PERMACULTURE DESIGN

For Urban Balcony

10/6/2014
UNDER THE CHOKO TREE
Nevin Sweeney

Ethics and Goals

The following ethics and goals underpin the work that we do in and around the balcony garden.

Balcony Garden Ethics

1. We grow food using organic gardening principles
2. We eat everything we grow
3. We use recycled materials where possible

Our Goals

- Grow as much food as we can

What is Permaculture?

“Permaculture is a design system for creating sustainable human environments. The word itself is a contraction of not only permanent agriculture but also of permanent culture as cultures cannot survive without a sustainable agricultural base and land use ethic”.

From “Introduction to Permaculture” by Bill Mollison with Remy Mia Slay

Permaculture is not just for large scale agricultural concerns, however and translates equally well from balcony through back yard and acre block to full scale agriculture equally well, the ethics and principles apply at all levels.

Permaculture Zones Explained -

Zone 0 – In urban Permaculture this is usually the house or dwelling but in this case it is the school building which is to be turned into a room for cooking and processing the products of the Permaculture garden.

Zone 1 – this is the vegetable garden which is intensively cultivated and is likely to need the most intervention in the form of watering, weeding and harvesting etc and so is placed closest to zone 0

Zone 2 – this zone contains the closely planted and somewhat intensive fruit orchard which is also close to zone 0 but requires less intervention than the veggie production area.

Zone 3 – is the farming zone where commercial crops are grown and animal forage systems are used such as organic orchard, nut forest or extensive organic poultry system, or even cereal production or sheep or goats could be raised here.

Zone 4 – is the harvest forest where long term tree species are grown to produce firewood, mulch or timber to be used for sustainable building, complementary grazing animals can also share this zone at low stocking rates.

Zone 5 – is the indigenous conservation zone where plants native to the region are allowed to regrow into what would become natural forest.

In reality, the balcony garden will only be able to provide zone 1 elements although membership of a community garden or being given access to offsite land in the form of friends’ or relatives’ backyards could allow some zone 2 elements as well.

Balcony Permaculture Assessment

The balcony was assessed on the 6th of October 2014 using the Balcony Edible Garden Assessment Form by the author of this plan.

The balcony is on the first floor of an apartment complex located on Arthur Street, Homebush and has a usable area of just over 12m^2. The brick walls of the building form three sides of the balcony with a full brick wall on the open side rising to 1100mm. While the brick walls appear to provide area for fixing vertical gardens etc. to, the strata management may not allow holes to be drilled into walls or the balcony roof and so the construction of support frameworks may be required.

The floor of the balcony is tiles over concrete. There is a drain at the southern end of the balcony but no separate water supply on the balcony so any water will need to be transported from the kitchen, just inside the balcony doors. There is no access to stormwater downpipes.

The balcony faces slightly east of north so that good sunshine can be guaranteed in all seasons. There is a tree which provides some shade at the eastern end of the balcony, but even taking this into account there should be sufficient sunlight to grow most plants required. The balcony wall itself also provides some shade because it is unbroken brick, but this will be more of an issue in winter than summer.

One of the issues currently facing the owners are their two cats which have a tendency to use the pots and other growing containers as toilets and for digging practice. Also, the balcony is currently quite crowded with 2 trugs, a small greenhouse, gas BBQ, a series of self-watering pots including one large (560mm diameter) pot used to grow potatoes. There is also a table and chairs against the balcony wall and an egg chair in the north western corner of the balcony.

The Permaculture Design

The area we have to work with is fairly small (as are most balconies) and is currently somewhat crowded. To get the most out of the available area it will need to be revised and some fittings in currently place removed for storage elsewhere. Even with this in mind it will be important for some elements such as the table and chairs to remain in place so that amenity of the area is maintained.

The design is broken up into a number of elements under the following headings –

1. Food

1.1 Trugs x 2
1.2 Fruit tree
1.3 Potato Pot
1.4 Self-Watering Container Area
1.5 Mini-greenhouse
1.6 Table & Chairs
1.7 BBQ
1.8 Strawberry tower
1.9 Hedge area
1.10 Hanging baskets
1.11 Vertical Gardens
1.12 Sprouts
1.13 Microgreens

2. Water

2.1 Water Garden

3. Energy

3.1 Solar lights
3.2 Rocket Stove
3.3 Stored heat cooker

4. Waste

4.1 Bokashi bin
4.2 Worm Farm

5. Managing Cats

Element 1 - Food

The first element in this permaculture design is the provision of food. This design uses a number different elements to produce food in a small area. This requires maximum use of space in a balcony this small.

