Ten Year Forest Garden Trial

Final Report

(2011 - 2021)

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For The Permaculture Association UK

PERMACULTURE ASSOCIATION

Executive Summary

Forest gardens are an increasingly popular practice for providing a variety of products in an ecologically integrated way. This is a discipline led by practitioners, with little systematic research into, or review of, this practice until very recently. Such research is necessary if forest gardens are to fulfil their full potential as one of the ways to address the many challenges we are facing in the 21st century and beyond.

In order to address this gap, the Permaculture Association embarked on a participatory trial program in 2010. The trial aimed to observe ten forest gardens over the first 10 years of their establishment. Our aim was to investigate the ecological, economic and social benefits of forest gardens, and to share these lessons within permaculture, research culture and the wider community.

An initial meeting with participants was held in 2011, and reviews in 2014, 2016 and 2021 captured the progress of trial sites and participants in year 3 and 5 and after the end of the 10-year period. The final review also included an additional five sites that had been established for a longer time, in order to provide a comparison of younger and older sites.

The main outcomes of this study are:

- A typology of forest gardens that have informed subsequent research
- Design recommendations for forest gardeners
- Findings about the biodiversity, crop diversity and economic potential of forest gardens
- Lessons for the process of participatory research into forest gardens

The results of this trial show the potential of forest gardens to contribute to a number of challenges we are facing as a society, in particular with regard to biodiversity and food self-reliance. Additionally, they highlight both the potential of participatory citizen science in understanding new forms of land use and some of the steps needed to use this approach to its full effect. We hope that others will be able to build on the results and lessons of this trial through further citizen science research into forest gardens.

Background and Methodology

The emergence of Permaculture Research

For much of its early development, permaculture deliberately set itself apart from academic research. While experimentation has always been integral to developing permaculture solutions, few attempts were made at systematic observation such as comparison across sites, or comparisons of systems of practice and their results.

This started to change in the early 2000s. As one of the leading networks within permaculture, the UK Permaculture Association (PAB) developed a Research Strategy that was officially adopted in 2010. This trial is a result of the PAB's efforts originating in that strategy.

Our approach to the trial was informed by a training session (in January 2010) on Participatory Action Research (PAR) with pioneering researcher Peter Reason, then Director of the Centre for Action Research in Professional Practice at the University of Bath. We were aware of this being the PAB's first foray into research. We decided that Action Research was appropriate to developing a better understanding of what a permaculture approach to research might look like. Figure 1 shows an overlay of SADIM, a common process used in permaculture design, with the steps of the Action Research Cycle as presented by Peter Reason.

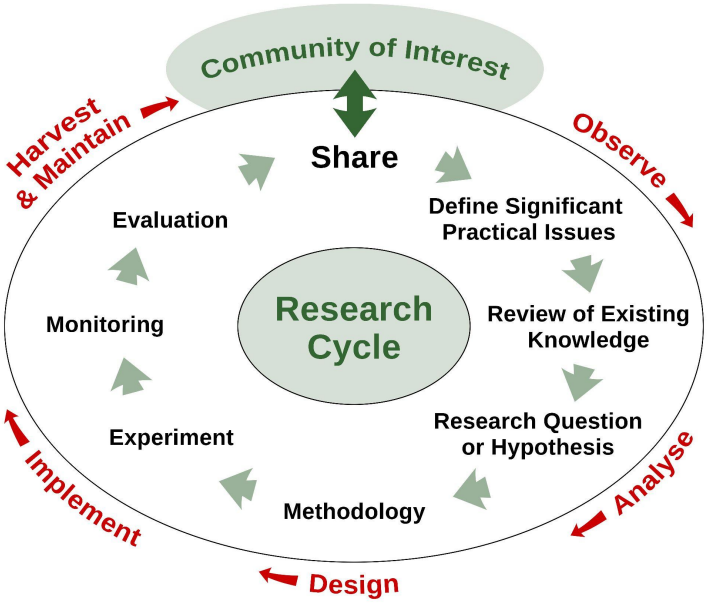

Fig 1: Participatory Action Research cycles (after P. Reason, 2010) overlaid with permaculture design cycle

Subsequently we decided to focus our efforts on researching *polyculture growing* as a core practice within permaculture. As a first step, we developed a questionnaire to

identify which polycultures were of most relevance for PAB members. The survey identified the scales and settings that participating members were working on as well as significant practical issues. Mixed annual vegetable growing and forest gardens emerged as the main areas of interest, and were pursued separately. A summary of our participatory research into mixed vegetable polycultures can be found in the Research section of the PA's website.

Forest Garden focus

Forest gardens have been a widespread practice across the globe for a long time, with an uninterrupted tradition of practice especially in tropical parts of the world. Some of these practices were picked up in the 1970s by researchers such as Robert Hart, who decided to rekindle the practice in temperate climates. Permaculturists in the UK and elsewhere were quick to embrace the practice after Hart created a forest garden in Shropshire, UK and published several books on the subject.

By 2010, forest gardens had become increasingly popular among permaculture practitioners and several seminal books had been published. However, there had been very little systematic research and no practice review up to that point. Neither had there been any long-term studies of temperate forest garden establishment across a number of sites. We identified this as a niche that the PAB would be well placed to help and fill, due to the serious interest in the practice and some rich experience among our membership.

In autumn 2010, a forest garden seminar at Cumbria University's Newton Rigg Campus was co-organised by the PAB and the Cumbria Food Forest Network. At the seminar, an anonymous donor offered the PAB £5,000 for a forest garden research project. This was later matched with a further £2,500. The associated challenge was to initiate a number of forest gardens and follow their development over a number of years.

Terminology: Forest Garden of Food Forest?
The terms "food forest" and "forest garden" are used by practitioners interchangeably. They both stand for multi-layer polycultures, typically containing woody and herbaceous perennial plants. This is a result of the evolution of the discipline in different parts of the world. The term "forest garden" was introduced in Britain by Robert Hart in the 1980s. At the same time permaculture pioneers in Australia started using "food forest" to describe their own practice. Both terms are now firmly established across the English-speaking world. In other languages, versions of both terms are used (e.g. German "Waldgarten", Spanish "Bosque comestible", Czech "jedli prales" or"lesni zahrad")

Methodology development

Based on the outcome of the seminar and our findings of the previous polycultures survey, we drew up a list of research questions that could be explored over the coming years. A number of them fed into a series of online surveys which aimed to establish a baseline of information about existing forest gardens. This research is being evaluated and will be published soon. A preliminary report is available from the PAB.

We also formulated a range of research questions appropriately suited to a long-term trial alongside other appropriate research methods. The underlying aim was to create an evidence base for the value of forest gardens as contributing to resilient landscapes and culture.

To find trial participants we published a call in Permaculture Works, the PAB's newsletter, and followed up expressions of interest with an online questionnaire. As an incentive, participants were offered a grant of £500 towards the cost of their project in return for their agreement to participate in the design of the trial and in the monitoring and evaluation process. The call for funding resulted in over 50 applications. From these, 10 sites were selected in autumn 2010.

Initial Goals and Timeline

In April 2011 we set some initial goals for the 10 year period:

- To collate site data in years 3, 5 and 10,
- To analyse data and use it to develop a report of findings,
- To develop case studies to support the development of best practice and replicable planting systems and approaches.

The trial was initially structured as follows:

- Year 1 (2011): Selection and initial planting of sites
- Year 3 (2013): Round 1 of data collection and initial evaluation
- Year 5 (2015): Round 2 of data collection and progress evaluation
- Year 10 (2020): Round 3 of data collection and final evaluation

Each milestone was to represent one iteration of the Action Research Cycle.

Typology of Forest Gardens (2011-12)

In late 2011 trial participants came together for a two-day workshop to discuss their aims and approach as participants of the project. A list of significant practical issues was drawn up. Many of these were beyond the scope of the trial itself, while others informed the subsequent design of interviews and site visits for the Year 3 Review.

A significant outcome of the workshop was the development of a typology for forest garden sites according to their use. During the discussions it became clear that there are three distinct user-types of forest gardens:

- Private gardens
- Community projects
- Commercial enterprises

Through discussion it became clear that each user-type was related to a distinct set of goals. At the same time it became clear that the chosen range of sites and their variation in size, focus and geographical location presented challenges in terms of comparability of data. This subsequently led us to favour a broad qualitative approach, with a focus on successes and challenges during the establishment and management of the gardens. Another reason for this decision was the lack of available funds and expertise to carry out extensive on-site data collection.

Further definition of trial aims (2013)

A forest garden advisory group consisting of academics and practitioners was established in 2013, to give guidance and academic input into the trial. Its most significant contribution was the clarification of the trial's aims and objectives as:

1. *Investigate diversity and abundance of a wide range of social, environmental, productive and economic yields in different social settings over time, including:*

- Measurement of inputs and outputs, crop yields;
- Biodiversity;
- Soil quality;
- Qualitative and (where possible) quantitative assessment of personal and community benefits.

2. *Facilitate participatory design of a long term FG research project, with outcomes at both operational research and project management levels, including:*

- Development of user-friendly research methodologies;
- Methods of sharing these methodologies and their results

Having been refined to this point, these aims and objectives provided the basis for the work plans in year 5 and 10, and for any additional work. Assessments in Year 3 and 5 were exclusively qualitative due to the limited capacity of participants, PAB staff and volunteers.

Intermediate Reports

In 2013, a series of interviews and site visits were carried out with the 10 participants. As a result of these, the following source materials were produced and contributed to the Progress Report:

- Site visit reports, telephone reports and site visit checklists for eight sites
- Site visit reports and site visit checklists for two sites

In 2015, another series of interviews with participants was carried out by PAB intern Silvio Volkmann. Seven of the 10 projects took part in the interviews. One participant had left the trial at this point, and two projects were hard to contact due to internal difficulties.

The two resulting reports were primarily qualitative assessments of successes and challenges in relation to the aims of each project, and of what was needed to help achieve those aims. Findings from year 3 and 5 have been incorporated into the following chapters.

During many of the interviews, participants highlighted the need for clear recording methodologies and guidance on using them. In response, we made efforts to develop methodologies for recording soils, yields and biodiversity. The soil methodology was based on the work of the Field Study Council's Open Air Laboratories (OPAL) and tested through the GrowLab projects which the PAB participated in. Yield templates developed by experienced forest garden (FG) practitioners were collated, and a biodiversity methodology was partially developed by PAB staff and interns. Unfortunately these methodologies were not formally introduced into the trial, as there was no capacity to train participants in their use or to follow up with support.

Year 10 Review

The final 10-year review was delayed due to the Covid-19 pandemic, and was carried over into the following year. As trials were started in early 2011, this was just after the end of the 10-year period, and we therefore felt it was appropriate to frame it as the Year 10 review.

In 2021 we were fortunate to get Karina Ponton on board, who was studying an MSc in Environmental Forestry with Bangor University. As well as gathering and evaluating information on the eight sites remaining from the trial (here referred to as **FG1-FG8**), Karina included five additional well established sites in her study (here referred to as **AFG1-AFG5**). She used three methodologies: semi-structured interviews with participants, ethnobotanical surveys and woody plant surveys. The findings from these are detailed below. The findings were the basis for Karina's MSc dissertation which forms a large part of the material cited below.

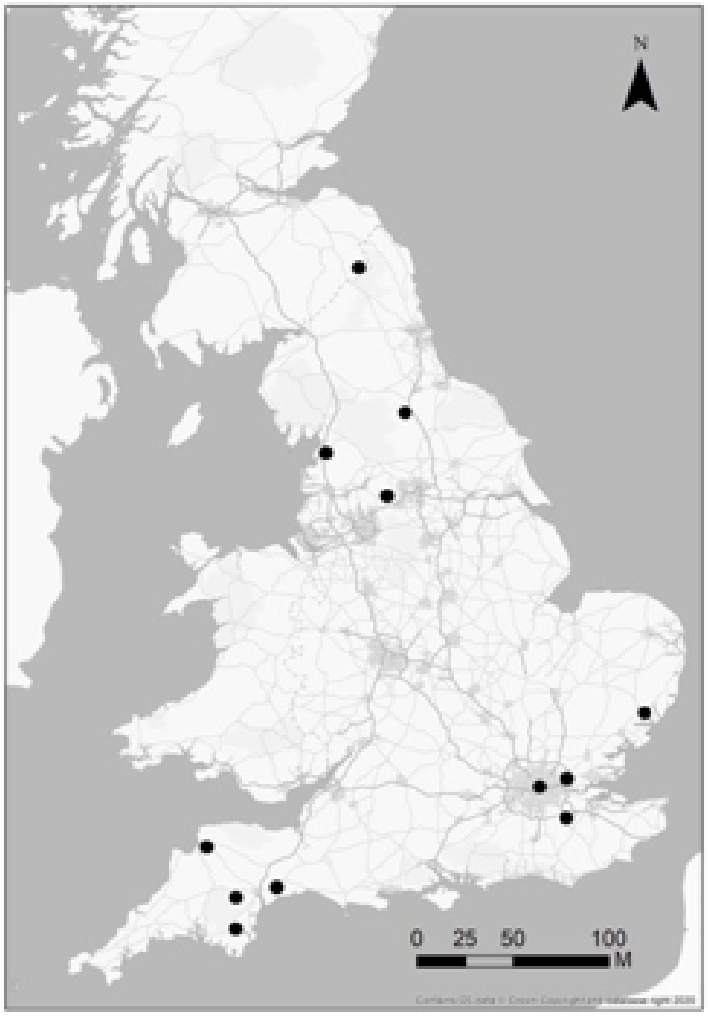

Figure 2. *Map of 13 forest gardens that took part in the study.*

Table 1. List of sites.

Site	Location	Age (yrs) / initial tree planting	Site total / surveyed area (ha)	Slope / aspect	Type
FG1	Stepney City Farm, London	11 / 2010	1.2 / 0.03	flat	Community Social Enterprise
FG2	(1) Steward Community Woodland, Devon	10 / 2011	12.95 / 0.12	Slope S-facing	Private, Intentional Community
FG3	The Quadrangle, Kent	10 /2011	1.2 / 0.66	Flat	Private Social Enterprise
FG4	Ilford, London	12 / 2012	0.01	Flat	Private
FG5	Oak Tree Farm, Suffolk	11 / 2009	4.8 / 2.65	Flat	Private
FG6	Edibles, West Yorks	13 / 2012	2.8 / 0.12	Marginal slope	Private Social Enterprise
FG7	East Devon Forest Garden, Devon	11 / 2012	1.2 / 1	Flat	Private
FG8	Bridewell, Devon	11 / 2010	4.5 / 0.43	Steep slope & terrace	Private
AFG1	Garden Cottage, Scottish Borders	31 / 1990	0.08	Flat	Private
AFG2	Esthwaite Gardens Lancaster	14 / 2007	0.02	Terraced W-facing	Private, Community
AFG3	Agroforestry Research Trust Devon	31 / 1994	0.85	Flat	Private Social Enterprise
AFG4	(2) Steward Community Woodland, Devon	18 / 2011	12.95 / 0.1	Slope N-facing	Private, Intentional Community

AFG5	Old Sleningford North Yorks	17 / 2004	6.87 / 1.43	Flat	Private Social Enterprise

For the eight original trial sites, detailed case studies are available separately

Interviews
As before, all trial participants were invited to take part in an interview with the researcher, with eight of the initial ten trial sites and four of the additional sites taking part. Questions were a mix of short answer and open-ended questions to provide in-depth assessment of the forest garden system and practice. The majority of questions were identical with those used in previous years, to ensure continuity of approach.

