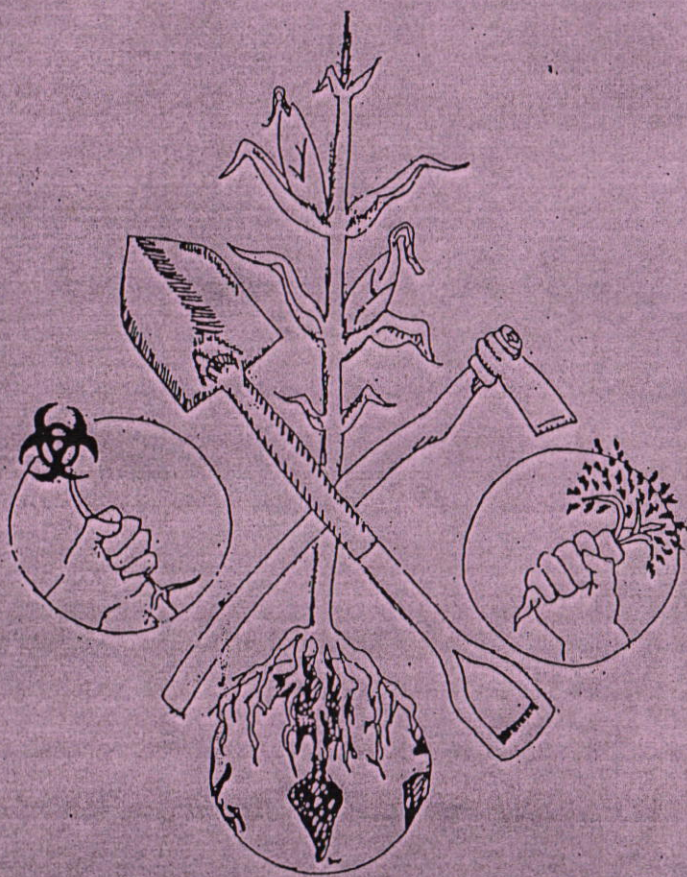




GUERRILLA GARDENING

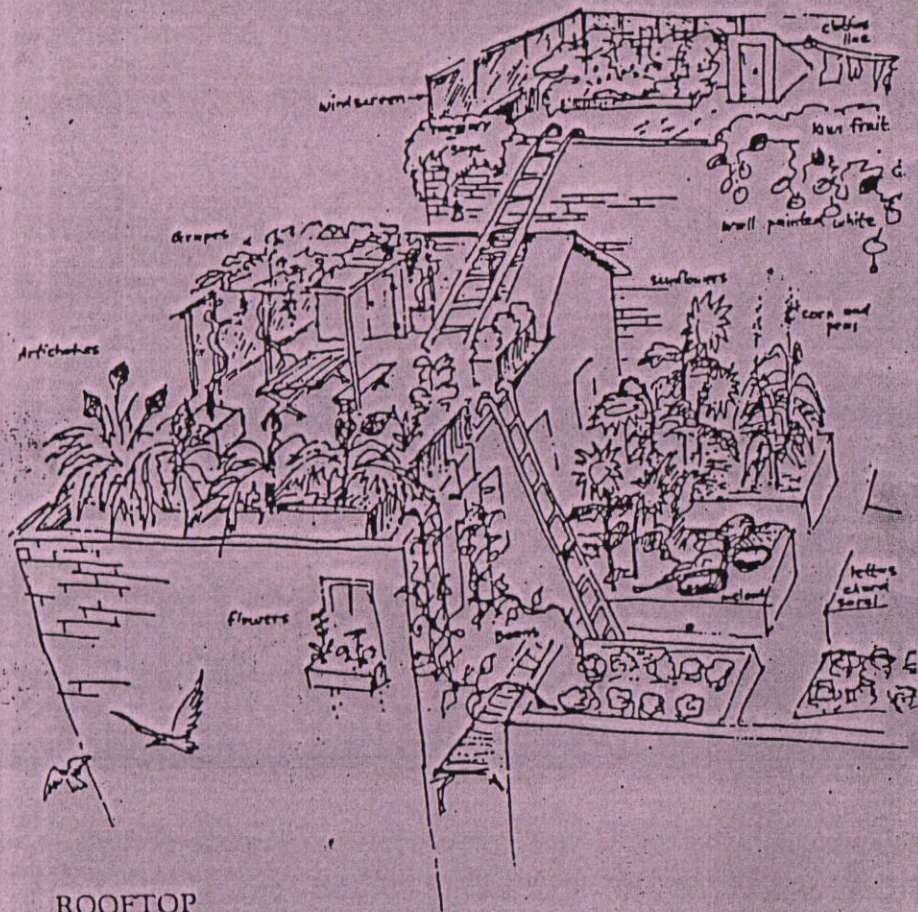


URBAN PERMACULTURE

A Reader Compiled for the DIY Skillshare



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BY
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ROOFTOP
GARDENS

Plant Stacking and Time Stacking and Swales

In the forest there are a series of interconnected levels - from the understorey of ferns and bushes to the upper canopy of the mature trees. Instead of planting a flat field of one crop which needs tons of attention and water, the idea is to intercrop taller and shorter species, climbing plants and herbs and different kinds of trees - everything placed according to their shade tolerance, heights, and water requirements.

In one of the permaculture sites there is a sequence of swales connected to a small dugout pond which carry nutrients down to the bottom of the slope. At the bottom of the slope there's a bunch of raised beds made of sticks and mud where all the garlic is planted. Swales are just these long level excavations that are dug to store water in the underlying soils or sediments. They're different than ditches because instead of just diverting water so it can drain somewhere else, swales work to intercept the water flow, hold it for a few hours or days, and let it slowly infiltrate the ground water, recharging soils and tree root systems. The site was a big swamp full of alder trees a couple years ago and slowly the permaculture crew has been rerouting the water to make the wet areas nicer and the surrounding areas more fertile for growing ground crops, carefully removing the alders and replacing them with fruit and nut trees. Trees are totally important parts of swale planting systems. Our teacher Brent shows us how he cuts the alder trees to harvest their wood but does it in such a way that the younger trees can take

advantage of the old root systems and exposed sunlight from removing the canopies. Just like everything else around here, the idea is to set up the system so that it doesn't need any inputs from the outside and can totally function as a self-contained ecosystem.

Guilds

The fir trees in the forest have like 26 different types of fungi and scrubs and insects that somehow pay a role in their growth and life. In the forest, the trees, bugs, birds, fungi, ferns, and huckleberry bushes all work together to create an interconnected web. Sometimes, rather than thinking about organisms individually, it's useful to think of them in clusters or groups. When the individuals are clustered around a central element we call these groups guilds. In the forest we can talk about the fir tree guild.

There are a couple of fruit orchards spread around the farm, mostly apple and plum trees. There are also a small herd of sheep which keep the grass down in the orchards by grazing. They also eat up any fruit which falls and rots on the ground, preventing diseases in the trees. Every week or so the sheep are moved from one orchard to another so that they don't graze the grass too low. To keep the trees healthy and not competing with invasive grasses, we grow yarrow and clover and borage and nettles and comfrey around the them. The sheep also eat these and like them too. We can say that the sheep and herbs we grow in the orchard and the trees are all part of the fruit tree guild.

