

THE KOANGA INSTITUTE FOREST GARDENS BOOKLET

KAY'S
PEACH
GUILD



GOURI

PERENNIAL LUPINS
UDO

ALFALFA

WISTERIA
HONEYWORT

ECHINUM

COMFREN

ROSA RUGOSA

KAY BAXTER

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PREFACE

Design for Home Gardeners

The information in this booklet is gleaned from our own and others' experience over many years, and we are including only information that we consider to be relevant specifically to home gardeners wanting to grow as much of their fruit, nuts and nutrition generally from a small backyard area up to perhaps an acre or so. If you are looking at larger areas than that, you may need a larger version of the data bases to work with. They can be found on our website on

<http://www.koanga.org.nz/knowledgebase/fruit-tree-knowledge/>

Design for Human Nutrition

We are designing our Forest Gardens as key and critical parts of our food supply. I understand that humans, just like plants, have nutrient budgets! We actually need certain levels of minerals and vitamins on a daily basis. The result of not ensuring those levels is slow degrading of our health and expression of our DNA now and in future generations. For this reason we have a range of poultry in our forest garden.

Poultry and animals in general are able to supply us with several key nutrients unavailable from plant sources. Poultry are easily included, however it will mean designing the ground cover plants used carefully so they are not destroyed by the poultry, and they support the poultry. It also means choosing your nitrogen fixers and mineral accumulators carefully so that they supply the poultry with key parts of their nutrient needs as well! I notice that all of the major books written so far about designing Forest Gardens do not include animals or design for animals, and I think quite a few of the plants chosen as ground covers will not work with animals present. We are specifically focusing on systems that could include chickens, ducks, geese, and muscovies.

For more information on designing spaces and diets to meet our human nutritional needs see our Koanga Urban Garden Design Booklet. This Forest Garden Booklet has been written to complement our best seller Design Your Own Orchard, we recommend you use it with this booklet.

DESIGN YOUR OWN FOREST GARDEN

INTRODUCTION

We have had over 30 years experience at designing, planting and managing permaculture style temperate/Mediterranean climate orchards using a diverse ground cover (herbal ley), and the hedgerow/shelter around the orchard as the main support for the fruiting trees and animals in the orchard.

I became increasingly aware whilst trying to maintain a herbal ley on heavy clay soil in Northland that it was not a sustainable option. The clay soil made establishing and maintaining herbal ley difficult, and after all that work I felt as though the trees only produced well if they were also fertilised. The theory was great, but I think especially on clay soil, the design needed further developing to become a sustainable option.

By the time I left Northland, I felt that using trees rather than a dense herbal ley sward was always going to be a better option, and was looking at how to do that. Forest Gardens were meanwhile becoming the 'in thing' and I put some energy into understanding just what a Forest Garden is. How is it different to an orchard? What are the main differences?

We watched Geoff Lawton's *Food Forest DVD*, I spent time in his Food Forests in Australia and Jordan, and we have read both Martin Crawford's *Creating a Forest Garden* and Dave Jacke's and Eric Toesemeyer's outstanding *Edible Forest Gardens* books... I had had the privilege of spending a couple of weeks in a 2000 year old food forest in Vanuatu, 10 years ago with Trish Allen.

We have the feeling, we're getting the idea... and the pattern language of forest gardens is exciting!

DEFINITION OF A FOREST GARDEN

In a Forest Garden a diverse range of vines, trees, bushes, shrubs, and ground covers are planted specifically to create a diverse and integrated system that will require little input from outside and will regenerate the soil and grow high quality fruit, chicken/poultry feed, mushrooms, firewood, garden stakes, etc.

In permaculture orchards, where the canopy coverage of the heavy feeding species is mostly 80% or more, we often use the ground cover as the sole medium to create diversity and nutrient maintenance... it now seems as though it actually takes all 7 layers of the forest to maintain nutrients in the nutrient cycle.

Basically the idea is that the nutrients, the minerals that give life to growth, are constantly being grabbed by the humus, microbes and tree roots in the soil, and travel to and are deposited in the leaves of our trees during the photosynthesis process. From there the leaves drop to the ground and decompose or are decomposed by the myriad of decomposers there to do the trick, are grabbed by the humus/carbon in the soil and made available again to come back up into the trees.

The more layers of roots in the ground, the more diversity there is of root species, the more likely the minerals will be grabbed by the microbes, the humus and then the tree roots, and returned to the bio mass above the ground.

The minerals are also highly soluble even once deposited in tree leaves and can wash out and back to the ground in rain and mist, so the more layers of leaves there are to halt the fall, pick up and absorb the minerals, the longer it takes for them to reach the ground and the more likely they will be held in the cycle.

The more layers of leaves above ground the more stable the system, the more layers of roots below ground the more stable the system... the more diverse the range of plants is, the more we are likely to be able to provide the right minerals in the right relationships that each tree needs to reach its potential. Each species has certain minerals it accumulates, each species has its part to play in providing for another's mineral needs.

The 7 layers of a Forest Garden are:

- Medium to large canopy trees (over about 10m high). In small Forest gardens this canopy may not exist, or only a very few trees of this height that are coppiced perhaps
- Small trees and large shrubs (4-9 m high)
- Shrubs (up to 4m)
- Herbaceous perennials and evergreen plants (up to 3m)
- Groundcover plants and creepers
- Climbers
- Underground (root crops)

Essentially the more diverse and the ‘wilder’ our system is, the less energy it will take to maintain. The more resilient, the higher the diversity, the higher the potential for interconnectedness, the lower the maintenance requirements, the lower the greenhouse emissions. The more cultivated our systems are, the more energy they take to maintain etc etc.

Martin Crawford and Eric Toensmeyer, also show through a study of the pattern language of Forests, that a maximum of 60% of the forest canopy can be what are classed heavy feeders (i.e. apples, plums, apricots, pears etc.) all those trees we regard as orchard fruit trees, if we wish to create something that will be sustainable.

The remaining area of canopy must be a diverse mix of legumes and mineral accumulators, including a range of trees that provide highly edible parts but are not gross feeders, to make up the 7 layers. In order to get maximum diversity in all the layers it is vital to know which trees, shrubs etc. are shade tolerant and which need full sun and every other possibility. Having a good data base to work with is key to this process!

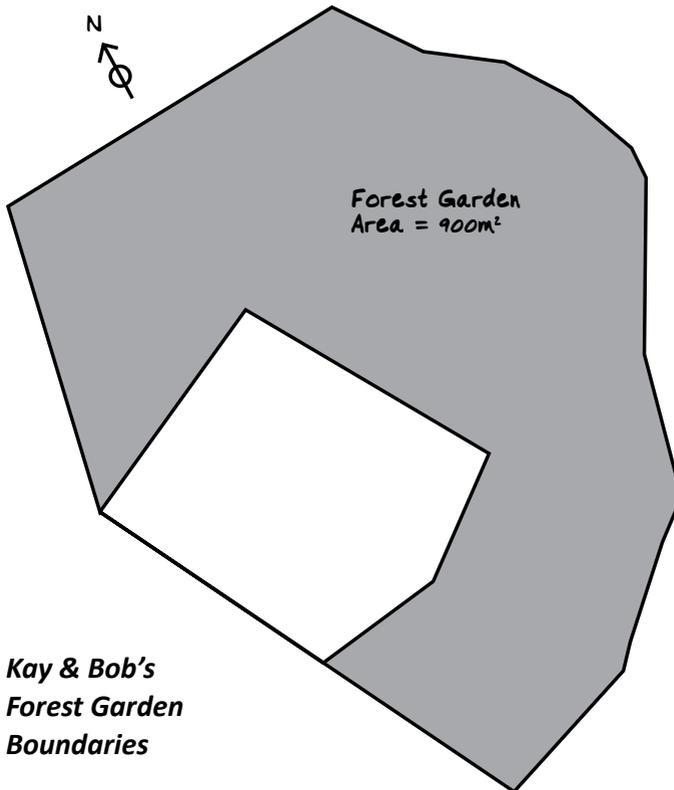
KEYS TO DESIGNING A SUCCESSFUL FOREST GARDEN

- a) 60% maximum of the canopy area can be occupied by heavy feeding, heavy producers, e.g. apples, pears, plums, peaches etc. I prefer to go for 50% which gives us more flexibility with other species.
- b) All 7 possible layers (tall canopy, large trees, medium trees, shrubs, low bushes, perennials, ground cover, roots, vines) of the forest must be present and functional to maintain the nutrient cycle.
- c) These trees must include enough legumes and mineral accumulators to provide for the nutrient needs of the heavy feeding trees. As a rough guide and example Martin Crawford says for each large heavy feeding fruiting tree (e.g. an apple) you will need 1 x 5m alder planted on the South side of the tree to supply its nitrogen needs, and comfrey planted around the feeder root zone will supply the potassium needed etc. Just as in designing a human diet, Vitamin A and available calcium seem to be the two key nutrients to focus on, in plant budgets we find if we can provide for the nitrogen and potassium, the other minerals will take care of themselves provided we plant following the above principles. If we begin with unbalanced demineralised soils we will achieve healthy trees and growth far faster if we also supply balanced minerals to start the process off. Different plants and shrubs and trees supply different minerals and nutrients. This information is included in our Food Forest data base.
- d) We must go for maximum diversity, maximum interconnections, maximum 'wildness', using all the sunshine as it enters the system, but being very clear that some trees need full sun to fruit well.
- e) It is one thing to 'get' the idea, another to do a design and plant and maintain it, especially when the examples we have and the books are all written in other lands! We need to know the trees in our own soils and climate zones that we can use to plant the layers in the forest garden, and we also need to know enough about these trees to ensure we plant them in the right places.