The five general topic areas for the interviews were:

1. Record keeping
2. Plants and layers
3. System, subcomponents and exchange
4. Forest garden activity
5. Evaluations

Participants' responses to the Year 3 and 5 surveys were taken into consideration where possible.

Virtual tours
For a selection of sites, virtual tours for some of the sites were produced to create a visual record of the forest garden during the visit. These tours will be annotated and made available via the PAB website for public access. They will enable people to experience forest gardens and gain information about the species, layers, management practices and so on.

Ethnobotanical Survey
Ethnobotany is the study of the relationship between humans and plants. For the review, we were interested in better understanding specific crops and how forest gardeners utilised them. The ethnobotanical survey focused on forest gardeners' knowledge and use of the system and its plants. Participants were invited to conduct a tour of the forest garden, and to identify species and their particular uses. They were also encouraged to highlight and discuss the uses of species, categorised into nine

categories (Table 1). Where participants were unable to take part in the survey in person, plant lists (AFG5) or documents (AFG1, AFG3) were provided instead.

Ethnobotanical surveys were also used to provide information on species richness across sites. This provides a measure of biodiversity and will help us understand whether forest gardens support more biodiversity than other forms of agriculture.

Table 2. Plant use categories employed in the ethnobotanical survey.

Code	**Use categories**	**Additional data**
BIO	Biodiversity/pollination	Particular species interactions
CUL	Culture, stories, poems	Notes on use
FEED	Animal feed, compost, mulch, nitrogen-fixing; anything that feeds the system	Notes on use
FOOD	Food and drink	
HYG	Hygiene, soap, bathing	Notes on use
MED	Internal or topical medicine	
ORN	Ornamental	
PROP	Propagating, selling	Notes on propagation
TECH	Timber, energy, firewood, live- or cut- fencing, dyeing/ windbreaks	Plant part used

Woody Plant Survey

Woody plant (tree and shrub) richness and abundance surveys were conducted at each site over 1-3 days, depending on site complexity and accessibility. These surveys aimed to get a better idea of which woody species were being planted, how frequently they were being planted, at what density and any impacts this was having on the system. The survey involved a precursory walk (often simultaneously filling in the Ethnobotany Survey) to identify more uncommon species and to create a survey plan. The aim was to identify all living trees and shrubs within the forest garden system.

Recording layers

Karina recorded the forest garden layer occupied by individual plants at the time of the survey, using the following categories:

- Upper Canopy (UC), Lower Canopy (LC) or Sapling (SP) for all tree species
- Shrub (SH) or Sapling (SP) for all shrub species.

Diameter at breast height (DBH) was also recorded for all UC and LC stems over 1m in height and over 3cm DBH.

Shrubs were identified based on form (either less than 3cm DBH and/or with multiple stems from the base). The ground area (sqm) occupied by each species was also estimated.

Trees with two stems were recorded as such, and DBH recorded for both stems. Trees with three or more stems were recorded as multi-stem (MS) or stools (ST) (such as for Corylus and other coppiced individuals), and the DBH of the largest stem was recorded. All pollarded trees were notes as such, and DBH recorded when the pollard exceeded 1.3m height. Coppiced stumps were not counted unless stems were present.

For the woody surveys, shrubs were often measured by estimated area. At larger sites, trees were measured as priority and some shrubs are likely to have been missed out due to sampling time/ effort/ inaccessibility. In those cases, the methodology may therefore have led to an underestimation of shrubs.

Additional information

As well as information from the year 3, 5 and 10 reviews, site visits and interviews were conducted by Tomas Remiarz in the course of research for *Forest Gardening in Practice*. Some of this information has also informed the writing of this report.

Results & Discussion

Interviews

1. Record keeping

In interviews participants were asked about 22 different types of record keeping, including both formal and informal methods. Participants' informal records included photographs, cookbooks or calendars. Formal records were mostly records of purchases of edible and non-edible plants (84% of participants), soils (84%), visitor & course income (50%) and staff & volunteer hours (50%). Records were often mixed in with accounts and emails rather than catalogued separately, and not necessarily related to the forest garden.

Sites with a commercial element usually kept more types of records than non-commercial sites. These included FG1 (16 types), FG3 (14), FG6 (14), AFG1 (19), AFG3 (16). All other sites kept between 0-7 types of records. Some record keeping categories were not applicable to all sites.

With regard to future record collection, FGers responded saying they had capacity to collect yield data (33%), soil data (50%) and biodiversity (50%).

2. Plants and layers

By 2015 (Year 5), not every site had developed its full potential. After a further five years, all participants said they currently have seven layers of a forest garden system, and most have aquatic or fungal layers (see Figure 4).

A natural layer, rather than cultivated, was used by several forest gardeners, including natural root layers (six sites), vertical layers (five sites), groundcover (two sites) and fungal layers (three sites).

"*We planted the original trees and shrubs into a meadow... We weren't going to plough it or dig up; we were just going to let it come. It's very difficult soil to plant into. So what we've done is we've just allowed the grass to grow and flower, and that's actually provided the most amazing variety of habitats for other creatures of the field." FGer 3*

Figure 3. Low density planting pattern in FG 3, year 3

All participants felt the upper canopy layer was complete. The most common incomplete layers were the lower canopy (five sites) and herbaceous layer (five sites). No differences were observed between established sites and younger sites. This highlights the variety of designs and species choice among forest gardeners.

We did not inquire about the reasons that some layers were left or seen as "incomplete", but some of the forest gardeners gave their own explanation.

"There was never an intention to pull up all the other layers and replace them with edibles... (groundcover) would be easily outcompeted by the natural ground layer." FGer 2

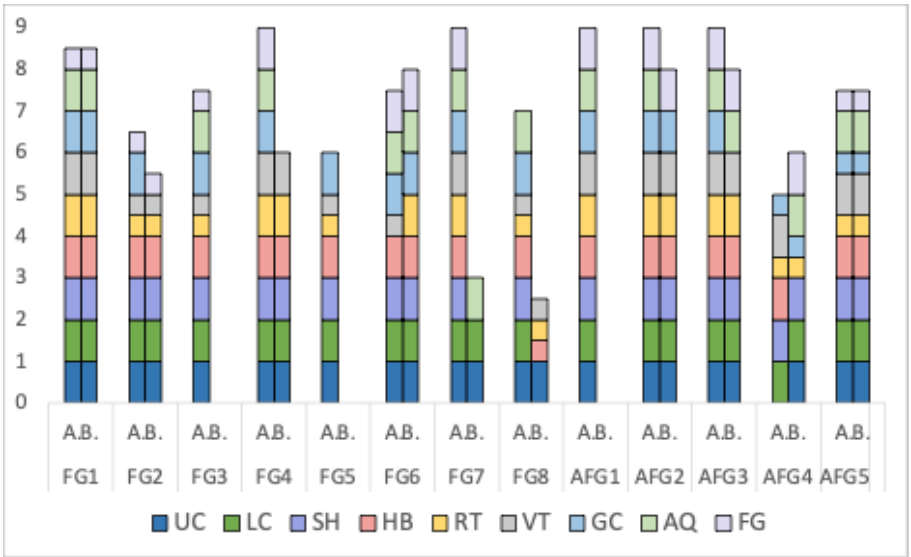

Figure 4. Overview of layers present at each site

A: Layer is present in the forest garden system;

B: Extent to which the forest gardener feels the layer is complete.
Completion of a layer =1,
A natural or uncultivated layer = 0.5 and
Layer is absent or incomplete = 0.

UC = Upper canopy, LC = Lower canopy, SH = Shrubs, HB = Herbaceous, RT = Root, VT = Vertical, GC = Groundcover, AQ = Aquatic, FG = Fungal

3. Systems, subcomponents and exchange

The forest gardeners in our study often applied poly-livelihood or multiple strategies in their systems, with forest gardens being one of many components. Many forest gardeners are also farmers, vegetable growers, foresters, carers, family members, teachers, etc. Diversity in each system creates resilience against shocks, as FGer3 (forest gardener 3) mentioned, “something always does well.” Species choices, uses and practices enable closed-loop systems in which nutrients are cycled within the system to provide for humans, animals and soil biota.

All FG systems comprised more elements than the forest garden itself (defined by a different set of practice or geographical distance). The level of integration between subcomponents varied across sites. The distinction between forest garden and other practices (particularly that of hedgerow or woodland) was often blurred towards the

edges. For example, AFGer1 referred to the forest garden as “a soft living room” where no distinction was drawn between inside and outside.

Figure 5. Other site uses at Stepney City Farm (FG1) include urban goats, allotments and a cafe

Ten of 13 forest gardens in our Year 10 study have some form of enterprise linked to the land or forest garden. Some of these enterprises are directly related to the forest garden. For example, AFG5 has a preserve business and FG6 has an annual market garden that incorporates perennial yields from the forest garden. Other enterprises are more indirectly related (such as FG4 and AFG2 which are managed by a permaculture teacher and forest garden design consultant respectively) where their relationship with the forest garden provides a space for personal and business development. Other enterprises are more indirectly related but utilise the physical space, such as FG7 which is used as a site for well-being retreats to provide monetary income. Many participants had income from diverse streams or used the forest garden in more than one way. For example, AFGer2 also plans to use the site as a venue, while FGer7 also sells surplus yields such as wine from fruit yields.

Figure 6. Old Slennigford's (AFG5) catering kitchen

Several forest gardeners talked about the desire to create a 'closed-loop' self-sustaining system. Most sites had low system inputs, primarily relying on natural, local and/or waste material. However, inputs and outputs have not been recorded fully in any system.

4. Forest garden activity

Forest gardener background

All forest gardeners had some previous experience in land use practices. Backgrounds included experience in one or more of the following: horticulture (including ornamentals, fruit, vegetables, herbs, biodynamics), woodland & forestry, permaculture, landscape history, countryside management and previous gardening or allotment experience.

Plans & visions

During interviews and site visits, forest gardeners highlighted the importance of their sites acting as **demonstration sites**, being open and inclusive for visitors with a range of backgrounds, and providing examples of minimum input and diverse systems. However, demographics of visitors to the forest gardens were not measured.

For sites that are still developing & implementing their designs, plans were often related to increasing biodiversity through habitat creation (bird boxes, deadwood, drilled nut

holes etc.) and planting. Other plans included developing food and commercial aspects of sites and experimenting with processing new yields.

The majority of forest gardeners reported plans and visions that indicated the sites are still in some form of development, sometimes addressing social concerns rather than the actual planting or management scheme itself. Some sought to improve tenancy agreements or apply for planning permission, as part of a movement for better access to land.

Some forest gardeners wanted to expand their sites, while others wanted to add further dimensions. For example, FGer7 likened the forest garden to the frame within which their lives played out – and now that the forest garden is established, there is time to fill the frame with other aspects of life including incorporating sculptures and decorative tree tags.

> "We have a complete system, but it's never complete. It's always changing…" AFG1

Main activities

The main activity undertaken across forest gardens was maintenance (weeding, mulching, path maintenance, pruning, liming, mowing/scything). Five participants reported extended breaks from the system of one year or more. This implies a good level of resilience within the system, not degrading without significant human input. Compared to other forms of food production, this is a significant advantage. Five sites reported infrastructure development as a main activity, with FG7 detailing the most infrastructure activity. Five also reported visits as a main activity although few sites mentioned this at 10+ years due to the Coronavirus Pandemic. It was hard to say whether the range and types of activities changed much over the years, as our methodology did not provide enough data to differentiate between them. (Figure 16).

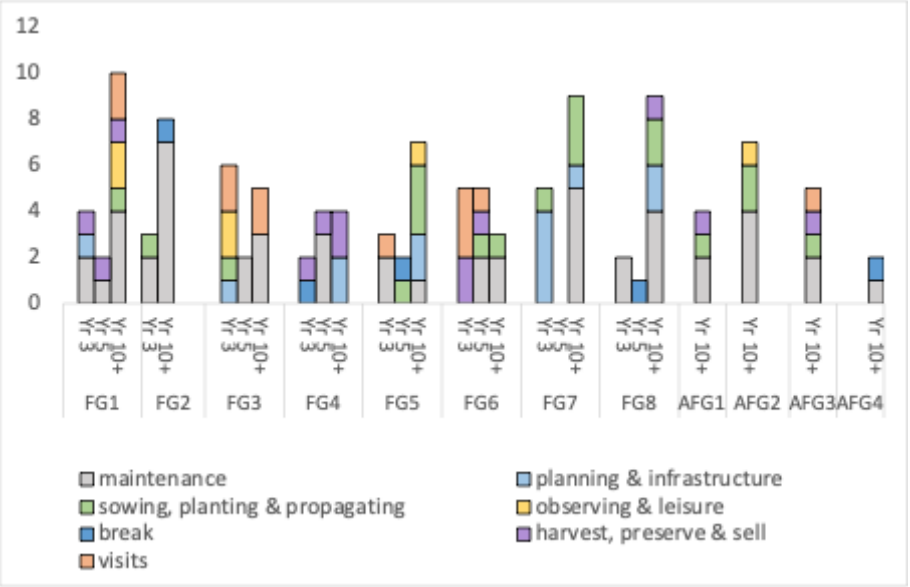

Figure 7. Main activities mentioned by forest gardeners in years 3,5 and 10
The graph shows the number of times activities were mentioned in the interviews.
Maintenance = weeding, mulching, paths, pruning, liming, mowing

Partnerships

Seven participants in Year 10 reported that they have direct or indirect partnerships with external individuals or organisations. These were often local organisations, including Spitalfields's Market and the Women's Environmental Network for FG1, beekeepers for FG6&7 and Lancaster Seed Library for AFG2.

5. Outputs

Forest gardening is a highly innovative form of land use. Onsite, FGers experiment with a diverse mix of species and varieties across many layers. Offsite, FGers build connections, work on advocacy and provide training and teaching in agroecological methods. Some are involved in promoting environmental justice such as FG1 & 3 as a social non-profit, AFG4 as a worker's cooperative and FG6 as community supported agriculture. Others employ and seek to teach holistic methods or connection with our surrounding environment (FG4, 5, 7 & 8). One participant has set up a local seed bank (AFG2), while many propagate material for others (AFG1, 3).

Economic activity

Of the thirteen sites interviewed in Year 10, only four sites directly referred to their commercial success. However, all forest gardens provided some form of socio-economic output (Figure 8).