Sub-Element 1.1 - Trugs

Description

These are two 1000mm wide x 760mm deep x 800mm high wooden structures that are designed for growing vegetables. They are deep enough to allow a variety of vegetables to be grown including the larger types like zucchini. They are currently fitted with translucent covers which act like a greenhouse, but reduce the amount of light getting to the bed. These are more for use in the colder weather. The growing medium also needs to be assessed and amended or replaced.

Features

- Grows vegetables
- Can have a trellis fitted to the back for vertical growing
- Provides shade for worm farm
- Provides cover for water garden

Plan details

1. Already in place (see “managing cats)

Plant list

Lettice, spinach/silver beet, tomato, cucumber, peas, beans, snowpeas, zucchini, carrots, cabbage, kale broccoli

Element 1.2 – Fruit tree

Description

A large pot (50-60cm diameter) placed on a 750mm x 1500mm recycled wooden structure to raise it up so it can get more sun. It will be sited next to the potato pot.

Features

- Provides area for growing fruit.
- Shallow rooted crops or herbs can be planted around the top of the pot
- Can provide structure to grow climbers up once established
- Structure underneath provides storage area

Plan details

1. Buy in or recycle the required pot,
2. Fill with potting mix designed to be light, containing cocopeat, vermiculite and/or perlite

3. Plant required tree, cover with potting mix and mulch
4. Plant any accessory plants

Plant list

Tree: dwarf citrus, fig, olive, blueberries
Accessory plants: strawberry, dwarf or climbing beans or peas, herbs

Element 1.3 – Potato Pot

Description

A large pot (50-60cm diameter) or grow bag placed on a 750mm x 1500mm recycled wooden structure to raise it up so it can get more sun. It will be sited next to the fruit tree pot.

Features

- Provides area for growing potatoes
- Structure underneath provides storage area

Plan details

1. Obtain pot or grow bag
2. Fill with potting mix to approximately half full
3. Plant seed potatoes (2-4)
4. When seed potatoes have sent up haulms, place more potting mix in the grow bag or pot
5. Repeat until pot or bag is full
6. Allow potato to grow until haulms die down and harvest mature potatoes

Plant list

Potato

Element 1.4 – Self Watering Container Area

Description

This is a wooden structure built from recycled materials as much as possible. It 875mm deep x 1500mm wide x 600mm high on the top area, 300mm high at the step down. It is designed to take 4 x 37 litre self-watering rectangular containers on the highest platform area and 2 x 20 litre self-watering containers based on recycled 20 litre buckets in the step down area.

Features

- Vegetable growing area
- Self-watering so needs less maintenance than other containers
- Structure opens to provide storage underneath

Plan details

1. Obtain raw materials: rectangular containers x 4; 20 litre recycled buckets x 10, timber and sheeting to cover the required area
2. Build stepped structure to take self-watering pots, include hinged door in the side facing the main doorway
3. Construct the required self-watering pots
4. Place on the structure and fill with growing medium and water
5. Plant out with required vegetables and mulch

Plant list

Carrots, tomatoes, cucumber, peas, beans, cabbage, kale, broccoli, herbs

Element 1.5 – Mini-greenhouse

Description

This is a steel tube and plastic connector structure covered by a clear plastic envelope, it is used to raise seedlings and is currently in place.

Features

- Provides area for raising seedlings which will be grown on in the other containers
- Provides an area for growing microgreens

Plan details

No construction requirements, structure is already in place, but may require the design and construction of a shadecloth cover for summer seed raising requirements.

Plant list

Any and all except potatoes and any root crops

Element 1.6 & 1.7 – Table and chairs and gas BBQ

Description

These amenity structures are already in place. Folding wooden table with 2 chairs and a gas fired BBQ with stand.

