Forest Gardening / Food Forests Design at the Agroforestry Research Trust, Devon.

Report by Tracey Fahy

COURSE: Forest Gardening / Food Forests Design Course with the Agroforestry Research Trust (ART).

LOCATION: Agroforestry Research Site, Dartington, Totnes TQ9 6EA.

DATE: 20-21 August 2022 (in person at the research sites in Devon)
24 September (zoom Q&A)

TUTOR: Martin Crawford

- Director of the Agroforestry Research Trust (www.agroforestry.co.uk), a non-profit-making charity that researches into temperate agroforestry and all aspects of plant cropping and uses, with a focus on tree, shrub and perennial crops.
- He is a director of 'Gaia', a Trust formed by James Lovelock to further his work.
- He has had broad and varied horticultural/agricultural experience over the last 25 years – he has worked for the Yarner Trust in North Devon, teaching small-scale organic agriculture; grown food for a small hotel on the Isle of Iona; restored the walled gardens of a manor house in mid-Devon; and run his own organic market garden and tree nursery in South Devon.

COURSE CONTENT:

- Two sessions at the research sites in Devon (Dartington Hall & Littlehempston). The sessions are specifically designed to cover design strategies for forest gardens.
- A course booklet, and two booklets about the sites.
- Access to all the materials in the extended online forest gardening /food forest course: 16 video episodes, 13 lecture episodes, online tours of our sites, pdf notes to online content.
- A zoom Q & A session with Martin Crawford.

The aim of the course is to give participants the confidence to design, implement and maintain a temperate forest garden or food forest.

CONTENTS **PAGE**

INTRODUCTION

I'm working towards a career in sustainable horticulture and I currently work as a freelance gardener (plus working 1-2 days a week as a florist to supplement my gardening income). My gardening work involves maintaining various private gardens independently, offering an ecological approach to garden maintenance.

In 2018, I completed the *RHS L2 Certificate in Practical Horticulture* at Capel Manor and, in 2021, passed my *RHS L2 Certificate in the Principles of Plant Growth, Propagation and Development* (studied via online distance learning). My horticultural interests lie in the wellbeing benefits of gardening and growing medicinal/edible plants sustainably.

In addition to paid employment, I also volunteer in the Kitchen Garden at Chiswick House & Gardens and keep an allotment bed at Eden Nature Garden (an award winning garden and South London site for the London Beekeepers Association) growing my own perennial edibles and medicinal plants. Established in 2000 as a community garden, Eden's aim is to create and maintain a sustainable habitat for wildlife and promote biodiversity by planting British native species and through organic gardening (www.edengardenclapham.org).

I strongly believe we need to work towards a more ethical way of working with the land and forest gardening is a method of producing food by replicating a woodland system. As I'm setting up a balanced edible ecosystem on my allotment bed, visiting the Agroforestry Research Trust will significantly help me achieve this goal.

My interest in sustainable horticulture has been inspired by reading *The Garden Awakening* by Mary Reynolds (2016), *The One-Straw Revolution*, by Masanobu Fukuoka (1978) and several Martin Crawford's books on edible forest gardens (listed at the end of the report). In addition, my trip to Japan (2018) to attend the *Japanese Garden Intensive Seminar Plus Seminar* in Kyoto (supported by grants from The Merlin Trust [M742] & RHS) has also influenced my outlook. My takeaway philosophy from this trip is that we are not gardeners *per se* but guardians of the land and should tread lightly on the earth. For Japanese horticulturalists, care for the environment is paramount, which comes through in their use of local materials. Most Japanese gardens use local stones and replicate nature in a way that isn't damaging to the environment; an approach I have embraced. The Japanese expect gardens to be active all year round. The notion that the gardener should submit to a fallow season in winter is absurd. Japanese gardens are multidimensional – evergreens in leaf all year round and deciduous species that mark the passing of the seasons. They also tend to employ perennials rather than annuals and therefore don't need replanting every year. Japanese gardens seek to emulate its wild, mountainous landscape, which is a philosophy that has a similar ethos in forest gardening, replicating an ancient woodland system. Careful thought is applied during the design phase to ensure the forest garden will be self-sustaining and produce edible crops all year round with no fallow season.