OLIVE (*Olea europaea*)

Small, evergreen tree to 8m; long-lived (up to 700 years). Dryland plant of Mediterranean region, not suited to maritime or cold regions (although fairly frost-hardy, fruit needs hot summers to ripen). Propagation by cuttings; olives bear in 4-6 years. Can grow on thin, rocky soils but yield is best on fertile soils.

USES: Fruit is eaten green or ripe; green olives must be soaked in a lye solution before pickling to remove bitterness. Excellent oil crop: fruit picked when fully ripe (but not soft), then crushed to a mash and placed in cloth bags. These are pressed and the oil collected. Good olive varieties yield as much as 30% oil. The remaining pulp after pressing can be fed to stock. Olive trees are a good shelter and occasional forage for stock.

PALMS

Woody perennials with many uses, from human food, oils, sugar, animal fodder, structural material, thatch, and fibre. Most useful palms grow in dry or wet tropics. Have deep tap roots, and many are successfully used in agroforestry (crops and pasture) as they do not compete for water.

Date palm (*Phoenix dactylifera*, *P. sylvestris*, *P. canariensis*): Dioecious, need one male to 60-80 females. Staple food yielding dates; old trees are tapped for toddy (sugar). Inferior species of dates can be used for animal fodder or possible fuel crop.

Borassus palms (*Borassus* spp.): Palmyra (*B. flabellifer*) tapped for sugar in India (produces 170 pounds of nectar per acre, or 40,000 litres of alcohol fuel). Timber is hard and durable. Others are *B. aethiopicum*, *B. sundulcus*.

Dum or gingerbread palm (*Hyphaene thebaica*): Multi-stemmed, branched palm to 15m, bearing heavy crops of edible hard-shelled fruits. Staple food and fodder crop of arid lands, mainly Egypt.

Coconut (*Cocos nucifera*): Essential plant of many tropical island cultures. Yields coir for rope, thatch, oil, drinking "water", nut meats, and sugar from flower stalks.

Chilean wine palm (*Jubaea spectabilis*): Temper-

ate-zone palm yielding 410 litres of sweet sap annually. Cold hardy. Fruits with edible nut, useful for fodder.

Peach palm or Pejibaye (*Bactris guillelma gasipaes*): A spiny-trunked plant; staple plant of Central & South America exceeding maize in protein and carbohydrate yields per acre. Fruits chestnut-like, boiled and dried as food. Also for poultry and pig forage. Hardy only in frost-free areas.

PASSIONFRUITS (*Passiflora* spp.)

Evergreen perennials; vigorous growers (sometimes rampant as they will naturalise and climb in forest trees). USES: Edible fruit, poultry and pig fodder, sun deflector to shade walls, used to cover (and keep cool) water tanks and sheds. Ornamental, with showy flowers.

Black passionfruit (*Passiflora edulis*) is a vigorous climber of subtropical to tropical areas. Cultivated on fixed fence trellis, cropping for 4-8 years (some varieties last longer). Frost tender in early growth.

Banana passionfruit (*P. mollissima*) is grown in temperate maritime climates; will withstand moderate frost once established. Yields from late autumn to early summer, and is a valuable poultry fodder (fruit seeds). An under-used fruit for winter fresh fruit, more easily peeled than *P. edulis*.

Lilikol (*P. alata*) is a hardy, vigorous grower of the subtropics and tropics; plant two or more for best cross-fertilisation. Delicious fruit.

Other edible passionfruits of the tropics are granadilla (*P. quadrangularis*), sweet granadilla (*P. ligularis*), and water-lemon (*P. laurifolia*).

PAULOWNIA (*Paulownia tomentosa*, *P. fargesii*)

Quick-growing, drought-resistant deciduous trees to 15m. Mild temperate to subtropical range, with *P. fargesii* in the cooler climates. Grown extensively in China. Has deep taproot and will not compete with pasture, crops. Has large leaves, but with some pruning and wide spacing allows light through.

USES: Timber crop for fine furniture, boxes, chests. Used in agroforestry to shelter cereal, soybean, and cotton



SUB DOMINANT: COFFEE, CACAO, VANILLA, PIGEON PEAS...
DOMINANT SPECIES: AVOCADO, COCONUT, JACKFRUIT, CASHEW, PECAN... Coconut Circle

crops; wood taken in 6-12 years (pruning and shaping necessary to maintain good log growth). Leaves contain nutrients, nitrogen; can be used as stock fodder and mulch.

PERSIMMON (*Diospyros kaki*, *D. virginiana*)

Many varieties, especially in Japan. Deciduous tree to 15m, yielding fruit in winter. Temperate to subtropical climates. Fairly frost-hardy; does well in most well-drained soils. Japanese persimmon (*D. kaki*) does best in full sun, while American persimmon (*D. virginiana*) can tolerate partial shade.

USES: Fruit, eaten when over-ripe (harvested when hard and ripened indoors). Fallen fruit is an excellent pig and stock food. Ornamental plant, with autumn colour (spectacular red fruits on leafless tree). A good front yard plant, along with other such ornamental edibles as nasturtium, kale, almond, peach, currant, etc.

PIGEON PEA (*Cajanus cajan*)

Leguminous woody shrub of dry subtropics and tropics; frost sensitive. Quick-growing, short-lived perennial; sometimes grown as an annual, 1-4m tall.

USES: Major tropical food grain, green seeds and pods used as vegetables. Ripe seeds for flour, dhal, sprouts (22% protein, 10% calcium). Important forage plant eaten green or made into hay or silage. Sometimes planted in pastures as a browse plant. Ideal windbreak and shade for vegetables; leaves cut for mulch on garden beds. Shade tree plantations (coffee, cacao) and vanilla production in India. Useful windbreak hedge species.

Used in Asian medicine as a treatment of skin irritations, cuts. Leaves used for silkworm culture in Malaysia. Green manure and cover crop. Used in erosion control. Dried stalks for firewood, thatching and baskets in India.

PRICKLY PEAR (*Opuntia* spp.)

Spiny cacti with flat, fleshy pads grown in dry subtropics/tropics. Like full sun; grow to 2m. Propagated by planting

pads into the ground. Will grow in poor soils; drought-resistant. Caution: can be invasive; birds carry seeds.

USES: Fruit, eaten fresh or stewed (numerous hard seeds); use gloves to harvest, then scrub off fine spines and peel. Seeds are nutritious and are sometimes ground for animal feed. Young *Opuntia* pads are de-spined and sold in Mexican, Indian markets for human food; pads also fed to stock (spines are burnt off). Good barrier hedges. Some varieties are: mission prickly pear (*O. mega-cantha*); common prickly pear (*O. ficus-indica*); *O. undulata*, *O. streptacantha*.

PRUNUS SPP.