Features

- Table and chairs allow area to be enjoyed by owners
- Table provides ideal surface for sowing into punnets, potting on and general garden work
- BBQ allows for off-grid cooking

Plan details

Structures existing, no changes required

Plant list

Nil

Element 1.8 – Strawberry Tower

Description

Approximately 60 litre recycled plastic container has hollows fashioned in it to take plants, are filled with growing medium and planted out. The growing plants trail down the side of the tower improving the aesthetics of the area. A central worm cylinder can be included. Other edible plants can be grown in the top of the container or more strawberries put in. Some strawberry spaces could be taken up with edible flowers.

Features

- Keep strawberries off the ground and result in improved fruit
- The towers can be painted and decorated
- Worm cylinder allows the strawberries to be fertilised directly with vegetable waste.
- Edible flowers provide extra food source and improve amenity of the balcony.
- Rotates manually to ensure plants get sun.
- Underneath area provides area for bokashi bin

Construction Details

1. Obtain the recycled 60 litre bucket
2. Mark out where the plants are to be accommodated and then drill through at each point with a drill and 50mm hole saw.
3. Place wire mesh or tubing in the centre for worms and fill with growing medium
4. Place pot on stand and lazy Susan bearing, rotate as required to ensure all plants get sun

Plant list

Strawberries; nasturtiums; anise hyssop; rocket; chamomile; chrysanthemum; calendula; marigold; dianthus; violas, pansy; violets

Element 1.9 – Hedge Area

Description

The top of the balcony outer wall is a full brick (230mm) wide. This will allow the construction of a railing to be constructed and slipped over the wall and a series of herbs installed in troughs and self-watering containers. The railing will be constructed with recycled timber where possible and slip over the bricks so that it will not need to be fixed to the structure.

Features

- Lavender in the hedge acts to attract bees
- The hedge acts as a windbreak to reduce damage to vegetables
- Allows herbs to be grown for amenity and use.

Plan details

1. Obtain timber to construct railing and construct so that timbers slide down each site to provide stability to prevent pots or troughs falling off.
2. Build and place railing
3. Review existing self-watering pots and select those required for the hedge area,
4. Fill with growing medium and plant herbs
5. Install pots and troughs

Plant list

Lavender, rosemary, oregano, lemongrass, chives, sage, parsley, thyme

Element 1.10 – Hanging Baskets

Description

Hanging baskets make use of vertical space for growing plants which weep down over the side to provide a harvest. They should be self-watering to reduce issues with drying out and sufficient chain provided such that they are at a reasonable level for harvesting. They can be supported by drilling hooks into the balcony roof or, where this is not practical, hung from a constructed wooden overhead support.

Features

- Provides space for trailing vegetables
- Reduces heat reaching the balcony, keeping the area cooler in summer

Plan details

1. Obtain 5 or 6 hanging baskets, self-watering where possible,
2. Drill in supports or construct wooden framework braced back to the walls of the balcony
3. Fill baskets with potting mix and water retaining granules
4. Plant vegetables and herbs and mulch well

Plant list

Cherry tomatoes, strawberries, nasturtiums, herbs

Element 1.11 – Vertical Gardens

Description

Vertical gardens are tubes of varying lengths, secured to the east and west walls horizontally with holes cut to accept pots which can be used for growing edible flowers or herbs

Features

- Provide growing space for vegetables and herbs
- Absorbs some solar radiation falling on the walls, keeping the area cooler
- Improves the look of bare walls

Plan details

1. Obtain pipes, endcaps and brackets.
2. Cut appropriate sized holes in the top of the pipe to fit the intended pots.
3. Fit brackets directly to the wall if possible or build a framework to support the pipes horizontally.
4. Place the end caps on each end of each tube and mount the tubes in the brackets.
5. Fill the required pots with growing medium and plant out with plants.
6. Pour water so that the level is 12mm to 25mm up pots and place the pots in the tube

Plant list

Spring onions, lettuce, Asian greens, herbs, cherry tomatoes, cucumber

Element 1.12 – Sprouts

Description

Sprouts can be grown using a number of techniques that do not require direct sunlight, soil or much water or growing space.

Features

- Provide fresh vegetables without taking up growing room on the balcony

Plan details

1. Obtain one (or several) glass jars and filter material such as pantyhose and a thick rubber band per jar.
2. Place a dessert spoon of required seed into the jar, cover the top of the jar with panty hose or similar material and secure with rubber band.
3. Half fill the jar with water leave overnight
4. Empty the jar the next morning, rinse and leave the jar on it side to drain
5. Repeat morning and night for 5 – 7 days
6. Remove grown sprouts form the sprouter, they are ready for use and can be kept in the refrigerator for up to a week.

