

Forest garden research – finding the baseline

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All permaculture sites are experimental in nature. One reason is the bespoke character of every permaculture solution. We may be able to apply universal patterns, but the way they are used is always influenced by local conditions and the intentions, resources and limitations of the people involved. A second reason is the fact that permaculture is a very young discipline. Measured by the life cycle of a tree, there are still only very few mature permaculture systems around, especially in the temperate parts of the world where growth is naturally slower. Where older sites do exist, very little coherent, comparable information is available about them in the public domain. At the moment, nobody really knows how many well-established sites there are that have been conceived, executed and consistently maintained with a permaculture approach. Slowly and retrospectively, with a forty-year delay, we are beginning to plug some of these holes in our knowledge.

I am not sure how many people practising permaculture are aware of both the experimental nature of their work and the benefits that a conscious “research and development” approach could bring to what they do. If we want to move from guessing to knowing, or at least accurately predicting the tendency of what effects our actions might have, we need to set our sites up as consciously designed experiments, record what we find – the failures as well as the successes – and share them with each other freely and openly.

Forest gardens seemed to me an obvious early target for investigation. As a multi-layered, perennial, no-dig system they display many of the characteristics that permaculture insists contribute to productivity and resilience. They are also widespread enough as a practice to supply a sufficiently large number of sites (“samples”) to allow us to spot patterns and draw conclusions as to what might work or not.

Establishing the baseline

The point of this survey was to take a first step towards systematic analysis of existing forest gardens, to provide a baseline upon which other researchers might build their own enquiries and improve our knowledge of temperate perennial polyculture growing. As with all current permaculture research, I hope that there are at least three areas of yields from this survey: Learning about permaculture, learning about research into permaculture and a glimpse into what a permaculture approach to research could look like.

Survey method

A questionnaire was produced and published as an online survey on www.surveymonkey.com. The content of the questionnaire is summarised in [Table 1](#) below. The link was then published in relevant magazines, on websites and, online forums and social networks.

Geographical data	Site name, location and contact details, climate zone, altitude, aspect, soil, geology, location type (built up area, urban greenspace, farm or rural area, other)
Other site data	Year of establishment, size, user type (private/ community/ commercial),
Goals	Respondents were asked to grade the following options in order of priority: Biodiversity, commercial production, education, food self-reliance, research, other. People had the option of responding "not applicable" to each option.
Achievements	Respondents were asked to rate how well they achieved their stated goals in the same categories as above, using the following scale: Better than expected, As expected, Less than expected, Not at all, Not applicable
Structures and species	Respondents were asked to list species present in their <i>forest gardens</i> , in the following categories: Trees, shrubs, perennials and ground cover, roots, climbers Separately, respondents were asked to list species within their favourite <i>guild</i> , using the following categories: Trees, shrubs, tall perennials, ground cover, climbers, other
Maintenance	Number of people involved, hours per week for each season
Challenges and learning	Respondents were asked "What has been the greatest challenge for you?" and "What was the most important lesson for you?"
Record keeping	Respondents were asked to say if they were keeping any of the following records: Base map, soil tests, design plans, plant lists, photos before/ during/ after establishment, yield and/or sales records
Further research	Respondents were asked to say if they were happy to be contacted for further research if they were happy to receive site visits by researchers if they were interested in being part of an online network of forest gardens What other support they might be able to offer
Feedback	An open question asked for feedback from respondents at the end of the survey.

Responses – summary

By the end of 2013, 117 responses to the survey had been received. These break down as follows:

Section/Question	Responses	Detail
Location/ Contact details	113	
User type, age, size of sites	101	
Site-specific data (altitude, soil, geology, type of area)	97	
Goals	96	
Achievements	96	
Component species	82	4 responses “information available in another format” 6 responses numbers of species per layer only, no names
Guild components	22	
Maintenance information	65	
What is your greatest challenge?	71	
What was the biggest lesson?	35	
Records kept	74	
Further involvement	73	
Comments & Feedback		

Responses in Detail

Basic information

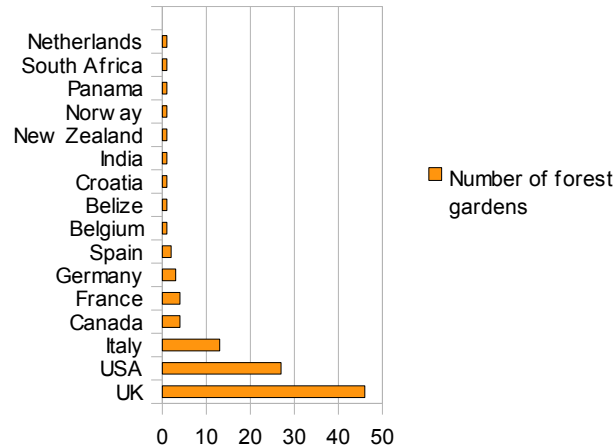
Geographical distribution

The majority of forest gardens captured in this survey is located in Britain and USA, with a smattering of European and other sites. Significantly, only one site from New Zealand is recorded, and none from Australia. This clearly cannot be the whole picture, and a survey that includes Southern

