

Permaculture Project Choices

Project 1: Designing a worm farm

School environments are notorious for producing large amounts of food waste. Everyday students throw food (e.g. fruit peels, apple cores, sandwiches) into the school rubbish bins. Food waste that is not recycled ends up in the landfill. Trapped in plastic bags, buried under other waste and starved of oxygen, this uneaten food is unable to recycle back into the soil. Instead, it releases harmful greenhouse gases such as methane (CH₄), which is roughly 30 times more potent as a heat trapping gas than carbon dioxide (CO₂).

To address the issue of food waste at school you could design a worm farm at your school. Worm farms can be effective at recycling many types of food scraps into reusable worm castings (worm poo). Worm castings are great for veggie gardens and indoor pot plants, often referred to as 'black gold' by permaculture gardeners. Utilising special compost worms such as red tiger worms, worm farms can recycle food scraps within three to five weeks. There is also added benefit of worm wee which is a great substitute for liquid fertiliser.

Due to the large amount of food waste schools produce, your students may need to design an area with a large number of small worm farms or design a large scale worm farm. Consider using recycled materials; polystyrene boxes and old bathtubs make great alternatives to expensive store bought ones. Make sure your worm farms are insulated, protected from rain and shielded from direct sunlight; worm farms can be located alongside or within food forests. Many food wastes are unsuitable for worm farms such as bread, sandwich meats and citrus skins. Other composting and food recycling methods would need to be designed in this area to deal with these wastes.

A good worm farm should include not only well designed worm farms but have spaces that allow the efficient collection and sorting of food waste, so that only appropriate food waste is put into worm farms. Good clear instructional signs are needed so that all users can learn and understand effective food waste recycling. Spaces are also needed for collecting and storing worm castings and worm wee.

Permaculture Principles:

- Produce no waste
- Catch and store energy
- Use small and slow solutions

Permaculture Project Choices

Project 2: Design a chook yard and house

Keeping backyard chooks is becoming increasingly popular for many people living in both rural and urban environments. Chooks make great companion animals and can be valuable additions to permaculture gardens. They can provide nourishing fresh eggs, recycle food waste into manure, mow lawns as well and keep weeds and pests under control. Many people are also keeping chooks due to concerns they have for the welfare of chickens in large scale commercial production systems.

In most places, chooks are allowed to be kept on school grounds. Schools that produce large amounts of food waste may consider chooks in addition to worm farms. Chooks not only produce eggs, but also consume a wide variety of food such as bread, sandwich meats and vegetable scraps quicker than worms. If utilised in movable pens and chicken tractors, chooks can be used to mow lawns and fertilise soil at the same time.

You could design a chook yard and house in the school. An adequate shelter should be constructed to protect chooks from poor weather and potential predators such as foxes or birds of prey. Chooks are great at escaping so you will need suitable fencing to prevent them from accessing school ovals or veggie beds.

Shade should be provided in the chook yard, particularly during the hot Australian summers. Access to sunlight is also essential in maintaining good vitamin D. Your yard will need to be large enough for chooks to perform natural behaviours such as egg laying, dust bathing, foraging and scratching.

Both your chook house and yard should be easy to clean, with deep litter in the sleeping areas. Natural wood shavings from local timber mills and timber yards make great deep litter for houses. Do not use wood shavings from the school wood working rooms as this is often too fine and could be filled with glues from MDF boards. Any old deep litter mixed in with chicken manure can be added to compost piles. When designing your chook yard, make sure you allow for an area in where you can store uneaten food scraps, deep litter materials and where you can recycle old litter. Chicken feed must be stored securely, kept dry and protected from rats (a bin with a secure lid is a great option).

Care and consideration is needed regarding the welfare of all animals kept in schools. Adequate space, access to shelter, clean drinking water and the nutritional chicken pellets are required at all times. This is also a legal requirement. You will need to spend some time finding out what the appropriate requirements are for your state (check with your local council to find out more).

Permaculture Principles:

- Obtain a yield
- Integrate don't segregate
- Use and value renewable resources and services

Permaculture Project Choices

Project 3: Design a school food forest

Many of us are interested in making more sustainable choices about our food. One way to do this is to grow your own. Foods from your own veggie garden also taste fantastic, and are a great way of introducing us to foods that we might not normally try.

Food plants can be roughly divided into two types of plants: annuals and perennials. Annuals are lowering plants that are typically planted for one season of growth, after which the plant dies. These include vegetables such as tomatoes, lettuce, cabbage and broccoli. Perennials are flowering plants that grow year after year, generally remaining dormant during the winter. They can produce fruit for many years, often decades. Perennials can survive even if neglected during the school holidays.

Perennial fruit trees are ideal for schools, as they offer an opportunity for everybody to contribute and share the produce. "Food forests" can be created by planting food-producing trees, shrubs and other plants along the boundary of the school grounds. By planting along the boundary, the forest will not interfere with other activities in the school's open spaces. Students benefit from the food forest because they can eat the produce, while the community benefits from the improved appearance of the school and surrounds. The goal of a food forest is for you to be able to harvest food grown in your own school.

