

What Is Good Gardening Soil?

For the last 2,000 years healthy, productive soil has been described as “tender,” “sympathetic,” and “mellow,” in which “fertility is combined with moderation.” The best way to achieve it is to garden the organic way.

MAURICE FRANZ

WHAT KIND OF SOIL is best for your garden?

Good garden soil is rarely inherited and, usually, we have little choice about what we get. Once the location of the house is determined, we generally take the soil that comes with it and make the best of it.

Although it's not too easy, good garden soil has to be achieved and then maintained by a *continuous program* of good growing practices. Here's how many gardeners are doing it.

How to Achieve Good Soil

Good soil can be built by the home gardener who follows a balanced, year-round, continuous program of soil replenishment and maintenance which includes the following operations: 1—Composting and growing cover crops and green manures to prevent loss of topsoil, opening up and aerating the subsoil with deep and widely reaching root systems, and supplying the soil with plenty of humus where it is needed— in the row; 2—Rotary

tilling to aerate the topsoil, improve structure and also to incorporate



humus, plant nutrients and fertilizers; 3—Liming to correct soil acidity (after testing), to condition texture and structure, and to encourage microbial life; 4—Maintaining the ideal carbon-nitrogen ratio in the soil by incorporating plenty of nitrogen-

ous materials to balance the carbon in mulches and crop residues.

Composting and Cover Crops

It's hard to beat compost as a source of sustained soil fertility, tilth and structure because, just by itself it has all the elements needed for a complete plant food. When you combine it with rock minerals, cover crops and a green manure program, the arguments in its favor are irresistible. Last and by no means least, compost costs the organic gardener little or nothing—is the end result which comes from combining the various organic wastes produced in the normal operation of the homestead.

WHAT SOIL IS BEST?

THE VERY BEST OF SOILS is black earth of tender nature, the most easily worked and the best for cereals.

In a tender soil we find fertility combined with moderation, a softness and a pliancy easily adapted to cultivation, and an equal absence of humidity and of dryness. Earth of this nature will shine again after the ploughshare has passed through it, and when newly turned up attracts ravenous birds that follow the ploughshare, the ravens going so far as to peck at the heels of the ploughman.

Natural History
 PLINY THE ELDER
 23-79 A.D.

While a cover crop is grown chiefly to prevent or reduce erosion, the green manure crops improve soil quality when they are plowed under. The advantages of growing protective, soil-replenishing crops right in the garden are obvious. First — time and labor of hauling and spreading are saved. Second — the deep, widely-spreading root systems open up the soil, making it more permeable. Third — the decomposing residues of the roots further serve as nutrients for the succeeding main crops.

Which are best cover crops for you? Check the adjacent table for nitrogen percentages and then decide which of them will do best for you in your particular area. In Mississippi, 4 years of cropping to kudzu brought increases of 43 per cent nitrogen and 85 per cent carbon as compared to straight corn production. A long-term rotation in Ohio which included alfalfa increased yields quickly but then leveled off. In a 5-year program of corn; oats, alfalfa, alfalfa, alfalfa, there were no additional benefits after the first round was completed.

However, if you are short of mulching materials — and the average homesteader rarely has too much — cover cropping over the winter is a good idea, particularly in Zones 5 and 6.

Tilling Health into Sick Soil

Rotary tilling is practiced by many gardeners to improve soil tilth and structure by incorporating humus and composts in the top layer while they build fertility. Paul Rhoads writes from Grove City, Pennsylvania, that “sick soil lacks organic matter, aeration and physical condition.” The corrective steps he recommends are “to aerate by tillage, improve with compost and bone meal, sweeten with lime if needed, and give mulch protection. This treatment gave us wonderful re-

**GREEN MANURE CROPS
 NITROGEN PERCENTAGES**

Some green manure crops with the approximate nitrogen percentages on a dry basis:

Crop	Percentage of N
<i>Alfalfa</i>	3.0-4.0
<i>Austrian winter peas</i>	3.0-3.8
<i>Clover, Red</i>	2.8-3.2
<i>Clover, Crimson</i>	3.0-3.3
<i>Cowpeas</i>	2.5-3.0
<i>Lespedeza, Common</i>	2.2-2.5
<i>Lespedeza, Sericea</i>	2.1-2.4
<i>Lupine, Blue</i>	2.0-2.5
<i>Vetch, Hairy</i>	3.0-4.0
<i>Oats</i>	1.3-1.4
<i>Rye</i>	1.2-1.3
<i>Ryegrass</i>	1.2-1.3

sults even on sandy fill on the shady side of our home, and also in our vegetable garden,” he concludes.