WHAT IS A FOREST GARDEN?

- Forest gardens – also known as food forests and multistrata systems – are gardens modelled on mid- succession woodland, near to the climax vegetation of most temperate climate regions.
- Forest gardens usually contain many edible crops and sometimes other useful crops of many kinds.
- Forest gardens are long-term biologically sustainable systems.

HISTORY OF FOREST GARDENS

- Long history in tropics and subtropics, at least 14,000 years from southern Asia.
- Much shorter history in northern temperate regions: UK and USA since 1980's (rest of Europe later).
- In the UK, Robert Hart pioneered this style with his garden and books.
- Now there are thousands of forest gardens in the northern regions.

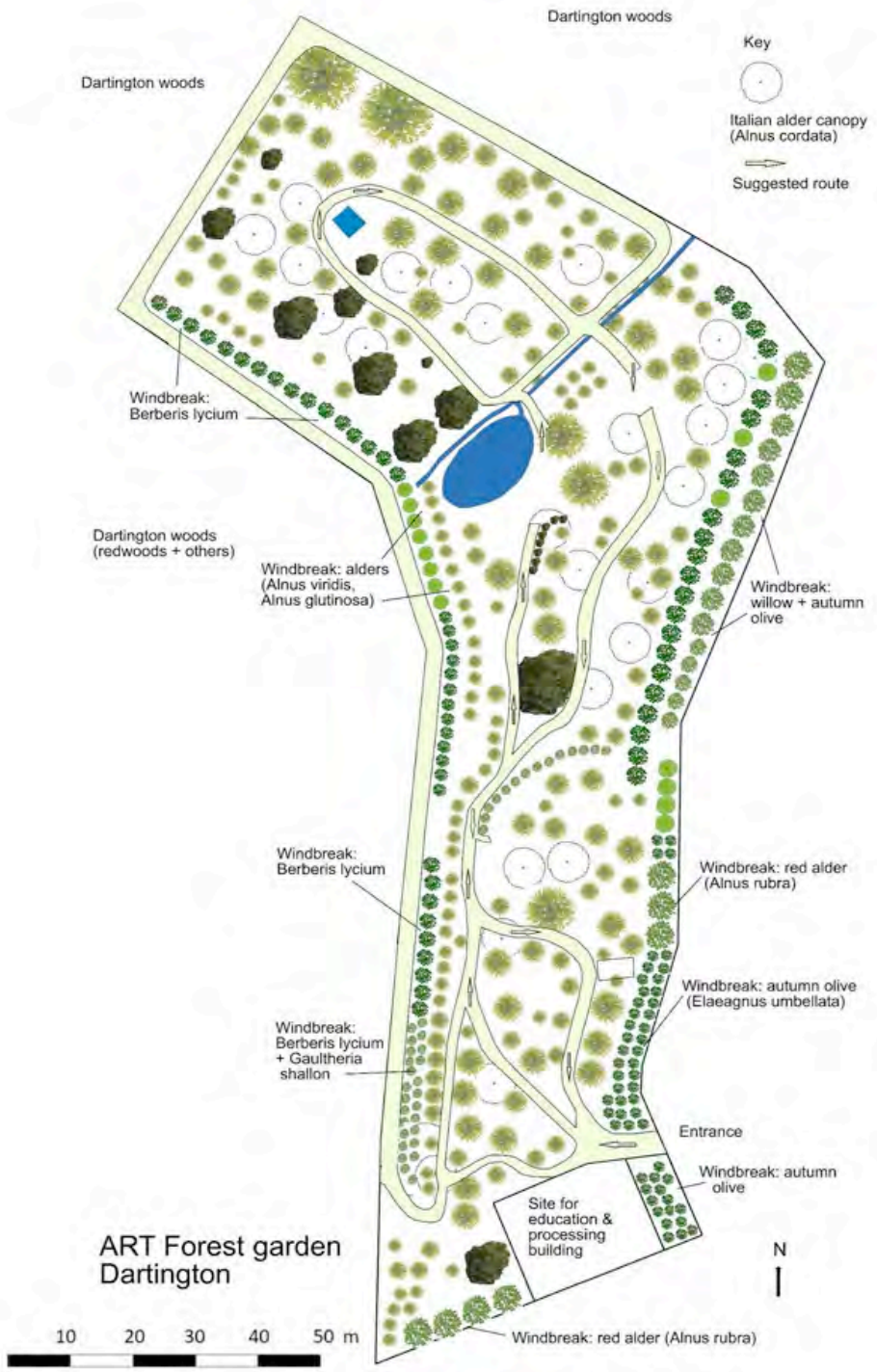
WHY CHOOSE A FOREST GARDEN?