FOLLOW THE STEPS TO DESIGN YOUR OWN FOREST GARDEN

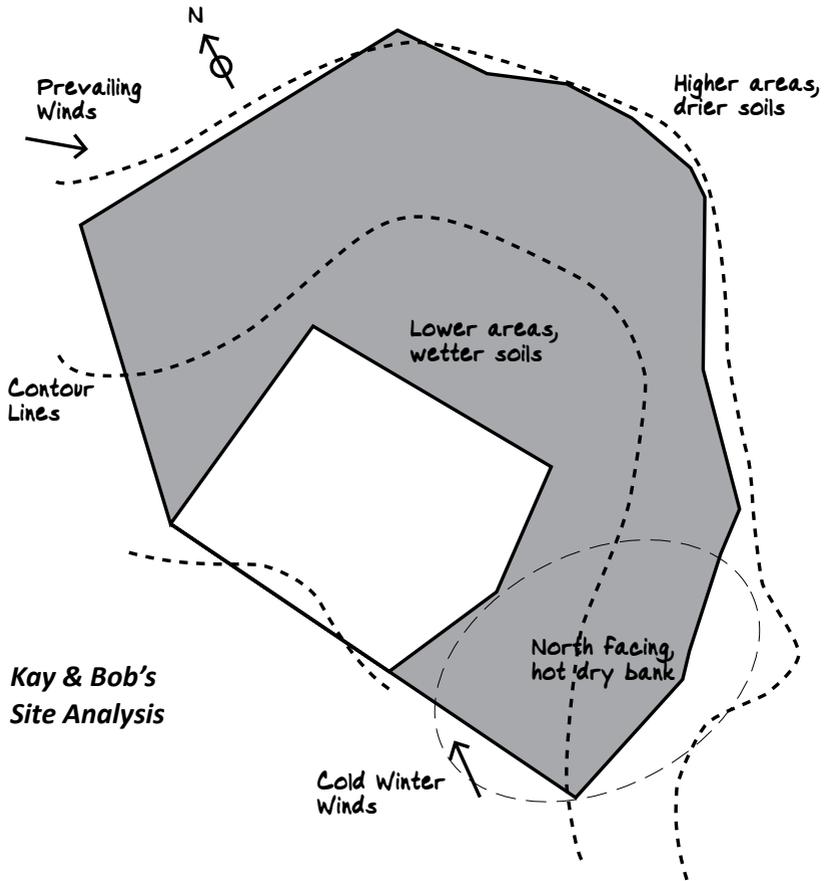
1. Draw a base plan of your Forest Garden area (*diagram 1*). Measure the area. Fill in the first row in Chart ① (see page 14).

Diagram 1)



2. Spend time getting to know your area, map soil types, water tables, wet / dry areas, shelter, shaded areas etc. Mark on your base plan the areas with significant different characteristics (see *Diagram 2*).

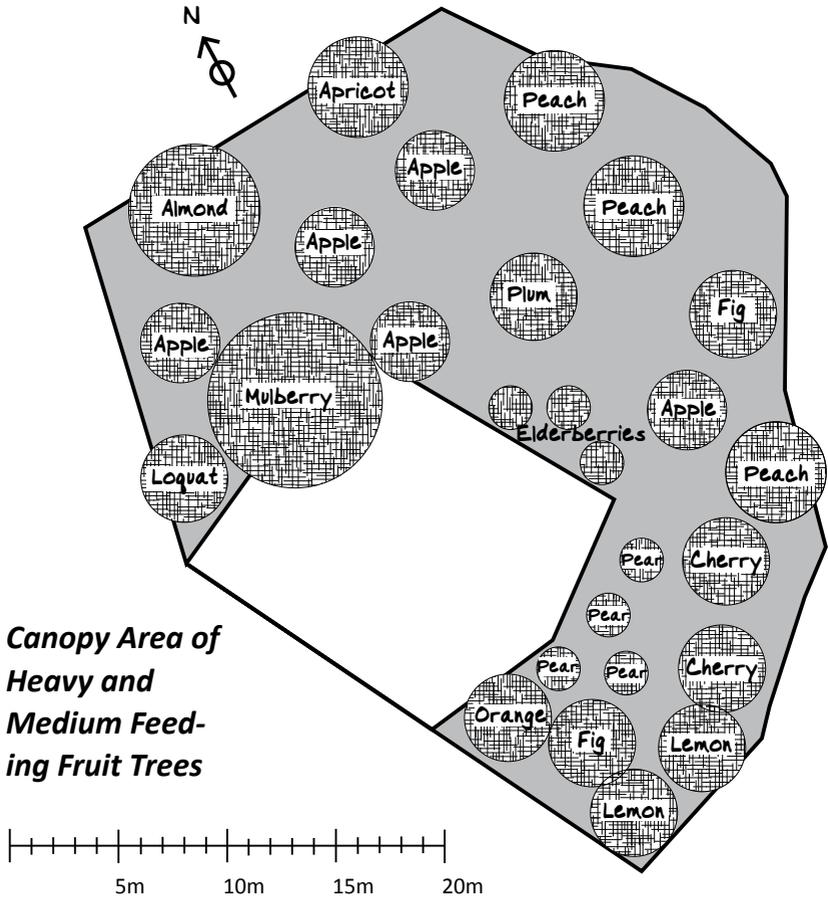
Diagram 2)



3. Study the section on *Guilds* on page 21 - which trees like which conditions, and which trees grow well together in which environment... and what your rootstock choices are, see page 12.

4. Use the *Fruiting Times* chart on page 13 to choose how many and which types of trees you are keen to plant. This chart will ensure you spread ripening times throughout the year. Start making a tentative list of fruit trees you'd like to plant on scrap paper.
5. List the heavy and moderate feeding fruit trees, INCLUDING THE NUMBER YOU WISH TO PLANT, on *CHART* ② provided on page 15, in column 1. Fill in columns 2 and 4 at the same time.
6. List the rootstocks of your choice (refer to *Rootstocks* chart) in column 5 on *CHART* ②.
7. Fill in the canopy sizes in column 6 on *CHART* ② with the help of the *Rootstocks* chart.
8. Add up the canopy areas of Heavy Feeders and Medium Feeders to get a total for column 7 and 8. What percentage is your total canopy area of heavy and medium feeding trees of your total area available? Be sure to keep it less than 60% of the total available area, or preferably under 50% to have more flexibility with support species!
9. Fill in your canopy area in Step 3 of *CHART* ① on page 14.
10. Collect Heritage Fruit Tree catalogues that will give you trees that have come from one or two climate zones North of where you are. Choose your varieties, watching carefully to choose rootstocks and varieties that will suit your conditions. Fill in column 3 on *Chart* ②.
11. Adjust your tree wish list as appropriate.
12. Order your trees.
13. Go out into your Forest Garden area and place stakes where those trees will be planted, or move them around on your base plan. Take your time, shift them over and over until you know you are happy. Rootstocks that need moisture and wet feet get the wettest spots, trees that need wind and air movement must have it to do well, trees that need shelter will not do well in the shelter belt... a pear will not do well next to a peach because they need opposite conditions. Check it all out in *Design Your own Orchard* and keep playing around with your stakes... (*Diagram 3*)

Diagram 3)