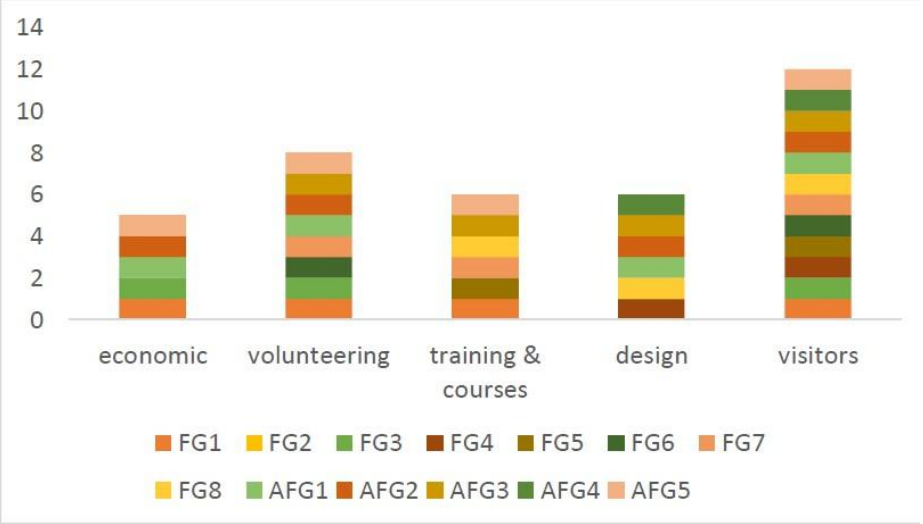

Figure 8. Social and economic output of forest gardens and gardeners; economic (provision of paid work), volunteering, training & courses (including educational visits), design (informal advice and professional design services).

Economic outputs include provision of external employment or paid work for people who live off-site or outside the forest garden system. Forest gardens varied in number and regularity of volunteers. Some have regular volunteers or volunteer days (FG1 & 6). Others have irregular volunteers and woofers (FG7), some engage family members (FG5 & 6); others no longer accept volunteers (FG8, AFG2). Several established FGers reported that volunteer competence influenced hosting (AFG1, 2 & 3).

Eight of 13 sites host courses or training, although to varying degrees and not necessarily on multistrata agroforestry. Design output varied considerably, with AFGer2 reporting 100 designs, and FGer2 & 8 more informal advice. Twelve of 13 were currently receiving visitors, while the thirteenth had done so in the past.

Where forest gardeners were part of a low impact lifestyle on the land, some participants faced challenges through the English planning system or legal agreements. However, with many councils now adopting Climate Emergency policies, there is some hope it will become easier to succeed with such schemes. There is at least one case (which was not part of this trial) where planning permission was granted to live in a forest garden setting.

6. Successes

Biodiversity

Throughout the trial, people cited biodiversity as a major benefit of the forest gardens they had created, with some species lists and much anecdotal evidence. In some cases participants had made special efforts to attract specific types of wildlife.

In year 10, eight forest gardeners referred to biodiversity success. Bird species were particularly well reported.

"A field that was previously pasture turned to being very alive in every sense and rich in colours; an ordinary suburban garden turned into a wildlife haven full of food for the owner's family." Year 5 report

"... the best day was seeing the barn owl fly in ... " FG5

"I've created a wildlife refuge. Well, I haven't created it, I've done the things that were in my power to enable it, and I think that that's the biggest yield. There is a lot of wildlife now." AFG2

"We had a pond specialist come and document all the species in the pond. He was really surprised by a couple of things; he said he'd never seen anything like this garden and never seen so much wildlife for that size before as well " FG1

Figure 9. Ponds such as this one at Stepney City Farm (FG1) attract and support much wildlife and can be a great addition to a forest garden.

Crop species

While only four sites referred to commercial successes, all but one site mentioned particular species success after year ten. Particular species included species common in the UK such as apples and plums and less common ones such as Pawpaw (*Asimina triloba*) and Sichuan pepper (*Zanthoxylum spp*.)

"It's been amazing to get people to learn uses of plants, for example mugwort, that is so medicinal and so easy to grow and it's great to be able to sell that at the farm."

"I suppose it's the plants that are marginal that have been the greatest surprises, like this one called *Asimina triloba* - the temperate paw paw. Or a mulberry called Pakistan which has fruits three or four inches long and that fruited for the first time last year. And Shipova pear - some of the research said it can take up to 12 years to start producing fruit, but we had our first fruit in the seventh year. So that's a thrill. But it's almost like asking what's your favourite child, you know?" FG7

"The roses are a big success because they're really beautiful. I've chosen all the roses to be good for pollinators and the pollinators come. I also use the hips so I would say the roses are really big elements for suburban forest gardening." AGF2

"Sichuan pepper has grown spectacularly well. It was previously only ever found in botanic gardens in this country and nobody seemed to realise you can actually grow it here." AFG3

Figure 10. Roses at Esthwaite Gardens, Lancaster (AFG2) provide food, beauty and support for wildlife.

A number of crop challenges were also reported, either relating to establishing particular layers or to particular species.

”The smaller plants for the ground cover just haven't been successful; have been outcompeted by couch grass really or brambles. Vines weren’t really suitable in the first site. We tried cranberries and Nepalese raspberries, but they just get outcompeted by couch grass if you're not there weeding it, and we're not.” FG6

“We planted bullace on plum root stock that suckered all over the place. It spread much too rapidly and doesn't give a lot of fruit. We tried to take it out but it just keeps coming back.” AFG4

Management Practices

Successes with forest garden infrastructure, tools and practices were mentioned more after 10 years, as forest gardeners developed successful strategies over time. Only two sites reported early landscaping or earthworks (FG7 & 8). More established sites had a tendency to refer to success with particular species, social benefits / outputs or overall success

“We have a compost system that works really well. We've had black soldier fly and people came to harvest the maggots to feed to their chickens” FG1

“Buying a strimmer helped a lot. The woods are very bad for bracken, and in July and August it’s horrendous, and the community rules were that I had to pull by hand. I bought a strimmer a few years ago and haven’t looked back.” FG2

“We were constantly path clearing but… two years ago we invested in a flail mower - a two-wheel tractor and a flail attached to the back. We used to scythe around the base of trees and weed around them in the winter, but then we had a flail mower through the spring and summer. And it just kind of reinstates the paths and is a game changer – because woodchip & scything, we couldn’t keep on top of.” FG6

“The first year we planted Italian ryegrass and winter tares, a winter green manure mix that got sowed in the autumn and grew through the winter and then got dug in for next year. And then we planted a nutrient cycling mix following that. These are separate processes: one’s just incorporating huge amounts of organic matter and the other’s mining for minerals deep in the soil.” FG7

Whole site success

Success with regard to the totality of the site and social impact were both reported by nine sites, with more social impact success reported in the first five years. Social impact successes included provision of education, shifting local attitudes, or demonstrating alternatives to national organisations.

FG7 highlighted low maintenance as a great advantage of the forest garden. “It was complete after the first two years because we've hardly done any work on it since then and it's just been producing.”

AFG4 stressed the resilience of the system in the face of neglect: “We, the humans, have been dormant. The forest garden’s growing like crazy. That's a testament to forest gardening, because the vegetable gardens are empty after we’ve had years of struggling to get to the site.“

AFG1 summarised the overall success of their maturing system by saying “I just keep saying to people, you know whatever fantasy I had at the beginning, it's way better than I could have dreamed it would be. For me, I think the overall success is the totality.”

AFG2 agreed, stressing the wellbeing benefit of engaging with the evolving edible ecosystem at her doorstep. “The very fact that it exists is a success. It’s becoming more and more of a haven and a place of spiritual renewal.”

7. Difficulties

Difficulties varied across years and sites. The main difference between younger and established sites was that established sites reported fewer difficulties.

Ten sites reported *biotic difficulties* at ten or more years, relating to plant failures or competition, but with more reference to pests (rabbits, badges, deer, birds). Tree establishment or species competition were other difficulties that were frequently mentioned.

Abiotic difficulties included the nature of the soils or climate and the impact on plant health.

> “We do have problems with canker. We wouldn't necessarily sell our fruit in a shop because they don't necessarily meet customer expectations. It would be nice to be able to grow more commercially viable fruit.” FG6

Socioeconomic difficulties included lack of funding, time, labour, internal group dynamics and not having sufficient guidance from the PAB on what data or information to record.

> “Not living on site anymore was actually a huge shock because it meant organising everything in a completely different way.” FG2

Figure 11. Young tree struggling to establish due to grass competition.

Ethnobotany Surveys

Plant uses

The total number of plant uses recorded was 1,899 with an average of 143 uses recorded per site (Figure 12). FG7 had the highest number of uses recorded at 237, compared to the lowest of 62 at AFG4.

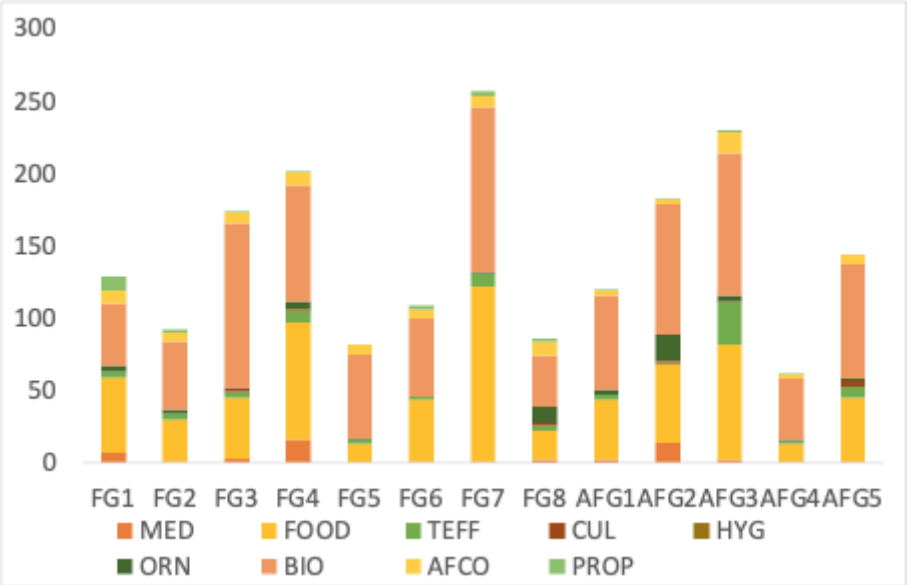

Figure 12. Number of use categories identified in thirteen forest garden systems. MED = internal/topical medicine; FOOD = food and drink; TECH = timber, energy, firewood; live- or cut- fencing, dyeing, windbreaks; CUL = culture, stories, poems; HYG = hygiene, soap, bathing, ORN = ornamental; BIO = biodiversity, pollination; FEED = animal feed, compost, mulch

A sample of the recorded plants and their uses are listed in the Appendix. The full list can be found in Ponton (2021) and is available on request.

Biodiversity was the highest use category for 10 of 13 sites, followed by food for three of 13 sites. FG4 identified the most plants with medicinal properties (MED) at 16 species, compared to an average of three per site, with some species being present or identified more than others. Five participants identified one or zero species for medicinal uses. Species identified for timber, energy, fencing, fuelwood or dyeing (TECH) ranged from 29 for AFG3 to two for AFG6, with the most abundant species in these categories across all sites listed in Table 3.

Table 3. Most abundant species for MED, TECH and FEEDF uses, in order of frequency mentioned by participants

MED	**TECH**	**FEED**
Yarrow *Achillea millefolium* Broadleaf plantain *Plantago major* Rose *Rosa spp.* Rosemary *Salvia rosmarinus* Feverfew *Tanacetum parthenium*	Alder *Alnus spp.* Sweet chestnut *Castanea sativa* Hazel *Corylus avellana* Silverberry *Eleagnus x submacrophylla.* Willow *Salix spp.*	Italian alder *Alnus cordata* *Eleagnus spp*. Silverthorn *Eleagnus pungens* Silverberry *Eleagnus x submacrophylla* Comfrey *Symphytum spp*. Sea buckthorn *Hippophae rhamnoides*

Five participants reported one to four species as having cultural significance, second lowest of all use categories. AFG2 reported the highest number of ornamental species at 18, compared to either one or zero species reported by six of the 13 forest gardens. AFG3 reported the highest number of species used for animal feed, natural fertiliser or compost (FEED) at 15 species, compared to lowest of three FEED species recorded by AFG1, 2 & 4. *Saponaria officinalis* was the only plant identified for its hygiene properties, by three separate FGers. Low recording of particular use categories may be due to lack of time in recording such elements, and less importance placed on such categories as different forest gardeners will have different focus areas.

Biodiversity details that participants gave mostly referred to whether a plant was beneficial for birds, bees or pollinators. Few, if any, reported a specific plant for a particular species. Details on food use included the time of year the edible parts were available, flavours, particular varieties or how to process and utilise a crop. Main uses for woody plants in the es TECH category were windbreaks, structure, poles or canes, although some other properties were reported such as tying thread, fibre, wax and for wrapping. Plants in the FEED category were mainly noted for use as a nitrogen-fixer, incorporated in a liquid feed, to make biochar or to feed particular animals. Medicinal properties included uses for respiratory illness, digestion and pain relief as well as herbal and other folk remedies.

Findings presented here are likely an underestimate, as the ethnobotanical surveys lasted no more than one day while other ethnobotanical surveys can last over a year. No distinction was made between actual or potential use, meaning we don't know whether people actually employ the plants in their own lives for the uses they cited. Nevertheless, this is the first known account of a widespread survey of forest garden

species utilisation in the UK that provides detailed examples of uses in situ and has the potential to be built upon in future.

Species richness

A total of 520 species of 112 families were identified to species level across the forest gardens, from a total of 1308 plants across seven layers (Figure 13). This ranged from 44 species at FG8 to 160 species at FG7.

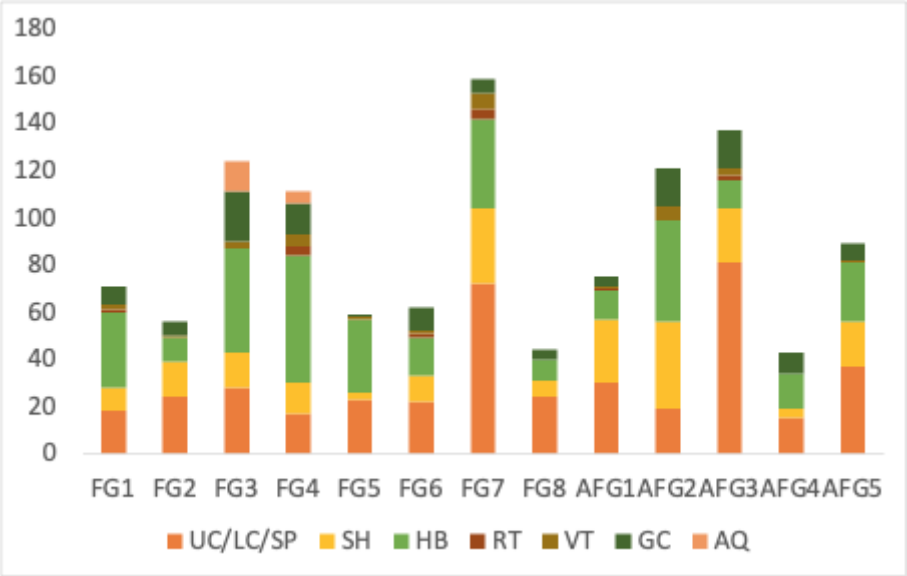

Figure 13. Species richness for each layer across thirteen UK forest garden systems; Upper canopy (UC)/Lower canopy (LC)/Sapling (SP), Shrub (SH), Herbaceous (HB), Root (RT), Vertical (VT), Groundcover (GC), Aquatic (AQ)

Tree, shrub, herbaceous and groundcover species were identified at all sites. Root layer species were identified at six of the 13 sites. Vertical species were identified at all sites except one. Aquatic species were identified at two sites.