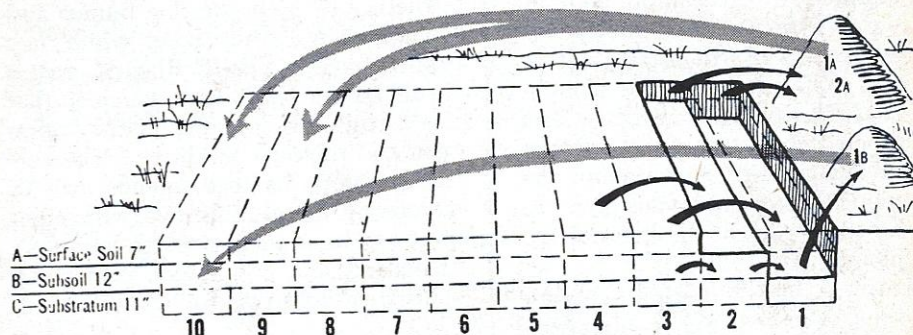
Where drainage is poor, rotary tilling practically seems to be a “must” — according to P. E. Dorsey of Springfield, Illinois. “Nothing flourished where rain water stood,” he writes, “until I tilled in a mixture of shredded leaves and alfalfa hay impregnated

with rock powder and let it lie over the winter. The next spring I set currant and gooseberry bushes in this renovated spot and have been rewarded with splendid growth. In this case, aeration with organic matter restored soil efficiency."

Don't Remove the Stones When Turning Soil Over

One quick word of caution should be inserted at this point — when tilling, digging, or subsoiling, *don't remove all or most of the stones you uncover.*

TRIPLE-SPADING "STUBBORN" SOIL



Triple spading: 1A and 2A strips of surface soil are removed, and later moved to cover the last two strips at 9A and 10A; 1B strip of subsoil is removed, and added finally to 10B; 1C strip of substratum is spaded; 2B subsoil is spaded, mixed, and placed above 1C; 3A surface soil is put above moved subsoil in place of the original 1A.

More serious cases of impervious clays call for stronger turning-and-aeration methods. Twenty centuries ago Pliny noted that "the Ubii dig to a depth of 3 feet and, taking up the earth, cover the soil with it in other places a foot in thickness." Today this practice is known as triple spading which calls for "3 layers of spading" while mixing in organic matter with the subsoil.

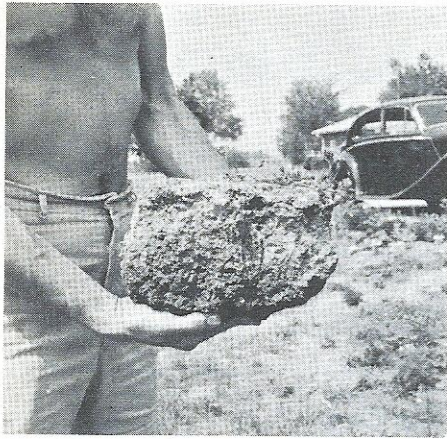
Mere spading does little good if the soil is "massive," because the soil particles will settle back together when the soil is wet again with the deeper layers heavily pressed by the weight of the ones above them. Besides spading, it is necessary to add abundant organic matter and basic fertilizers for good structure and the adequate nutrition of deep-rooted plants. Once you have well-drained soil, its organisms are enabled to decompose organic matter to produce compounds that lead to natural soil granulation.

The reason for this is plain — stones act as moderating influences on the soil. In the summer, they help keep it cool; in the winter they help heat it up. They are sources of trace elements which they contribute steadily over the years and also encourage symbiotic soil relationships.

Pliny notes that a husbandman who was "a stranger to the territory of Syracuse cleared the soil of all the stones and the consequence was that he lost his crops from the accumulation of mud, so that at last he was obliged to carry the stones back again."

