A Garden Organic Activity Booklet

Testing soil and improving fertility

This activity tells you how to start building soil fertility. It has several simple texts as the first step in understanding soil as a living mass of organisms and chemistry that provide plants with water, fertility and anchorage. From these results, continue to develop an improvement plan for your particular soil.

Resources

- Clipboard/s, pen and paper
- Tools including hand fork, trowel, spade and fork
- Soil pH testing kit, glass jars
- Materials for soil improvement, eg home-made compost

Activity

1. Follow some/all of the instructions overleaf for testing and improving your soil

   a Soil texture and main characteristics
   b Organic matter and living content
   c Compaction and drainage (typical air and water content)
   d Soil 'acidity' or 'alkalinity' (pH)

2. Review the test results and consider the implications

3. Plan and implement a programme of soil improvement from the test results, eg adding organic matter, relieving compaction, improving drainage, adjusting soil pH, etc.

Adding organic matter for soil improvement

Health and Safety

Be careful when handling soil. Cover open wounds, wear gloves if necessary, and wash hands. Keep tetanus vaccinations up-to-date. Soil and organic matter can be dusty/slippery.

a. Soil texture and main characteristics

Typical properties

Soil types

Rub a small amount of moist soil between your fingers

Stir in a handful of soil in a jar full of water. Leave to settle for two hours

Method and reason for improvements

Sand	Mostly sand particles; water drains quickly (often too quickly, washing out fertility and causing drought). Light to dig; quick to warm up in spring.	Feels gritty and doesn't stick together (though a sandy loam will stick together a little).	Will form a distinct gritty layer at the bottom and leave slightly dirty water above.	Add organic matter to improve structure, water retention and fertility. Can also add 5-10cm layer of organic matter (eg compost - see below) on the soil surface to conserve moisture underneath ('mulching').
Clay	Mostly clay particles; water drains slowly (can waterlog); often nutrient rich (but may be unavailable to plants); soil 'bakes' hard and cracks when dry; heavy to dig; slow to warm up in spring.	Feels sticky and heavy. It will hold together in a ball without crumbling (though less so for clay loam). Soil may 'shine' when smoothed.	Water will stay cloudy because there are so many smaller particles, with a thin layer of particles at the bottom.	Add organic matter to improve structure, drainage, and make nutrients available. In heavier clay, dig in a bucket of 'horticultural grit' per square metre to improve drainage. Can also roughly dig over in winter, exposing clay lumps to frost to help break them down; dig again in spring.

Silt	Mixture of clay and sand characteristics. Usually moisture retentive with good fertility. Compacts easily.	Feels silky or soapy and may show imprints when pressed; will hold together a little.	Will leave a small layer of particles at the bottom and dirty water.	Add organic matter to improve structure and help minimise likely compaction.
Loam	Balanced mixture of different sized soil particles; easy to work; fertile; water drains freely, yet soil retains moisture. 'Sandy loams' and 'clay loams' are common.	Feels slightly gritty and dark in colour. It will hold together a little before crumbling.	Will settle to fairly even layers of clay, silt and sand particles (with smaller clay particles at the top). Water left slightly cloudy.	You're very lucky - this is good soil! Add organic matter to maintain soil structure and fertility in accordance with crop rotation.
Chalk	Generally shallow with lumps of chalk and flint stones; free draining; low-medium fertility; high pH (alkaline); texture can make digging difficult.	Usually pale in colour and often stony with bits of chalk.	Will make the water go pale grey colour with a gritty layer at the bottom (possibly with small white bits).	Add organic matter to improve structure, water retention, soil fertility, and build up the depth of top-soil (raised beds can help). Take out biggest stones if inconvenient for digging and crops; smaller stones cause no harm.
Peaty	Very rich in organic matter; dark coloured, often very dry in summer and wet in winter; low-medium fertility; low pH (acid); easy to dig.	Feels slightly spongy. Dark coloured and glistens when wet.	Will leave material floating in dirty water.	Unusual to find naturally, but seen in raised beds filled just with compost. Mix at least 50:50 with top-soil (bought or from a spare pile in your garden). if peat is naturally occurring, add a bucket of 'horticultural grit' per square metre to improve drainage.

b. Organic matter and living content

- Make a series of holes 5-15cm deeparound the garden in different growing locations, including current and potential growing areas, eg vegetable beds.
- Compare the colour of the soil removed from the holes. Darker soil will have more organic matter where it was added by previous gardeners or built up naturally, eg by leaves from nearby trees. Lighter soil less so.
- There should be more living organisms in soil with high organic matter content. Earthworms are the best indicator as they are part of the decomposition cycle of organic matter.
- Poor growth of previous crops and surrounding plants can also suggest a soil low in organic matter.