AFG3 had the highest tree species richness, FG7 had the highest shrub and vertical species richness, FG4 had the highest herbaceous species richness and FG3 had the highest species richness in groundcover and aquatic layers. AFG4 had the lowest tree layer species richness and FG5 had the lowest shrub species richness. No root species were identified at FG2, 3, 5, 8 or AFG2, 4 or 5.

Recorded plant richness differed widely across sites. This may be a result of planting practice, maintenance, how the sites are used and sampling effort. For example, AFG2, despite being one of the smallest sites (0.02ha compared to the average of 0.5ha) was unusually species rich. This may be attributed to the site's age (>15 years), overplanting (as reported by the FGer), as well as the various habitats created on the site, that

require different maintenance practices, thus supporting different niches. It may also be a reflection of the knowledge gained by the forest gardener throughout their time of interacting with the garden. This site includes three polycultures, the forest garden proper, a neighbouring garden that acts as an extension to the site managed more for wild species, a woodland edge habitat with an ornamental shrub layer, a wildflower meadow verge and two extensive shrub walls; one planted with species suitable for a north facing wall and another for ornamental, food and biodiversity uses. Furthermore, the FGer had extensive knowledge of the plants in the system and spent a full day with the surveyor recording species and their uses.

Available resources may influence species richness. Several of the sites with lower species richness (FG8, FG2 and AFG4) all had extended personal breaks from the sites, which may explain low species richness compared to other sites.

However, initial site conditions such as soil also influence the potential for species richness to develop. FG2 and AFG4, had the lowest soil pH at pH4.4 (FG2) and 5.4 (AFG4) with FG2 reporting difficulties in establishing non-native groundcover or root vegetables. These two sites are part of the same community woodland site and were the only two sites of the study that converted the forest gardens from degraded woodland habitat, rather than from pasture. Both FGers stressed their desire to maintain and nurture the natural seedbank, so a propensity for wild species may also contribute to lower species richness.

FG7 and AFG3 had the highest species richness, with highest tree diversity. These systems were much larger, more complicated and both FGers had a strong background in horticulture with interest in experimental species and varieties.

In Contrast, FG5 was the largest site but recorded low species diversity. This is likely explained by the change in tenure of the system, and by the herbaceous layer being composed mostly of a seed mixture that was planted there a few years ago, with few other introductions.

Woody Plant Surveys

A total of 4,380 woody plants were surveyed across sites in the upper canopy, lower canopy
and shrub layers, including saplings. The average number of woody plants per site was 337, with the lowest of 36 at FG1 and the highest of 1,075 at FG7. (Figure 14)

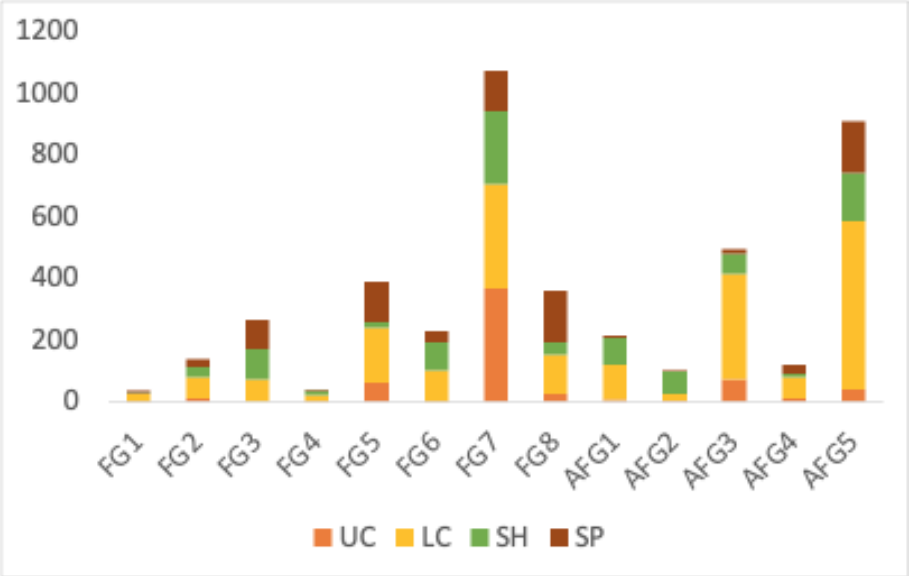

Figure 14. Total number of woody stems recorded at each site
UC = Upper canopy, LC = Lower canopy, SH = Shrubs, SP = Saplings

Stem density

The average number of woody plant stems per hectare was 1,722, with the highest stem density of 5,101/ha for AFG2 and the lowest density of 148 stems/ha for FG5 (Figure 15). FG5 also had the largest site at 4.8ha, with 50% of fruit trees displaying signs of stress. For comparison, target densities in UK forestry for broadleaved woodland are 1,000/ha (low) to 3000/ha (high density).

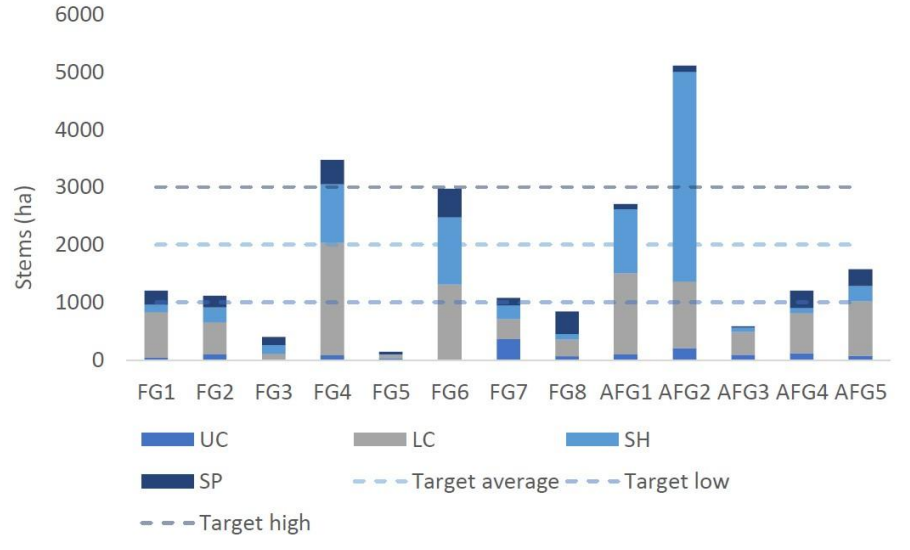

Figure 15. Number of stems (ha) across sites compared to UK broadleaf low-, average- and high stocking densities (Kerr & Evans, 1993)
UC = Upper canopy, LC = Lower canopy, SH = Shrubs, SP = Saplings

Forestry stocking density guidance may not always be appropriate to forest gardens, as it does not take into account the various layers and mixed heights in multistrata

systems. Stocking densities in a single forest garden may vary widely across patches, and both higher and lower stocking densities than in standard forestry may be acceptable depending on the intended type of habitat for any specific patch. Where forest gardens contain large areas of open ground or herb layer plantings without woody layers, a lower overall stem density may be appropriate, while a top fruit-soft fruit polyculture may favour a higher density. While forest gardens are not directly comparable to broadleaved woodland, forestry stocking rates may be useful as guiding figures for the establishment phase of a forest garden.

Low and high density sites
FG3 had a low stocking density, with trees spaced in an orchard pattern. The forest garden also acts as a campsite and the FGer is keen to maintain ground cover diversity which may be lost if the upper canopy increases. However, the FGer reported that frost and the free draining nature of the soil were issues for the site and tree health. A higher stocking density could aid frost suppression and water retention. As the FGer is keen to nurture natural regeneration of trees, the site's woody plant density may increase naturally.

By contrast, AFG2 had the highest stocking density. The FGer noted several times during the survey that they had overplanted the site and are now seeing some negative effects on tree health and yield.

Species abundance
The five most abundant woody species were all trees and shrubs noted for their use in the categories of FOOD, with TECH and FEED also recurring uses (see table below). Ten of the most abundant species across all sites are non-edible species, including ash (*Fraxinus excelsior),* Leyland Cypress *(Cypressus x leylandii),* willow (*Salix spp.),* alder *(Alnus spp.),* maple *(Acer spp.)* and oak (*Quercus spp*.). Some of these were planted, while others naturally germinated. All of them have potential functions for the forest gardener.

Table 4. Most commonly mentioned woody plants by genus.

Genus	**Number of sites**	**Main yields and functions**
Malus	8	Top fruit
Corylus	8	Nuts, poles, windbreak
Ribes	7	Fruit
Eleagnus	6	Nitrogen-fixing, windbreak, fruit

Prunus	6	windbreak, hedging, wildlife fruit
Crataegus	5	Windbreak, hedging, wildlife, fruit

The study found variability across sites, reflecting differences in site conditions and goals, planting choices and management practices. This can be seen as a result of forest gardeners being innovators: having to learn, explore and experiment as knowledge has not been passed down intergenerationally (Levidow et al., 2014; Wartman et al., 1988).

The results presented here bring us one step closer to understanding the type of crops that FGers are using, and which ones have potential for introduction at larger scales. While the trial participants are employing diverse species mixes and utilising a wide range of species, there are a range of types of crops that were not recorded or are lacking. In particular roots, verticals and staple crops were largely absent.

Figure 16. Pollarded specimen of Whilte mulberry (Morus alba) *at AFG3 (Agroforestry Research Trust), grown as a leaf crop with potential for wider use*

There remains a need for more crops with other uses, however the types of forest gardens included in this study may not be the most suitable places for large scale experimentation. The forest gardens here are mostly smaller than 0.5ha (1 acre), thus experimenting with new crops may be a challenge for some. AFG1 notes, it is better to experiment on only 5 - 10% of land, to ensure reliable yields. However, FG7 and AFG3 had large numbers of successful experimental species (*Asimina triloba*, Judas tree, and *Schisandra chinensis, Toona sinensis*, Bamboo spp., *Castanea sativa* varieties, etc).

Woody stem abundance

Forest garden stem abundance across sites was compared to low, average and high broadleaf forestry stocking densities for the UK (Kerr & Evans, 1993), as no multistrata agroforestry stocking guidance exists. Stocking densities provide guidance for saplings, not mature trees. As FG1-8 are about ten years of age, broadleaf woodland density targets could provide a good comparison to aid FGers on planting density and practice where woodland structure is a medium term objective.

The wide range of stem densities is in line with other studies of forest gardens (see Rockwell, 2022). Forestry stocking density guidance does not take into account the various layers and mixed heights of multistrata systems, so higher stocking densities than those recommended in broadleaf forest gardens may be acceptable in forest gardens. Equally, lower densities may be appropriate when prioritising light-demanding species and an extensive herb layer. As sites mature, it is possible that lower stocking densities are required in order to guarantee sunlight and air flow levels conducive to plant health. Results presented here could therefore provide a starting point for suggested forest garden stocking densities to aid practitioners with deciding on canopy and shrub densities.

Figure 17. Pattern of medium density canopy with high density shrub layer, observed in AFG1, a site with high overall productivity

Growth rates and potential for carbon sequestration

Through collection of the stem diameter of all woody species, the study has identified potentially useful species for timber sequestration, such as leylandii of 8cm, Italian alder *Alnus cordata* of 13cm, Sea buckthorn *Hippophae rhamnoides* at 8.3cm, and Japanese walnut *Juglans ailantifolia* at 9.2cm, based on the average diameter of more than 20 stems at 10 years from FG7. The first three of these can be seen as support species rather than main crops, often used in windbreaks. Sea buckthorn is a relatively short lived shrub, making it less useful for carbon sequestration.

Many of the sites are too young (FG1-8) and small (FG1,4, AFG2) to provide analysis of sequestration, and comparisons to more established sites (e.g. AFG3) would be unrealistic. However, if forest gardeners are to consider their sites for sequestration, then species choice and abundance are important factors. Schafer et al. (2019) and Lehmann et al. (2019) indicate that the majority of carbon is sequestered in the canopy layer, with the understory only contributing a small percentage. The variability in upper canopy species and density across FGs indicates that the rate of sequestration occurring across these systems will vary widely. However, many of the sites also have other components, so this should not be measured in isolation. For example, some sites have mature hedgerows, or have planted heavily elsewhere on their sites.

Key findings and lessons from the trial

In this section we highlight key findings and most valuable learning from the 10-year trial that we hope others will take further in future research. These relate to forest garden design, biodiversity of forest gardens, their economic potential, and participatory research methodologies.

Table 5. Summary of key findings from our 10-year trial.

Forest garden design principles	● Forest gardens can be created in a wide number of settings and scales. Patterns of layout and management need to be adapted accordingly. ● Identifying key functions from the start helps to embed forest gardens in the wider setting they are part of. This helps in deciding on the right location, scale and layout for different multi-layered plantings. ● An extended observation phase can help prevent fundamental errors and allows for more informed design choices ● In plant choice, combine dependable successes with some experiments ● The most successful forest gardens are those in which humans constantly and actively seek to learn and where both the system and their own practice is constantly evolving in response to changing needs and conditions. ● Low maintenance is not “no maintenance”.
Biodiversity & crop diversity	● Biodiversity is highly valued by forest gardeners, and there is good evidence that it is a major benefit of forest gardens. (This is also supported by our online surveys of over 250 temperate forest gardens) ● There is some evidence that forest gardens compare favourably with other forms of productive land use in terms of biodiversity ● There is already a great diversity of crops in many forest gardens. Further crop diversity, especially in terms of staples and cash crops, could be achieved through targeted research and development. ● The ethnobotany survey indicates potential

	for a wide range of uses for plants grown by forest gardeners. Further research is needed into which of these plants are actually used, and what the development challenges are to achieve a wider uptake of their use.
Economic potential	• The main economic contribution of forest gardens may be in providing a level of household and community self reliance and food sovereignty. • Forest gardens can contribute to economic independence by providing products and services for trade and sharing. • Sites can reduce external inputs and associated costs by using forest garden products and services.
Participatory research	• Small organisations and practitioner networks like the PAB are crucial in enabling and carrying out practitioner-led research, and need to be resourced accordingly in research collaborations. • The process of collaboratively defining a typology can be the basis for studying different types of forest gardens • In order to get usable data on areas such as biodiversity, soil improvement and yields through participatory research it is crucial to develop methodologies and provide participants with data collection methods that are easy to use for

"Arguably the most important thing about the trial is its existence, making a clear statement that UK forest gardens are worthy of study. In this sense the project was ahead of its time. Published research on temperate forest gardens was almost non-existent in 2010 but is now starting to emerge."
Chris Warburton Brown, research coordinator, in the Foreword to Year 5 Report

Forest garden design

Whatever the context, it should be noted that designing a complex or large multistrata system like a forest garden is no small undertaking, particularly during the first five to ten years when much of the planting and infrastructure work takes place. As our research has shown, forest gardens vary widely in scale, setting and purpose as well as

planting patterns and management approaches. From our analysis of the diversity of sites and practitioners involved in the trial we propose a number of principles to bear in mind when designing forest gardens.