- Low maintenance due to high efficiency.
- Yields a wide range of products.
- Biologically sustainable.
- Resilient to weather extremes and climate changes.
- Environmental benefits including carbon sequestration, shelter & erosion control
- Good wildlife value.
- Aesthetically pleasing & to be closer to nature.

MAINTENANCE REQUIREMENTS OF A FOREST GARDEN

- Weed control
- Pest control
- Path maintenance
- Pruning
- Irrigation
- Occasional replanting

<u>THE ART FOREST GARDEN AT DARTINGTON HALL</u> – Visited on 20/08/22.



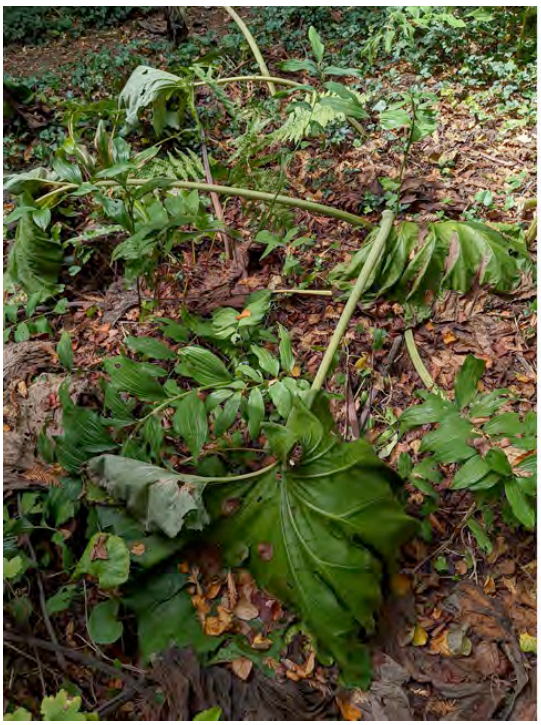
This project started in 1994 on land owned by the Dartington Hall Trust and rented to ART on a long-term basis. It was previously a pasture field, size 0.84 ha (2.1 acres). The main preparation of this site was a single application of lime to raise the pH of the soil. Windbreaks were erected (especially along the East) using a variety of species including Red alder (*Alnus rubra*), Juneberry (*Amelanchier lamarckii*), Barberry (*Berberis lycium*), Sweet chestnut (*Castanea sativa*), Autumn olive (*Elaeagnus umbellata*), Willow (*Salix 'Bowles'*) and Guelder rose (*Viburnum opulus*).