These deciduous species contains some of the most important temperate fruits: apricot, plum, almond, peach, nectarine, cherry. Many cultivars, some miniature varieties. Most are small trees and shrubs 1-10m tall. Mediterranean climates, warm dry summers best. Semi-tolerant of drought.

USES: Mainly for fruit, usually eaten fresh or in preserves, juice. Almonds are a storable product. Some species such as damson plum (*P. insillia*), sour cherry (*P. cerasus*), and common plum (*P. domestica*) will form thickets, making an excellent hedge for windbreak, wildlife habitat. All species good bee forage.

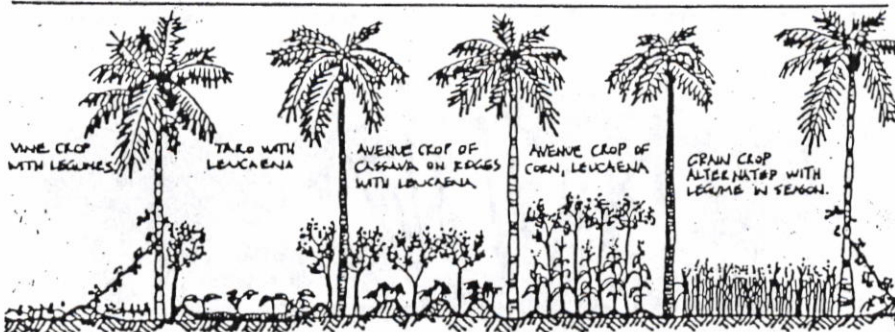
QUEENSLAND ARROWROOT (*Canna edulis*)

A clump-forming perennial of the subtropics and tropics (originally from the Americas). One of the hardiest arrowroot plants, can grow in temperate areas where there is little frost (needs warm, sunny position).

USES: Tubers cooked for a sweetish taste, though inferior to sweet potato due to fibre. Arrowroot flour. Animal forage, especially pigs. Also used as a garden windbreak and weed barrier with comfrey and lemon-grass; and can be chopped occasionally for garden mulch.

QUINOA (*Chenopodium quinoa*)

Hardy annual to 1-2m, grown in South American Andes; cold temperate, dryland. Drought-tolerant. Sow in spring

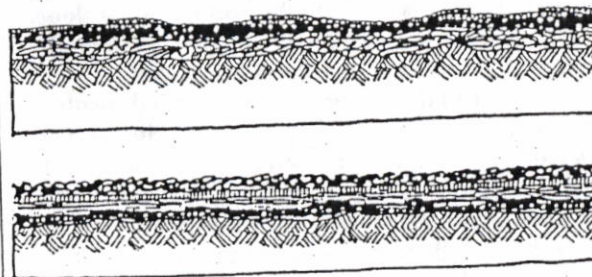


Classical Palm Intercrop



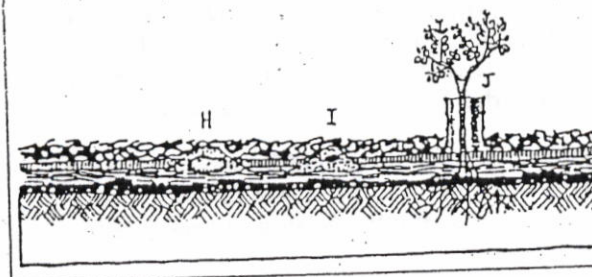
1. Rough original surface with weeds, shrubs, grasses. Woody plants are slashed and laid flat.

2. AREA is sprinkled with blood and bone, decayed leaf or thin scatter of food wastes plus some lawn clippings. Then, carpeted with cardboard, newspaper, underfelt, old carpet, lino, or clothes, hardboard, softboard, etc. (all organic materials). Crushed and darkened weeds and grasses yellow and die, soil fauna start work.



Sheets of material
Blood and bone
Slashed weeds

Cosmetic layer of woodchips, bark, sawdust, nut husks, rice husks etc.
'Hard' layer of pine needles, seagrass, straw.
75mm seaweed, stable sweepings or manure.
(E, F, and G weed free)
Layers as per 2 above.



3. Appearance of planted area in first year. (H) tubers (I) large seeds (J) trees and shrubs. All are newly planted as soon as mulch is completed.

FIGURE 5.12 Steps in sheet mulching.

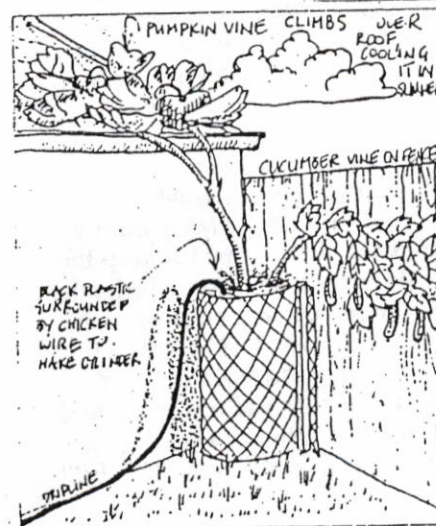


FIGURE 5.17b Circle garden with plastic tent.

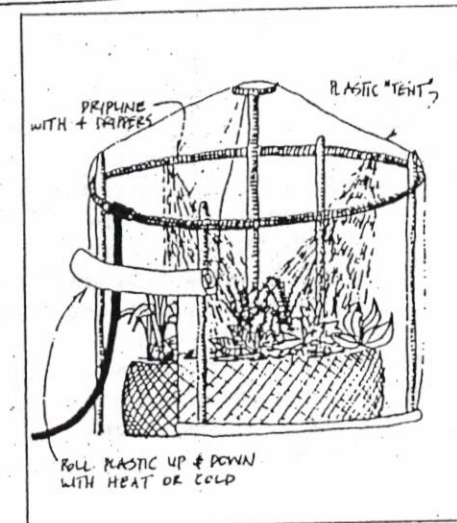


FIGURE 5.17c Chicken-wire column for rooftop vegetables.

The same thing happens in abandoned rubble lots and pastures and anywhere else where the land has been disturbed. Areas will be colonized by a new weed and herb layer which might hold the soil against erosion, bring water to the topsoil with their roots, break up compaction, fix nitrogen, reduce salts, or bring up nutrients from the subsoil which will end up in the topsoil as they die back and decompose. Blackberry bushes with big old thorns will invade an area and keep everything else away while the land heals itself. Eventually, just like with the alder, trees will grow up through the blackberry vines and shade them out.

We can do the same thing by building up the soil and substituting our own herb, pioneer, and climax species. Depending upon the type of soil you start with (which might be eroded, salted, swampy, worn out, acid, alkaline, clayey, or sandy) - it's possible to introduce plants that will easily survive and might be more useful than the existing vegetation. We can grow cover crops of clover or alfalfa or peas or beans which fix nitrogen in the soil and then turn them in to build up the fertility. We can grow buckwheat which is a phosphorus accumulator or winter rye which suppresses weed growth. We can

introduce animals into a system and have them do our work for us while they happily live their lives. If we play our cards right, in 20 years we can end up with forests of hazelnuts and peaches and blueberries. That's the plan - a permanent agriculture.