Plant list

alfalfa, clover, fenugreek, lentil, pea, chickpea, mung bean, oat, wheat, maize (corn), rice, barley, rye, broccoli, cabbage, watercress, mustard, mizuna, radish, and daikon, rocket, tatsoi, turnip, onion, leek, spinach, lettuce.

Element 1.12 – Microgreens

Description

Microgreens are plants which are grown in the mini-greenhouse and are harvested at an immature stage and can be included in salads, they do not require much space but do need light and soil.

Features

- Provide fresh vegetables taking up only a small amount of growing room on the balcony

Plan details

1. Obtain a 290mm x 350mm seedling tray, fill with growing medium and compress.
2. Wash seeds and soak from 4 to 8 hrs before sowing
3. Sow thickly with desired seed or mixture of seed, compress again to ensure good soil/seed contact and cover with a thin layer of growing medium or newspaper, cloth etc
4. Water thoroughly or place on a capillary bed
5. Water regularly until seed is germinated and remove cover if used
6. Harvest with scissors in 10 -14 days at at least 4 leaf stage.

Plant list

alfalfa, clover, fenugreek, lentil, pea, chickpea, mung bean, oat, wheat, maize (corn), rice, barley, rye, broccoli, cabbage, watercress, mustard, mizuna, radish, and daikon, rocket, tatsoi, turnip, onion, leek, spinach, lettuce.

Element 2 – Water

Unfortunately there are no water sources in the area which can be tapped, there are no accessible rainwater downspouts and the only tap available close by is in the kitchen. There does not seem to be much point in taking up space on the balcony with a water barrel when it would only contain towns water which would have to be transferred from the tap in the kitchen.

Element 2.1 – Water Garden

Description

The water garden consists of a large tub or sunk set up under the inner trug. It will be filled with water and contain goldfish to control mosquito larvae.

Features

- Provide a space to grow water vegetables such as water chestnuts, arrow leaf or kang kong
- The water helps reduce temperature swings and increases humidity in the area
- Water plants such as azolla can be grown on the water surface, they grow quite quickly and can be regularly harvested to provide a high nitrogen mulch for container plants
- The goldfish manure provides nutrients in the water which not only support the water plants but can be used to fertilise container grown vegetables by regularly withdrawing 30% of the water then refilling the pond with fresh
- A fishpond is a fascinating hobby and this is a low maintenance way to do it.

Plan details

1. Construct a timber frame to support the tub or sink and make sure any drain holes are plugged.
2. Secure under the trug.
3. Place a layer of gravel 25-50mm thick on the bottom of the tub.
4. Fill with water.
5. Place pots filled with potting mix containing the plants to be grown into the water and add a layer of gravel to the top of the pots.
6. Add goldfish by floating the plastic bag they came in on top of the water for 30 minutes, then pouring them into the tub.
7. Place azolla on top of the water surface

Plant list

Water chestnuts, arrow leaf, kang kong, lotus, azolla.

Element 3 – Energy

Without access to a crawl way in the roof or under the floor it is difficult to run wiring for an alternative energy system. There are a number of sub-elements which can, however, operate in a self-contained way and reduce the requirements for energy to be drawn from the reticulated system.

Element 3.1 – Solar lighting

Description

There are a number of self-contained solar panel/rechargeable battery/light units available, usually quite cheaply, from hardware or specialty suppliers. One has about 1.8 metres of electrical cord between the small solar panel and the battery and light unit enabling the panel to be mounted in the sun and the light to be mounted inside where it is required. All other units are totally self-contained and require being left in the sun to charge before use.

Features

- Provide free light for use instead of 240v electric lighting

Plan details

1. Identify an area on the balcony which gets enough sun to allow the various solar panels to be charged
2. If required construct a platform which has a place for all the panels and keeps them at the required angle to the sun.

Plant list

Nil

Element 3.2 – Rocket Stove

Description

The rocket stove is composed of an L-shaped combustion chamber inside container of fireproof insulating material. The stove uses twigs and small branches to generate heat which is contained by the insulating material and focussed on the bottom of the cooking container by the upward draft from the combustion chamber.

