



Gardennote

Permaculture

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Use of species diversity is a common sense approach in any permaculture garden.

The concept of Permaculture (short for permanent agriculture) was developed by Bill Mollison and David Holmgren in 1974 and has since found recognition and applications worldwide. Permaculture is a clever design approach to agriculture or gardening, which is based on the observations of natural systems. Its aim is a productive, sustainable system with minimum energy input, where the interaction of different elements (light, shade, wind, warmth, water, nutrients, plants, animals, ponds, buildings and infrastructure) is designed to give multiple benefits for efficient and sustainable living.

Permaculture is gaining popularity in suburban areas and on small landholdings. This Gardennote outlines the general principles of the concept, its usefulness to natural pest, weed and disease management and some practical hints for managing your landholding.

Design

Good planning is the first step to a permaculture system. Whether you start with a new, or already established house and garden, plan your system

to suit your lifestyle and ambitions. Your local permaculture society may be of assistance for professional advice and information material.

If designing a new house, the permaculture concept encourages 'passive solar' designs, which means a well insulated house with big windows facing north, where the active areas (living, kitchen, dining) are on the north side and the sleeping areas on the cooler south side. Eaves and slat design can enable the changing angle of the sun in summer and winter to shade the hot north side in summer but allow solar heating in winter. With this approach the addition of a thermal mass (brick or rock wall or water tanks) along the northern windows will act as heat storage and help moderate temperature changes inside.

Permaculture designs aim to integrate house and garden. Deciduous trees or vines planted on the north side of a house provide summer shade but allow the sun in during winter.

Hot and shade houses can be attached to the house for food and seedlings production, and the difference in temperature between the hot and shade house may generate an air flow which assists in climate modification in the home.

General Layout

The garden and yard layout is generally designed in zones based on intensity of use – high frequency zones are close to the house, low frequency zones are further from the house. For example a herb garden next to the kitchen provides readily available seasoning for cooking. Other elements which are visited daily like salad vegetable gardens, small perennials (herbs), certain fruit trees, fish ponds, small animals like rabbits and pigeons should be all situated close to the house. Easy access is important to enable intensive management of these elements. Other fruit trees and crops, which take longer to grow

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and use more space such as pumpkins, melons and potatoes or animals like chickens which are odorous and attract flies should be placed further from the house.

Garden structures like potting and storage sheds can be situated to provide areas of shade and shelter from the wind. To avoid winter shade, place taller (evergreen) plants on the southern side of gardens with shorter plants tapering down toward the north. Pathways, leading to the house can be lined with vegetable or herb borders.

Everything should be considered in relation to other elements, so that the influence or products of each element benefit another e.g. chickens ranging under fruit trees will eat fallen fruit, fertilise the soil and control insects and weeds.

A well designed permaculture system should be as self sustaining as possible. In a mature system, very little input should come from the outside, apart from labour, sunlight and water. Plants grow biomass which is constantly recycled via animal droppings and compost. Healthy plant growth and lots of species diversity can minimise pest and disease problems.

Permaculture elements

Garden beds

Whether your garden beds are for herbs, salads, vegetables or ornamentals, they should have periodic additions of mulch, worm casts, animal manure, compost and other organic materials to maintain soil fertility. A mature system aims for beds with well drained, thick layers of soil, rich in organic matter.



Raised garden beds with fertile, organically enriched soil are the basis for healthy plants.

To start up a garden bed, apply composted manure, and other elements if deficient like dolomite for calcium and magnesium, rock phosphate for phosphorus and trace elements. For clay soil, gypsum may help improve structure whereas for sandy soil adding some clay like bentonite can help improve texture.



Healthy plants produced in raised, fertile garden beds.

Use newspaper, cardboard or old (non-synthetic) carpet to sheet-mulch the area. This will suppress all the weeds and save digging.

On top of the sheet-mulched area apply composted manure, straw, seaweed and a cosmetic layer of mulch like woodchips, bark or sawdust. Water this patch well to break the layers down.

When planting into those beds, punch or slit a small hole into the sheet mulch and fill with fertile soil if needed.



In permaculture, trellised plants grow harmoniously with other vegetables providing shelter for beneficial organisms.

After the first season, the soil will contain worms, soil bacteria and fungi. Organic matter is periodically added in the form of composted manure and mulch. Experts suggest that plants in this system can be planted more closely and, as long as the beds are mixed with diverse plants, there is no need for rotation.

The diversity of plants in the garden beds act as host for a range of beneficial organisms (insects, frogs and birds), which is a major factor in natural pest control.

Garden beds can be built in a number of different shapes and functions as suggested in permaculture publications.

Herb spirals, narrow beds, broad beds, salad clipping beds, keyhole raised beds cater for low growing vegetables, and a vast range of trellised

beds in various shapes are for climbing, or staked vegetables such as beans, hops and tomatoes.

In windy conditions, use buildings or hardy plants to create a sheltered area. Lower growing vegetables can be sheltered with trellised climbers or Jerusalem artichokes (sun roots).

Part of the fun of permaculture gardening is to experiment and work out the right combination of plants for your situation and climate.

Hot and shade house

A greenhouse (hothouse), made of glass or clear plastic, can be used to raise seedlings in a controlled atmosphere and to grow plants which would normally not be suitable for the climate.

Attaching a greenhouse to the sun side of the house will assist with heating in winter and cooling in summer. Air vents at the roof of the green house let the hot air escape, and this can draw in cool air from a shade house attached on the shady side of the house. This process creates a cool breeze through the house which can be managed through the vents. Cover the greenhouse with a deciduous vine or shade cloth to protect the plants from excess summer heat.