Sheet Mulching

There's all these subtle little sheet mulching projects all over the farm - it's a really basic, cool idea. The grass is full of nutrients cause it's so good at pulling minerals up from down in the subsoil. It becomes obvious pretty quick that it's a waste of time and resources to try and pull it out of the ground and clear beds for growing stuff. It's much easier to just throw a thick layer of wet cardboard or an old carpet over an area - wait a year - and when the top layer of weeds is dead and rotted back into the soil from all the heat and lack of air, then it's time to sow the vegetables. Periodically I stumble upon one of Brent's mulch spots - sets of bamboo poles or alder branches with nitrogen fixing beans trellising up from the cardboard, getting the soil ready for next year.

Pigs and Junkus

The pigs I feed everyday are fenced off in an area full of this thick weed called junkus that's scattered throughout the pasture land. It's really hard to get rid of with farm machinery, but pigs love to dig with their snouts and root up whatever they can. The longer they hang out there, the clearer that soil gets and eventually the farm crew is going to plant another fruit and nut orchard. We get to feed them our garbage, they get to play around all day and be really cute, and a bunch of people (not me) are going to be eating a lot of meat in the Wintertime.

Cows and Bamboo

The cow barn is close the lake. There's a huge clump of bamboo that's been planted at the edge of the barn which absorbs the excess nitrogen from the cow manure which would otherwise run down into the lake. The clump gets periodically harvested for poles. Everything works out.

after frost. Nutritious grain food, tasty greens. Grind seeds into flour or remove bitterness of whole grains by soaking; use boiled or in soup. Chicken fodder.

Other useful *Chenopodium* spp. for human food and chicken fodder are fat hen or lamb's quarters (*C. album*) with calcium-rich leaves for salads, seeds relished by poultry and birds; and good king henry (*C. bonus-henricus*), young plant eaten like asparagus and spinach.

ROSELLA (*Hibiscus sabdariffa*)

Fast-growing annual shrub of subtropics and tropics. Grows 1.5-2m tall. Tolerates most soils; must be well-drained. Needs long summer growing period.

USES: Fruits stewed or used in desserts and drinks; conserves. Tender leaves and young stems used as a salad or steamed; leaves are chopped as a savoury herb (for curries). Another useful plant of the *Hibiscus* family is okra (*H. esculentus*) with the tender pods boiled or sliced and fried. Used in soups and gumbos.

SALSIFY (*Tragopogon porrifolius*)

Temperate, biennial clumping plant to 0.6m, often planted as an annual. Cultivated for its oyster-flavoured edible tap-root (harvested autumn, winter, spring). Young leaves and flowers edible in spring and summer.

SCARLET RUNNER BEAN (*Phaseolus coccineus*, *P. multiflorus*)

Herbaceous perennial (grown as an annual in cold climates) with thick root stock. Tolerates some frost; grown in mild coastal or island climates. Needs cool periods to fruit heavily.

USES: Edible young pods, beans fresh or dried. Good trellis plant for shade; bright red ornamental flowers. Tubers are boiled as a vegetable in Central American highlands. Other useful *Phaseolus* are lepre bean (*P. acutifolius*), a high-value dryland species; and lima bean (*P. lunatus*), a tropical low hedge plant on fences.

SESBANIA (*Sesbania bispinosa*, *S. aculeata*, *S. grandiflora*)

Fast-growing (4-6 m/year), short-lived subtropical and tropical legume tree 6-9m high. Drought-resistant. Easily propagated by seed.

USES: Seeds used for poultry fodder and leaves for forage. *S. aculeata* used in Asia as traditional green manure crop and border plant (nitrogen-fixer) planted together with rice. *S. grandiflora* grown in the Mekong delta in home gardens for its leaves and flowers used for human food and livestock & poultry. Planted along rice paddies, yield up to 55 tons of green material per hectare. Used as temporary shade trees in nurseries. Windbreak in citrus and coffee, banana. Living fence and firewood source. Used for large-scale reforestation of bare land outside forests in Indonesia.

SIBERIAN PEA SHRUB (*Caragana* spp.)

Tall, leguminous shrubs 1-5m, forms thickets. *Caragana arborescens* is the only species that grows into a tree. Very cold and wind hardy, growing from arctic circle to warm, dry climates. Seeds burst out of 6cm-long pods and should be collected in bags before completely ripe if needed for seed.

USES: Windbreak and hedge shrub for very cold climates. Seeds are excellent poultry forage food, and pods can be left on the shrubs to burst open. Wildlife habitat, sheltering small animals in the thickets. *C. arborescens* leaves produce a blue dye. Nitrogen-fixer.

STONE PINE (*Pinus pinea* & other spp.)

Conifer up to 10-30m tall; slow-growing and long-lived. Suits cool areas and can grow on exposed, dry, rocky sites.

USES: Pine nuts or kernels are rich in oil, have a very good flavour. Cones are collected when mature but unopened; opened in summer sun or dryer and nuts are shaken free. Many species have excellent edible nuts, including pinyon pine (*P. edulis*), Coulter's pine (*P. coulteri*), *P. cembra* (Europe), *P. gerardiana* (Afghanistan).

SUNFLOWER (*Helianthus annuus*)

Annual plants 0.7-3.5m tall; temperate to tropical climates (not suited to the wet tropics, however). Drought-resistant, but do best when watered at intervals. Grow on a wide range of good draining soils. Release root exudate; some crops do not grow next to them.

USES: High-value protein seed for human and livestock; especially poultry, pigeons. Whole heads may be given to stock. Salad and cooking oil made from seeds; with seedcake residue fed to stock. Also used in blends with linseed for paints and varnishes. Lubricant and lighting. Stalks and hulls are mulch, bedding for livestock.

SUNN HEMP (*Crotalaria juncea*)

Tall shrubby annual 1-3m subtropics and tropics; frost-sensitive. Quick-growing, large leaved legume. Hardy and drought-resistant.

USES: Cultivated for fibres used as twine, paper, nets, sacking (better than jute). Root exudate said to control nematodes in the soil. Easily grown in gardens, with leaves used for mulch. *Crotalaria breviflora* used as annual fodder in tropical Africa. Green manure crop, often grown in rotation with rice, maize, cotton; and interplanted with coffee, pineapple. When thickly-sown, will smother all weeds, even vigorous grass weeds.

SUNROOT (*Helianthus tuberosus*)

Also called Jerusalem artichoke. Tall perennial which dies back to roots; 1-3m tall. Propagated by tubers. Yields are often 4-5 times that of potatoes. Hardy, wide climatic range from temperate regions to tropics. Will tolerate

poor soils, drought. Like sunflowers, sunroots release a root exudate which is toxic to some plants.

USES: Human food; tubers eaten as vegetable. Animal forage: dry stalks and leaves eaten by goats; tubers by pigs. Fast garden windbreak; also useful to break up hard soils. Leaves used for mulch in gardens after tubers harvested.