Forest gardens can be created almost anywhere

The trial and 10 year review show clearly that forest gardens can be created and run in a number of settings and at different scales. Sites studied here are located in urban, suburban and rural areas, ranging in size from 100sqm to 2.66ha.

Let the purpose define the design

Forest gardens are best when they are designed, created and managed in the context of the whole farm, household or community. If you think "I want a forest garden", ask yourself "what is it for?" The intended functions will determine the best size and location for the forest garden. The functions shown in the image below or a subset of them can be relevant, independent of the type of forest garden.

Where (as in most cases) a site includes more subsystemss than the forest garden itself, some outputs of the forest garden such as fertility, wildlife habitat or wood for poles can be used in other parts of the site and reduce the need for external inputs.

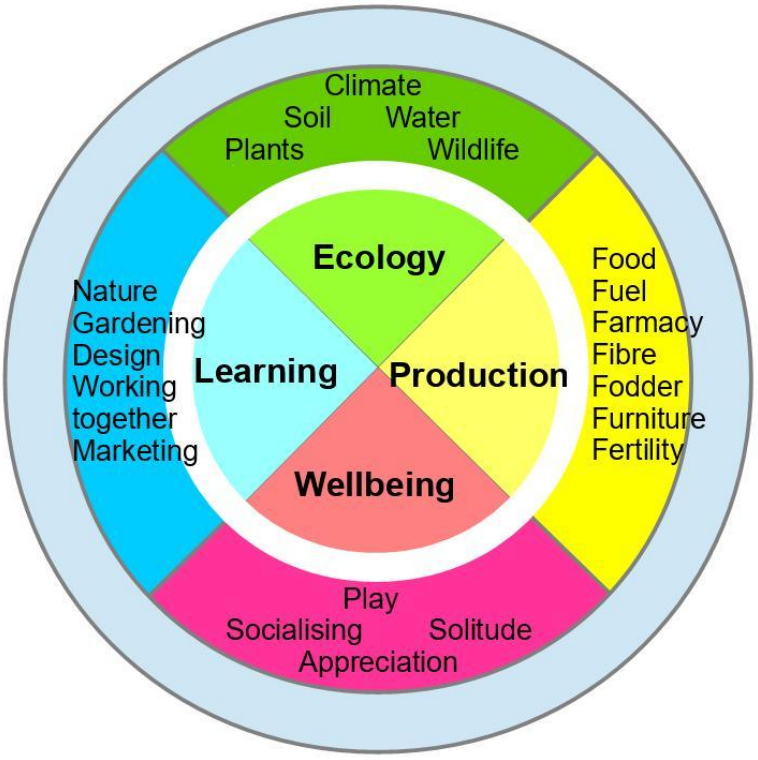

Figure 18: Possible Functions of a forest garden (Remiarz, 2017)

Slow down, observe and reflect

A number of participants stress the importance of a prolonged observation and design phase of up to two years. Others reflect that such a phase might have prevented them from making particular mistakes in design decisions such as location and size of the planting or species choices.

"The best thing we ever did was to plant the green manures, which just gave us two years to dream. And out of that came the design. That's the thing I keep recommending to other people ... to not feel you need to rush in [toplanting the whole forest garden]. FG7

Focus on dependable success, build in some experiment

Especially in smaller gardens, space is at a premium. It makes sense to plant the majority of the site with tried and tested crops or plants that are known to be desirable. It is worth including some experimental crops, whether for their flavour or because they may be future beneficiaries of climate change.

"If you're gonna try to do this - make sure that 80 to 90% of what you're planting is truly reliable and 10 to 20% can be experimental." AFG1

Low maintenance is not "no maintenance"

FGs are not maintenance free. Care and attention will be necessary, especially in the set up phase. Once the system has established its own dynamic, continued observation and targeted interventions will make sure that it remains functional, productive and healthy. Throughout the lifetime of the forest garden, air and light management are crucial to plant health. Many maintenance operations have a defined seasonal window and need to be timed accordingly. Among the establishment and maintenance tasks ther design, establishment and management of ground cover is one of the most challenging aspects for many forest gardeners.

We are all still learning about forest gardening

Temperate forest gardening is a young discipline. There are only a few mature examples around at the moment. It is worth seeking them out in order to learn from them.
Not all forest gardeners start out as plant and ecology experts, and there is always something new to learn. Horticultural experience and ecological understanding make both the sites and the gardeners work better, and forest gardens are a great training ground to acquire these skill sets. The fact that established sites reported fewer difficulties than younger ones could be seen as an indication of increased learning as the site matures. This would be good to investigate further.

Multi-layer cropping systems exist under a range of different headings, and there is overlap between them as well as distinctions. Traditional and contemporary land use forms resembling patterns used by our trial participants include traditional orchards (FG3), woodland (AFG1 and cottage or home gardens (FG7, AFG2). Other gardens are distinctly different from other land use forms.

Learning can also be inspired by the practices of other forest gardeners around the world, especially from the well-established and mature systems in the tropics. Many of these have been continuously maintained by indigenous cultures going back many generations. One forest gardener pointed out “I've learned to listen to my indigenous sisters on an indigenous approach to forest gardening. I think my greatest learning really is that healing comes from being in the garden” (AFG2).

The idea of forest gardening is infectious
It is remarkable that people working on sites with a wide range of sizes, settings and purposes feel drawn to using the term forest gardening for their practice. For this very young discipline, there is more research to be done in order to identify and optimise planting patterns for different purposes, scales and management intensities

Biodiversity and crop diversity

Biodiversity emerges as a particular strength of forest gardens. Many plants with biodiversity benefits were recorded in the surveys, and by participants, and participants often mentioned sightings of wildlife. We believe there is much scope to investigate these benefits further, and compare them with the biodiversity related to other forms of land use. Further quantitative studies could shed light on this area.

To our knowledge, this is the first account of a widespread survey of forest garden species utilisation in the UK that provides detailed examples of uses *in situ*. Although the findings of this trial with regard to crop diversity are limited, they raise a number of questions for further research, including:

- Which of the potential uses cited by participants translate into actual use of a plant?
- What are the barriers to crop use, and how can they be overcome?
- What is the potential for growing staple crops?
- What are suitable planting densities for healthy growth of different layers?
- What are the most effective patterns for perennial planting at commercial scale?
- How can crop yield be optimised, including processing and preserving?

The presence in our survey of a wide range of plants with multiple uses indicates the potential for household and community self-reliance, potentially providing resilience in

times of strained global supply chains. However, the question remains as to which of the potential plant uses cited by participants are actually employed. This would be a valuable line of future inquiry that could tell us both about opportunities and challenges related to using these crops at a household or community level.

Figure 19. A stand of Hazel Corylus avellana*, including a red variety, at AFG5. Hazel is cited by several participants as a crop for nuts and poles and as a windbreak.*

The growing of many unusual crops, and crops in new combinations, constitutes valuable citizen research into the viability of both. It can also be understood as re-establishing an eroded knowledge base of polyculture growing in the British Isles. It would be worthwhile to compare the forest garden approach and other contemporary polycultures with traditional approaches such as cottage gardens, a polyculture practice indigenous to Britain.

Comparison to conventional & organic systems

Forest gardening practice can also be compared to other farming methods, such as conventional and organic farming. Species richness of the forest gardens included in our study is comparable to that of large-scale farming systems despite the size. Gibson et al. (2007) report the identification of 325 plant species across 20 conventional or organic farms in South-Western UK (with a mean hectarage of 126 and 226 respectively), compared to over 500 species reported here with a mean of 0.5ha. Furthermore, the number of varieties in forest garden systems adds another level of diversity that was not studied here, with many species (particularly *Malus spp.*, but also *Aronia*, *Amelanchier, Prunus spp.*, etc.) having many varieties. This indicates that forest

gardens have a great role to play in creating and maintaining crop diversity which in turn can contribute to community and household level resilience.

Participatory Research & Development of new crops

Toensmeier (2016) lists perennial staple crops (basic starch crops, protein crops, protein-oil crops, edible oil-crops, sugar crops) and perennial industrial crops (biomass crops, industrial starch crops, industrial oil crops, hydrocarbon crops, fibre crops, etc.) that could be employed in carbon farming. Our ethnobotanical survey shows that the forest gardens presented here are not employing these types of crops. Further research could focus on the conditions under which perennial staple and industrial crops could be grown in multi-storey polyculture systems.

For many of these potential crops, further research and development is needed to make them attractive commercial propositions. Government incentives may also be able to play a part, especially with crops and techniques that have significant carbon-fixing potential.

Economic potential

The question of economic viability was outside the focus of this trial, but some information can be gleaned from information given by participants.

Forest gardeners often applied poly-livelihood or multiple strategies in their systems, with forest gardens being one of many components. All FG systems comprised more elements than the original forest garden. The level of integration between subcomponents varied across sites.

Many forest gardeners are also farmers, vegetable growers, foresters, carers, family members, teachers, etc. Diversity in each system creates resilience against shocks. As one participant said of their crops, “something always does well.” Skilful species choice, plant use and management practices enable closed loop systems in which nutrients are cycled within the system to provide for humans, animals and soil biota. This reduces the need for external inputs and associated costs to the gardener.

While there was little mention of commercial activities in the Year 3 and 5 reports, 10 of 13 forest gardens had some form of enterprise linked to the land or forest garden after year 10. Some participants were selling produce or plants, while others offered design or training services.

This could be interpreted as an indicator of the site’s maturity and/or of the increased capacity of forest gardeners to share their produce and expertise. However, only four

sites referred to commercial successes of their site. Forest gardens are rarely a commercial proposition on their own, but they can contribute to a multi-income livelihood. Their greatest contribution may lie in increased household and community level self reliance and resilience to external stressors such as rising food prices. This role is very similar to what has been found in research of tropical home gardens (Torquebiau, 2006 and Mohan, 2006).

Participatory Research

Typology of Forest Gardens

Establishing a typology of forest gardens in discussion with participants early on in the trial proved to be extremely useful. The distinctions between private gardens, community projects, and commercial enterprises have many implications for design, establishment and maintenance practices over the lifetime of a forest garden. Consequently, they may also have to be studied using different approaches as "depending on whether a project identifies itself as a private, community or commercial forest garden, the intentions behind it differ greatly, and therefore the expected yield types. Different ways of recording these yields will be required for each group (Ashman, 2012)."

The typology informed further research, including our own subsequent forest garden baseline surveys. At the time, this distinction had not been made in any other forest garden research. Further investigation into the design, layout, planting and maintenance implications associated with each of these types of forest garden would be fruitful and create new learning.

> "A private garden in a backyard might be designed to produce a wide variety of different crops over a long time. For community projects, social yields like learning and people's involvement might be as important as what is actually harvested, whereas in a commercial forest garden guilds may be designed around a few major commercial crops." (Ashman, 2012)

Our category of "private gardens" closely corresponds to the established category of "home gardens" found in tropical biomes and could be studied in similar ways. It would make sense to reframe these gardens accordingly. Comparative studies between temperate and tropical home gardens would be a good field of research to open up. The PAB's soon to be published survey of temperate FGs has identified 129 gardens

within this category across Europe and North America, with a data pool that would allow such comparative studies.

Another type of forest garden that has emerged in recent years is sites in public spaces. These arguably share many characteristics with other kinds of community spaces and could be studied using approaches developed for community and public spaces.

There has been some more recent work on forest garden typologies, such as that by Food from the Forest in the Netherlands. However, their four different themes all fall into the category of commercial projects.

Methodologies for participatory forest garden research

During the trial it became clear that user-friendly methodologies for recording key aspects of forest gardening would have to be developed. Forest gardening remains a practice-led field, where much knowledge is acquired by experimentation on individual sites. In order to gain a wider and deeper understanding of best practice in different settings, comparative studies will be needed that draw on this wealth of grassroots knowledge. This can only be done effectively through methodologies and data collection methods that take into account the strengths and limitations of working with non-scientists.

According to their own statements, all our trial participants stopped keeping records as part of this trial after three years, due to lack of time and lack of clear guidance from the PAB. They did however carry on keeping their own records to some extent, which fed into the final review. Apart from the initial set-up grant, none of the trial participants were paid to take part in the trial or to keep records, and the PAB had limited staff resources to support the project. Additionally, forest gardening was not the sole or even main occupation of the trial participants, though often a part of a multi-stream life and livelihood. Research into the forest gardening aspect of their lives was a minor concern for all participants, and would have needed much clearer and more consistent guidance and support from experienced participatory researchers.

A start was made within the PAB to develop methodologies for researching soil and biodiversity benefits, but it became clear that this could only be successfully done with further input from experts in the field. The work was therefore shelved. Some practitioners within the Association have developed their own recording systems for material yields and social benefits of forest gardens. These could be adapted and rolled out for wider use in future trials. Meanwhile others have taken on the challenge of creating citizen science methodologies and data collection systems for forest gardeners (e.g. Food from the Forest).

Developing participatory methodologies

SInce the start of the trial and in some cases informed by it, progress has been made in parallel projects including:

- Soil and biodiversity research methodologies by PAB
- PAB's GROW LAB involvement
- Yield methodologies developed by Graham Bell and Tomas Remiarz
- Social benefits research - Sandy James, Five ways to Wellbeing
- Food from the Forest - effort for comprehensive citizens research

These projects have answered some of the initial questions raised at the start of this trial in 2010. While there was not sufficient capacity to use the soil, biodiversity and yield methodologies in this trial, they can be made available to inform future research efforts.

Any future participatory research into forest gardens including trials would need to take into account the need for both initial and ongoing support of participants. This includes:

- Clarity about the aims and research questions from the start.
- A clear methodology designed to achieve these aims.
- Simple formats for data collection.
- Initial training of participants in collecting the relevant data..
- Ongoing check-ins with participants and guidance to keep up motivation, ensure the methodologies are used correctly and ensure the results are usable.
- Some level of specific support on forest garden related questions.

Going forward, it would be worth considering a "Research and development" approach for future participatory projects. This would imply a much more active role for trial coordinators, with ongoing guidance for participants, regular feedback from participants and suggestions for interventions where relevant. However, this level of input would require sufficient funding and staff capacity on the part of the coordinating organisation to ensure support is consistent and relevant throughout the project. This is unlikely to materialise without targeted support from policy bodies and research institutions.

Conclusion

This trial started out as research into a then marginal land management practice, carried out from a position at the margins of formal research with little to no access to research funding and capacity. This was partly a legacy of permaculture stepping out of academic research soon after its conception. In 2010, we were just beginning to re-engage.