More recently, Eli Bartoo of Ulysses, Pennsylvania, reports "my father had a field being prepared for corn in which there was a spot of rather heavy soil which had previously troubled us little except for the stones in it. We removed the stones and the field was prepared and planted. *Practically nothing grew on that spot!* Neighbors said that removing the stones had soured the soil.

“The Surface Was Hard and Dry as Concrete”



Justin Kleinhans of LaCarne, Ohio, is an original, persevering and resourceful gardener who makes his own equipment in his own workshop and who “rakes grass cut along the highway to apply it 8 to 10 inches deep after my plants were well established.” What was his reward?

“My ground was so wet and gummy under this mulch, it was impossible to stick a pitchfork in it deep enough to stand up. Three weeks after my garden should have been planted, it was still wet and soggy even though all the adjacent ground had dried off. I then bulldozed all the mulch off to allow the sun and air to dry the ground. Two weeks later the surface was as dry and hard as

concrete, and it was still wet and gummy below.”

Can such an inert, lifeless soil be saved? We think so. The main problem is lack of microbial life in the soil which will return to convert the blocky, impervious layers into crumbly, porous, aerated and moisture-conserving aggregates once it is given the proper conditions. Humus plus organic nitrogen should mellow the layers so that extremes of wetness and dryness are avoided. Deep-rooting cover crops will open up the subsoil, while liming — applied only after a series of careful soil tests — will further act on the impervious clays and encourage a healthy bacterial life.

Liming Not a Cure-All

Over 1,900 years ago Pliny the Elder wrote “The Aedui and Pictones have rendered their lands remarkably fertile by the aid of limestone which is also found to be particularly beneficial to the olive and vine.” Nevertheless, liming is not a panacea for any and all garden ills and should not be done unless a series of soil tests repeatedly indicate an overacid condition exists.

Some form of organic nitrogen — soybean meal, cottonseed meal, blood meal are all fine — should be added with the lime or you will have a nitrogen deficiency because liming stimulates soil microbial life by breaking down the humus present. The bacteria

that go to work on the humus need more nitrogen and will take it from the soil if you don't give it to them. David Criner warns of the danger of liming without adding nitrogen with this laconic advice:

“Out here in Arkansas we have an old saying that goes — ‘Lime without manure makes the father rich, and the son poor.’ We have also found that heavy cropping, without replacing organic matter and lime, makes the soil more acid.

“I cure sour soil by adding lime in the form of ground limestone — wood ashes are also good — and using plenty of compost and mulch. My organic soil retains moisture perfectly and thus prevents the leaching out of lime.”

Lime is also vital to soil management because it lightens heavy clays through a granulating process that enables water to move more easily through them. This same granulation works in reverse on sandy soils, making them more moisture-retentive by reducing the air spaces. This ability to act as a conditioner for both light and heavy soils alike is also a characteristic of greensand, a marine calcareous residue which once was the bottom of the sea, and the rock minerals. When applying lime, be sure to use ground dolomitic limestone which can also contain magnesium carbonate and calcium carbonate — “bonus” plant nutrients.

Carbon-Nitrogen Ratio

While not too much is known about what exactly goes on in the soil when we plow or till crop residues under — we do know we have to return humus to the soil to maintain tilth and fertility. C. A. Black of Iowa State College observes on page 183 of *Soil-Plant Relationships*: “The Nature of the nitrogenous fraction of soil organic matter is still something of a puzzle.”

Most plant residues which go into the soil are 50 parts carbon to one part nitrogen. The ideal carbon-nitrogen ratio is 15-30 parts carbon to one of nitrogen. Very little of this soil nitrogen is used to make plant tissue, which is largely dependent on photosynthesis for its growth. But the C/N ratio of crop residues plowed or tilled back into the soil directly affects the vigor and size of its bacterial population which needs the nitrogen to build cell tissue. When you add crop residues to the soil, be sure to include extra nitrogen — cottonseed meal, soybean meal and blood meal are fine. Otherwise you will have a soil nitrogen deficiency because the bacteria which break down the residues need the extra nitrogen for energy. If you don't give it to them, they'll take from the soil, adding to the imbalance of carbon.