SWEET POTATO (*Ipomoea batatas*)

Perennial twining plant, often treated as an annual. Temperate to tropical tubers usually planted on ridges or mounds (cannot stand waterlogging). Propagated by stem cuttings in tropics; tuber sprouts in temperate climates. Needs frost-free growing period of 4-6 months.

USES: Important food source, eaten boiled or baked. Used for canning, drying, flour manufacture, and as a source of starch, glucose, syrup and alcohol. Also fed to livestock. Vines are widely used as fodder for stock. Grown in subtropics as a groundcover for orchards, but must occasionally be slashed from tree trunks. Die back in frost.

TARO (*Colocasia esculenta*)

Tropical wet culture plants with over 1000 cultivars. Grown either in wetland terraces with *Azolla* fern (for nitrogen fixation) or on mulched and irrigated plots. Staple food of the tropics. Large root is eaten, although some taros are grown for their leaves. The leaves of many taros are poisonous.

TAUPATA (*Coprosma repens*)

Also called New Zealand mirror plant. Large, evergreen shrub 2-3m with shiny leaves; dioecious (separate male and female plants). Easily grown from cuttings. Temperate climates; windhardy and resistant to salt spray, drought, and fire. Common ornamental seaside plant in New Zealand and Tasmania.

USES: Hedgerow plant and fire retardant. Fruit and seeds are excellent poultry forage. Leaves are eagerly eaten by sheep, horses, cows. Pruned clippings make a good mulch or compost.

TAGASASTE (*Chamaecytisus palmensis*)

NOTE: Previously named tree lucerne (*Cytisus proliferus*). Nitrogen-fixing legume tree 6-10m, living for more than 30 years. Easy to grow from seed (scarify or pour boiling water over seeds and soak). Tolerant of poor soils, drought, wind; originated in dry, Mediterranean-type climate, but does well in cool temperate areas, withstanding light frosts. Tagasaste recovers after pruning or defoliation by animals.

For best results fertilise with trace elements and lop branches regularly (either by hand or browsing) to give a more bushy foliage. Seed can be direct drilled into pasture, but plants should be protected from stock for up to 3

years (or stock let in for brief periods to graze). If sheep ringbark trees, cut to the ground to encourage new growth; this will form thickets more resistant to sheep damage.

USES: Foliage an important protein-rich fodder for stock during drought and at the end of summer. Bee forage; many small white flowers. Chickens eat seeds. Windbreak hedge. Nurse plant surrounding frost-sensitive trees in early years. Excellent cut mulch; tree can be lopped 3-4 times in summer.

TAMARILLO or TREE TOMATO (*Cyphomandra betacea*)

Short-lived shrub to 3-6m, of the tomato family. Sown from seed or propagated by cuttings from 1 or 2 year old wood. Yields in two years. Subtropical, marginally suited to cool areas (place in a sheltered, sunny position—will tolerate mild frost). Well-drained soil. USES: Fruit high in vitamin C; used fresh, stewed, preserves. Commercially grown in New Zealand; high-value crop.

TRAPA NUT (*Trapa natans*, *T. incisa*)

Also called Indian water chestnut. Several species, temperate to tropical regions. Aquatic perennial, floats in water 2-3 feet deep. Needs high nutrients. USES: Important starchy food plant, rich in iron; flour like arrowroot.

WALNUT (*Juglans regia*, *J. nigra*)

Spreading, deciduous trees to 30m; long-lived. Temperate climate, cold areas. Yields best on deep, well-drained rich soils. Release root exudate which inhibits some understorey plants, although pasture does well. USES: Both species are important for nut production, timber, specialty woods. Husks produce a dye. Black walnut (*J. nigra*) rootstock is resistant to *Armillaria* root rot; all commercial English walnut stands are grafted. Black walnut is a particularly sought-after wood, with very high prices paid for good, straight timber (yields in 40-50 years).

WHITE CEDAR (*Melia azedarach*)

Short-lived (20 years), deciduous tree 9-12m tall. Suited to a wide range of warm climates (tropics to Mediterranean climates, e.g. South and West Australia).

USES: Fast-growing shade tree; good for afforestation. Valuable timber; resistant to termite attack (does not need to be treated) and used for poles, furniture, and roofing material. Fuelwood. Coppices well; trees lopped for green manure. Leaves, bark, and fruits are credited with insect-repellent qualities. Extracts of the leaves are used as a spray against grasshoppers, and leaves placed in books and wool clothing to protect against moths. Caution: fruits are very poisonous.

WILLOWS (*Salix* spp.)

Around 300 species. Mainly spreading, deciduous trees;