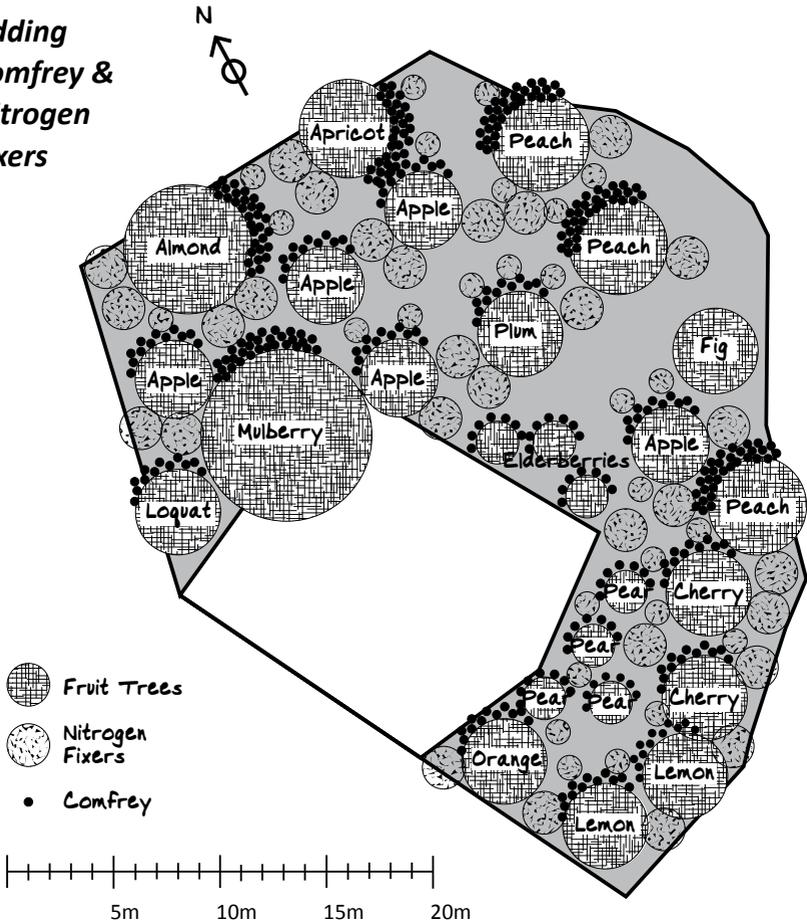


14. Get a Reams soil test done (in New Zealand BioServices do them 0800 8676737) and apply whatever fertiliser you need to ensure you have the right minerals in the right relationships to get your fruit trees off to a great start in the tree holes at planting time... see *Tree Planting Instructions* on page 26.
15. Work out the number of comfrey plants you need to plant in total to supply your potash needs, by filling in Step 7 on *CHART ①*. Place your comfrey plants on the base plan around the drip line of the final canopy size on the north side of each fruiting tree. (*Diagram 4*)

16. Check out the details of *Nutrient Budgeting* on page 16. Work out the square metres of legumes you need to plant in total by filling in Step 4, 5, and 6 on *CHART ①*, and find the best nitrogen fixers for you in the Forest Garden Data Base. Play with your list until you have a set of legumes that is diverse and fits your Forest Garden, and will give you the nitrogen you need. Include as many layers as you can... fill in your *Legumes* chart on page 17. Place them on your base plan or put stakes in the ground. (*Diagram 4*)

Diagram 4)

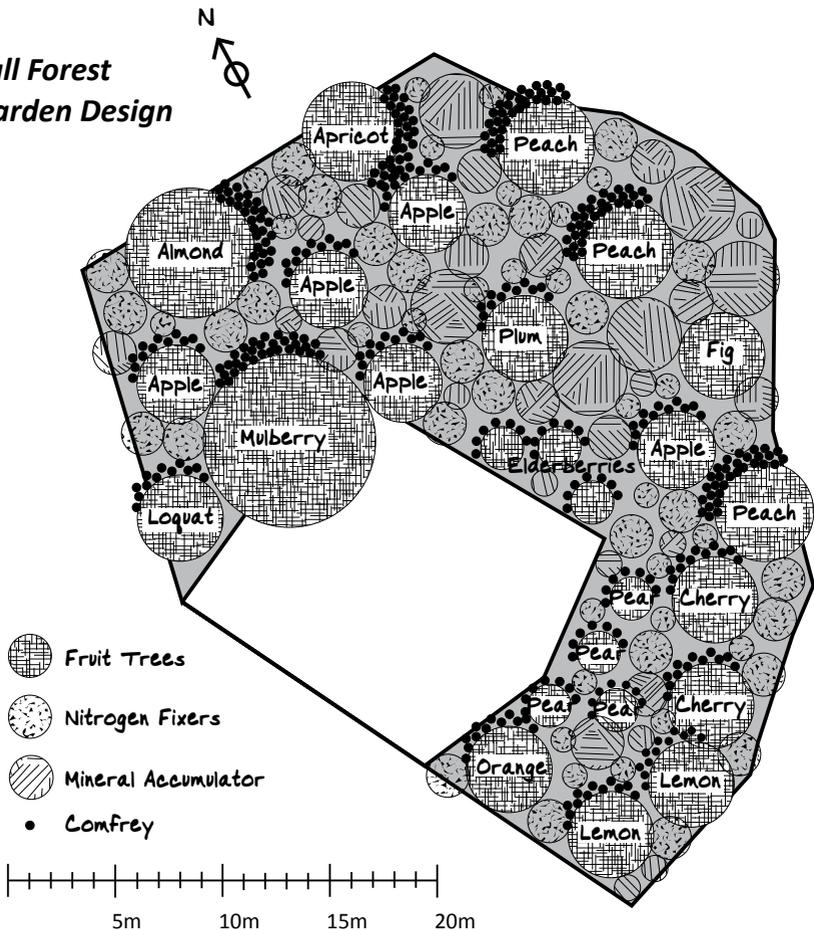
**Adding
Comfrey &
Nitrogen
Fixers**



17. Go to Chart ① and fill in Step 8 to get (H). Use the Forest Garden Data Base to include as many other trees and shrubs as possible that not only supply you with a diverse range of extra outputs but that also provide the Forest Garden with the widest possible range of minerals. This list needs to include trees, shrubs etc. from all 7 layers... fill in your *Mineral Accumulators* chart on page 18. The total canopy size must be equal to or less than (H) in chart ①. Add your mineral accumulators to your map or place stakes in the actual Forest Garden. (Diagram 5)

Diagram 5)

Full Forest Garden Design



ROOTSTOCK CHOICES AND CANOPY SIZES

<i>Fruit Tree</i>	<i>Rootstocks</i>	<i>Diametre (m) *</i>	<i>Canopy Size (πr^2)</i>	<i>Preferences</i>
APPLE	Dwarf	2	3.14m ²	Irrigation, mulch, staking Free draining soils Heavy, wet soils Free draining soils
	793	4 - 8	30m ²	
	Northern Spy	4 - 8	30m ²	
	mm106	4	12.56m ²	
CHERRY	Dwarfing	2 - 4	7m ²	Free draining most soils
	Non-dwarfing	5 - 8	31m ²	
CITRUS	Trifoliata	4 - 5	12.56m ²	Free draining, moist, high nutrients, mulch
	Flying Dragon	2 - 3	3m ²	
	Seedlings	6 +	30m ²	
ELDERBERRY	Cutting grown	2 - 4	7m ²	Moist. Prune hard each winter for bunches.
		2 (hedge)	3m ²	
FEIJOA	Grafted	4 - 5	7m ²	Moist, mulch. Tend to blow over in strong winds if cutting grown.
	Cuttings	2 (hedge)	3m ²	
	Seedlings	4 - 5	7m ²	
FIG	Cuttings (kept pruned) (large unpruned)	4	12.56m ²	Free draining, moist, hot, full sun. Can keep small with good pruning.
		10	50+ m ²	
GRAPE	Cuttings	2 - 6	12m ²	Hot, dry, free draining essential, good air move- ment
KIWIFRUIT (delicosa)	Grafted, heavily pruned	4 - 8	12m ²	Irrigation, mulch, free draining, structure to grow on
KIWIFRUIT (actinidia arguta)	Cuttings, heavily pruned	4 - 8	12m ²	Irrigation, mulch, free draining, structure to grow on
LOQUAT	Seedlings	6 - 8	30m ²	Free draining
MULBERRY	Cutting	8 - 10	50m ²	Free draining, moist, can espallier
OLIVE	Cutting dwarfing	2 - 4	7m ²	Dry, bony, exposed, irrigation to get tap root down
	Cutting full size	6-8	30m ²	
PEACH, ALMOND NECTARINE, PLUM, APRICOT	Peach stock and seedlings	5 - 8	30m ²	Drier, bony soils, ex- posed Heavier, wet soils, ex- posed
	Plum stock (mari- anna, myrobalum, St. Julian cuttings)	3 - 6	12m ²	
PEAR	Dwarf (BA29 - quince)	2 - 4	7m ²	Heavier, wet soils es- sential Heavier, wet soils es- sential
	Tall (pear seedling)	10 - 15	50+ m ²	
PERSIMMON	Seedling/Grafted	4 - 8	30m ²	Moist, free draining
QUINCE	Quince BA29 grafted	3 - 6	12m ²	Heavy, wet soil

* Size depends also on soil type and vigour of specific varieties and your own preferences. The more space you can give them the better. All trees will grow bigger on free draining soils than on heavy clay. How you choose to prune (or not) plays a big part in the eventual size too.

