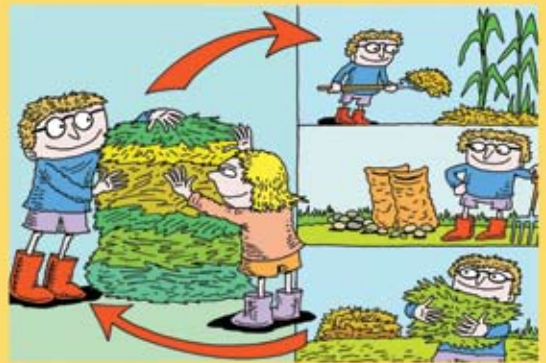




Growing Gardeners

The Fun and Science
of Organic Gardening

Dee Pignégy



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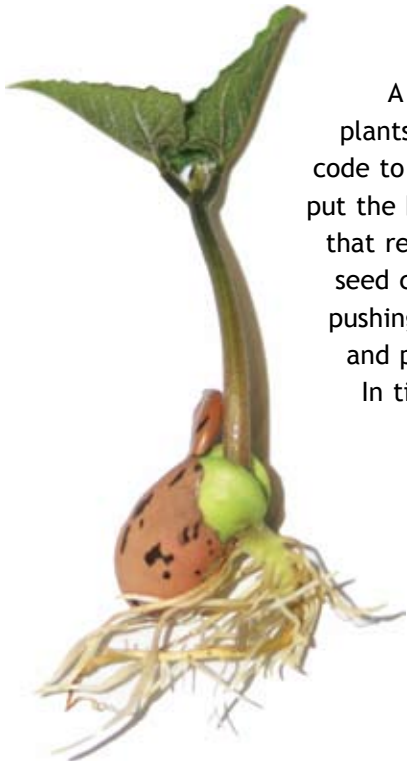
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Biological Gardening For Earth's Future

Have you ever looked at a bean? Really looked at it I mean.



A bean is a seed. It is the genetic link between generations of bean plants. The creamy white stuff inside the tough skin carries the genetic code to make a new bean plant and the energy needed for growth. If you put the bean in warm earth and water it, the water will activate enzymes that release the stored food energy and the seed will swell, bursting the seed coat. A new plant has started to grow. A tiny root grows downward pushing the seed upwards. Once the seed cap falls off small leaves open and photosynthesis begins. The tiny plant begins to make its own food. In time it will become a tall plant with leaves and pretty red flowers, and pods full of beans exactly like the one you planted.

How does this happen? How does a bean know what to do? This is one of the miracles of nature!

Another miracle of nature is a process called photosynthesis, which means “putting together with light.”

Photosynthesis is the **MOST IMPORTANT** process on earth. Without it, no living thing would exist on the land. It is how all green plants grow in the sunlight taking in carbon dioxide, using the carbon for food and giving off oxygen. So green plants grow and animals, including humans, have oxygen to breathe, as well as having all the other things that plants provide for us. Without plants and photosynthesis, we would die!

What has all this to do with organic gardening?

Everything! Organic gardening is nature's way.

Nature's way of gardening can also be called biological gardening, ecological gardening or permaculture.



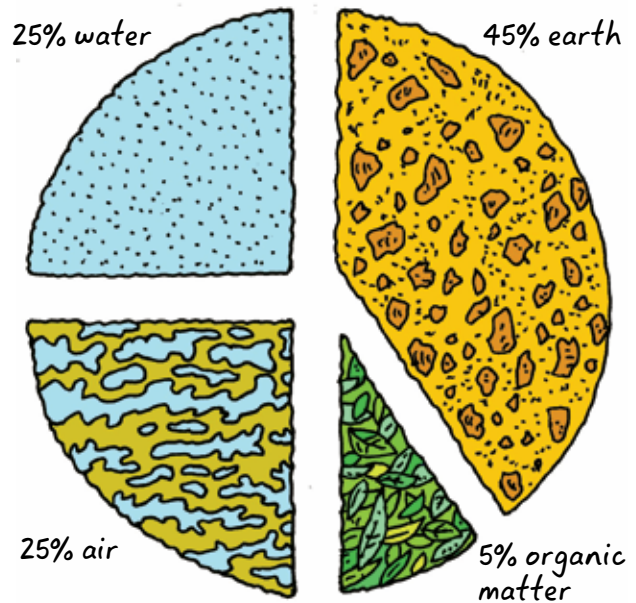
What is Soil?

We walk on soil every day, but how often do we stop to consider how important it is to life on earth. Soil is not just dirt; it is a complex and vibrant ecosystem.