Over the last decade, the field of forest gardening has moved on significantly. There are now many more sites across the temperate world, and the practice is beginning to be taken seriously both by mainstream actors in society and in academic research. In the context of this development, the research into forest gardens carried out by the PAB has made a substantial contribution to our understanding of forest gardening practice.

Much of the knowledge about forest gardens is still provisional and each site can be seen as an experiment in its own right. Following the best of these sites with a participatory research approach could yield great benefits for our understanding of this practice and its potential contribution to our adaptation to the ecological, agricultural and social challenges of the coming decades.

It must be noted that, apart from a small initial philanthropic donation and academic support in the later stages, this research trial was maintained for a decade in the most part by practitioners with little or no academic training who volunteered their time and effort to further knowledge in this field.

This trial has shown that there are a range of potential benefits from forest gardens to be gained for communities and households, and it has contributed useful new data and raised questions for further study.

While some of the questions we have identified could be studied through third-party academic research, many of them would greatly benefit from a participatory Research & Development approach, with close collaboration and regular feedback between practitioners and researchers.

Future research will require appropriate support and investment. However, as this study also shows, the knowledge and commitment of grassroots forest garden researchers and practitioners must remain central to the design, planning, implementation and analysis of forest garden research, and must be appropriately supported and compensated.

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Appendix

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Appendix

Examples of plants found in this study, with their uses and additional properties

Common Name ***Scientific name***	**Primary Use Category**	**Primary Use Category properties mentioned**	**Additional properties**
Bird cherry ***Prunus avium***	**BIO**	birds love them	stella variety; not great in a small garden polyculture as birds get them
Cherry laurel ***Prunus laurocerasus***	**BIO**	great for birds	black berries - very tasty
Dwarf comfrey ***Symphytum ibericum***	**BIO**	a really good ground cover; does well competing against grass and nettle	
Evening primrose ***Oenothera biennis***	**BIO**	seeds for birds in winter	roots as food, seeds for MED
St John's wort ***Hypericum x moserianum***	**BIO**	birds love the seeds	shade loving
Amelanchier spp	**FOOD**	Cherry sized fruits; *A. alnifolia* noted by one FGer for best edible fruits of the family; 7 varieties	the first fruiter of the year; birds also love them

American groundnut ***Apios americana***	**FOOD**	edible beans, seeds and tubers	Nitrogen-fixing
Black chokeberry ***Aronia melanocarpa***	**FOOD**	Use in drinks, etc., very astringent, but a superfood high in anthocyanins - antioxidants; can be prepared to make more palatable	
Wild leek ***Allium ampeloprasum***	**FOOD**	perennial - grows bulbs like onion sets	very good at establishing and spreading
Korean barberry ***Berberis koreana***	**FOOD**	one of the best in the family for edible fruits	
Bladdernut ***Staphylea pinnata***	**FOOD**	a large understory shrub; producing nut crop	does well in low light conditions
Angelica ***Angelica archangelica***	**TECH**	for structure	bee plant and for beauty
Greater burdock ***Arctium lappa***	**TECH**	uses leaves to wrap things on BBQ	
Hazel ***Corylus avellana***	**TECH**	used for poles, bean poles;	rather than paying for woodchipper, uses billhook and cuts poles into sticks and uses as mulch

Leyland cyprus ***Cupressus × leylandii***	**TECH**	fast-growing; strong; grown close together and in rows of two to build raised platforms & treehouses	Uses with Johnson-su style bioreactor; great for soil biology. Also uses to make woodchip every year; it's not acidic
Umbrella bamboo ***Fargesia murielae***	**TECH**	small canes flexible to weave into fencing	shoots too small to eat, but frequently flowers and yields rice-like grain crop
Californian wax myrtle ***Myrica californica***	**TECH**	wax from fruits	Nitrogen-fixing; leaves for flavouring
Miscanthus x giganteus	**TECH**	grows up to 12 feet tall - can act as a quick growing short-term shelter & windbreak	
Golden bamboo ***Phyllostachys viridiglaucescens***	**TECH**	greenwax golden bamboo - useful garden canes	very productive, producing edible shoots from Apr-Jul
Persian silk tree ***Albizia julibrissin***	**FEED**	Nitrogen-fixing	good pollinator for bees - but the common variety doesn't do well
Apios americana	**FEED**	Nitrogen-fixing	edible beans and tubers
Elaeagnus spp.	**FEED**	chickens like it; also Nitrogen-fixing	evergreen & deciduous spp.; fast growing to create shelter;
Cleavers ***Galium aparine***	**FEED**	used in a liquid tea fertiliser with nettles	can make coffee from the buds; put leaves in salad

Green alkanet ***Pentaglottis sempervirens***	**FEED**	liquid feed/	flowers are edible
Dog rose ***Rosa canina***	**FEED**	chickens like the hips	
Blackberry ***Rubus fruticosus***	**FEED**	makes biochar - can apply directly to the soil in autumn or charge it in compost then apply in spring	
Garlic mustard ***Alliaria petiolata***	**MED**	leaves good for digestive system	all parts are edible
Hairy marshmallow ***Althaea hirsuta***	**MED**	roots good for respiratory ailments	leaves in salad; not able to cope with root disturbance makes plant sale difficult
Greater burdock ***Arctium lappa***	**MED**	used in Chinese medicine	Roots are like carrot, peel & soak in water & bicarb, then sauté; sprout the seeds; eat the stem; can eat the young leaves but are very bitter
Mugwort ***Artemisia vulgaris***	**MED**	much of the family is cleansing	very bitter, but less intense when young
Black horehound ***Ballota nigra***	**MED**	colds & phlegm	
Pot marigold **Calendula officinalis**	**MED**	dark and strong colour with higher anthocyanin	

Greater celandine ***Chelidonium majus***	**MED**	can use the sap for warts	A toxic plant so you need to know what you're doing with it

Stepney City Farm

London

Site Age / Initial Planting: 2010; established trees were present prior to this
Size and aspect: 0.03ha of flat ground within a 1.2ha urban farm
Soil: Sandy Loam with 18% organic matter, pH 7.2

Setting: Community Social Enterprise

The forest garden is part of a larger city farm community project. It has to ensure economic viability and meet funding by increasing food production and by generating income through sales of produce, the café and courses. The Farm includes a pond, nursery, market-garden/veg-box scheme with polytunnels & raised beds, paddocks with various animals, a farm shop, farm café and support for microbusinesses, courses and events. Open 6 days a week, and with free entry for any individual or group, this site is able to promote the use of forest gardening to a wide audience.

"We have a compost system that works really well. We've had black soldier fly, and people that are harvesting the maggots to feed to chickens this by-product."

Key Features

The site has all layers in the forest garden system and the forest gardener feels all layers are complete. A total of 72 species across all layers were identified, whilst 37 individual trees, shrubs and saplings were recorded.

Upper Canopy (1 individual): elder (*sambucus nigra)*
Lower Canopy (24 individuals) including: apple, ash, blackthorn, Chinese cedar (*toona sinensis*), fig, hazel, medlar, mulberry, plum, rowan, willow
Shrubs (4 individuals) including: saltbush, rose, gooseberry
Herbaecous layer including: bluebells, borage, fat hen, salsify, tansy, three cornered leek
Ground cover including: wild garlic, mint, wild strawberry, clover, chickweed
Saplings (7 individuals) including: maple, blueberry, tayberry, goji

Successes

- Reshaping trees / pruning
- Using trees and bushes as climbing frames for crops & fruits (layer integration / utilising interactions)
- Taking cuttings & selling them (propagating & yield & sales)
- Teaching plant uses e.g. mugwort (education / social)

Difficulties

- Plant overcrowding
- Competition e.g. strawberries outcompeted by three-cornered leek
- Figwort has become invasive

Uses

Fig: Fig leaves are sold to restaurants - who then infuse ice cream; cuttings are sold on site

Calendula: Used in salads; sold in pots and bouquets

Elder: Flowers cut and given / sold to start ups for wine making

Horseradish: Very easy to propagate and sell; root grows back very well; roots to make wasabi

Evaluations

Click here or scan for virtual tour >>>

The forest gardener feels that irrigation would help the most in maintaining the site, whilst engagement literature/media would help the most in educating and encouraging more sustainable dietary behaviour.

They felt that the biggest weakness was the design, and that yields are very small. While the harvest goes to the community cafe, it is not a lot. The forest gardener felt it would have been good to plan the garden based on the produce based on the cafes needs.

The forest garden is an excellent learning tool during permaculture courses, and for school groups, to show them unusual crops, the way they grow, forest garden layers and how different amounts of light comes through the trees. About 2,000 children per year join the gardening based classes.

Steward Community Woodland Devon

Site Age / Initial Planting: 2011
Size & aspect: 0.12ha of S-facing slope within a 32-acre mixed broadleaf and conifer woodland
Soil: Loamy sand with 11% organic matter, pH 4.4

Setting: Private

A south facing private site on a hill surrounded by mature mixed broadleaf and conifer woodland owned by a workers cooperative. The forest gardeners used to live on site until 2017, when the local council evicted the residents. The forest garden sits within a 32 woodland, and the forest gardener keeps chickens. It feels like there are two halves to the site - the more curated garden side, and the wilder zone that is further from the entrance; as naturally more time is spent on the side closest to the entrance. The forest garden is partially integrated with the rest of the site. For example, woodland inputs include harvesting tree branches to protect young saplings, and leaf mould that is incorporated into compost for a growing medium. Forest garden outputs include crop yields that are used as animal feed.

"I never had an intention to pull up all the other layers and replace them with edibles. I've just replaced the top layer trees and that's it. Never planted a groundcover, it was allowed to develop with a bit of management."

Key Features

The forest garden has all layers in the system except an aquatic layer. The forest gardener feels all layers are complete, except for the aquatic and vertical layers, where they think there is scope for increasing both of these. A total of 59 species across all layers were identified, whilst 140 trees, shrubs and saplings were recorded.

The most dominant tree species are apple, followed by ash, maple, currents, hazel and oak.

Upper Canopy (12 individuals) including and dominated by: silver birch (*betula pendula*)
Lower Canopy (71 individuals) including and dominated by: apple, hazel, oak, *Elaeagnus spp*.
Shrubs (32 individuals) including and dominated by: currants, gooseberries, raspberries
Herbaceous layer including: creeping buttercup, dead nettle, herb Robert, purslane, thistle
Ground cover including: hemp weed, moss, ground ivy, grasses, ground cover raspberry
Saplings (25 individuals) including and dominated by: ash and sycamore

Successes

- It's too early to tell
- Buying a strimmer, "the woods are very bad for bracken, and in July & August it's horrendous. The community rules were that I had to pull by hand. I bought one a few years ago and haven't looked back."

Difficulties

- Anything experimental didn't work
- Not living on site
- Maintenance
- Nettles and creeping buttercup are a nuisance; a result of human disturbance
- Pulling up natural regen
- Small rootstocks are unsuitable for site, likely due to acidity and competition

Uses

Dog rose and *Eleagnus* spp.: chickens like the fruit
Hazel: used for bean poles
Bracken: used as mulch around trees
Blue honeysuckle *Lonicera caerula*: Berries palatable but not very nice; Birds like them
Plum: Doing well in acid soil; used for jam

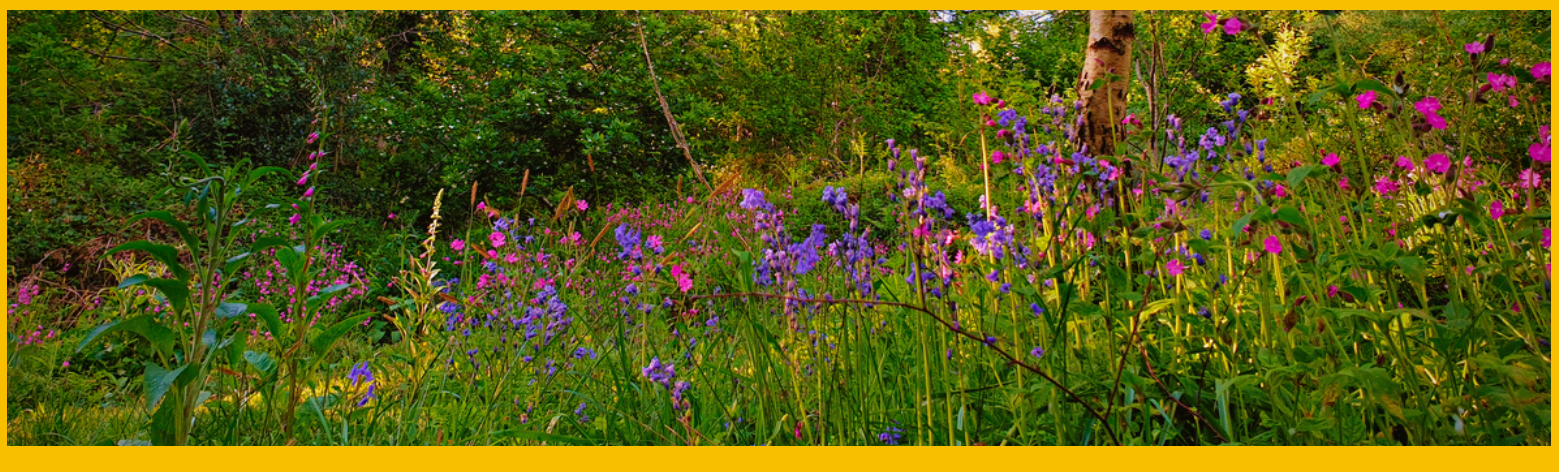
Evaluations

Click here or scan for virtual tour >>>

Many of the fruit trees have been heavily pruned to increase fruit yield or to prevent growth that is out of the forest gardener's reach, thus increasing ease of harvest.

It's clear that the highly acidic soil was a limiting factor here, and we should all be aware of this during our species selection, remembering to select the right tree in the right place, for the right reasons.'

"The buartnut died. And the small apple trees on dwarf rootstock. One of the pear trees hasn't done well, but another did well. I'm sure if it's just microclimate, or whether that's the variety of pear that just happened to go in that spot. I mean, it's not very scientific. The Mulberry trees didn't work out very well either. Anything experimental didn't work." It might have been better i.e. more productive to stick to apples, as all the experimental trees seem to not have done very well - this could be a result of acid soil - it doesn't matter how much you lime it, it will still be acidic."



The Quadrangle Kent

Site Age / Initial Planting: 2011
Size & Aspect: 0.66ha of flat pasture on 1.2ha
Soil: Sandy Loam with 9% organic matter, pH 7.6

Setting: Private Social Enterprise

This is a relatively large forest garden owned by a trust that promotes permaculture, rewilding and conservation, particularly with young school groups. The forest garden is seen as being fully integrated with the rest of the site, and integral to the functioning of the trust. Other parts of the site include a river, wide hedgerow, annual vegetable garden, large buildings (previously the family home) and what is now a diversified business including events, workshop units, wellbeing retreats and more. The vision is to allow the forest garden to become more wooded in time, and increase the educational use.