This is an added argument in favor of using compost which is a complete soil conditioner with its fertility ready to be assimilated — as many organic gardeners already know and more are finding out.

It's Up to the Gardener

What, then, is the best soil — the ideal soil — for your garden? From this necessarily brief discussion it is evident that there is no one “best” soil, but there are a variety of soils each of which will produce well for

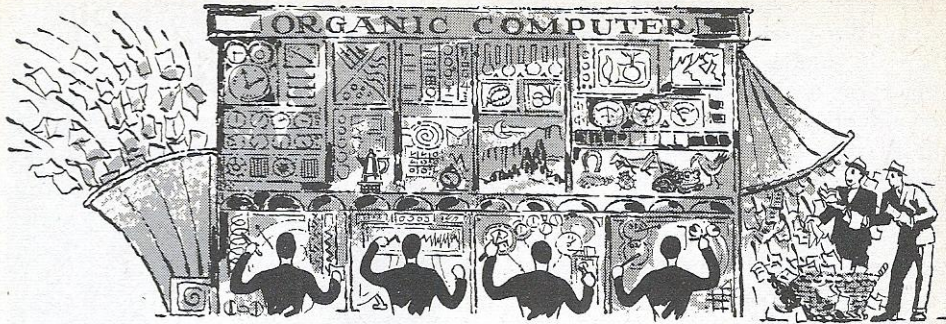
TYPES OF SOIL

THE IDEAL SOIL which is presumed — but rarely does — to make up your garden consists of 35 per cent sand, 25 per cent clay, 10 per cent humus-making materials, and 30 per cent air and water. The table below gives the proportions of the more common soil types.

	Clay	Sand	Silt
<i>Clay</i>	40 %	45 %	
<i>Clay Loam</i>	27-40	25-45	
<i>Sand</i>	10	85	
<i>Sandy Clay</i>	35	45	
<i>Sandy Clay Loam</i>	20-35	45	28%
<i>Sandy Loam</i>	20	50	
<i>Sandy Soils</i>	15	70	

you — depending on where you live and what you want to grow.

But it is equally self-evident that the organic way of gardening is the best — the only real way to garden. Soil texture and fertility must be built steadily and then maintained at that level which Pliny described so eloquently almost 2,000 years ago: “Soil is best that has the flavor of a perfume . . . imparted to it by the sun. It is this odor that the earth when turned up ought to emit and which, once found, can never deceive a person and thus will be found the best criterion for judging the quality of a soil.”



Mr. Computer:

Would My Roses Bloom If . . . ?

A look into the future when the Big C may become a major source of gardening advice.

JEROME OLDS

WHEN GARDEN PROBLEMS arise, who do you turn to . . . that is, who besides ORGANIC GARDENING magazine? Neighbors? County Agent? Garden Club President? Whoever he or she is, one constant drawback remains. They're human. And like any human, he or she can be wrong.

But the future holds hope for vast improvement. In not too many years, we may be able to get straight sure-fire garden answers from a source whose closest contact with plants may be the artificial potted greenery near his "GO" button. Yes, our fountain-head of gardening know-how may turn out to be Mr. Computer himself.

Already doctors, lawyers and other professions are taking the necessary steps to use the computer's magnetic tape to store all types of interesting information in compact, miniaturized form. Writes one reporter: "Just as in a jukebox when a person pushes the button, the arms find what he wants, so the searching arm (inside the computer) goes along the discs and picks

out what the researcher wants."

Well, there are many more gardeners doing daily research in their backyards than scientists in laboratories, so we can justifiably expect to hear soon about the Home Gardeners' Computer. Let's try to envision the happy gardening days ahead when the Big C lends a hand.

Need for "Organic" Computer

First and foremost, you'll need to have an "organic" computer so the typed answer won't mess you up more than you were originally. Next, you've got to learn to limit or "negotiate" your question. For example, if your roses haven't been blooming like the ads say they can, and you ask: "Mr. Computer, Why don't my roses bloom?" it might take 7 days of machine time for the typing to be done. But if you'd ask, "What fertilizers would help my roses bloom?" then both you and the computer have a fighting chance for success on an answer like:

"Use coarse, raw ground bone meal