Top tip

Visual Assessments

These assessments are simple indicators of soil health for growing food plants. If organic matter is low, add extra (see below). The soil life will increase naturally, including beneficial bacteria and fungi.

c. Compaction and drainage

(typical air and water content)

- Dig a hole at least 60cm across, wide and deep. In most soils, you should see distinct layers of
  - › dark coloured topsoil;
  - › lighter 'sub-soil' with fewer organisms, and posibly;
  - › a base layer of 'bed rock'
- Bad compaction is suggested by
  - › solid lumps of soil when digging that don't break up easily;
  - › there is an impermeable layer of severely compacted soil ('pan' between top and sub soil);
  - › poor drainage.
- Poor drainage is suggested by
  - › frequent puddling when water does not drain away quickly from soil surface,
  - › stagnant smell, possibly combined with 'blue-mottling' on the soil surface or lower down.

Top tip

Visual Assessments

These assessments are also intended as simple indicators of soil health. reduce compaction and improve drainage by digging. This adds air and lets water drain. Adding organic matter also helps by improving structure.

Home-made compost

Good NPK and trace elements.
'Green waste' compost from local council has good K;N released slowly.
Typical application: Up to one wheelbarrowful per 5m^2 (3m^2 for green waste).

Animal manures

Varied; usually higher NPK than compost. Must be well rotted and from uncontaminated source (no weedkillers).
Typical application: Up to one wheelbarrowful per 10m^2 per year (20m^2 for richer poultry manure).

Leafmould (rotted leaves)

Very low NPK. Excellent for improving soil structure.
Typical application: Apply layer up to 2-3cm deep. Can be added in autumn with no danger of leaching.

Top tip

Benefits of adding organic matter

- Adds th three major nutrients plants need. These 'minerals' are nitrogen (N), phosphorous (P) and potassium (K), known as NPK. A range of 'trace' minerals are added as well (eg zinc and iron).
- The residue of organic matter ('humus') clings to soil particles, eg improving drainage in clay soils and water retention in sandy soils, plus enlarging the surface area for available plant nutrients. Also adds air, reducing soil compaction.

When: apply organic matter when plants are actively growing, usually spring and summer is best. Applying in autumn can leave surplus nutrients to wash out the soil ('leach') unless plants are growing through winter.

How much: see table for typical application. Nutrients can also leach out before they're used by plants if too much organic matter is added. This wastes valuable nutrients and can potentially pollute water courses, damaging natural ecosystems. The same applies when applying 'concentrated fertilisers' such as liquid feeds.

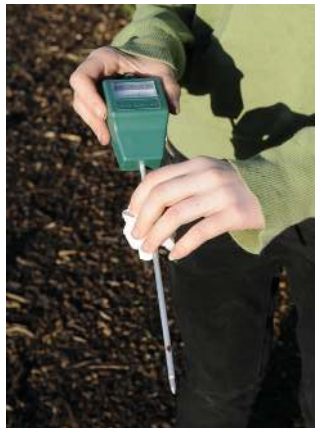
Where: apply to different areas of the garden according to their needs using crop rotation.

How to apply: Dig into the topsoil or spread over the soil surface, ie 'mulching' and 'no-dig' gardening.

d. Soil 'acidity' or 'alkalinity' (pH)

pH meter

- Insert the probe into the soil at root level (about 10cm deep). Record readings at several different locations around the growing areas. Wipe clean between uses. Follow any other manufacturers' instructions.
- Meters are usually about £10.



Top tip

Soil Acidity

The soil 'acidity' or 'alkalinity', measured on a scale of 1-14 (very acid to very alkaline; neutral pH7). Most soils are pH4-8. The majority of vegetables prefer pH6.5-7 and most fruit pH6-6.5. Some diseases like 'potato scab' are more trouble on alkaline soil while 'clubroot' in the cabbage family spreads in soil that is too acid.

Adjust pH by adding dolomite limestone (less acid) or sulphur chips (more acid). Only minor shifts in pH are possible; easier to raise pH than lower. Only alter if necessary.

pH liquid testing kit

- Take a small sample of soil from about 10cm deep and put it in the tube. Carefully open the capsule and pour the powder into the tube and add water. Shake well and allow to settle. Compare the colourof the water with the pH identification chart. Follow any other manufacturers' instructions.
- Repeat in several locations with new kit, or mix several samples together in a bucket and test this (representative) sample.
- Kits are usually about £2 each.
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