It takes nature hundreds of years to build the humus-rich topsoil full of nutrients, micro-organisms and minerals that plants depend on for growth. And the plant roots hold soil in place while plant leaves shelter soil from storms and rain. Without plants to protect the soil it can be blown away during droughts or washed away in floods.

Soil is made up of:

- 25% water which dissolves and carries nutrients and minerals to plants and soil.
- 25% air which is essential for root growth and water and nutrient uptake. Without air soils tend to become alkaline.
- 45% earth, originally from weathered rock. It is made by rain, glaciers, rock slide and ice. Acids from lichens and micro-organisms eventually dissolve rock.
- 5% organic matter, the food source for all soil microbes.



The composition of soil.

Soil is the very heart of the garden. Healthy soil breathes, recycles wastes, provides support and nourishment for plants, shelters seeds, stores nutrients, renews soil fertility and cleanses water.

Soil “eats” wastes and the remains of dead animals and plants while regulating carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O).



Digging Deeper

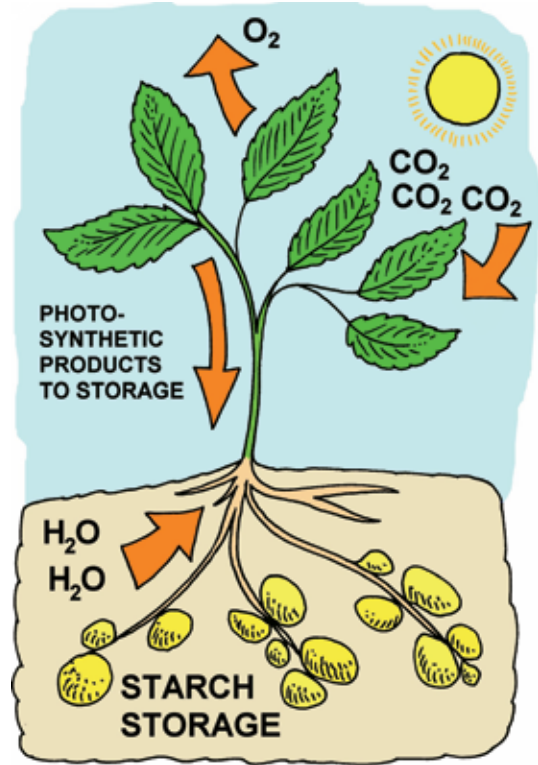
A group of bacteria called actinobacteria give soil its smell. Deep under roots they decompose dead plant and animal material. In the process they free up carbon, nitrogen and ammonia and make nutrients available for plants. They can produce antibiotics to inhibit bacterial growth. If these bacteria are not present, the earthy smell can not be detected.

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The primary source of energy that powers life on earth is the light energy from the sun. Plants are living power stations, and using the process of photosynthesis they capture light energy and turn it into chemical energy – glucose, the basis of sugars, starches and carbohydrates. Photosynthesis provides the oxygen in the air we breathe, and ultimately provides the food we eat.

Chlorophyll and carotenoids are light absorbing pigments in the chloroplasts of plant leaves that soak up the light energy allowing plants to manufacture glucose. Plants can use this glucose to make oils and when nitrogen is available they can manufacture amino acids for making proteins.

The underground tubers of the potato plant store the food the leaves have been making. Like rats and mice we steal food created by the plant.



Many other plants store starch in seeds, fruit or tubers which humans and other animals eat, including sunflowers, avocados, olives, corn and peanuts.





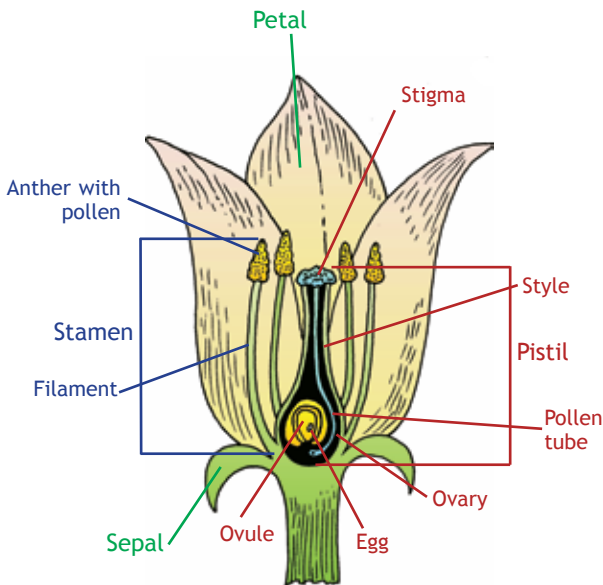
Following pollination, the Himalayan Balsam develops a seed pod which bursts open when mature, catapulting the seeds for some distance.