You could design a food forest for your school. When designing, consider the different tree species that are suitable for the climatic conditions of your area. Consider the soil type you have on your school grounds. The soil may need to be tested for any contaminants found from previous use. Ensure you plan accordingly for the seasons and the time of fruiting. A great food forest will have some tree producing fruit at anytime of the year. Companion planting of other perennial herbs can have many positive impacts on the health of fruiting trees so be sure to research this.

Permaculture Principles:

- Obtain a yield
- Use and value the marginal
- Design from patterns to details

Permaculture Project Choices

Project 4: Design an aquaponics system

Many schools have issues with growing food on their grounds due to limited space, heavily concreted areas and poor quality soil. One way to overcome these issues is to grow food plants using an aquaponics system.

Aquaponics systems involve the feeding and growth of fish in an enclosed body of water often referred to as a fish tank. Fish are fed high protein diets to ensure they produce waste known as ammonia (NH_4). This waste material can be utilised by filtering the water through nitrifying bacteria growbeds; which will convert ammonia firstly into nitrites (NO_2) and (NO_3).

Nitrates are water soluble and can be up taken by plants through their roots. Food plants can be grown in these bacterial growbeds. Once plants are removed to be eaten, the excess nitrogen is removed from the aquaponics system. Clean water is then cycled back into the fish tank to start the whole process again. The benefit of aquaponics is that you can grow food without soil. This can be an extremely water efficient method to grow food as you are continuously recycling water through the system. Leafy green edible plants often grow more quickly in such systems.

If you decide to design an aquaponics system, you will need to ensure:

- You have access to water and power to maintain the system pumps.
- The area is suitably fenced so that young children cannot access the water.
- Fish are protected from predators.
- You choose your fish and/or yabby species carefully as climatic conditions will determine which species are suitable and at what times of year.

Permaculture Principles:

- Obtain a yield
- Use and value renewable resources and services
 - Apply self regulation and accept feedback
 - Produce no waste

Permaculture Project Choices

Project 5: Design a native habitat garden

Permaculture gardens are not only about designing food production systems for humans. Good permaculture gardens are designed to integrate wild animals and plants. A biologically diverse garden is more likely to be a healthy garden and more able to withstand changes in climatic conditions. It will also provide shelter and food for native animals, while supporting pest control and pollination.

Flowering shrubs and plants which don't provide much food for humans are often essential habitat for pollinators such as native bees. Areas of the school which with poor soil or those that are exposed to high winds and harsh afternoon sun may be not suitable for planting vegetable gardens or food forests; however these areas may support habitat gardens using a combination of native and introduced flowering perennial shrubs. These would then attract and support native pollinators that are essential for increasing the production of fruits and seeds.

Shady corners of the school may be best used for native gardens that also incorporate small frog ponds and ground habitat. These can be created using recycled materials like childrens seashell play pools and bathtubs, and such ponds provide water to insects, birds, lizards and frogs during times of heat and dry. These animals can play important roles in the management of pests in the school grounds, for example, frogs like to eat the american cockroach often seen in school grounds, while lizards such as blue tongues love to eat snails and slugs.

When designing a native school garden at your school, take the time to research what animals and native plants may be found within your school ground. Walk around and observe the animals you see and hear. Early before school is often the best time to observe birds and insects feeding. Also consider interviewing your school gardener, groundkeeper and farmhand if your school has one, as they will regularly observe the animals found at your school. Your local council is also a great resource for native plant and animal species that should be found in your area.

Permaculture Principles:

- Observe and interact
- Integrate don't segregate
- Use and value diversity

Permaculture Project Choices

Project 6: Design a herb/vegetable garden

When most of us think of permaculture gardens we think of gardens filled with organically grown vegetables. Nothing beats biting into a carrot you grew yourself or cooking with fresh tomatoes off the vine. Designing a herb or vegetable garden at school is a great way to learn the skills necessary to produce your own food at home. You can also provide fresh herbs and vegetables for cooking classes.

You could design a large scale garden as a class or design smaller sections within a garden. Consider the following:

- Think of recycled materials that could be used to construct garden beds and hold soil.
- What type of irrigation will you use? Herbs and vegetables have shallow roots so they require more watering than large shrubs and trees. If you rely on hand watering often people will forget and become too busy resulting in dead plants. Plan and design your irrigation well.
- Think about what pests may be present at your school and what plants they prefer to eat. Are there natural pest control methods you could use to combat these pests? Strawberries for example may be best grown in vertical gardens off the ground and protected from birds and rats with netting. If space is limited at your school look for sunlight walls facing north that may be suitable for vertical gardens.
- Think carefully about what herbs and vegetables are suitable for the climatic region your school is located. Sometimes it is best to focus on fewer plant species and make sure you look after them well rather than focus on a huge variety. Think about what structures may need to be built in order to allow your vegetables to grow. For example, tomatoes and cucumbers are vines so will need climbing structures in which to grow.

Permaculture Principles:

- Obtain a yield
- Apply self regulation and accept feedback
- Creatively use and respond to change
- Design from patterns to details