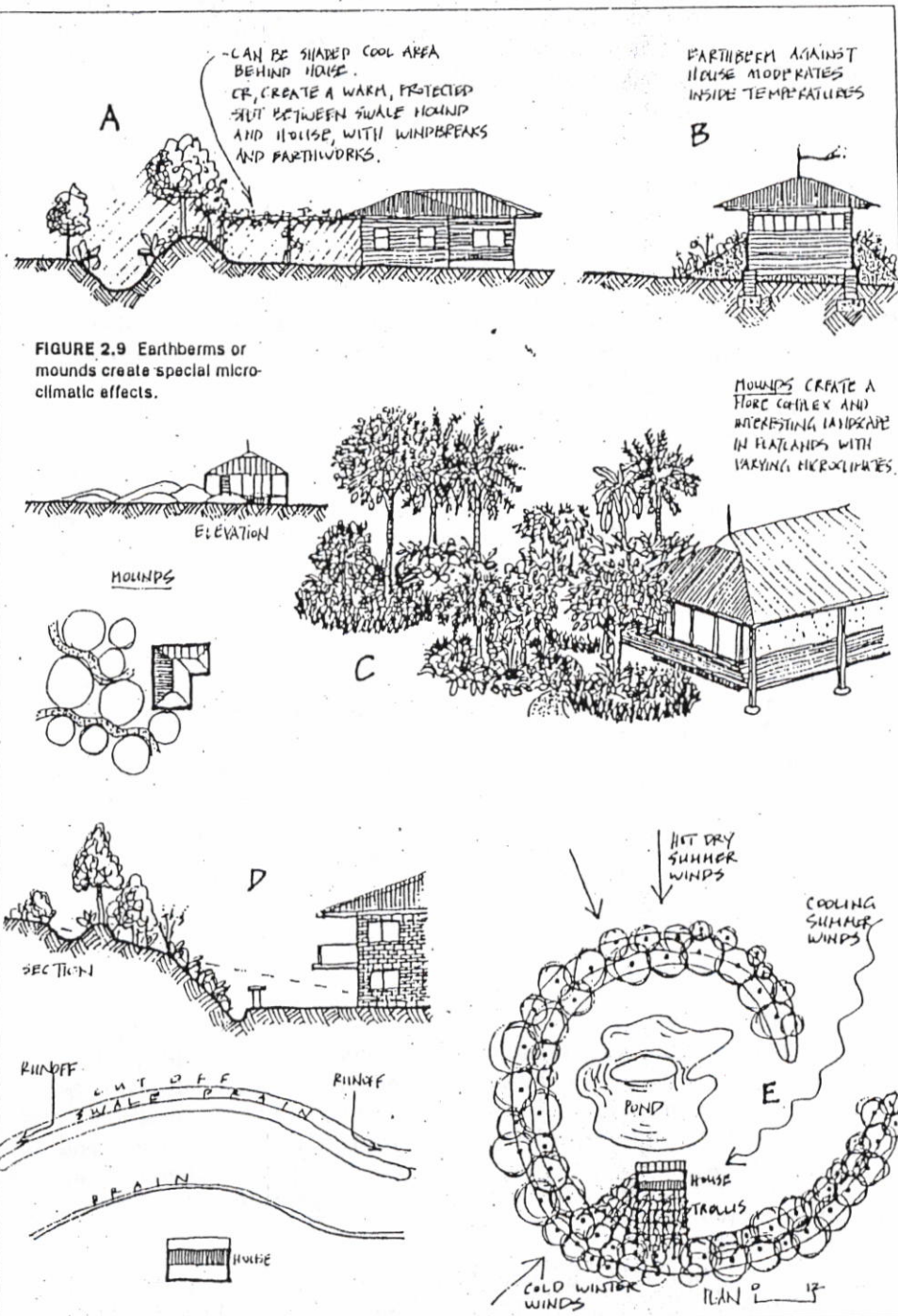


FIGURE 2.9 Earthberms or mounds create special micro-climatic effects.

Straight Up Permaculture

Everything we do on the farm is somehow mimicking things that happen out in nature. The principles and forces at play out in the forest are the same ones we use to design our fields and gardens and homes and lives. Where I've been living is like a big experiment in organic development and sustainability. Instead of acres of tractor tilled monocrops full of pesticides and herbicides and fungicides and factory buildings pumping out mutated cows and chickens, we have an organic vegetable gardens and happy animals and what we call little patches of permaculture scattered throughout the farm.

Energy Cycling

In the forest water falls from the sky, soaks into the soil, moves through the soil and across the land, rises up in the stems of trees, and returns to the atmosphere. The same way the trees in the forest hold onto water, use it, then let it back out - we try to turn flows of nutrients and energy (sun, water, wind, organic wastes) through our farm into cycles.

We have a pipe which runs from our water source (a spring) up in the hills and intercepts the flow before it runs down the creek and into our lake. Our pipe connects down to a big ferrocement tank at the top of a bluff which connects to a number of other pipes which carry water down to our houses and fields. The idea is to catch, store, and use all of our resources before they run off the property. Recycling kitchen waste into compost, channeling household greywater into the garden, raking leaves up around trees as mulch - those are all different ways of energy cycling. Rather than using expensive, complex machinery which need petroleum and random parts from the other side of the world, we use hand tools like scythes, wheelbarrows, forks, and spades. The energy we expend out in the fields goes into our food cultivation, then we eat the food and the cycle starts all over again.

The idea is to create a closed circle where we feed ourselves and don't have to be dependent on the global market for our survival. The idea of localized economy is based on the same principle - supporting your friends and regional community and keeping the trade flowing in a circle. Buying from the neighborhood family market rather than the megamall - supporting local businesses rather than giving it to people who already have plenty of money and live really far away from you in fancy houses somewhere.

Accelerated succession - pioneers and climax species.

The forest develops and changes over time, always giving rise to a new succession of different species. Each stage creates the right conditions for the next stage. When the trees get cut down on this land, the first thing that happens is the alders grow. There are patches of alder all over this forest from where the old trees have been clearcut. Alder is a pioneer species. Their roots fix nitrogen in the ground and build up the soil for the next generation to come along. As the rest of the flora and fauna develop around them in layers of vines and shrubs and ground cover, the cedar and fir slowly begin growing again. Eventually the alder fall and break back down into soil, shaded out by the climax species cedar and fir.

water-loving. Mostly temperate climate. Easily propagated from stem cuttings. May become naturalised or rampant, especially along streams.

USES: *Salix viminalis* (osier willow) and other species used for basketry. Long 1-2 year old shoots are cut from pollarded willow stumps, or from thickets of willow stems (trunk cut at ground level). *S. matsudana* is used in New Zealand for erosion control. Weeping and pussy willows (*S. discolor*), among others, are excellent bee forages. Willows are fire retardants (steam rather than burn). *S. matsudana* var. *Tortuosa* has lush foliage for emergency sheep and deer fodder during drought; one hectare of willows can maintain 1000 sheep for 6 days (data from Agroforestry in Australia and New Zealand).

WINGED BEAN (*Psophocarpus tetragonolobus*)

Leguminous, twining vine, growing to over 3m when supported. Valuable, nutritious tropical garden bean.

USES: Edible pods, young leaves, shoots, flowers as vegetables; immature tuberous roots eaten raw or cooked. Very high protein content. Can be used as for soy beans for processing to bean cake. Seeds contain oil for cooking, soap, and lighting. Dry flowers eaten like mushrooms. Excellent nitrogen-fixer (heavy nodulation), soil conditioner and cover crop for the tropics.

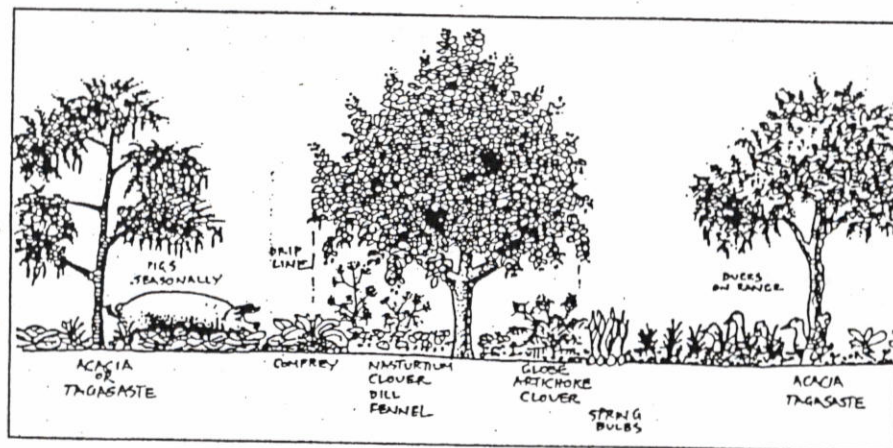
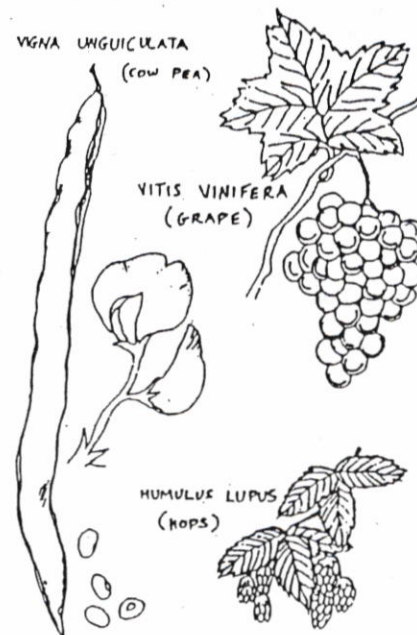
YAM BEANS (*Pachyrhizus erosus*, *P. tuberosus*)

Herbaceous, twining plant 2-6m tall. Warm-climate, dry-land perennial beans with crisp, edible tubers; harvested after 4-8 months. Mature seeds and leaves toxic.