Features

- Allows food to be cooked with the minimum of found fuel
- Provides ash for use as a fertliser

Plan details

1. Obtain a 20 litre steel container with a lid
2. Obtain some steel tubing to act as the combustion chamber

3. Cut a hole in the centre of the lid and at the side of the bottom of the container the same size as the diameter of the combustion chamber tubing
4. Cut the tubing into 2 lengths and make the L-shaped combustion chamber
5. Install the combustion chamber in the outer container
6. Fill the outer container with perlite insulation

Element 3.3 – Stored Heat Cooker

Description

The stored heat cooker is an ottoman which has had polystyrene insulation built up inside it around a pot, and an insulating cushion for placing in top of the pot before the top of the ottoman is in place. The ottoman can be used as furniture and used as a stored heat cooker.

Features

- Can be used a s a footstool
- Can be used to cook food using stored heat
- Can be used to make yogurt
- Can be used to keep food cool

Plan details

1. The ottoman is already in place and no changes are required

Element 4 – Waste

Putrescible waste like veggie scraps can be turned into valuable fertiliser for use in the garden. Not only does this mean that a resource is recovered, it prevents material going to land fill which, if not properly treated will evolve methane gas during its decomposition. Methane is a much more potent greenhouse gas than carbon dioxide.

Element 4.1 – Bokashi Bucket

Description

The bokashi bucket uses effective microorganisms to ferment vegetable and food waste but can also take meat. The material can then be put into the worm farm or incorporated directly into the soil to improve fertility. The bucket is set up such that any liquid expressed from the waste can be gathered and used as a fertiliser as well.

Features

- Prevents putrescible waste going to landfill
- Provides material which can be used to increase fertility in the soil
- Does not produce objectionable smells
- Provides fluid which can be used as liquid manure

Plan details

1. Obtain 2 x 20 litre recycled buckets
2. Drill holes in the bottom of the inner one
3. Drill a 20mm hole in the outer one and install a tap
4. Cut the inner part out of one of the bucket lids, screw in a cross of wood to enable the lid to be used to apply pressure to the waste in the bokashi bin
5. Obtain some bokashi material and it is ready for use.

Element 4.2 – Worm Farm

Description

The worm farm can be either a commercial one or made from two polystyrene boxes. It will be installed under the outer trug so that it is in the shade which will keep the worm farm cooler and reduce the light falling on it.

Features

- Prevents putrescible waste going to landfill
- Provides material which can be used to increase fertility in the soil
- Provides material which can be used to make seed raising mixture
- Can provide worms to feed fish

Plan Details

1. Obtain rectangular commercial worm farm
2. Set up in accordance with manufacturer's instructions
3. Place on bricks under trug

Dealing with Cats

In this particular garden the most troublesome pest is cats, who have a tendency to pee on, crap on, lie on and dig out the plants the owners wish to grow for food. There are a number of possible strategies for dealing with these furry inconveniences –

Barriers – Placing a barrier around at least some of the garden will reduce the effect of the cats. Chicken wire and supports protecting the trugs and the self-watering pot area are worthwhile considering. Some chicken wire around the pond would be also worthwhile to prevent the cats going fishing.

There are also electric fences (static operated) which can keep cats out of the area.

Repellents – There are mechanical devices available on the market which sense movement and provide a spray of water or sound to repel the cat. Other options are to spray repellents like lavender, cinnamon and rosemary water extract; lemon and eucalyptus water extract or black pepper water extract. Bottles of ammonia in the area you wish to keep the cats out of can also work.

References

The Permaculture Home Garden – Linda Woodrow – Viking/Penguin Books(AUS) 1996

Earth Users Guide to Permaculture – Rosemary Morrow – Kangaroo Press (AUS) 2006

Introduction to Permaculture – Bill Mollison with Reny Mia Slay – Tagari Publications (AUS) 1991

The Edible Balcony – Indira Naidoo – Penguin (AUS) 2011

The Edible Balcony – Alex Mitchell – Kyle Cathie Ltd (UK) 2011

Permaculture in Pots – Juliet Kemp – Permanent Publications (UK) 2012

Appendix 1 – planting calendar

Month	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug
Beans - Climbing/dwarf												
Broccoli												
Cabbage												
Carrots												
cucumber												
Kale												
Lettuce												
Peas												
Snowpeas												
Potato												
silver beet												
Tomato												
zucchini												