"We noticed a huge change in biodiversity where we let the grass grow. Interesting plants are coming back dormant for many years, like orchids. It was a overgrazed pasture field since the 70s. Great insect life and certainly the butterflies are very abundant."

Key Features

The forest garden has all layers in the system, and some of these will be extended in time, although much of the space will remain open for visitors and natural ground cover. The site is surrounded by a dense and inaccessible hawthorn hedge on two sides, and a mature wooded strip on the other two sides - making up the upper canopy. The hedges and woodland were not included in the survey.

129 species were recorded in total, whilst 266 individual trees, shrubs and saplings were recorded.

Lower Canopy (74 individuals) including and dominated by: apple, hawthorn, plum (and other prunus species) and sea buckthorn
Shrubs (99 individuals) including and dominated by: currants, gooseberries, *Elaeagnus spp.*, bramble/thornless blackberry and Siberian pea shrub
Herbaceous layer including: black horehound, black knapweed, ragwort, pyramid orchid
Ground cover including: hairy sedge, perennial rye-grass, red fescue, soft brome, clover
Saplings including and dominated by: prunus species, hawthorn, hazel and oak

Successes

- Something always does well, this changes every year
- Wild grass / natural regeneration is highly biodiverse;
- Picking and choosing what to leave in the soil
- Seeing how things grow, observing the variability in the field, to plant where and when it's needed

Difficulties

- Frost
- Free-draining soil

Uses

Raspberry "Autumn bliss": does really well and visitors really enjoy picking it
Quince (*Cydonia oblonga)*: jelly, quince paste
Elder: flowers for cordial
Siberian pea shrub: nitrogen fixer

Evaluations

Watch an inspiring short film on the journey of this field >>>

Here, the land is tended in a beautiful way, interweaving rewilding with forest gardening, and a strong focus on providing social and educational yields. They don't have any wishes or desires, they allow the site to grow organically, and observe development over time, "some trees were lost due to frost - for everything else, we just accept it and go along with it. We're not fighting against anything, we are watching and allowing the site to develop organically."

They also recognise the importance of maintenance, "we could have more mulching - we don't do enough of it and know it's important; when volunteers ask if then can help we ask them to mulch or weed the fruit bushes."

Early site plans for school visits have developed and continue to occur, they have built a geodome for this purpose.

Image credit to: www.temjam.com

Illford Forest Garden

London

Site Age / Initial Planting: 2012
Size & aspect: 0.01ha of flat ground; two adjoining private gardens
Soil: Sandy loam with 11% organic matter, 6.7pH

Setting: Private Garden

One reason Rootsman Rak decided to create a forest garden in his family's garden was that his elderly mother struggled with garden tasks. He often had to spend large amounts of time away from the UK and wasn't able to help. Now, only half a day per month is spent on site - a huge testament to the forest garden's ability to sustain itself. The plants yield a decent level of produce which is used in the home's kitchen. The huge variety of plants in the garden provide a huge variety of flavours that are used in cooking. The site design makes use of zoning the most harvested plants nearest the kitchen door. The design also ensures the site is very easy to manage for all those who use it.

"It was the intention to show that a forest garden does not need lots of money. Because so many community projects I see chasing after money. That's is because they think they need money for everything. It cost me £12 for the grey water treatment system. The trees and plants came from different places, from making exchanges with different people."

Key Features

For such a small site, it includes a very complex herbaceous layer, with over 54 plant species or varieties. The most dominant woody species were blackthorn, dog rose, hazel, elaeagnus and elder.

A total of 110 species across all layers were identified, whilst 52 individual trees, shrubs and saplings were recorded.

Upper Canopy (1 individuals) including: a very large mature cherry tree
Lower Canopy (25individuals) including: blackthorn, cherry, elaeagnus, elder, hazel, nepalese pepper, mulberry,
Shrubs (39 individuals) including: goji, currents, jasmine, mahonia, rose, bramble, dog rose
Herbaceous layer including: alkanet, burdock, calendula, kale, mugwort, plantain (*plantago* species),
Ground cover including: cinquefoil, cleavers, pine berry, mint, lovage, wild garlic
Saplings (5 individuals) including: blackthorn, bay laurel dog rose, elder
Vertical layer including: kiwi, grape

Successes

- Harvesting, fermentation, preserves, experimenting
- The forest gardener received up to 80% of their nutrition from the site
- Youtube videos on lacto-ferments and other knowledge on perennial growing and processing

Difficulties

- An Om shaped hugelkultur was inappropriate for site
- Not keeping on top of bindweed;
- Personal health
- Sourcing for free/barter/exchange - lessened over time

Uses

Nepalese pepper (*Zanthoxylum planispinum)*: edible seeds used as a spice
Wild cherry: uses them for chutney ripe and unripe, both as lacto-ferments and dried
Ribwort plantain: "If I could travel the world with one plant, this would be it." Both for food and medicine
Salad burnet: leaves taste like cucumber, consume before if flowers
Hawthorn: fruit is dried, and is fairly sweet, makes a great snack

Evaluations

Click here or scan for virtual tour >>>

It's all in the design. One should understand the land and micro-climates of the site and plan accordingly - work from patterns and designs.
If possible, allow for an area for growing living mulch, especially at first.

"I haven't done any work in the last two years except for some shearing and putting some woodchip down on the path. No work, no weeding, no compost moving, no watering. Every weed has been used. The rainwater goes to the grey water system which waters the part of the forest garden that really needs water. The rest looks after itself. I don't plant any new things, it just is being taking over by perennials and weeds."

"Since my parents passed away there is nobody to pick and eat the produce. Things are just overgrowing. Now I need three days a year to manage the overgrowing. There are still plenty of things I can do to make it zero maintenance."

Oak Tree Farm

Suffolk

Site Age / Initial Planting: 2009
Size & aspect: 2.65ha of flat ground; with additional Community Supported Agriculture (CSA) on neighbouring site
Soil: Loamy sand with 3% organic matter, pH 7.6

Setting: Private Site

The site initially had community involvement with different groups and local residents. It was planted as a large commercial scale forest garden, with plans to integrate it into a wider CSA scheme on-site. The site was sold in 2018, with the new owners kindly agreeing to take part in the study. They plan to create an arboretum and grassland. For them, it is a personal journey, so there is no clear plan and they want the development to be organic.
There is a fierce crosswind that blows across the site and as the windbreak was planted at a similar time to the main trees, it hasn't provided adequate cover. East Anglia often faces harsh winters, low temperatures and high snowfall; the young fruit trees have struggled under these conditions.

"The best day was seeing the barn owl fly in."

Key Features

The site has all layers in the system except an aquatic layer. They feel there is much more planting to do across all layers, including creating an aquatic layer. A total of 59 species across all layers were identified, whilst 291 trees, shrubs and saplings were recorded.

Upper Canopy (64 individuals) and dominated by: Italian alder
Lower Canopy (176 individuals) including: ash, sweet chestnut, apple, plum, blackthorn, pear, lime (*tilia*), cherry, Italian alder
Shrubs (18 individuals) dominated by: raspberries & currants
Herbaceous layer including: bristly ox-tongue, cats ear, comfrey, vetch, nettle, holy hay, St. John's wort, spear thistle, tansy, white dead nettle, yarrow
Ground cover including: grasses
Saplings (33 individuals) and dominated by: hawthorn, elm, ash, sweet chestnuts, elder, oak

Successes

- The new owners haven't been on site long enough to know what plants have done really well
- The trees are mostly alive despite difficulties with soils and exposure

Difficulties

- The new owners reiterated that they haven't been there long enough to have encountered many difficulties
- Some saplings struggling in drought
- Deer arriving and need to be aware of possible impact on regeneration
- The initial vision wasn't fulfilled, but trees are still there and the new owners are keen

Uses

Small leaved lime (*tilia*): spring leaves for salads
Thistles: cut away leaves and tough outer skin of stem and eat the stalk like celery
Yellow vetch: nitrogen fixation
Italian alder: windbreak and nitrogen fixation

Evaluations

The previous site owner regrets not making better ground preparations before planting took place.

Don't be too ambitious in the size of your site. Smaller projects are easier to manage. Make sure your site has an adequate means of irrigation, decent ground preparations and windbreaks.

Spend 1-2 years improving the soil (if you want to be planting) – and make a design plan during this time; then plant – think about the type of habitat you want to create – one that's naturally occurring on light soils.

The site was probably low nutrient, and the best thing was possibly to let it rest.

Edibles Forest Garden

West Yorkshire

Site Age / Initial Planting: 2008
Size & aspect: 0.12ha of SE facing marginal slope within 2.8 hectare no-dig market garden
Soil: Sandy clay loam with 13% organic matter, pH 6.2

Setting: Private Social Enterprise

This is a good example of a forest garden that integrates different activities and aims. The social benefits are already well embedded, including interactions with school children and those with a keen interest in forest gardens. A demonstration plot at the front of the site is a nice small scale example that would be manageable by most gardeners. The forest gardeners also value the benefits to wildlife and soil whilst making sales from harvests. The Forest garden area was initially ploughed and sown with grass. The first trees were planted in 2008, with under-planting in 2009. They used carpet mulching originally – which is still in place - but they are now less keen, with potential dye contamination and its unattractive degraded form, preferring to use cardboard.

"The native hedge, now where it is mature, really has noticeably increased the biodiversity, certainly birds. Before we planted any hedges or any of the forest garden, there were no small garden birds at all, because it was just a big open site, a big field. The amount of birds is just incredible."

Key Features

The forest garden has all layers in the system although the root layer, vertical layer and groundcover are naturally occurring. The forest gardener feels more planting is to be done on the vertical layer. A total of 63 species across layers were identified, whilst 230 trees, shrubs and saplings were recorded.

Upper Canopy (1 individuals) including: Italian alder
Lower Canopy (101 individuals) including and dominated by: hawthorn, maple, hazel, apple, cherry, sea buckthorn, elaeagnus, pear
Shrubs (89 individuals) including: blackcurrant, redcurrant, blueberry, jostaberry, raspberry, tayberry, cranberry, rose (hips, petals), gooseberry, sea buckthorn, Worcester berry
Herbaceous layer including: herb Robert, horseradish, *juncus*, thistle, willow herb
Ground cover including: comfrey, rhubarb, strawberry, Nepalese raspberry, mint
Saplings (39 individuals) including: hawthorn, maple, cherry, blackthorn, ash, sycamore

Successes

- Community development
- Volunteers
- Biodiversity
- Commercial output
- Sea buckthorn
- Initially only planted trees because they like trees & fruit, but to now have a commercial outlet

Difficulties

- Couch grass has outcompeted most of the ground cover
- Not being able to plant ground cover
- Not recognising the ground in the forest garden would be too wet for too many months of the year, causing waterlogging, poor tree health low fruit productivity for many of the fruit trees, although the sea buckthorn has done well

Uses

Creeping comfrey (*Symphitum ibericum*): good ground cover; competes well with grass and nettle

Horseradish: pickling the roots for sales

Oca (*Oxalis tuberosa*): leaves are similar to nasturtium and good for salads; the root is like potato

Jostaberry: cross between black current and gooseberry, making it easier to pick

Evaluations

Click here or scan for virtual tour >>>

If the forest gardeners had to do it again, they would plant a field of creeping comfrey or sort the ground preparation more thoroughly. For maintenance, they recommend using a flail mower - a two wheel tractor with a flail mower attachment, that keeps down the couch grass and mulches around the paths. They continue to use a scythe where possible.

Despite difficulties, the forest gardener has planted two subsequent forest gardens on site, indicating the success of such a system. Through their learnings, they have made changes to the design to aid commercial viability. For example, the second forest garden has been planted more openly, with more space between the trees and shrubs. This increases ease and speed of picking.

East Devon Forest Garden

Site Age / Initial Planting: 2012
Size & aspect: 1ha of flat ground
Soil: Sandy loam with 5.4% organic matter, pH 6.2

Setting: Private Site

Extensive earth works and landscaping has created a system of micro-climates. Earth banks protect from prevailing westerly and northerly winds, whilst increasing thermal mass - protecting plants from extreme temperatures. The earth banks are arranged in a series of circles and semi-circles creating different 'rooms' to the site. As you walk around the site the 'rooms' provide different levels of protection from the elements, with physically noticeable changes in temperature. There are also many unique features, including a natural swimming pool and a fantastic social and recreational area. A three tiered amphitheatre-style seating area incorporates a rocket stove for use in colder months - 'keep those bums warm,' we say!

"The main thing was, we didn't do any irrevocable decisions for two years, so the first two years was literally devoted to the planning and the dreaming. I think it allowed for much deeper and more multilayered design to sort of emerge."

Key Features

The site is surrounded by a dense and diverse hedge, although most of this was not included in the survey. All layers are present in the system although the forest gardener feels many of the layers are yet to be completed, including the herbaceous layer, vertical layer and ground cover.

A total of 160 species across all layers were identified, although many more were present, whilst 1069 individual trees, shrubs and saplings were recorded.

Upper Canopy (366 individuals) including: leylandii, italian alder, heartnut, cabbage palm
Lower Canopy (340 individuals) including: cherry plum,, apple, staghorn sumac, bamboo, mulberry, sea buckthorn, pawpaw, elaeagnus, peach olive, fig, loquat, quince, dogwood, Judas, cherry laurel, Portuguese laurel, lime (tilia), walnut, ginkgo biloba, rum cherry, wild service,
Shrubs (230 individuals) including: rose, saltbush, thornless blackberry, Japanese wineberry, loganberry, gooseberry & currants, blue honeysuckle, NZ flax, Nanking cherry, feijoa, aronia,
Herbaceous layer including: artichoke, banana, Babington's leek, fuki, peony, saffron crocus
Ground cover including: marjoram, Nepalese raspberry, wild garlic, wild strawberry, grasses
Saplings (133 individuals) including: magnolia, mulberry, akebia, persimmon, oak, Chilean guava, pawpaw, hazel, banana, Chinese date, amelanchier, apple, silver birch, lime (*tilia*), plum yew, willow, blue bean plant

Successes

- Two years planning & observation
- Major planting of alder around the perimeter (windbreak & nitrogen fixation)
- Edible plants rare to the UK are coping due to creating warmer micro-climates, including the temperate pawpaw (*Asimina triloba)*, Pakistan mulberry that fruited for first time last year and the shipova pear that started producing at year seven

Difficulties

- Rabbits broke through the fencing
- Badgers & wood pigeons
- Predators not arriving in sufficient numbers as the area may not be big enough to support apex predators;
- Having to over plant to ensure enough for everybody i.e. the animals too;
- planning

Uses

Thornless blackberry: produced 30 litres of blackberry wine in 2020
Scorzonera: good root crop
Yacon: root crop to cook, roast, etc; stores well through winter
Chinese cedar (*Toona sinensis)*: tree with delicious leaves; Fruit doesn't ripen
Juneberry (*Amelanchier spp.*): Seven varieties - the first fruiter of the year; cherry sized fruits; superfood with antioxidant, minerals and vitamins

Perennial Egyptian walking onion >>>

Evaluations

Click here or scan for virtual tour >>>

"The best thing we ever did was to plant the green manures, which just gave us two years to dream. And out of that came the design. That's the thing I keep recommending to other people. I know no one ever does it... The first green manure mix was Italian ryegrass and winter tares , it's a winter green manure that got sowed in the autumn and grew through the winter and then got reincorporated for next year. And then we planted a nutrient cycling mix following that. These are separate processes: one's just incorporating huge amounts of organic matter and the other's mining for minerals deep in the soil. That was through Dave Jacke, who said if you do that, by the 5th year you'll have overtaken someone who planted on the first day, so by delaying it two years, you actually speed up the rate, so it's kind of like magic. I'm so grateful to have come across that. One bit of information has so influenced what we did here. And probably that is why we've got no regrets."