USES: Tubers widely eaten in Mexico, Philippines, SE Asia, raw or cooked. Called jicama (*P. erosus*) in Mexico and eaten in salads or sliced thinly and sprinkled with salt, lemon juice and chilli sauce. Young pods of *P. erosus* sometimes eaten like French beans. Old starchy tubers are fed to cattle.

YARROW (*Achillea millefolium*)

Herbaceous perennial to 1 m, with white flower heads. Drought-resistant; naturalises along roadsides and disturbed soils. Bee forage. Insectary plant (a member of the composite family which attracts beneficial insects). Flowering tops and foliage of medicinal use for stock, especially sheep.



Appendix B

SPECIES LISTS IN USEFUL CATEGORIES

The following are lists of useful permaculture categories, with no attempt to describe particular plants. Some of those listed can be found in Appendix; others are so common as to need no description. Asterisk (*) marks tropical/subtropical species.

Table 1: Plants with Food Products from Roots, Tubers, or Shoots

*Arracacha	Asparagus
Bamboos	Beet
*Cassava	Carrot
Celeriac	Chicory
Choko	Dandelion
*Yam beans	Onion
Parsnip	Radish
Sunroot	Potato
*Taro	Turnip
Salsify	*Queensland arrowroot
Peanut	Scarlet runner bean
Duck potato (USA)	

Table 2: Plants Giving Storable Food Products

A. Nuts	
Almond	Black walnut
Walnut	*Bunya pine
Butternut	Chestnut
Filbert, hazel	*Macadamia
Ginkgo	Pecan
*Pistachio	Oaks
Stone pine & other pine nuts	
B. Fruits (suitable for local drying & storing)	
Apple	Apricot
Fig	Jujube
Peach	Prune plum
Cherry	Pear
*Mango	*Pineapple
*Banana (some small varieties)	
Grape (some raisin varieties)	
C. Flours and meals	
Carob	Honey locust
Sweet chestnut	White mulberry
Pigeon pea	
*Indian water chestnut	
*Queensland arrowroot	
D. Cooking and salad oils	
Almond	Beech
Hazel	Olive
Live oak	Walnut
Mustard	Grapeseed
Safflower	Rape
	Sunflower

Table 3: Fresh Fruits

A. Temperate	
Alpine strawberry	Loquat
Apple	Medlar
Apricot	Mulberry
Blueberry	Nectarine
Cape gooseberry	Peach
Checker berry	Pear
Kiwifruit	Persimmon
Feijoa	Plum
Fig	Grape
Strawberry	Grapefruit
Strawberry guava	Jujube
Cherry	Tamarillo
Berries (black, logan, boysen, red)	
Banana passionfruit	Black, red currants
B. Subtropical/Tropical	
Mango	Jakfruit
Guava	Rambutan
Carambola	Mangosteen
Lychee	Naranjilla
Sapote	Jaboticaba
Mammey sapote	Pepino
Papaya	Custard apple
Prickly pear	Natal plum
Granadilla	Pineapple
Passionfruit	Citrus spp.
Table 4. Fruit Used in Cooking, Preserves, Wine	
Cranberry	Elderberry
Quince	Huckleberry
Comelian cherry	Barberry
Pomegranate	Cumquat
Table 5. Fruit High in Vitamin C	
*Barbados cherry	Citrus
Rose (<i>Rosa rugosa</i>)	*Rosella
*Guava	
Table 6. Animal Forages and Feeds	
A. Nuts, pods, seeds	
Almond	Mesquites
Beech	Taupata
Oaks	Siberian pea shrub
Honey locust	Tagasaste
Hazel	Walnut

All my housemates are really busy with projects: canning tomatoes, cooking jam, drying plums, threshing amaranth and quinoa and beans, making pesto and tending to the berry wine. Our eight month sustainable agriculture program ends in six weeks and we're all planning our futures, heading off in different directions ready to take on the world with all this knowledge in our hands and arms and minds.

My days are really full and completely revolve around food - sowing it, tending to it, talking about it, studying it, harvesting it, processing it, eating it. I've been t-bud grafting fruit trees and rooting semi-hardwood cuttings of shrubs and trees in tins of wet sand, saving tons of different kinds of vegetable and flower and herb seed, staying up late at night reading drip irrigation and biofertilizer and plant propagation textbooks. I swear it's so magical - like casting spells - getting the timing down and mixing up the right amounts of soil and seeds and water and sun and - poof! - it all starts growing.

Reclaiming Lost Knowledge

What's incredible is that people aren't learning these skills anymore - food cultivation and land stewardship are rapidly becoming lost arts. Not so many generations back most of our families were providing their own food in one way or another. Our grandmothers had fruit trees in their backyards, our grandpas would catch their own fish, people would save their own seed and grow the same tomatoes their grandparents had grown. We lived in tighter communities with more localized economies and had a closer connection to the land we lived on and the people around us.

Now a couple multinational chemical companies own most of the crop seeds in the world and genetically alter our food to be dependent on their fertilizers and herbicides. We grow our food on huge tracks of monocropped land and transport it all over the place in monster trucks and buy it wrapped up in plastic from nightmarish superstores. We've sprawled out of our cities in strangleholds of highway and covered up our best agricultural soil with cancerous growths of suburban development and industrial parks. Our economy is based on an infinite growth model that doesn't factor in our limited natural resources or peoples' livelihoods and happiness. The rivers are full of toxic waste and there's a law against fruit trees in my home town because the fruit might fall on peoples' cars. Kids like me grow up in big apartment buildings totally alienated and clueless and never knowing where our food really comes from or how anything really works.

When I listen to the news on the radio full of war and catastrophe and stock market bullshit, I take comfort in the fact that the skills I'm learning will never become outdated. No matter what I end up doing I will never be downsized and replaced by a machine. I'm going to spend the rest of my life helping to clean up the mess the corporations have created in all their greed and shortsightedness. And just like the rest of the people I work with everyday, I'm just going to get better at all of this stuff as the years go on. Anyone can learn how to grow food and take care of themselves and the world around them. What follows are some rough notes about some of the stuff we've been learning out here:

Can't Hang with the Monocult - Lessons in the Forest Kickin it on the Farm - Month Seven

I'm sitting under a huge cedar tree on a thick cushion of moss and needles and decomposing wood; it's early Saturday afternoon, and I'm in the middle of the forest across the lake from the farm. I've been working clearing trails in the park here for the past bunch of hours, cutting back sollar roots and pulling up ferns; now I'm watching the squirrels run across the upper story of the trees and resting my sore arms in the shade, feeling sweat beading down my neck, listening to the sound of my breath and the birds chirping and the wind blowing across the lake. I'm about at fern level, looking straight up into the crisscrossing network of spirals and whirls of tree branches, light flickering through the patterns of needles and swirls. The soil under the cedar needles I'm resting on is thick and black, held together with decomposing organic matter - constantly in flux and full of life. It's all mulched under a carpet of the tree's energy - breaking down and building up and breaking back down again - slowly getting taller and deeper - holding the energy in and letting it go little by little over time. Life in this forest is an endless flow of producing, consuming, and decomposing. The tree I'm sitting under sheds it's weight and builds the soil it stands in. The old growth fir trees stumps everywhere that were hand-logged back in the 1920's have giant new hemlocks growing out of them - the new trees taking advantage of the old root systems carved through the soil and rock.