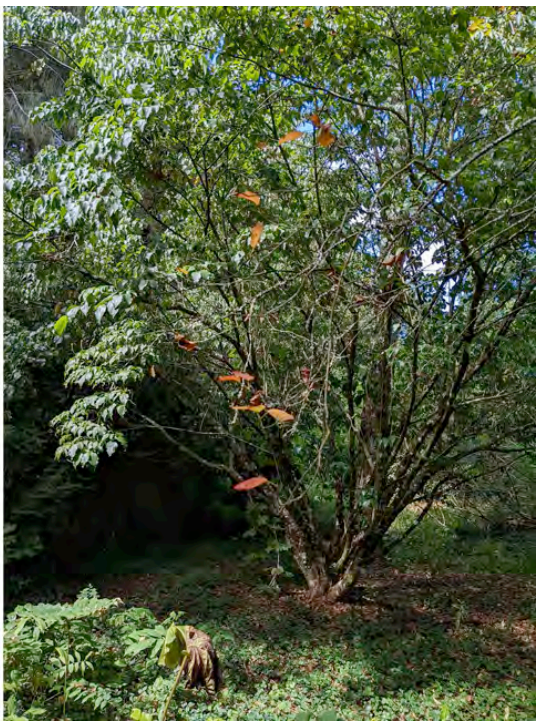
Particular points of interest at this site include:

Above Left: New Zealand flax (strips of leaves used for tying).

Above Right: Trachycarpus palms (used for fibre and edible buds/flowers).

Above: Mushroom log (shiitake and oyster mushrooms are being grown on a variety of different woods).



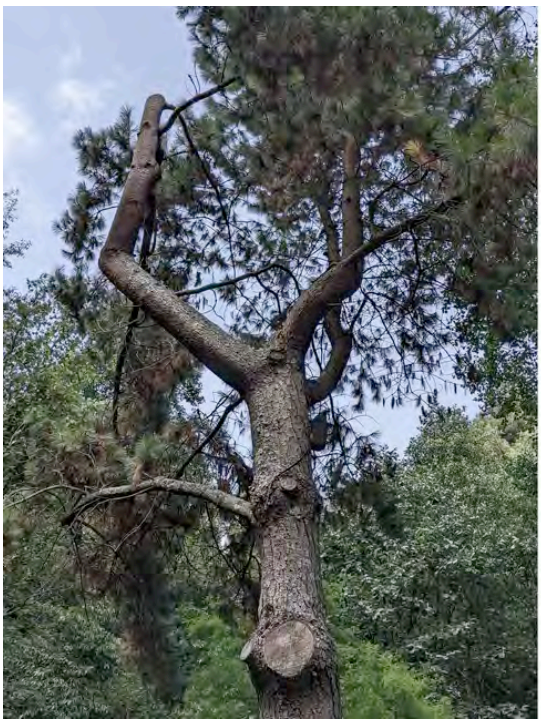


Above left: Japanese vegetable Fuki (*Petasites japonica*).

Above right: Chinese dogwood (*Cornus kousa chinensis*) has edible fruits.

Above left: Pear tree (*Pyrus communis 'Louise Bonne of Jersey'*).

Above right: Hostas & ostrich ferns (*Matteuccia*), both have edible leaves.



Above: Monterey pine with ‘people’s space’ beneath.

Above: The pond area surrounded with beneficial purple loosestrife for bees.

Other notable plants at this site include:

- Toon trees (*Toona sinensis*), a tree vegetable with delicious spicy leaves.
- Szechuan peppers (*Zanthoxylum spp.*)
- False strawberry (*Duchesnea indica*).
- Wild strawberry (white flowers).
- Solomon's seal (*Polygonatum biflorum*).
- False indigo, used mainly as a nitrogen-fixer.
- Pollarded small leaved lime trees for edible leaves, also used as a living trellis for hardy kiwi vines (*Actinidia arguta*).
- Greenwax golden bamboo. This is one of their most productive bamboos, producing edible shoots from mid April to July, as well as useful sized canes for garden use.
- Korean raspberry groundcover (*Rubus tricolor).*
- Periwinkle (*Vinca major*), an evergreen ground cover and bee plant.
- Dwarf comfrey (*Symphytum ibericum*) for bee fodder and mineral accumulation.
- One of the nicest members of the Rubus family, Japanese wineberry (*R. phoenicolasius*).
- Hop plant (*Humulus lupulus*), the hop is mainly used for edible shoots through spring and summer.
- Sweet cicily (*Myrrhis odorata*).
- Lungworts (*Pulmonaria officinalis*) for bee fodder.
- American edible (when cooked) pokeweed (*Phytolacca Americana*).
- Nepalese raspberry groundcover *(Rubus nepalensis).*
- Turkish rhubarb (*Rheum palmatum*), has edible leaf stalks.
- Mashua (*Tropaeolum tuberosum*), edible leaves and tubers.