Sprengel's observations showed why flowers develop their smell, colour, shape and size. In 1793 he published his work, but people didn't want to believe that plants had male and female parts. His theories were overlooked until they were confirmed by the work of Charles Darwin.

Pollination



A cone flower with pollen grains clearly visible.



Parts of a flower.

Today we know that pollination is essential for life itself. Nearly 80% of the world's crop plants need to be pollinated.

Pollination, the transfer of pollen grains from the anthers to fertilise the seed producing ovaries, is a vital stage in the life cycle of flowering plants.

Pollination ensures that a plant will produce healthy fruit and a set of fertile seeds that will be able to germinate.

In an organic garden every flower is important. The carbohydrate-rich nectar powers the flight of insects while the protein-rich pollen is needed by bee larvae as well as many beetles.

Beneficial Insects

The Predator~Prey Cycle

When watching the fantail in flight capturing insects, or white-eyes scouring insects from branches or ladybugs devouring aphids you are seeing nature's predator-prey cycle in action.

Understanding the predator-prey cycle is a fundamental part of organic gardening. In the insect world each species is either predator or prey. It either eats other insects or gets eaten itself.

To see the cycle in action get to know the three P's – the pollinators, the predators and the parasites. Pollinators like bees fertilise the flowers. Predators, like ladybirds and preying mantises, eat insects for food. And the parasites use pests as nurseries for their young especially the ichneumon wasps with their sword-like ovipositors. On any day in your organic garden the three "Ps" are feeding on pests or on flower pollen and nectar.



In the cycle when prey populations are low there are few predators. When there are lots of insects to eat, the predators increase as well. When we interfere by using poisonous sprays and kill the insects eating our plants, the insect-eating predators are killed as well. Before the introduction of synthetic chemicals, nature's cycles took care of explosions of insects.

The majority of beneficial insects are attracted to umbelliferous plants with flower clusters that look like miniature flat topped parasols. The flowers of dill, fennel, coriander, lovage, carrots and Queen Anne's lace make good landing platforms and have accessible nectar.



Carrot flowers

Many insects have short tongues so these flat open flowers are perfect bug banquets. It is the larval stage of these insects that are insect eaters; the adults feed on nectar and pollen.

So plant some of the following to keep insects in your organic garden.



Plants for Beneficial Insects

- Angelica Parasitic wasps, ladybirds and lacewings.
- Borage Bees, hoverflies, beneficial wasps, ladybirds.
- Calendula Bees, beneficial insects and seeding heads for green-shield beetles.
- Cleome Green shield and bronze beetles – cleome is a sacrificial plant (trap plant).
- Dandelion Beneficial wasps.
- Dill Dill flowers attracts bees, hoverflies, beneficial wasps.
- Fennel Hoverflies and praying mantis.
- Rosemary Bees and large numbers of beneficial insects.
- Swan Plant Ladybirds to feed on aphids, parasitic wasps.
- Stinging nettles Many beneficial insects.

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Sowing Seeds Indoors

When sowing seeds indoors, you can get an earlier start. But there is less air movement so seeds can dampen off.

1. Make sure your seed trays are clean and use a seed sowing mixture. Do not use garden soil as it contains weed seeds and the nutrient levels are not high enough for quick growth.
2. Moisten the soil, then plant the seeds, and cover with newspaper. Use a pane of glass on top of the newspaper (you can also try a plastic bag or shade cloth), and put in a warm place.
3. Remove the newspaper and glass when seedlings appear. Put in the light but not direct sunlight. Water using a fine spray, but don't allow the soil to get soggy.
4. Too much water can cause the seedlings to damp off. This is caused by a fungus that kills the seedlings.
5. When seedlings start to grow their first true leaves (not the little round embryonic leaves), transplant into larger containers and put outside to harden off. Choose a warm place but not in direct sunlight. Protect the seed trays from slugs, snails and cats.
6. Soon they will be big enough to transplant into the garden.



Follow the directions on the packet and you will find that sowing seeds is easy. You might want to try sowing seeds of sugar snap peas, runner beans, beetroot, carrots, parsnips, turnips, pumpkins, radishes, sweetcorn, silverbeet, lettuces and spinach.



Digging Deeper

Fruit is a ripened ovary containing seeds. After fertilisation, the ovary swells and becomes either flesh (fruit) or hard (nuts) to protect developing seeds.