Bridewell Forest Garden

Devon

Site Age / Initial Planting: 2010
Size & aspect: 0.43ha of steep slope & terrace within a 4.5ha mixed smallholding
Soil: Silty loam with 8% organic matter, pH 5.6

Setting: Private Site

The forest gardener has observed positive increases in biodiversity. Major earth works created terracing, increasing access and preventing soil erosion. The terraces have broken the site up into manageable sections, with polycultures created along rows. It has led to many 'nooks and crannies' in the walls of the banks, hospitable to slow-worms, grass snakes and lizards. Some trees have been planted on raised mounds of soil, providing small spaces for reptiles and insects. The ponds provide a new dimension of biodiversity, attracting dragonflies to the area. Due to several difficulties, the design has been simplified overtime and the forest gardener is optimistic about this.

"The sweet chestnut has done well on other parts of the site. In the forest garden, only two produce fruits, which might be due to lack of pollination (...) I've tried top working scions into the tops of the trees, but I've tried it a few times and I can't get them to take, so you know, here's hoping those would then be able to pollinate what's below it, or next to it."

Key Features

The site has all layers in the forest garden system. Some layers are incomplete (groundcover, aquatic and fungal layers) or kept as the natural system (root and vertical layers).

A total of 44 species across all layers were identified, whilst 359 individual trees, shrubs and saplings were recorded.

Upper Canopy (26 individuals) including: sweet chestnut, Italian alder, mimosa, pear, willow
Lower Canopy (127 individuals) including: Nepalese pepper, apple, plum, willow, elaeagnus, autumn olive, ash, hazel, medlar, Devon whitebeam, Chinese dogwood, hawthorn, Chinese cedar
Shrubs (39 individuals) including: elder, guelder rose, gorse, elaeagnus, josta berry
Herbaceous layer including: foxglove, hogweed, hart's tongue fern, nettle, oxeye daisy, yarrow
Ground cover including: bracken, comfrey, grasses, wild strawberry
Saplings (167 individuals) including: willow, ash, alder, apple, oak, hazel

Successes

- Pears and Italian alders have been very successful, with good yield
- The forest gardener is optimistic about the redesign
- Apple espalier
- Managing the bramble

Difficulties

- Wind is a major issue for the site, although planting has improved this
- Getting ill and losing control of the initial design
- Trying to get others involved
- Maintenance
- Tree failures, especially experimental ones

Uses

Italian alder: Used as a mulch; use of deadwood to remove/prevent grass growth
Autumn olive (*Eleagnus umbellata)*: Berries used in ice cream; named varietes will be grown in the hedges
Willow species: Used for animal feed
Eleagnus x ebbingei: Shelter for pears and as a nitrogen fixer

Evaluations

"Start with your windbreaks. Careful observations and work on windbreaks at the start of the project will provide a better growing environment and help to save effort later on in the project."

"Have a good balance between complexity and simplicity. Ecosystems can be very complex but management of ecosystems is easier the simpler they are."

"There hasn't really been a yield such yet. Because of the wind, the birds and the drought on the mountain, the trees struggle."

"Plum species also don't do well in this climate (site/regional specific); so the redesign a few years ago was to cut down the plums and repurpose that area."

Garden Cottage

Coldstream, Scottish Borders

Site Age / Initial Planting: 32 / 1990
Size and aspect: 0.08ha of flat ground including intermixing of annual flowers and vegetables
Soil: Loamy Sand with 8.7% organic matter, pH 6.88

Setting: Private Garden and Enterprise

This is a well established walled garden, cared for by Graham Bell and his family. The site is home to a plethora of wildlife, whilst providing food and fuel for domestic use.
Near meticulous record keeping has provided a strong dataset - including of soil biology, soil chemistry, food nutritional content and overall crop yield. The findings indicate that crop yields from forest gardens are at least comparable to industrial agriculture, with the added benefits to biodiversity and community. The family has stacked enterprises, including hosting of tours, as a teaching venue and as a plant nursery.

Here, there is no distinction between inside and outside.

"If you're gonna try to do this - make sure that 80 to 90% of what you're planting is truly reliable, and experiment 5 or 10% at either end of the scale."

Key Features

The site has all layers in the forest garden system and the forest gardener feels no layer is ever complete - it's constantly changing.

A total of 75 species across all layers were identified, whilst 216 individual trees, shrubs and saplings were recorded.

Upper Canopy (8 individuals) including: atlas cedar, heartnut, butternut, silver birch, ash
Lower Canopy (110 individuals) including: apple, laburnum, autumn olive, corkscrew hazel
Shrubs (91 individuals) including: tayberry, cranberry, Japanese keria, Siberian dogwood
Herbaceous layer including: blue iris, aquilegia, culver's foot, meadowsweet, red hot poker
Ground cover including: comfrey, common oak fern, ground elder, wild strawberry
Saplings (7 individuals) including: apple, hazel, whitebeam

Successes

- The totality - the entity is the garden
- Record maintenance (e.g. all the visitors, including humans)
- Set up of Abundant Borders charity and trying to alleviate food poverty
- Training other teachers
- Apples, pears and grapes
- Making a 65 species salad! (in May)

Difficulties

- People and trying to set up an intentional community
- "The biggest failure is of people. This was supposed to be an intentional community and that didn't work. Plants are much easier than people."

Evaluations

Click here or scan for virtual tour >>>

"If everybody did what we do here, in their garden, there are at least a million hectares of garden in Britain, this (site) yields at the rate of 16 tonnes a hectare and only half of it's food. If we did the whole thing, we could probably double that. There isn't a farmer on grade one land here for all their John Deere tractors and all their Agri chemicals, who gets more than 8 tonnes a hectare unless they grow potatoes. So if everybody in Britain, did in there garden what we're doing here, there will be 16 million metric tonnes of food - that'll be about half the amount of food we need in Britain and the farmers could carry on growing the field scale crops, wheat, barley, you know, celery in East Anglia and things like that which they can do really well and they could stop using chemicals and they could put more of their land down to woodland or wilderness. And we could all work a bit less hard and reduce the suicide rate of farmers.

The one thing I would like to add is to encourage everybody who's got a garden to grow their own food. If they don't have a garden, find a community garden allotment. Grow your own food. Persuade all local authorities to turn golf courses, cemeteries, bus stops, parklands into places where food is grown. Doesn't have to stop being a golf course. But you could fill it with fruit trees, walks for the public and so on. We have a very good project with Sterling Golf Club about this who are totally on board. And in relieving the burden on farmers, we relieve the burden on wildlife. And we allow biodiversity to explode again. And we get healthy food closer to home, reduce food miles. 20% of carbon on Planet Earth is generated by humans from shipping stuff around the world."

Esthwaite Forest Garden

Lancaster

Site Age / Initial Planting: 15 / 2007
Size and aspect: 0.02ha of terraced w-facing garden and additional front garden
Soil: Loamy Sand with 8.3% organic matter, pH 7.36

Setting: Small urban garden

Jenni's heroic efforts are inspiring change across the world. Using her plant knowledge, she designs ornamental forest gardens for clients that are fruitful and aesthetically beautiful. Her dedication to the community is infectious - including spearheading a range of local initiatives, designing food forests for local schools and guerrilla gardening. She has created an entire edible hedge along the roads of her culdesac. Even the city's taxi drivers recognise her site as 'the garden.' She focuses her efforts on creating social change, and lets others worry about the record keeping (cheers Graham!).

"...my vision is really one of the cycle of nature of the abundance. And you know, sharing the abundance, which is one of the third permaculture principles."

Key Features

The site has all layers in the forest garden system except a root layer (albeit a natural root system is present) and the forest gardener feels all layers are complete.

A total of 121 species across all layers were identified, whilst 101 individual trees, shrubs and saplings were recorded.

Upper Canopy (4 individuals): wild cherry, silver birch, rowan
Lower Canopy (23 individuals) including: buddlea, amelanchier, apple, hazel, euonymus fortunei
Shrubs including: *rosa mundi, rosa apothecary, rosa perpetua*, hebe midsummer glory, barberry
Herbaceous layer including: aquilegia, sedum spectabile, bridalwreath, corncockle, self heal
Ground cover including: bugleherb, elephant ear, gold flower, London pride, marjoram
Saplings (2 individuals) including: mulberry, Chilean guava (*ugni molinae*)

Successes

- seed saving and sharing
- several thousand Linkedin connections and sharing natures patterns with them
- Creating a wildlife refuge and place of spiritual renewal
- Dismantling barriers around wild food
- Guerilla gardening
- Plums, apples, pears and roses

Difficulties

- To not take into account the size or potential size of the trees / overplanting
- Restraining ambition

Uses

Cleavers (goosefoot) and willow herb: use the leaves for herb tea
Climbing hydrangea: **t**he only variety for a north-facing wall
Darwin's barberry: berries can be eaten raw, they are palatable; also used in jam & jelly
Aronia: used in drinks and dried; its very astringent, but it's a superfood (high in anthocyanins - antioxidants) and can be prepared to make more palatable

Evaluations

Click here or scan for virtual tour >>>

"Let me just say one fun thing, which is the older I get, the more I realise that I need to ask questions of our indigenous elders. And in every place I create gardens. My questions are always 'what did the first people of this place do? How did they grow their food? How did they interact with nature? What medicines did they find?'"

"I'm a keeper of the site. It's not like a sculpture that I created and it's inert..."

"So I think if I had a huge site and I created a woodland and I was allowing the woodland to go wild, then there are parts of it that I could just let do their thing. But you know, I mean this is a tiny suburban site so I can't do that."

Agroforestry Research Trust

Dartington, Devon

Site Age / Initial Planting: 32 / 1990
Size and aspect: 0.85 ha of flat ground within Dartington Estate
Soil: 13.5% organic matter

Setting: Research site

Martin Crawford's book 'Creating a Forest Garden' has been an inspiration to thousands change makers - including many of the participants of this study. A range of studies have been conducted on this well established site, leading to peer-reviewed research papers highlighting the benefits of forest gardens.

"people who (...) come on tours like (...) the management of (...) the National Trust (...) chatting to them, they realise what they're doing is not sustainable, so I think I'd call that a big success..."

Successes

- Sichuan pepper
- Visitors and tours
- Changing people's and organisation's perspectives
- Minimal maintenance

Difficulties

- Apricots and almonds due to geography / humid climate

Evaluations

Click here or scan for virtual tour >>>

"I spend 30 hours a month in total in the forest garden. 20 years ago it would have been more than that, it was probably double, at 60 hours a month and and so between years 10 and years 20. I would say that went steadily down from 60 to 30 or less, and it's remained there since."

"It would be nice to be able to measure yields which haven't really ever had time or capacity to do or the money to pay somebody else to do so, so enabling that in one way or another would be quite nice."

Steward Community Woodland

Devon

Site Age / Initial Planting: 19 / 2003
Size and aspect: 0.1ha of S-facing slope within a 32 acre mixed broadleaf and conifer woodland
Soil: Sandy Loam with 7.7% organic matter, pH 5.46

Setting: Community Site

The forest garden is part of a larger community project. It is surrounded by a 32-acre mature mixed broadleaf and conifer woodland owned by a workers cooperative with aims to restore the broadleaf and manage under continuous cover forestry. This is a great example of designing a forest garden to replace poor conifer plantation.

The forest gardeners used to live on site until 2017, when the local council evicted the residents. This has made it difficult to live low impact and minimal lifestyles, as the community had hoped.

"(While) we, the humans, have been dormant, the forest garden's growing crazy. That's a testament to forest garden, 'cause the vegetable gardens are empty.."

Key Features

The site has all layers in the forest garden system and the forest gardener feels some layers could be improved. A total of 43 species across all layers were identified, whilst 120 individual trees, shrubs and saplings were recorded.

Upper Canopy (12 individuals): oak, ash, Douglas fir, silver birch
Lower Canopy (68 individuals) including: apple, bullace, beech, hazel, sycamore, hawthorn, willow
Shrubs (9 individuals) including: gooseberry, blackthorn, currant
Herbaceous layer including: bluebell, broadleaf plantain, burdock, purslane, stitchwort
Ground cover including: bracken, comfrey, ground ivy, *rubus tricolor*, wild strawberry
Saplings (30 individuals) including: ash, oak, sycamore, silver birch, hazel

Evaluations

"It (Steward Community Woodland) was based on like being a sustainable living project. That was the kind of the main core aim of it was to be humans integrated into Woodland and living there and managing it and growing food. And we're not there now. So as we predicted without living there, loads of the economies of scale and things don't work."

Old Sleningford Farm

Ripon, North Yorkshire

Site Age / Initial Planting: 19 years / 2004
Size and aspect: 0.03ha of flat ground within a 1.2ha urban farm
Soil: Loamy Sand with 5.8% organic matter, pH 6.6

Setting: Private Enterprise

The forest garden is part of a small holding including sheep, pigs, poultry, bees and woodland. The forest garden is across the road from Old Sleningford Farm Garden's. During Open Garden events, visitors can explore these contrasting yet complementary sites. The forest garden has a nature haven within the garden, where humans are excluded. Rachel has set up Old Sleningford Preserves, an innovative Community Supported Agriculture box scheme with monthly preserve boxes delivered to local members by bicycle. Preserve boxes include jams, chutneys, relishes, cordials, apple juice and cider - and the lemon curd is divine!

Key Features

The site has all layers in the forest garden system and the forest gardener feels all layers are complete. A total of 89 species across all layers were identified, whilst 907 individual trees, shrubs and saplings were recorded.

Upper Canopy (40 individual): beech, field maple, Scot's pine, cherry, ash, walnut
Lower Canopy (547 individuals) including: apple, willow, walnut, damson, sea buckthorn, alder, medlar, pear
Shrubs (151 individuals) including: Japanese wineberry, jostaberry, blue honeysuckle
Herbaceous layer including: sweet cicely, nettle, daisy
Ground cover including: comfrey, forget-me-not
Saplings (169 individuals) including: ash elder, chuckle berry

Click here or scan for virtual tour >>>

We are greatly indebted to the participants who took part in this review. We now have greater insight into how forest gardens are created, including some of the difficulties incurred and how such difficulties are either overcome or accepted as part of the natural process in working with the land.

PERMACULTURE ASSOCIATION

See more virtual forest garden tours here! >>>

Ten Year Forest Garden Trial

Final Report

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