FRUITING TIMES

Fruit	Feeding Requirement*	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
ALMONDS	H												
APPLES	H												
ASIAN PEARS	H												
APRICOT	H												
BLACKBERRY	H												
CHERRY	M												
CHESTNUT	H												
FIG	L												
FEIJOA	H												
GRAPEFRUIT	H												
GRAPES	M												
KIWIFRUIT	H												
LOQUAT	H												
LEMONS	H												
MANDARINS	H												
MULBERRY	H												
NECTARINE	H												
ORANGE	H												
PLUMS	H												
PEACH	H												
PEARS	H												
PERSIMMON	H												
QUINCE	H												
RASPBERRY	M												
TANGELO	H												
WALNUT	H												

- * H - Heavy feeder
- M - Medium Feeder
- L - Low feeder

Notes

Deciduous cold climate crops usually have short sharply defined ripening seasons in summer or autumn. Subtropicals tend to have longer poorly defined ripening times, often in winter/spring and with wide variations.



Approx. ripening season

Season may be extended if fruit stored

CHART ① - CANOPY CALCULATION SHEET

STEP	Description	AREA
1	Your total forest garden area in m ²	(A) _____
2	(A) _____ x 0.5 (50% of total area)	(B) _____
3	Total Area HEAVY FEEDERS + Total Area MODERATE FEEDERS from CHART ②. This should equal or be less than (B).	(C) _____
4	Total Canopy Area HEAVY FEEDERS x 0.8 (canopy area of legumes in full sun required to support heavy feeding fruit trees)	(D) _____
5	Total Canopy Area MODERATE FEEDERS x 0.2 (canopy area of legumes in full sun required to support moderate feeding trees)	(E) _____
6	(D) _____ + (E) _____ (total area of legume canopy for full sun options)	(F) _____
7	Number of comfrey plants in full sun to supply potash = (C)	(G) _____
8	(A) _____ - (C) _____ - (F) _____ (canopy area left to plant in as diverse a range of mineral accumulators etc. to finish the creation of a forest)	(H) _____

NUTRIENT BUDGETING

The key nutrients to be concerned about when designing the Forest Garden are nitrogen, and potash. If you have done your soil test and added a general purpose fertiliser that ensures you are adding the missing minerals, they will be held in the system by careful planting over time. You may have to fertilise for two – five years until the system is well enough developed for nitrogen and potassium to be cycling within it, along with all the other minerals our fruit trees need. It is the 7 layers and the diversity of species that will ensure this happens over time.

The key information is that each square metre of canopy of heavy cropping/demanding tree or shrub requires the same area multiplied by 0.8 of nitrogen fixing tree or shrub in full sun, or twice that area in part shade to supply its nitrogen requirements. For moderate croppers multiply the square metres of canopy by 0.2 to get the canopy area of nitrogen fixing tree, shrub, or plant required to supply the nitrogen.

For example, an apple tree (heavy cropper) with a canopy size of 28m² will require $28 \times 0.8 = 22\text{m}^2$ of nitrogen fixing trees in the full sun (on the south side of the tree so the apple is not shaded) or 44m² of nitrogen fixing trees in the partial shade. Whereas a cherry (moderate cropper) with a canopy size of 7m² will require $7 \times 0.2 = 1.5\text{m}^2$ of nitrogen fixing canopy in full sun to supply its nitrogen needs.

To supply the potash needed you must plant 1 comfrey plant for every square metre of canopy for the heavy feeders, and 1 plant for every 3 square metres of a moderate cropper and feeder.

Once you have your nitrogen and potassium taken care of in your design, the next key thing is to add as many mineral accumulators as possible, and to include as wide a range of them as possible. We know that in a living functional biosphere, a tree or plant will draw the minerals it needs from distances away using the fungi and microbes as transporters of the minerals it requires.

NB: if you choose nitrogen fixers that do well in partial or full shade, you need to adjust the canopy area as above.

Remember to look carefully at the data bases to ensure you choose the legumes and mineral accumulators best suited to your conditions and your needs (possibly providing poultry food).

FROM GRASS TO FOREST GARDEN

There are many ways of turning paddock or grass into Forest Garden. Following are the most common:

1. Mulching to Smother Existing Ground Cover

Martin Crawford and Dave Jacke focus on using a mulch of some kind to kill the ground cover, then blanket planting. I find that works well in very small areas, in urban areas where no animals are present, and especially in spaces where you have time to do regular maintenance. You can use carpet, plastic, cardboard, paper etc., and when your grass is dead go hard with the planting, covering the entire area immediately.

2. Using Poultry

For larger areas we recommend using muscovy ducks and/or Chinese Weeder Geese to keep the grass down whilst establishing the 7 layers. Once you have the light largely blocked out to the ground by all the trees, you may need to change animal species, there may not be enough grass left to feed geese or muscovies, but you will have an ideal environment for chickens who co-evolved in Forest Gardens. They will scratch around in the undergrowth and decomposing vegetation on the forest floor eating grubs and bugs, microbes and fungi.

The key with using geese (preferably Chinese Weeder Geese which don't fly) is to have the right number for the area of grass. We have an area of 1000m² and 2 Weeder geese which seems to be working well, and another area of 900m² with 10 muscovies which works well most of the year.

You'll have to watch the geese or ducks carefully to ensure they don't get hungry, or run out of grass, and if the soil is demineralised the grass will be very poor. In this case you will need to get a soil test done, re-mineralise your soil and also possibly feed your poultry minerals to keep them healthy and able to produce young. If you keep your geese shut up on poor grass and hungry to get the grass down the geese will not do well. We feed ours comfrey daily to keep them tame. If they are not used to eating comfrey, it may take a few weeks of routinely feeding them to establish a routine of them coming to you and eating it. If you are fencing

your forest garden area first before putting in poultry it may be possible to put sheep in first to get the grass down to begin with, or it may be possible to weed eat the grass to get it down as well.

Basically both muscovies and Chinese Weeder geese require short actively growing grass. Long grass is poisonous to them, they need fast growing tips. They also need enough water to be able to put their heads under, and love a pond or dam but do not need one. Having a pond or dam means they will be safe from predators however. Feeding them comfrey will also ensure they are getting a wider range of minerals. Weeder geese will kill the comfrey, they love it so much, so it's best to plant it once the layers are all established and the geese are out. Muscovies don't seem to eat comfrey, and if you have enough planted, chickens will not kill it.

If muscovies or Weeder geese get very hungry they could attack the bark of your fruit trees so ensuring they are happy and feeling well nourished is important. That means being able to keep a daily eye on them and building relationships!

3. Using Machinery

If you are establishing your Forest Garden on swales that have been dug using earth moving machinery, or if you have bare ground after earth works to begin with, then your strategy will be the same as if you had smothered all the grass/ground cover. You must begin with covering the ground fast with legumes. In New Zealand we use a mix of several clovers including red, white and subterranean, to cover strong growth in all seasons, as well as alfalfa if the soil is free draining. Blue lupins would also be great in the short term but I would be wanting seed that has not been grown in soil that had previously been sprayed with Round Up (any seed you buy that has been grown in soil treated with Round Up, exudes toxic substances that kill the healthy soil microbes in the areas you plant them). We need to go for regenerative strategies (and not strategies that kill what we have left of life in the soil, which will in turn affect our health in a negative way).

If you are beginning with bare ground I recommend you plan to have ready to plant as many of your 7 layers as possible all in one go, whilst the going is easy, and before it becomes a nightmare of weeds and potentially erosion.

RESOURCES

GUILDS

Guilds are groups of plants, animals, insects, fungi etc. that have co-evolved together over millennia, somewhere on earth in specific conditions in an integrated way. For example our apple trees evolved in Kazakstan. They did not evolve in isolation, they evolved with many other ground cover plants, e.g. comfrey and Spring bulbs, vines like hops, shrubs like raspberries and blackberries, legumes like alders, and all the layers of the Forest in that place. They also co-evolved with the fungi and browsing animals, the minerals and microbes, the birds and insects of that place. It was a diverse integrated set of living things... we call a Guild.

When our ancestors decided they'd like the apples, they took them away from the rest of the guild, or family, or life support system, and as a consequence we are now discovering that if we want to get rid of the toxins that go with industrial orcharding, we must replace the guild, or naturally functioning life support system. Our apples need the rest of their family in order to be strong and healthy and in order to be part of a regenerative system.