Here in the forest, everything is connected up and down and underground - from the smallest microbe fixing nitrogen in the soil to the cougar catching a deer for its dinner on the edge of the bluff. There are a lot of important lessons to learn out here.

The Backdrop:

So while most of my friends are back in the city somewhere cultivating their stress and balancing activism and computer temp jobs or scamming their way along the trainlines and supermarket dumpsters of America, this urban kid has been learning how to grow food and living at a farm near the edge of the forest on a tiny island in British Columbia for the past half a year.

Here's my routine: I wake up in the morning with the sun and write down my crazy dreams, slip out of the house and feed the pigs, water the greenhouse full of tomatoes and peppers, tend to my little broccoli transplants which are just starting to make heads for Fall, maybe jump in the lake if it's not too chilly. Usually after breakfast, me and the rest of the crew head out to the production garden and harvest corn and beans and squash and carrots and eggplants and leeks and beets and lettuce and tomatoes and zucchini and basil. We work on building compost or building fences or slowing down erosion in the creek that feeds into the lake by our house. A couple times a week we'll have a discussion group kind of class on soil chemistry or composting toilets or land trusting. A couple of us are building a seed bank and networking with a bunch of local farmers and seed companies and exchanges.

Hickories	Acacias
*Ice cream bean	*Leucaena
*Pigeon pea	Amaranth
Quinoa	*Sesbania
*Winged bean	Carob

B. Foliage	
Bamboo	Lespedeza
Chicory	Lucerne
Comfrey	Lupin
Tagasaste	Pampas grass
Sunroot	Vigna spp.
*Lab-lab bean	*Leucaena
Tree medic	*Pigeon pea
*Sesbania	Taupata
Willow	Kurrajong
*Winged bean	Dandelion
Choko/chayote	

D. Roots, tubers, rhizomes	
*Arracacha	*Yam beans
Sunroot	Chickory
*Yam	Choko
Comfrey	Sweet potato
Arrowhead, duck potato	
*Queensland arrowroot	

Table 7. Edible Flowers For Salads

Daylily	Borage
Calendula	Feijoa
Black locust	Nasturtium
*Sesbania	Dandelion
Salsify	Sweet violet
Zucchini	*Winged bean
Rose (<i>Rosa rugosa</i> , <i>R. canina</i>)	

Table 8. Hedge Plants

Taupata	Some clumping bamboos
Alder	Hawthorn
Hazel	Russian olive
Autumn olive	Elderberry
Laurelberry	Pampas grass
Coprosma	*Queensland arrowroot
Pomegranate (closely-spaced; clipped)	
Some <i>Prunus</i> spp. (Damson plum, sour cherry)	

Table 9. Animal Barrier Plants

(Spiny or unpalatable dense thickets)	
Euphorbia spp.	Hawthorn
Gorse	Sloe
Honey locust	Natal plum
Prickly pear cactus & other cactus spp	

Table 10. Useful Perennial Vines

A. Deciduous	
Grape	Wisteria
Kiwifruit	Scarlet runner bean
Scarlet trumpet vine	*Yam beans
Virginia creeper	

B. Evergreen	
*Passionfruit	Choko/chayote
*Vanilla	*Lab-lab bean
Jasmine	Ivy

Table 11. Pest Control Plants

*Sunn hemp (nematodes)	
Marigold (<i>Tagetes</i> spp.)	nematodes
Pyrethrum daisy (broad spectrum insecticide)	
White cedar and neem tree (insecticide)	
Tobacco (insecticide)	
Derris root (<i>Derris elliptica</i>)	
Rhubarb (insecticide)	

Table 12. Umbelliferous Plants

Celery	Angelica
Florence fennel	Parsley
Dill	Chervil
Lovage	Queen Anne's lace
Caraway	Coriander
Fennel	Cumin
Anise	Sweet cicely
Parsnip	Carrot

Table 13. Composite Plants

Tarragon	Southernwood
Tansy	Chamomile
Wormwood	Daisies
Artichoke	Salsify
Sunroot	Sunflower

Table 14. Water or Wetland Plants

Azolla	Rush (<i>Scirpus</i> spp.)
Watercress	Water chestnut
Mint	*Kang kong
Water lily	*Lotus
Wild rice	Rice
Duckweed	Duck potato (arrowhead)
Willows	Cranberry
Highbush cranberry	
Cumbungi or cattail	
Reed (<i>Phragmites</i> spp.)	

Table 15. Bee Forage

Almond	Lavender
Apple	Loganberry
Bergamot	Lucerne/alfalfa

Blackberry	Lupin
Black currant	Mesquites
Apricot	Mints
Black locust	Borage
Leatherwood	Cherry plum
Clover	Comfrey
Peach	Dandelion
Pear	Tagasaste
Raspberry	Gooseberry
Rosemary	Citrus spp.
Sage	Hawthorn
Sloe	Hyssop
Sour cherry	Laurelberry
Pride of Madeira	Some Eucalyptus
Osier willow (& other willows)	

C. Tropics/Subtropics

Trees

Acacias	Albizia
Gliricidia	Calliandra
Leucaena	Sesbania
Pongamia	Tamarind
Cassia	Ice cream bean tree
Tipuana tipu	
Small species	
Pigeon pea	Lab lab bean
Winged bean	Peanut
Beans & peas	Clover
Lucerne	

Table 16. Species for Very Dry Sites

Almond	Mesquites
Black locust	Mulberry
Burr oak	Olive
Carob	New Zealand spinach
Cork oak	Pampas grass
Tagasaste	Prickly pear
Many Acacia spp.	*Pistachio
Pomegranate	Jujube
Fig	Quandong
Holm oak	Rosemary
Honey locust	Stone pine
Lavender	Taupata
Most aromatic herbs	

Table 17. Legumes & Other Nitrogen-fixing Plants
The trees can be coppiced for green manuring and animal fodder. * denotes non-legume nitrogen-fixer.

A. Temperate

Trees

Tagasaste	Black locust
Autumn olive	Russian olive
*Alder	Siberian pea shrub
Albizia	*Ceanothus
Tree medic	

Small species

Azolla (aquatic)	Fenugreek
Clover	Lucerne
Beans & peas	Veitch
Lupin	Lespedeza

B. Warm/dry climates

Trees

Mesquite	Acacias
Tagasaste	Albizia
Casuarina	

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