compost* comes from Old French, but in the sixteenth and seventeenth centuries various spellings were used—*compass*, *compess*, *compast*, *composture*, and others.)

Early American Compost

On the North American continent, compost was used by native tribes and by Europeans upon their initial settlement. Public accounts of the use of stable manure in composting date back to the eighteenth century. Early colonial farmers abandoned the fish-to-each-hill-of-corn system of fertilizing when they discovered that by properly composting two loads of muck and one load of barnyard manure, they obtained a product equivalent to three loads of manure in fertilizing value. By the middle of the nineteenth century, this knowledge was thoroughly ingrained in Yankee agricultural philosophy, and Samuel W. Johnson, professor of analytical and agricultural chemistry at Yale College, as-

serted that "this fact should be painted in bold letters on every barn door in Connecticut."

Many New England farmers found it economical to use the white fish or menhaden abundant in Long Island Sound, as well as manure, in their compost heaps. Stephen Hoyt and Sons of New Canaan, Connecticut, made compost on a large scale, using 220,000 fish in one season. A layer of muck 1 foot in thickness would be spread on the ground, then a layer of fish on top of that, a layer of muck, a layer of fish, and so on, topped off with a layer of muck, until the heap reached a height of 5 or 6 feet. Their formula required 10 or 12 loads of muck to 1 of fish. This was periodically turned until fermentation and disintegration of the fish (except the bones) had been completed. The resulting compost was free of odors and preserved perfectly all the manurial values of the fish.

Our first president was a skilled farmer and a strong advocate of proper composting methods. After the Revolutionary War, one of Washington's main concerns was the restoration of the land on his plantation. For this purpose he looked for a farm manager who was "above all, like Midas, one who can convert everything he touches into manure, as the first transmutation toward gold; in a word, one who can bring worn-out and gullied lands into good tilth in the shortest time."

According to Paul L. Haworth, author of the 1915 biography *George Washington, Farmer*, Washington "saved manure as if it were already so much gold, and hoped with its use and with judicious rotation of crops to accomplish" good tilth. Washington carried out his own composting experiments, from which he concluded that the best compost was made from sheep dung and from "black mould from the Gulleys on the hillside which seemed to be purer than the other."

Thomas Jefferson was no less skilled as a farmer, and equally inventive. In fact, Washington and Jefferson, when not otherwise occupied with affairs of state, often corresponded about mutual farming problems and observations.

Jefferson routinely depended on the use of manure to maintain the fertility of his fields. In *Thomas Jefferson's Farm Book*, Edwin Morris Betts, the editor, discusses Jefferson's use of various kinds of manure:

> Jefferson used dung in three different stages of decomposition—fresh or long dung, half purified or short dung, and well-rotted dung. He does not state which condition of the dung he found most beneficial for his crops.
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> Jefferson probably used very little manure of any kind on his lands in the early days of farming at Monticello and at his other plantations. The newly cleared land was plentiful and rich and brought forth abundant crops. He expressed this idea in a letter to George Washington on June 28, 1793. He wrote, ". . . Manure does not enter into this, *a good farm* because we can buy an acre of new land cheaper than we can manure an old acre. . . ." But later, after the soil had been robbed of its fertility by successive crops of corn and tobacco, fertilizing his soil became a necessity.
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> Jefferson often followed a green dressing of buckwheat with dung in his crop rotations. In a plan of crop rotation which he sent to Thomas Mann Randolph on July 28, 1793, he wrote, ". . . 3d. wheat, & after it a green dressing of buckwheat, and, in the succeeding winter put on what dung you have."

Jefferson was also an innovative farmer. Noting the difficulty and expense entailed in carrying manure to distant fields, he came upon the idea of stationing cattle for extended periods of time in the middle of the field which needed fertilization. Jefferson wrote of "a moveable airy cow house, to be set up in the middle of the field which is to be dunged, & soil our cattle in that thro' the summer as well as winter, keeping them constantly up & well littered."