ART LITTLEHEMPSTON RESEARCH SITE – Visited on 21/08/22.

This 4.5 ha (11 acre) site was acquired in January 2012. Previously the site had been used as both arable and pasture land for periods of time. The soil was quite compacted but being a medium-textured loam, over a 'shillet' subsoil, means good potential levels of fertility and better drainage than the soil at the Dartington site. Initial works consisted of fencing (to keep most rabbits and all deer out), groundworks (making the track, levelling ground for the nursery buildings), decompacting the soil using a subsoiler, erecting nursery buildings and temporary windbreak netting in the nursery areas, plus planting windbreaks of Italian alder (*Alnus cordata*), Autumn olive (*Elaeagnus umbellat*a) and New Zealand flax (*Phormium tenax*).

The site comprises:

- **Forest garden 1**: 400m2 - demonstrating what can be done on a small scale.
- **Forest garden 2**: 2000m2 (1/2 acre) – medium scale.
- **Forest garden 3**: 2500m2 (0.6 acre) – medium scale using techniques to maximise carbon sequestration.
- **Nut orchard** comprising mainly hazelnuts, pine nuts and walnuts.
- **Experimental coppice area**.
- **Forest garden/climate change greenhouse** containing a young subtropical forest garden.
- A **reservoir** (pictured below) is positioned at the top of the site, which was reconstructed and lined in 2019 (the original reservoir system failed to work very well), collecting rainwater and also water from the nursery building roofs (polytunnels and shed). Current capacity is about 500m3 (500,000 litres), which (if full) would be enough for more than 2 years of irrigation. The water is circulated via a solar-powered pump through a stone-sand biological filter (pictured left below). Like many places in the UK, the weather is changing, with dry springs and early summers becoming common so irrigation could well be needed more in the future. The winters are often very wet here, giving a good opportunity to collect rainwater.




Above (left-right): Nursery polytunnel, coir-topped plants to prevent water loss, groundcover raspberries (*Rubus spp.*) plus mother propagation beds for strawberry (*Fragaria*) species.

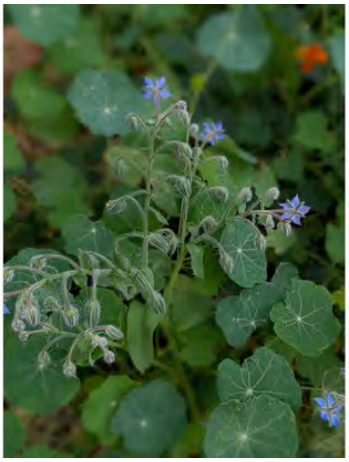
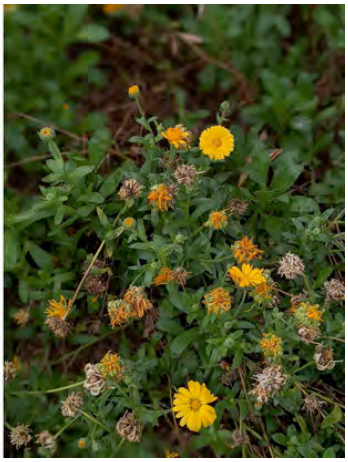
Some points of note:

- The aim at this site is to grow most of the plants in the soil as this is sounder and uses fewer resources.
- Alongside the edge of the track is a predator strip with grey-leaved Senecio and umbellifers mixed to attract aphid predators.
- Pictured below are hedges of New Zealand flax (*Phormium tenax)*. N.B. All the tying up to bamboo canes onsite is done with strips of New Zealand flax.