Designing Forest Gardens is about recreating regenerative guilds as best we can that match the inherent needs of the fruit trees and supporting trees, as well as our own environment and as our nutritional and cultural needs... a really exciting journey!

If I want to know which guild a tree belongs to I close my eyes and imagine where in the world that tree came from and what the conditions are like , or were like there, and what the other elements of the guild might have been. To make things easy we can divide our main fruit and nut trees into the:

- Temperate Guild
- Mediterranean Guild
- Citrus/Loquat Guild
- Feijoa Guild
- And the Subtropical Guild here in New Zealand (covered in *Design Your Own Orchard*)

We're not covering the Subtropical Guild in this Booklet but we will cover the Mediterranean and Citrus and Feijoa guilds because in almost all areas of the country we have small pockets and in other places larger pockets where these trees will grow well.

The **Temperate Guild** includes *apples, pears, cherries, plums, walnuts, chestnuts*, and many other less common trees with edible parts listed in the Forest Garden Database of support trees in the centre pages of this booklet. These trees have evolved in areas with cold winters, usually snow and often long deep snow, and often heavy wet soils. Many of them tolerate windy sites and fluctuating soil and moisture conditions... and most of them can be grown on more than one rootstock so you can match your trees to your conditions to some extent (see *Rootstocks Chart* page 12). You can mix and match and create your own guild that goes with these temperate climate heavy croppers from the Forest Gardens Database in the centre spread. Be sure to follow the steps though ... on pages 6 - 11.

The **Mediterranean Guild** includes *grapes, figs, olives, carobs, peaches, almonds, nectarines, and apricots*. These plants love the heat in Summer but they are happy with cold (but not extremely cold) winters. They are happy in dry windy exposed sites and boney soils. They usually have very deep tap roots once established, and they do not do well in very humid areas. You can choose a guild to support your Mediterranean trees also from the Forest Garden Databases in the centre spread.

The **Citrus Guild** co-evolved as tall high seedlings in subtropical and tropical forest gardens, but grafted and budded trees that form a far lower and more rounded, and sometimes dwarfing shape, that are available for us now mostly do well in warmer temperate zones of NZ and also in Mediterranean areas too, so long as their requirements are met. They seem to be able to be quite at home in a subtropical forest garden, with colour and vines, and a huge mix of moisture loving rampant growth, or a Mediterranean forest garden with the aromatic Mediterranean herbs and legumes.

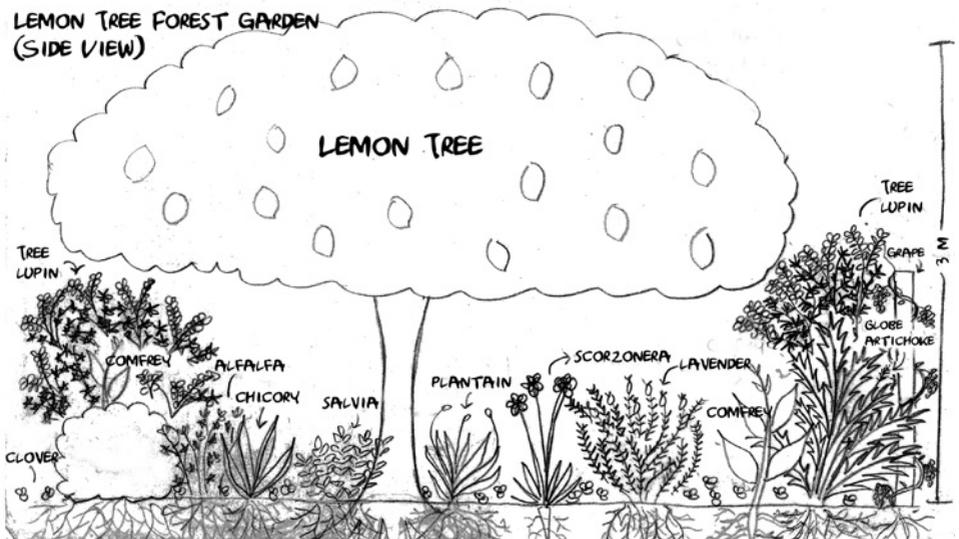
They need hot, sheltered, sunny, free draining but moist situations. They have very shallow feeder roots and hate drying out. They crop very heavily and if we want healthy nutrient dense fruit we must ensure their nutritional needs are being met. Following the Design steps will ensure that happens over time, and I would strongly recommend you also get a

soil test done... see notes in the back of this Booklet, and apply specific fertiliser for your soil in the short term.

Loquats also can be at home in both guilds, and to produce healthy excellent fruit need the same conditions.

Feijoas come in between the citrus, the subtropical and the temperate guilds. They have shallow feeder roots like the citrus, and so hate drying out and get very stressed if they do, however they are more tolerant of the wind and the cold than citrus is. Be sure to leave the ground under your feijoas clear when designing them into your forest garden because their fruit drop before ripening so you must be able to get to them to pick them up.

To understand more about the specific needs of all of your trees I suggest you get a copy of *Design Your Own Orchard* by Kay Baxter... all of the detail and information in that book will help you do a more informed job of Designing your own Forest Garden.



WESTON A. PRICE

Humans, just like all other living things, need certain nutrients to remain alive and healthy, and to maintain their DNA and reproductive ability. I believe the research and work of Dr Weston Price, who studied many groups of traditional peoples in the 1920's and 30's before and during the period they switched from eating traditional food to modern food, is key information for all of our futures. His book *Nutrition and Physical Degeneration* is a profoundly important book.

On his journey he discovered that all the traditional people's he visited were unbelievably healthy, and that also unbelievably they all followed the same principles in their diets. These extremely healthy people, who had virtually no tooth decay, no heart disease, no cancer etc., and who were very fit, were on average getting:

- 1500mg of available calcium on a daily basis
- an average of 12000 IU of Vitamin A + on a daily basis
- They were eating only traditional fats and oils. Seeing as these fats made up 30-80% of the calories eaten on a daily basis that meant most of them were eating large amounts of saturated animal fat.
- On an average traditional people were eating 4 x more minerals in their diets than Western people at that same time, and 10 x the amount of fat soluble vitamins. The mineral and vitamin intake of those of us in the western world has seriously deteriorated since that time.

The older I get the more I realise the importance of looking back to see what the patterns of the past were that worked, before we go headlong into something new that we have no evidence to show it might work.

The Weston A. Price Foundation dietary recommendations based on the characteristics of these traditional diets are:

1. *Eat whole and unprocessed foods.*
2. *Eat beef, lamb, offal, poultry, eggs (organic pasture fed).*
3. *Eat wild fish, shellfish and fish roe from unpolluted waters.*
4. *Eat full fat milk products from pasture fed cows, preferably raw and fermented.*

5. *Use animal fats, especially butter, liberally.*
6. *Use traditional vegetable oils only - extra virgin olive oil, expeller-expressed sesame oil and flax oil, tropical oils like coconut and palm oil.*
7. *Eat fresh fruits and vegetables (preferably organic).*
8. *Use whole grains, legumes and nuts that have been prepared by soaking, sprouting or sour leavening.*
9. *Include lacto-fermented vegetables, fruits, beverages, condiments.*
10. *Prepare home-made meat stocks.*
11. *Use filtered water for cooking and drinking.*
12. *Use unrefined salt and a variety of herbs and spices.*
13. *Make your salad dressing using raw vinegar and traditional oils.*
14. *Use natural sweeteners in moderation (honey, maple syrup, rapadura etc.)*
15. *Drink unpasteurised wine or beer very moderately with meals.*
16. *Cook in stainless steel, cast iron, glass, or good quality enamel.*
17. *Do not use a microwave oven.*
18. *Use only natural food-based supplements.*
19. *Get plenty of sleep, exercise and natural light.*
20. *Think positive thoughts, and practise forgiveness.*

Clearly Forest Gardens covered a significant part of the Earth's surface at one time and they supplied all the nourishment one could need to survive and be healthy. Our journey today is about recreating these healthy diverse and productive systems, so that we can live lightly whilst being fully nourished.

I consider one of the most important things when designing a garden to feed people is to consider the nutrition needed by the people who will be eating from that garden, and then attempt at least to meet those nutritional requirements. We use Weston Price's figures for the levels of minerals and vitamins we will eat on a daily basis as far as possible. This is the only evidence I have ever seen in 30 plus years of studying nutrition that shows us that we can maintain our health for many thousands of generations and remain healthy eating following these principles. Like all indigenous peoples we looked at our environment, our cultural needs and we decided how to design our diet so that we had the correct amounts of minerals and vitamins to maintain our health and our DNA.