James Madison, our fourth president, was also aware of the need to renew the fertility of croplands. On May 12, 1818, in an address to the Agricultural Society of Albemarle, Virginia, he stated:

> Closely as agriculture and civilization are allied, they do not keep pace with each other. There is probably a much higher state of agriculture in China and Japan than in many other countries far more advanced in the improvements of civilized life. Nothing is more certain than that continual cropping without manure deprives the soil of its fertility. It is equally certain that fertility may be preserved or restored by giving to the earth animal or vegetable manure equivalent to the matter taken from it. That restoration to the earth of all that naturally grows on it prevents its impoverishment is sufficiently seen in our forests, where the annual exuviae of the trees and plants replace the fertility of which they deprived the earth. Where frequent fires destroy the leaves and whatever else is annually dropped on the earth, it is well known that land becomes poorer, this destruction of the natural crop having the same impoverished effect as removal of a cultivated crop. A still stronger proof that a natural restoration to the earth of all its annual produce will perpetuate its productiveness is seen where our fields are left uncultivated and unpastured. In this case the soil, receiving from the decay of the spontaneous weeds and

grasses more fertility than they extract from it, is, for the time being, improved. Its improvement may be explained by the fertilizing matter which the weeds and grasses derive from the water and atmosphere, which forms a net gain to the earth. That individual farms do lose their fertility in proportion as crops are taken from them and return of manure neglected is a fact not likely to be questioned. The most logical mode of preserving the richness and of enriching a farm is certainly that of applying a sufficiency of manure and vegetable matter in a decomposed state; in order to procure which too much care cannot be observed in saving every material furnished by the farm. This resource was among the earliest discoveries of man living by agriculture; and a proper use of it has been made a test of good husbandry in all countries, ancient and modern, where its principle and profits have been studied.

The famed botanist-chemist-agriculturist George Washington Carver advised the farmer to compost materials and return them to the land. In an agricultural experiment station bulletin entitled "How to Build Up and Maintain the Virgin Fertility of Our Soil," Dr. Carver says, "Make your own fertilizer on the farm. Buy as little as possible. A year-round compost pile is absolutely essential and can be had with little labor and practically no cash outlay."

Dr. Carver also stressed the importance of covering the heap to prevent the leaching away of nutrients by rain. He explained:

> It is easy to see that our farm animals are great fertilizer factories, turning out the cheapest and best known product for the permanent building up of the soil. In addition to this farmyard manure, there are also many thousands of tons of the finest fertilizer going to waste all over the South, in the form of decaying leaves of the forest and the rich sediment of the swamp, known as "muck." Every idle moment should be put in gathering up these fertilizers.

A Professor Johnson, in 1856, had written some articles for *The Homestead* that proved to be so thought provoking and that excited so much attention among readers of this journal that he was invited to address the annual meeting of the Connecticut State Agricultural Society in January 1857 on the subject "Frauds in Commercial Manures."

It was then established that "gross deceits had actually been practiced by parties soliciting the patronage of farmers in Connecticut, and the facilities for perpetrating further frauds were the subject of the lengthened exposition." A few years later, in 1859, Professor Johnson wrote a book entitled *Essays on Manure*, in which the subject of composting received prominent and favorable comment. Composting was said to develop the inert fertilizing qualities of muck itself, and a fermentation that began in the manure extended to and involved the muck, reducing the whole to the condition of well-rotted dung. It was pointed out that in this process of composting, the muck effectively prevented the waste of ammonia or nitrogen.

Relatively small quantities of plant material were composted in this period because there was plenty of barnyard manure. However, in some sections of the South, cottonseed was composted with muck. The heap was started with alternate 6-inch layers of muck, and 3-inch layers of cottonseed, finished off with a layer of muck. This was turned and repiled once a month until complete decomposition of the cottonseed had been effected. Considerable watering was a prime requisite.

As America grew older, many of the sons and daughters of the early New England settlers trekked westward searching for more abundant, lower-priced land. Some of them found soil so rich in organic matter from buffalo droppings, plants, grasses, and dead animals, all nicely composted, that little thought was given to composting. Only a few farsighted settlers in this newly discovered land of plenty continued composting practices proven effective by farming poorer soil.