Forest Garden / Climate Change Greenhouse (pictured below)



This experimental system is based on the ideas of Jerome Osentowski from Colorado USA. The aim is to maintain a frost-free climate making it possible to grow a subtropical forest garden system without having to use any external heat energy input during the winter months. The structure is a standard commercial 'Venlo' glasshouse (though higher than many, to 6.75m at the ridges), which was erected in summer 2016. Occasionally, overhead spray irrigation is used, but care is taken not to make the atmosphere too humid, which encourages fungal disease. Two destratification fans keep the air moving inside, even if the windows are closed. The main trees were mostly planted in the spring and summer of 2017, along with a green manure mix of annuals (to improve soil quality and reduce compaction) including Persian clover, calendula, marigold, nasturtium, cumin, coriander, borage, anise and others, a few of which still persist by self seeding (some pictured below). Since then there has been gradual planting of shrubs, perennials and ground covering plants.

The plan here is to have a self-sustaining subtropical system with ground covered by evergreen perennial plants. A weather station (both inside and outside) measures climate variables and so far has shown a mean difference in annual temperature of +5.0 to +5.5°C over the outside. This has enabled ART to grow banana, lemons, lime, clementine, Thai lime, satsuma, Fig and babaco (all of which fruited within 2 years) as well as avocado, loquat, sapote, passionfruit, starfruit, longan and mango. The lower layers include shrub peppers, dwarf tamarillo, tomatoes, Mexican pepper leaf

and Okinawa spinach. At ground level, the New Zealand spinach has been a very successful edible, evergreen groundcover.

Above: Dwarf tamarillo (*Solanum abutiloides*), has a beefy scent.

Above left: 'Water hemp' (*Debregeasia edulis 'Elite'*) edible orange fruits with a sweet taste and exotic aroma.

Above right: Shrub pepper (*Capsisum pubescens 'Rojo'*).

Forest garden 1

This forest garden is intended to demonstrate forest gardening on a much smaller scale. Incorporated into the design of this site are some raised beds for small areas of annuals. The garden resonated with me the most for it's manageable scale (the size of an average garden).

Points of interest here include:

- Groundcover of wild strawberry (*Fragaria vesca*).
- Rhubarb (*Rheum cultorum 'Champagne'*).
- Good king henry (*Chenopodium bonus-henricus*).
- Day lilies *(Hemerocallis 'Stella d'Oro').*
- Bog myrtle as an under storey shrub.
- *Toona sinensis,* pollarded for edible leaves.
- Several raised beds with annual vegetables and some perennials for propagation (including marsh woundwort (*Stachys palustris*) for its edible roots, perennial leeks, rakkyo (*Allium chinense*), liquorice (*Glycyrrhiza glabra*), asparagus and horseradish (*Armoracia rusticana*), to name a few).

Above left: Artichoke (*Cynara scolymus 'Tavor'*).

Above right: Martin Crawford explaining small-scale forest gardening.

Above right: Pear tree (*Pyrus communis*).

Above left: Dwarf quince (*Chaenomeles*).

Above left: Under the medlar (*Mespilus Germania 'Nottingham'*) is dwarf comfrey (*Symphytum ibericum*) and Himalayan strawberry groundcover.

Above right: Apple (*Malus domestica 'Lord Derby'*) and perennial *Brassica oleracea.*

Above: Edible bamboo shoots (Phyllostachys nuda).

Forest garden 2

This site is significantly more exposed than forest garden 1, especially further up the slope. There are a lot of nurse plants used to give initial side shelter and to input nitrogen into the system. Scotch broom (*Cytisus scoparius*) is the most obvious here, but others are being used including hardy Acacia species (some of which may remain long term). Most striking is the east hedge of sea buckthorn (*Hippophae rhamnoides*) – comprising 85% females and 15% male plants (pictured below).