HOW TO PLANT A FRUIT TREE

The aim of these instructions is to make sure you end up with a strong healthy tree that grows a main frame fast and is capable of producing high brix crops for many years.

1. Dig a hole 1 x 1 x 1m for each tree, that is a 1 cubic metre hole for each tree. If you are on heavy clay, or soil that does not drain, you will have to put drainage out the bottom of your hole, and if you are unable to do that you may have to build your tree space partly up above the existing soil surface.
2. As you dig out the soil, separate topsoil from subsoil.
3. Mix your top soil 50/50 with compost. You must use high quality aerobically made compost. That excludes all the municipal compost available in shops as far as I know, you have to get organised and make it yourself, or you could use well composted hay or well rotted bark etc.
4. If you have your own compost, and it has been made aerobically using high brix plant and animal ingredients, and you have also added minerals, especially calcium and phosphate, and seaweed then you may not need to also add fertiliser, but I would suggest you add paramagnetic rock dust to get the current flowing and things moving.

or

5. If you don't have amazing high quality aerobic highly mineralised, biologically active compost, we suggest you add 5kg of EF Soil-Force (available from Environmental Fertilisers) mixed throughout topsoil/compost mix, or sprinkled in layers throughout the hole per tree. EF Soil-Force contains Sechura R.P.R. (soft rock phosphate) providing valuable Calcium, Phosphorus and Trace Elements, which is composted with Humic Acid, Fish Protein, 4 Seaweeds, Lucerne Dust, animal manures and a highly paramagnetic Basalt Rock Dust (CGS4400). It is also inoculated with beneficial bacteria and soil fungi (e.g. Azobacter, Trichoderma, Bacillus Subtillus and Bio -Vam Mycorrhizal fungi).

6. Plant your tree into the hole so that it is sitting in the soil at the same level as it was in the nursery or pot previously, and making sure it is on a small mound, so that as the soil in the hole settles your tree will not be in a hollow!
7. Your tree will also grow and perform better if you plant it so that the strongest roots face into the South. The tree's roots will have aligned already in the nursery with the magnetic field in the earth which means the strongest roots will face south, so if you can also plant it facing this direction, your tree will perform better and be happier! All Koanga Gardens Brand fruit trees have a paint dot on the North side of the tree so you can also check how to plant it.
8. Make a berm at a radius of 1m around the tree to hold all the nutrients and mulch and moisture inside it. You may have to breach this berm in the winter so it does not hold water inside and drown the tree! After year 2 it won't be necessary to maintain the berm.
9. Sprinkle another kilo of your top class compost out to 1m radius all around the tree or inside your berm and mulch heavily to suppress weeds over the summer.

or

10. Sprinkle 500g of EF Soil-Force to a radius of 1m all around the tree or inside your berm and mulch heavily to suppress weeds and help maintain moisture over the summer.
11. Continue feeding your tree on an annual basis each autumn after the rains come using either highly mineralised composted animal manure or high quality highly mineralised compost or EF Soil-Force or other suitable biological fertiliser.

Our advice is to plant only as many fruit trees as you can take care of in this way. Your rewards will outweigh the effort required!

HERITAGE TREES

If we are seriously looking to set up a regenerative system, then our own health is a key part of the regeneration. In order to maintain our health we must be eating nutrient dense food. We can do that by paying attention to both the genetics of the elements we place within the system and by paying attention to remineralising the environment.

Our heritage fruit trees have been shown to contain many times more nutrition than modern fruit cultivars and it also seems clear that ancient berries and wild fruit will have still higher levels of phytonutrients. We recommend you use only heritage fruit trees and try to fit as many support trees and mineral accumulators into your design as possible that include edible parts for humans.

Koanga holds the Northern Bioregional Fruit Tree Collection, ideally suited to be planted over most of the North Island of New Zealand following Martin Crawford's advice below.

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"I'm all in favour of local food production, reducing the miles food travels, but it is now a mistake to hold on romantically to old 'local' varieties of fruit where they originated. The realities of climate change give us no choice but to adapt. Traditional varieties can still be of great use, but further South (or higher up in altitude) rather than at their original sites."

Martin Crawford

1) Roots & Ground Covers							
Name	Latin Name	Shade/Sun	canopy size m ²	Soil Type	Nitrogen Fixing	Fruiting	Special Function
Apple Mint	<i>Mentha x villosa alopereuroides</i>	Sun, Light shade	0.6	Wet, Well Drained	No	No	Great culinary and medicinal herb.
Chinese Artichoke	<i>Stachys affinis</i>	Sun, Light shade	0.45	Well Drained	No	No	Edible Tubers.
Daikon Radish	<i>Raphanus sativus</i>	Sun, Light shade	0.45	Well Drained	No	Vegetable	Great, easy to grow vegetable with a variety of culinary uses. Spicy and distinct. Repels insects from tomatoes, cucumbers, and carrots. Plethora of medicinal uses. Helps a lot of digestive issues. Anti-bacterial, anti-fungal etc.
Horseradish	<i>Armoracia rusticana</i>	Sun, Light shade	0.7	Wet, Water-logged	No	Edible Roots, leaves	Strong flavored young leaves for salad. Roots can be sliced and cooked and made into a mustard like condiment. Fungicide, prevents brown rot in apples. Prevents potato worm. Tolerant of neglect once established. Many medicinal uses.
Jerusalem Artichoke	<i>Helianthus tuberosus</i>	Sun, Light shade	2.4	Well Drained	No	Tubers	Edible Tubers, Jerusalem artichoke is a folk remedy for diabetes and rheumatism.
Lady's Mantle	<i>Alchemilla mollis</i>	Sun, Light shade	0.3	Well Drained	No	No	Edible leaves for teas, great medicinal plant for woman's health.
Meadow Sweet	<i>Filipendula ulmaria</i>	Sun, Light shade	1.2	Wet, Well Drained	No	Edible Roots, leaves	Edible leaves and roots with culinary uses. Dyes and Perfumes. Ancient and extensive medicinal uses.
Red Clover	<i>Trifolium pratense</i>	Sun	0.6	Wet, Water-logged	Yes	No	Green Manure, Nitrogen Fixer, Soil Builder. Dyes. A large amount of medicinal uses.
Scorzenera	<i>Scorzera hispanica</i>	Sun, Light shade	1	Any	No	Edible Flowers and Roots	Edible roots, leaves and flowers. Repels carrot flies away from nearby carrots, annual plant - can reseed itself
Skirret	<i>Sium sisarum</i>	Sun, Light shade	1.2	Wet, Well Drained	No	Edible Roots	Raw or cooked roots. Taste like cross between carrot and parsnip. Roots used to thicken soups, stews and in baking. Roots are coffee substitute. Very resistant to insects and diseases.
Soapwort	<i>Saponaria officinalis</i>	Sun, Light shade	1	Well Drained	No	No	Leaves used for soap, cleansers, and cleaners. External medicinal uses.
Solomon's Seals	<i>Polygonatum</i>	Sun, Light shade	1.2	Wet, Water-logged	No	Edible shoots	Cooked young shoots (Asparagus substitute). Roots - soaked cooked, high in starch. Cosmetics. Ancient Medicinal plant. The root is astringent, demulcent, emetic and tonic. An infusion is healing and restorative, good for treatment of stomach inflammations, chronic dysentery etc. Many other medicinal uses. Excessive quantities can be poisonous.
Strawberry Clover	<i>Trifolium fragiferum</i>	Sun	0.6	Wet, Water-logged	Yes	No	Nitrogen fixing, tolerates waterlogging, drought, and high salinity. Green manure.
Subterranean clover	<i>Trifolium subterraneum</i>	Sun	0.2	Well Drained	Yes	No	Deep Rooting, Nitrogen Fixing. Works symbiotically with apple orchards. Ground cover green manure under tomatoes. Negative effect near gooseberries.
Violets	<i>Viola spp.</i>	Sun, Light shade	0.2	Well Drained	No	No	Bee Forage, flowers and flower buds edible, leaves can be cooked.
Watercress	<i>Nasturtium officinale</i>	Sun	0.5	Wet, Water-logged	No	Edible leaves	Incredible Mineral Accumulator. Leaves can be eaten raw or cooked. Culinary uses. Very rich plant for medicinal uses because of high amount of minerals. Good for treating chronic illness. Should not be eaten raw if downstream from animal waste.
White clover	<i>Trifolium</i>	Sun	0.1	Well Drained	Yes	Leaves	Nitrogen fixer, bee plant. Green manure. Edible leaves and various culinary and medicinal uses.

