soil management

what is it?

It's ensuring that your soil is healthy and alive, with good structure and high humus content. When we grow food we break the nutrient cycle - we harvest food and take out nutrients that would have otherwise gone back to the soil. So we need to manage the soil to maintain fertility and health - get the soil right and everything else is easy. There are 3 things in the soil that require management:

- **Fertility:** providing nutrients for healthy plants
- **Structure:** a 'crumb' structure is best - lots of small crumbs that don't disintegrate or bulk together, but leave enough air gaps for the right amount of drainage and for plant roots to grow
- **Life:** look after the micro- and macro-fauna (macro you can see with the naked eye, micro you can't) and they'll provide the above 2 things

Humus (not hummus, which is something completely different) is the most important element of the soil for fertility, structure and life. It's a colloidal substance that is the product of soil fauna breaking down organic matter. Good soil should have at least a 5% humus content. Its structure allows soil to hold a lot of water and nutrients without becoming waterlogged.

Soil management is becoming more important. Many of the varieties that we grow today are a lot more demanding of nutrients than older varieties, because plants have been bred to grow as fast, as big and as high-yielding as possible. With the development of petroleum-based fertilisers, soil management was abandoned in favour of plant management, and correspondingly, non-organic soil health has deteriorated all over the world. Indigenous communities traditionally fed and looked after their soil. The 'Green Revolution' in the 1960s changed that, with a move to chemical fertilisers, pesticides, heavy machinery, an increase in average farm size and a mass exodus of people from smallholdings to urban slums.

Adding well-rotted organic matter is the best thing you can do for the health of your soil.

Straw mulch around broad beans.

There are lots of different kinds of soils, but the same strategies for soil management apply to all of them. Sandy soils suffer from too much drainage and not enough nutrient retention. Adding organic matter will allow the soil to hold water and nutrients better. With clay soils it's the opposite problem - they have high nutrient content but retain too much water. Adding organic matter will improve drainage without reducing nutrient content. Adding organic matter is in fact the most important aspect of soil management - but there are other techniques too (see 'what can I do?').

what are the benefits?

There's a fundamental difference between soil management and chemical growing approaches. If you build humus you will keep fertility locked in the soil that can be absorbed by plants as and when they need it. In contrast, synthetic fertilisers don't feed the soil, they feed the plant - which is a tricky business. Plants can be over-fed, producing tasteless food, or fed the wrong thing at the wrong time - if tomatoes are fed too much nitrogen when they're fruiting, they'll put more energy into producing leaves than fruit. But if you feed the soil, the plants will feed themselves with what they need when they need it. Managing soil looks after plants long-term rather than short-term.

Good soil management results in fewer pests and diseases, consistently higher yields, better drainage (not too much - you don't want flooding, but you don't want leaching of nutrients either), increased soil fertility and less work (you get soil organisms to look after the soil for you). It's also better for the whole ecosystem - more soil organisms and no toxins means a healthier environment for wildlife.

what can I do?

Organic matter: is the number one soil improver - compost, leaf mould, wood chip/straw or animal manures; must be fully rotted, otherwise add to the soil a year before planting. Nitrogen is used in decomposition, and if the organic matter isn't fully broken down, it will take nitrogen from the soil to do it - which is the opposite of what you want. Also, unrotted animal manures could contain pathogens. Home-made compost contains lots of micro- and macro-fauna, which eat organic matter and excrete it in a form that makes hard-to-obtain nutrients accessible to plants. Bought compost is sterilised and so there is no fauna left in it.

Dig or no dig: there are two schools of thought.

Dig: produces a uniform, well-aerated topsoil with well-spaced fauna, into which you can plant immediately. This is a good method if you have compacted soil. However, if you dig below 10cm, aerobic organisms (require oxygen) will be buried and die, and anaerobic organisms (don't like oxygen) will be exposed and die.

No-dig: organic matter is placed on soil and soil fauna take it down. Doesn't disturb soil ecology, & after a few weeks it's incorporated. If not fully rotted, it needs to be added at the start of winter, ready for planting in the spring.

Mulching: covering the soil around plants with a layer of organic matter. Stops compaction, drying and cracking of soil, plus retains moisture and provides food for soil fauna. But it provides a refuge for slugs and snails, so it's better for less vulnerable plants like trees, bushes and older plants. Not a problem in drier parts of the world.

Crop rotation: important for fertility - patches of land are planted with different crops in 4- or 5-year cycles. Year 1 - plants with short roots like lettuces or tomatoes; year 2 - plants with long roots like carrots; year 3 & 4 - short roots / long roots as well, but with plants from different families than in years 1 & 2. That way, different nutrients will be taken from the soil (and from different levels) in consecutive years, so the soil doesn't become drained of particular nutrients. Also, plants with high nutrient requirements like courgettes, tomatoes, potatoes or aubergines are followed by plants with low nutrient requirements like beans, radishes or lettuces, so that the soil isn't working too hard all the time. The 5th year can be fallow, to allow the soil to rest. You can run animals on in year 5. Chickens and ducks remove pests and pigs dig out deep roots. Animals will add fertility with their droppings. Otherwise you can just leave it and see what happens, or you can plant a:

Green manure: species with lots of foliage and thick roots to prevent weed growth and to maintain moisture / structure. Plus green manures are often 'nitrogen-fixers' - i.e. take nitrogen from the air and dump it into the soil. Legumes such as peas and beans are nitrogen-fixers, as are green manures such as clover and alfalfa. Hungarian grazing rye isn't a nitrogen-fixer, but it has a hormone on its roots that prevents weed seeds germinating. This hormone stays in the soil, but doesn't affect crops that are planted out after germinating.

Soil testing: you can use very simple tests over time to see if your soil is improving in terms of moisture content; drainage; worms per unit of area; soil structure; compaction; field capacity (how much water your soil holds when saturated); erosion (on a slope); soil horizon (thickness of topsoil); bulk density (weight of a given volume).

Things to avoid

- walking on the soil, as it damages structure
- bare soil: nutrients can leach away, rain can compact it and it can become dry & blow away
- removing weeds before you know what's going to replace them. Their roots will hold the soil in place and their leaves will shelter it
- synthetic fertilisers: cause an explosion in soil life that soon dies. They don't help to build humus, and are bad for long-term soil health
- pesticides: kill soil life, reduces the ability of soil to look after itself; also wreak havoc with bees

resources

- see lowimpact.org/soil for more info, advice, courses, links and books, including:
- Jeff Lowenfels, *Teaming with Microbes*
- Jo Readman, *Managing Soils Without Using Chemicals*
- Stu Campbell, *Mulch It!*
- Martin Crawford, *Nitrogen-fixing Plants for Temperate Climates*
- soilandhealth.org - library of e-books on soil management
- puyallup.wsu.edu/soilmgmt - good articles on soils and soil testing
- soils.org.uk – British Society of Soil Science