A shower in the hothouse releases steam and water, which will benefit the nursed plants. This system may be connected to a grey water tank, where water can be recycled to water the rest of the block.

A shade house can be used to grow shade loving plants such as ferns, capsicum, spinach, Swiss chard, arugula (rocket), endive, radicchio and some herbs. The shade house might be covered with a permanent vine and a moist mulch layer can help generate a cooling breeze.



A garden pond shelters fish and frogs and produces food.

Grey water system

Effective grey water systems are available commercially. Grey water from the bathroom and from the laundry may be used. The kitchen sink water contains fat and solids and may block your system. Grey water should be only used for

ornamentals and fruit trees, not for vegetables because there is a small risk of contamination by harmful bacteria and fungi.

Garden pond

Garden ponds add diversity and can be made from a number of materials. They can be used to grow water chestnuts, various Asian herbs, water lilies and can harbour insect eating frogs and fish. Garden ponds can be incorporated into a greenhouse design and also benefit certain plants, which prefer high humidity. If small children are around, secure the pond with a steel-mesh cover to prevent drowning accidents.

Trees

Fruit trees, as well as ornamental trees benefit the permaculture system. While fruit trees are a source of food, ornamental trees can add landscape appeal, providing pleasure and attract a whole range of creatures like insects, spiders and birds.

Trees can be strategically placed for climate modification, providing shade and shelter from the wind. Deciduous trees planted on the sunny (northern) side will provide shade in summer and enable solar heating in winter, when the leaves have shed.



Espaliered fruit tree (Photo by Galen Parks Smith)

If space is limited, winter vegetables can be grown under deciduous trees when they are dormant.

In a small area, trees can be grown in containers and kept small via pruning. Multi-grafted trees save a lot of room. For example peaches, almonds, nectarines, apricots and plums are from a similar family so several might be grafted onto one rootstock.

Fruit trees can be pruned against a wall or fence (espalier). The advantages of espalier are easier picking, netting against birds and saving space.

Animals

Depending on your local council regulations, animals may be an essential part of the permaculture system. Check with your local council (environmental health) - suburban councils may allow chickens, ducks, pigeons, quails, rabbits, guinea pigs and bees. Semi rural councils

may allow larger animals like pigs, goats, sheep, cattle and horses. If you want to keep a sheep in your suburban block (for example to keep the grass down), special approval can be sought.

It is important that animals are properly fenced and well managed in a permaculture system and that strict hygiene and animal welfare is observed. Make sure you get your stock from reputable sources, free from pest and diseases. For example, it is not unusual that people introduce mites, lice and ticks after having purchased poultry from Sunday markets.

Animals can be incorporated into the design to convert system waste into manure, assist in pest and weed control and also produce food.

A portable rabbit or guinea pig pen near the house can be used to cut and manure your grass if shifted regularly.

Quails, which are insect eaters, can be kept in the greenhouse, as they don't damage herbs and vegetables.

Ducks eat insects, snails and slugs and can be let out in a mulched garden because they do not scratch or eat mature greens. They also eat algae in ponds and increase nutrients in the water to aid in fish production.

Bees pollinate flowers for good fruit set and produce honey. Make sure there are no allergic persons living nearby, otherwise the council will not allow bee-keeping.

Poultry is best kept away from the house in a holding pen bordered by a straw yard containing productive trees, bushes and forage plants, which should be planted before chickens are introduced. The holding pen should be fox-proof i.e. enclosed on top and dug into the ground at least ½ m into the soil. The chickens can range out into the straw yard and this yard is continually mulched with straw, sawdust, corn stalks, hedge clippings, wood shavings, small branches, pine needles, leaves, weeds and bark.

Greens, shrubs and food scraps are thrown over the fence as chicken feed.

The chicken will fertilise the fruit trees, clean up fallen fruit and control insects, especially Mediterranean fruit fly.

The straw yard can be divided into different sections, and the chickens can be rotated, to give the yard some time to recover. The straw may be raked periodically and used to make a compost heap.

The chicken tractor

This is a transportable pen containing a number of chickens, which is used before planting and after harvest to clean up and fertilise broad vegetable

beds, where a crop is harvested all at once. The 'tractor' may cover two to four square meters and gets shifted regularly.

Compost heap and worm farm

A compost heap and a worm farm are an important part of the permaculture system. All kinds of garden waste, which can't be fed to animals (onion and citrus skins, leaves, lawn clippings) should be composted. Chicken manure should also be composted before use, as it's fresh form encourages the breeding of stable flies and nutrients can easily leach into waterways.

A worm farm can be kept in a shady place near the house. Worm casts and liquid worm cast extract are the products of worms and can be used as powerful fertilisers. Gardennotes 52 and 364 have more information on these subjects.

Resources

If you are interested in learning more about permaculture, there are associations and professional consultants that can provide information and design ideas. check your yellow pages for contact numbers and addresses.

Further reading:

Compost, manure and flies, Gardennote 53, Department of Agriculture and Food

Worm Farms, Gardennote 364, Department of Agriculture and Food

Vegetable growing: A guide for home gardeners in Western Australia. http://www.agric.wa.gov.au/objtwr/imported_assets/content/hort/veg/cp/bull4629_complete.pdf

Reference:

Mollison, B. and Slay, R.M. Introduction to Permaculture, Tagari Publications

Specimen identification requirements

When sending or delivering samples, the following information is required:

- Collector's name, location (where the specimen was found), full address, telephone number and e-mail address, description of the damage and date collected.

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