2) Herbaceous Plants								
Name	Latin Name	Shade/Sun	canopy size m ²	Soil Type	Coppicing	Nitrogen Fixing	Fruiting	Special Function
Asparagus	<i>Asparagus officinalis</i>	Sun, Light shade	1.5	Well Drained	No	No	Vegetable	Edible shoots, cooked. Repels nematodes. Ancient medicinal plant with many uses.
Cardoon	<i>Cynara cardunculus</i>	Sun	2	Well Drained	No	No	Edible leaf ribs	Globe Artichoke substitute with many culinary uses. Many medicinal uses as well: The leaves are anticholesterolemic, antirheumatic, cholagogue, digestive, diuretic, hypoglycaemic and lithontriptic. They are used internally in the treatment of chronic liver and gall bladder diseases, jaundice, hepatitis, arteriosclerosis and the early stages of late-onset diabetes.
Chicory	<i>Cichorium intybus</i>	Sun, Light shade	1	Any	No	No	Leaves	Leaves good in salads. Mineral accumulator, an annual plant - can reseed itself
Comfrey	<i>Symphytum officinale</i>	Sun, Light shade	1	Any	Chop and Drop Mulch	No	No	Incredible mineral accumulator. Great source of permanent nitrogen, amazing medicinal uses.
Day Lillies	<i>Hemerocallis spp.</i>	Sun, Light shade	1.2	Any	No	No	No	Edible Leaves, mildly hallucinogenic, medicinal properties, antidote for arsenic poisoning, gorgeous flower.

2) Herbaceous Plants								
Name	Latin Name	Shade/Sun	canopy size m ²	Soil Type	Coppicing	Nitrogen Fixing	Fruiting	Special Function
Fennel	<i>Foeniculum vulgare</i>	Sun	1.5	Any	No	No	Leaves	Edible mineral accumulator, great plant for salads and flavorings. Medicinal uses, great tea.
Globe Artichoke	<i>Cynara cardunculus Scolymus Group</i>	Sun	1.5	Any	No	No	Edible Buds	Edible Buds-Require cooking. Medicinal uses for liver, gallbladder and digestion.
Lemon Balm	<i>Melissa officinalis</i>	Sun, Light shade	0.7	Well Drained	No	No	Leaves	Edible Leaves, great flavoring. Oil is insect repellent. Great medicinal plant with LOTS of uses. Calming and great smelling. Bee Plant.
Mallows	<i>Malva spp.</i>	Sun, Light shade	0.45	Wet, Well Drained	No	No	Leaves	Edible leaves, great raw, in salads or thickening agent. Dyes from plant and seeds. Fibre for materials. Relieves insect bites. Plethora of medicinal uses. Antiphlogistic, astringent, demulcent, expectorant, laxative, salve.
New Zealand Flax	<i>Phormium tenax</i>	Sun, Light shade	3	Well Drained	No	No	No	Roasted Seed is coffee Substitute, edible nectar from flowers, edible gum from base of leaves. Great for weaving, fiber and paper.
Plantain	<i>Plantago spp.</i>	Sun, Light Shade		Wet, Water-logged	No	No	No	An extremely useful medicinal herb and mineral accumulator.
Sorrels	<i>Rumex acetosa.</i>	Sun, Light shade	0.6	Wet, Well Drained	No	No	Leaves	Edible leaves, multiple culinary uses. Roots can be ground and cooked like a pasta. Leaves can be eaten year round, though they can lock up nutrients if not cooked (this only occurs in large quantities). Seeds can be made into flour. Dyes, large amount of medicinal uses.
Strawberry	<i>Fragaria spp</i>	Sun, Light shade	0.5	Well Drained	No	No	Berries	Delicious fruit with multiple culinary uses.
Vetch	<i>Vicia spp.</i>	Sun	0.2	Well Drained	No	Yes	No	Nitrogen fixer bee plant. Mineral accumulator. Tea from leaves, liquorice substitute from roots.
Tree Lupin	<i>Lupinus arboreus</i>	Sun	2/3.14	Well Drained	Chop and Drop Mulch	Yes	No	Great pioneer plant, soil builder, nitrogen fixer. Bee forage. Symbiotic nitrogen-nodule relationship. Wind tolerant.
Rosemary	<i>Rosmarinus officinalis</i>	Sun	150	Well Drained	No	No	Leaves	Used as a decorative plant in gardens, many culinary and medical uses. Said to improve the memory. The leaves are used to flavor various foods, such as stuffings and roast meats.
Lavender	<i>Lavandula dentata</i>	Sun	60	Well Drained	No	No	Leaves	Lavender has many medicinal uses, the essential oil of lavender has antiseptic and anti-inflammatory properties. Lavender is also used as a condiment and in salads and dressings. Bunches of lavender repel insects. In pillows, lavender seeds and flowers aid sleep and relaxation.
Wormwood	<i>Artemisia spp.</i>	Sun	1.2	Well Drained	No	No	Leaves	Used to repel fleas and moths, help get rid of parasites in animals, and in brewing (beer, wine).

3) Shrubs								
Name	Latin Name	Shade/Sun	Mature height (m) / canopy size (m ²)	Soil Type	Coppicing	Nitrogen Fixing	Fruiting	Special Function
Apple Rose	<i>Rosa Rugosa</i>	Sun, Light shade	2/3.14	Well Drained	No	No	Fruit (must remove seeds)	Edible fruit (must remove the hairy seeds). Medicinal uses for leaves and fruit. Great hedge plant.
Barberries	<i>Berberis angulosa</i>	Sun, Light shade	1/1.57	Well Drained	No	No	Edible Berries	Large, edible berries with medicinal properties. Yellow dye from root.
Chokeberries/ Aronia Berries	<i>Aronia melanocarpa</i>	Sun, Light shade	3/4.71	Well Drained	No	No	Edible Berries	Edible berries, tolerates atmospheric pollution, tolerates wind.
European Elderberry	<i>Sambucus nigra</i>	Sun, Light shade	6/9.42	Wet, Water-logged	No	No	Berries	Berries are excellent, with culinary uses. HUGE amount of medicinal and material uses. Called the "medicine chest" of country people. Leaves repel insects, roots help compost ferment. Wind and salt resistant, pioneer species.
Goumi	<i>Elaeagnus Multiflora</i>	Sun, Light shade	8/12.56	Any	yes	Yes	Berries	Drought tolerant. Bee forage, excellent companion plant. Wind break.
New Zealand Broom	<i>Carmichaelia</i>	Sun, Light shade	3/4.71	Well Drained	No	Yes	NO	Native, pioneer species, tolerates harsh sites.
Northern Bayberry	<i>Myrica pensylvanica</i>	Sun, Light Shade	3/4.71	Wet, Well Drained	Yes	Yes	Inedible Berries	Nitrogen fixer and wind tolerant hedge. Berries can be used for wax, dyes and flavours. Possibly carcinogenic wax.
Oregon Grape	<i>Mahonia spp.</i>	Sun, Light shade	1.2	Well Drained	No	No	Edible berries	Medicinal herbs used for bone and joint problems, edible berries.
Raspberry	<i>Rubus idaeus.</i>	Sun, Light shade	2/3.14	Well Drained	No	No	Edible Berries	Great Raw, cooked or preserved berries. Dyes and Fibres can be made from the plant. Extensive medicinal uses.

3) Shrubs								
Name	Latin Name	Shade/Sun	Mature height (m) / canopy size (m ²)	Soil Type	Coppicing	Nitrogen Fixing	Fruiting	Special Function
Sala/Shallon	<i>Gaultheria shallon</i>	Sun, Light shade	1.2/1	Wet, Well Drained	No	No	Edible Berries	Pleasant, edible berries, raw or cooked. Oyes from different parts of the plant. Leaves have many medicinal uses.
Saskatoon	<i>Amelanchier alnifolia</i>	Sun, Light shade	4/3.14	Well Drained	No	No	Edible Berries	Windbreak and Earth Stabilizer. Excellent nutritious berries with a long list of culinary and medicinal uses. Animal Forage. Bee Forage.
Silky Dogwood	<i>Cornus amomom</i>	Sun, Light shade	1.5/0.8	Wet	No	No	Edible Berries	-
Japanese Snowball	<i>Viburnum plicatum</i>	Sun, Light shade	1.5/2	Well Drained	No	No	Edible Berries	-
Tea Viburnum	<i>Viburnum setigerum</i>	Sun, Light shade	3.5/5	Well Drained	Yes	No	Edible Berries	-
High Bush Cranberry	<i>Viburnum trilobum</i>	Sun, Light shade	4/3.14	Well Drained	No	No	Edible Berries	-