Organic Origins

Composting has been a basis of the organic method of gardening and farming since the days of Sir Albert Howard, father of the organic method. Howard, a British government agronomist, spent the years from 1905 to 1934 in India, where he slowly evolved the organic concept. In making compost, Howard found by experiment that the best compost consisted of three times as much plant matter as manure. He devised the Indore method of compost making, in which materials are layered sandwich fashion, then are turned (or are mixed by earthworms) during decomposition.

Austrian philosopher Rudolph Steiner outlined the principles of biodynamic agriculture in 1924, emphasizing composting as a central practice. Biodynamic farmers and gardeners approach composting with a kind of reverence; making compost entails use of specific preparations, which are thought to inoculate it with beneficial organisms and stimulate their activity. Adherents of biodynamics have been highly influential in promoting the idea of gardening in harmony with nature.

In 1942, J. I. Rodale, pioneer of the organic method in America,

J. I. Rodale introduced American gardeners to the value of composting as a means of building soil quality.

began monthly publication of *Organic Farming and Gardening*, assimilating the ideas of Howard and adding knowledge gained by further experimentation. From 1942, the organic method extolled the use of compost and stressed its importance as a garden necessity. Subsequent developments in composting included adding ground rock powders to the heap, sheet composting, shredding materials for quicker decomposition, digester composting, and numerous other innovations discussed later in this book.

The history of compost, then, is both ancient and modern. Compost was recognized, as early as ancient Rome and probably before, as a transitional force in the life cycle. For at least 2,000 years, people depended on compost to sustain croplands and to feed themselves. It was not until the nineteenth century, in fact, that we began to substitute chemical fertilizers for compost in the new "scientific" method of farming.

France's Jean Baptiste Boussingault laid the foundations of agricultural chemistry in 1834. Then, in 1840, the great German scientist Justus von Liebig published his classic monograph on agricultural chemistry. Up until that time, the humus theory had prevailed. It was believed that plants actually ate humus in order to grow. Liebig disproved this theory, demonstrating that plants obtained nourishment from certain chemicals in solution. Since humus was insoluble in water, Liebig dismissed its significance in plant growth.

For the next 100 years, agricultural practice became increasingly chemical in nature. It is ironic that in 1940, exactly 100 years after Liebig's classic work, Sir Albert Howard published his own magnum opus, *An Agricultural Testament*, which set in motion the movement to organic farming and gardening that now is widely accepted throughout the world. Even farmers and gardeners who depend heavily and routinely on chemical fertilizers now know of the value of compost and organic matter.

Today, the organic method of farming and gardening is more popular than it has ever been, at least since the turn of the last century. Gardeners have led the way in reestablishing organic methods, and now increasing numbers of farmers are making the transition to eliminate harmful pesticides and fertilizers. Organic farming, once considered the province of fanatics, has become established as a legitimate agricultural alternative. Thanks to increasing concerns about groundwater pollution, pesticide residues in foods, and the increasing costs of petrochemicals, the federal government has recently begun promoting "low-input sustainable agriculture," or LISA. LISA practices include composting as a means of recycling animal manures, improving soil structure and biological activity, and saving money for financially pressed farmers.

Composting has also gained considerable attention as a solution to the solid waste crisis now facing municipalities nationwide. Whereas just a few years ago, proponents of municipal composting were generally regarded as impractical, now escalating landfill costs and tighter restrictions on disposal of potentially hazardous sewage sludge have dramatically increased the economic attractiveness of large-scale municipal and industrial composting systems, which now number in the hundreds. Urban gardeners now have a wide array of bins and barrels available commercially that allow them to make compost quickly and easily. Even nongardening urbanites have begun saving kitchen scraps and yard wastes for their composting neighbors, in order to cut their trash disposal costs. It seems clear that composting, which has sustained us since the beginning of history, is now entering into an era in which the intelligent use of scientific methods will enhance the quality of life instead of destroying it. In this scenario, compost and composting will find an increasingly welcome place.