Above: View of the nurse plants in forest garden 2.

Forest garden 3

The last big area to be planted on this site, with planting started in early 2020. The area is approx. 2500m2 (0.25 hectare / 0.6 acre). Here, they are using techniques to try and maximise the rate of carbon storage. One of the major techniques is the intensive use of nurse trees/shrubs, so the initial planting is very dense (about 2500 stems/ha or 1000 stems/acre) – one tree or shrub every 2m or so. The nurse plants are fast growing pioneers, mostly nitrogen-fixing and include:

- Italian alder (*Alnus cordata*)
- Green alder (*Alnus viridis*)
- Silver birch (*Betula alba*)
- Scotch broom (*Cytisus scoparius*)

The main canopy trees for this forest garden are interplanted with nurse species throughout the area. Over time, the nurse species will be trimmed back or completely cut out, with the woody trimmings left on the ground to decompose in situ, returning most of their carbon into the soil.

Nut orchard/ experimental coppice area

This area is approx. 0.4 hectare (1 acre). There are two types of crop here:

- Nut trees of good fruiting origin. The aim is to test whether coppicing for wood production can be compatible with some nut production in the coppice cycle.
- Trees for wood/biomass production that are not usually considered for our climate. Most of these trees prefer warmer conditions than we're used to in England but will be suitable for temperatures that we're predicted to get in the near future due to global heating.

Above left: Views of forest garden 3. | **Above right:** Nut orchard.

Coppice cycles will depend on the growth of each individual crop.

Varieties include:

- Hazel (*Corylus avellana*)
- Downy oak (*Quercus pubescens*)
- Heartnut (*Juglans ailantifolia cordiformis*)
- Holm oak (*Quercus ilex*)
- Coast redwood (*Sequoia sempervirens*)
- Dawn redwood (*Metasequoia glyptostroboides*)
- Sweet chestnut (*Castanea spp.)*
- Swamp cypress (*Taxodium distichum*)
- Antarctic beech (*Nothofagus antarctica*)
- Walnut (*Juglans regia*)

Q&A WITH MARTIN CRAWFORD - (VIA ZOOM on 24/09/22).

This was an opportunity to ask Martin questions that arose from the site visits and/or to show him designs of your own forest garden. My queries were directed at growing edible food forests in community gardens and on urban Brownfield sites. Martin was concerned about soil contamination with regards to the latter but a fellow course attendee suggested I look up the work of Paul Stamets, in particular, his research on *Mycorestoration* (the use of fungi to restore degraded environments).

CONCLUSION

Learning about forest gardening from Martin Crawford has been a career changing experience and hugely beneficial in expanding my knowledge on sustainable horticultural systems, which I'm integrating into my private gardening work and allotment bed. Alongside using green manures and starting to grow more diverse edible perennial crops (including dwarf comfrey under fruiting shrubs, Good King Henry, Sweet Cicely, daylilies and lots more to come) other properties of mid-succession systems that I'm putting into action include:

- Improving biodiversity
- Improving rates of biomass accumulation
- Creating self-renewing fertility
- Creating a complex soil food web (including fungi)
- Creating complex species relationships
- Monitoring how new species continue to arrive into system

Experimenting with organic mulches including:

- Leaves (sheltered sites)
- Leaf mould (beware of weed seeds)
- Chopped bracken (cut late spring & apply thickly)
- Grass mowings (apply in thin layers)
- Mushroom compost (preferably organic)
- Garden compost (beware of weed seeds)
- Farmyard manure (rotted) – apply in spring
- Chipped bark (coarse, longer lasting)
- Chipped wood (okay for paths but compost before using around plants)
- Straw (sheltered sites)
- Commercial waste products (tea leaves / coffee grounds / hop waste etc)

Using ground cover plants to:

- Provide a thick leafy cover to control undesirable weed species
- Reduce workload
- Utilise the herb layer in a productive way
- Act as a green manure
- Act as disease-protecting plants

I was also interested to hear Martin's take on native or non-native species - a hotly debated argument! He proposed the following points:

- It is false to think that there is a fixed list of natives even for an island.
- New species are always arriving by seed blown in or carried by animals (including humans).
- Ecosystems have mostly evolved with species all arriving at different times.
- Opportunistic species produce many seeds or runners in the hope that there will be a disturbance they can exploit. Where humans have severely degraded ecosystems, such plants can spread widely. “Invasive”, “Aggressive”, “Over-running” etc are emotion-laden words, which should not be applied to plants.
- New opportunistic species arriving often take 300-500 years to achieve a balance in an ecosystem but they always do in the end.
- Much of the landscape of Europe is covered with “non- native” plants, e.g. apples, plums, wheat, barley, potatoes, hybrid grazing grasses, fodder maize etc.
- Plant ranges are moving northwards because of climate change, which adds another dimension to how “native” needs to be reassessed. With regards to Devon apples he said they’ve lost over 50% of the old Devon varieties. We have a different climate now – the climate of mid West France from 60 years ago so the obvious conclusion is that we should be growing French varieties rather than the old Devon ones (and Devon varieties would be much more useful further North, eg. in North West Wales).
- Useful plants from elsewhere which increase local self-reliance and efficiency of growing systems should be welcomed.

In an age of climate breakdown, we need to be adaptable and remain positive - be part of the solution, not the problem. Working towards having a carbon negative footprint and advocating growing diverse perennial plants on my allotment bed that are more likely to withstand the climate chaos coming our way is how I can contribute towards the solution plus sharing this knowledge at my local community garden (further enhancing Eden Nature Garden's ethos of sustainability and reducing water consumption) and encouraging private clients to forgo annual planting and focus on perennials instead.

Since completing this course, I’ve also carried out a residency at Grizedale Arts (in the Lake District), assisting in the upkeep of over 5 acres of bio diverse meadow, fruit & vegetable production and decorative gardens at Lawson Park, sharing the knowledge I learnt there as well.

Future plans include a desire to venture into education work, teaching sustainable horticulture (particularly edible food forests systems) and there are tentative plans in the pipeline to work with a local arts organisation, facilitating school groups in their newly created artist garden.

ACKNOWLEDGEMENTS

I’m sincerely grateful to Merlin Trust Trustees for awarding this grant to me and for their compassion and patience with regards to application changes and rearranging original dates. Special thanks also to Rebecca Slack for her assistance during the application process.

FURTHER READING - MARTIN CRAWFORD BOOKS

- *Bee Plants.* Agroforestry Research Trust (1993).
- *Creating a Forest Garden: Working with Nature to Grow Edible Crops.* Green Books (2010).
- *Food from your Forest Garden (with Caroline Aitken).* Green Books (2013).
- *How to Grow Perennial Vegetables.* Green Books (2012).
- *How to Grow your own Nuts*. Green Books (2016).
- *Shrubs for Gardens, Agroforestry and Permaculture.* Permanent Publications (2020).
- *Trees for Gardens, Orchards and Permaculture*. Permanent Publications (2015).

Above: Main course booklet and two booklets about each ART site.

BUDGET BREAKDOWN

Train fare:	£106.90 (return London-Totnes)
Course fee:	£329.00
Accommodation:	£81.86
Total:	**£517.76**

NB. I originally requested a £590 grant to do the 4-day *Forest Gardens and Edible Ecosystems* course at Schumacher College in Devon (accommodation included) in April 2022 but due to family bereavement I had to cancel at the very last minute. Schumacher College kindly refunded the course fees minus £150 deposit (£440 refunded). Martin Crawford was one of the tutors on the Schumacher course so (with permission from the Merlin Trust) I used the remaining grant money to attend his 2-day course at his research site, next door to Schumacher College in August 2022 (accommodation wasn't included with his course).