4) Small Trees 4 - 8m								
Name	Latin Name	Shade/Sun	Mature height (m) / canopy size (m ²)	Soil Type	Coppicing	Nitrogen Fixing	Fruiting	Special Function
Chinese Dog-wood	<i>C. kousa</i>	Sun, Light shade	10/15.7	Wet, Well Drained	No	No	Edible berries	-
Chinese Hawthorne	<i>C. pinnatifida major</i>	Sun, Light shade	7.5/10.99	Wet, Well Drained	No	No	Berries	Edible Berries, can be stored and preserved. Tough wood for tools. Lots of Medicinal uses. Heart Tonics, blood pressure, dyspepsia, diarrhea, menstruation. Tolerates wind, pollution, and drought.
Siberian Pea Tree	<i>Caragana Arborescens</i>	Sun	6/9.42	Wet, Water-logged	No	Yes	Peas	Excellent bee plant and chicken forage, edible seeds and useful in windbreaks.
Tagasaste	<i>Chamaecytisus palmensis</i>	Sun, Light shade	4/6.1	Well Drained	No	Yes	No	Animal fodder (protein and fibre), Nitrogen fixer.
Hazels (poles)	<i>Corylus spp.</i>	Sun, Light shade	8/12.56	Well Drained	Yes	No	No if coppiced	Firewood coppicer
Hawthorne	<i>Crataegus chrysocarpa</i>	Sun, Light shade	6/9.42	Any	No	No	Berries	Edible berries, tough wood for tools, medicinal uses.
Snowbell Tree	<i>Halesia Carolina</i>	Sun, Light shade	4/6.28	Wet, Well Drained	No	No	Fruit	Produces edible fruits and flowers, good bee plant, low maintenance.
Sea Buckthorn	<i>Hippophae rhamnoides</i>	Sun, Light Shade	6/9.42	Well Drained	No	Yes	Berries	High Vitamin edible berries, bee forage, good nitrogen fixing windbreak hedge.
Basket Willow	<i>Salix "Americana"</i>	Sun	6/0.785	Wet, Water-logged	Yes	No	No	Stems are flexible, used for basket weaving. Regular coppicing. Bark contains salicin.
Elderberry	<i>Sambucus canadensis</i>	Sun, Light shade	3.5	Well Drained	No	No	Berries	Excellent edible ripe berries. Medicinal uses. Fast growing, hardy, short lived plant. Wind Tolerant.
Himalayan Strawberry Tree	<i>Cornus capitata</i>	Sun, Light shade	8/12.56	Well Drained	No	No	Edible Fruit	-
Japanese Dog-wood	<i>Cornus kousa</i>	Sun, Light shade	8/12.56	Well Drained	No	No	Edible Fruit	-
Chinese Dog-wood	<i>Cornus kousa chinensis</i>	Sun, Light shade	8/12.56	Well Drained	No	No	Edible Fruit	-
Jones Hawthorn	<i>Crataegus jonesiae</i>	Sun, Light shade	5/7.065	Well Drained	No	No	Berries	-
Chinese Haw	<i>Crataegus pinnatifida</i>	Sun, Light shade	5/7.065	Well Drained	No	No	Berries	-
Large fruited haw	<i>Crataegus wangeriana</i>	Sun, Light shade	5/7.065	Well Drained	No	No	Berries	-

5) Canopy								
Name	Latin Name	Shade/Sun	Mature height (m) / canopy size (m ²)	Soil Type	Coppicing	Nitrogen Fixing	Fruiting	Special Function
Italian Alder	<i>Alnus cordata</i>	Sun	15/23.55	Wet, Water-logged	No	Yes	No	Very fast, nitrogen fixer, tolerates drier soil, tolerates waterlogging.
Common alder	<i>Alnus glutinosa</i>	Sun	22/25.5	Wet, Water-logged	Yes	Yes	No	Nitrogen fixer, firewood coppicer. Medicinal uses of leaves and bark. Very fast growing (1m per year). Good pioneer species. Coppices.
Northern Catalpa	<i>Catalpa Speciosa</i>	Sun	30/25	Wet, Well Drained	N/A	No	No	Timber- Sapwood posts, poles, fences, furniture. Tolerates pollution.
Himalayan Sea Buckthorn	<i>Hippophae salicifolia</i>	Sun	15/23.55	Wet, Well Drained	No	Yes	Fruit	Incredibly healthy fruit. Pioneer species, tolerant of wind, fast growing, prefers to be near water. Soil Stabilizer, tough and hard wood, medicinal uses. Firewood.
Oriental Raisin Tree	<i>Hovenia Dulcis</i>	Shade	9/14.13	Wet, Well Drained	N/A	No	Berries	Dried edible berries
Bamboo	<i>Phyllostachys</i>	Sun, Light shade	8/12.56	Wet, Water-logged	Yes-Vigorous	No	No	Excellent multi-purpose, edible shoots, requires regular input of nitrogen if repeatedly cut. Once established can grow extremely fast. Runner bamboo is invasive in NZ
Black Locust/ False Acacia	<i>Robinia pseudoacacia</i>	Sun	22/25.5	Wet, Well Drained	Yes	Yes	Edible Seeds (Boiled)	Firewood coppicing. Edible seeds, lots of medicinal, and edible uses, nitrogen fixer, earth stabilizer.
Kowhai	<i>Sophora tetraptera</i>	Sun, Light Shade	10/15.7	Any	No	Yes	No	Native nitrogen fixer, dense and durable wood for bearings, turnery, cabinet work, and ornamental uses.
Whitebeams	<i>Sorbus aria</i>	Sun, light shade	12/18.84	Well Drained	No	No	Yes-Fruit	Raw or cooked fruit (excellent when ripe). Excellent windbreak. Medicinal uses. Wood used for beams.
Lime Tree	<i>Tilia cordata</i>	Sun	25/25	Well Drained	Yes	No	Edible Leaves	Firewood coppicing. Edible leaves. Medicinal uses. Ground up flowers and immature fruit can be used as a chocolate substitute! Large amount of material uses: Fibre can be made into paper, wood, cloth and charcoal. Easy to transplant.
Maakia Amurensis	<i>Amur maackia</i>	Sun	15/23.55	Wet, Well Drained	Yes	Yes	No	Ground durable nitrogen fixing timber.
Swamp Wattle	<i>Acacia retinoides</i>	Sun	13/40	Well Drained, Well Drained	Yes	Yes	No	-
Service Tree	<i>Sorbus domestica</i>	Sun	15/110	Well Drained	Yes	No	Berries	-
Wild Service Tree	<i>Sorbus torminalis</i>	Sun	25/250	Well Drained	Yes	No	Berries	-
Table Dogwood	<i>Cornus controversa</i>	Sun	15/110	Well Drained	No	No	Berries	-
Poultry Feed Tree	<i>Croton megalocarpus</i>	Sun	30/310	Well Drained	No	No	Edible Fruit	-
Casurina	<i>Casuarina glauca</i>	Sun	20/80	Wet, water-logged	Yes	No	No	Accumulates phosphorus.

6) Vines								
Name	Latin Name	Shade/Sun	Mature height (m) / canopy size (m ²)	Soil Type	Coppicing	Nitrogen Fixing	Fruiting	Special Function
Everlasting Pea	<i>Lathyrus latifolius</i>	Sun, Light Shade	2.4	Wet, Well Drained	No	Yes	No-Inedible Peas	Potentially invasive, nitrogen fixing climber. Pods can be poisonous if ingested raw. Very tough. Bee Forage.
Hog Peanut	<i>Amphicarpaea bracteata</i>	Shade	1.5	Wet, Well Drained	No	Yes	Edible seed	Nutritious seed pods with medicinal uses, nitrogen fixing plant with rather low yields.
Nasturtium	<i>Tropaeolum majus</i>	Sun	-	Well Drained	No	No	No	Bee forage, great hot spice, edible flowers and leaves with high vitamin content, great in salads. High range of medicinal uses. Deters aphids away from surrounding plants.
Wisterias	<i>Wisteria spp.</i>	Sun, Light Shade	10/15.7	Wet, Well Drained	No	Yes	No	Great climbing, nitrogen fixer, bee forage.
Snail Vine	<i>Cochlosanthus caracalla</i>	Sun, Light Shade	-	Well Drained	No	Yes	No	-
Hops	<i>Humulus lupulus</i>	Sun	-	Well Drained	No	No	No	-
Runner beans	<i>Phaseolus coccineus</i>	Sun	-	Well Drained	No	Yes	Beans	-
Lab Lab bean	<i>Labiab purpureus</i>	Sun	-	Well Drained	No	Yes	Beans	-

Other Booklets produced by the Koanga Institute

Growing Nutrient Dense Food

by Kay Baxter

Save Your Own Seeds

by Kay Baxter

200m² Urban Garden

by Kay Baxter, Joanna Cathie and Koanga Interns

Beginner Gardener

by Kay Baxter

How to Build a Rocket Stove Oven

by Tim Barker

Check out our website for more information on workshops

www.koanga.org.nz