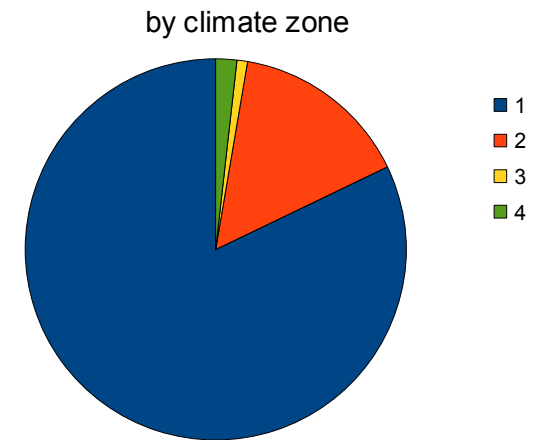
hemisphere forest gardens/ food forests would be an extremely valuable undertaking.

Country	Number of sites
UK	46
USA	27
Italy	13
Canada	4
France	4
Germany	3
Spain	2
Belgium	1
Belize	1
Croatia	1
India	1
New Zealand	1
Norway	1
Panama	1
South Africa	1
Netherlands	1

Number of forest gardens by country



Geographical Distribution of Forest Gardens



Distribution by climatic zone

The survey allowed three answers: Cool temperate, Mediterranean and Other, with a field for explanatory details.

Of 112 respondents, 92 located themselves in cool temperate climate (1), 17 in warm temperate or mediterranean climates (2), 2 in the humid tropics (3) and 1 in a subtropical climate (4). 16 respondents used other descriptions to specify their climate, such as temperature zone (US classification).

Size of sites

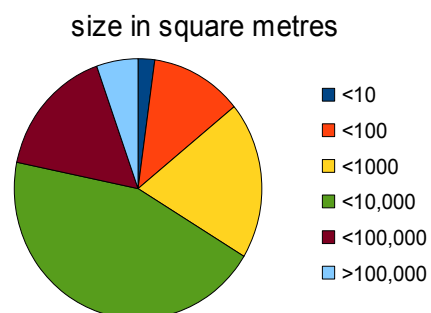
Sizes range widely, between 5 square metres and 33.75 hectares for listed sites. This, and the correlation with the goals and species composition at different scales, raises the question of terminology.

How much sense does it make to give systems on such different scales the same name?

The term “food forest” would seem most accurate for many of the medium scale systems, while “forest garden” fits the description of the smaller sites. Some of the larger sites might be more appropriately termed “forage forests”.

Size distribution of Forest Gardens

Size in sqm	Number of sites
<10	2
<100	11
<1000	18
<10,000	41
<100,000	15
>100,000	5



Averages (Responses in acres rounded to 4,000sqm/acre)

Mean size of sites entered is 15,335 sqm = 1.53 hectares.
 Median size is 1 acre or 4,000 sqm = 0.40 hectares.
 Mode size is 1 acre or 4,000 sqm = 0.40 hectares.

Age of sites

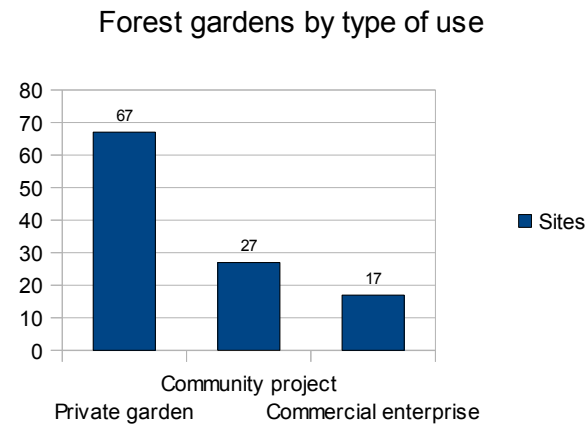
The oldest forest gardens on record are from the 1980s. Since then, there is a steady upward trend of new forest gardens being established. Although the survey was officially aimed at sites established in or before 2008, a significant number of younger sites were also registered.

Year started	Number of sites
1980-89	3
1990-99	14
2000-08	33
2009-13*	44
No date given	11

less than 5 years old at the time of the survey

Type of use

Participants were offered to choose between four types of use – private gardens, community project, commercial enterprise and other. This grouping was derived from the Permaculture Association's ongoing participatory trial, which identified a divergence of goals depending on the type of use. 60% of the respondents classed their site as a private garden, but community and commercial forest gardens also exist in significant proportions. There is a certain overlap between site uses.



Goals and achievements

Methodology

The survey asked respondents to reflect on their goals for their forest garden, giving a ranking to each one of six options: Biodiversity, Commercial production, Education, Food self-reliance, Research and Other, with a field to explain what “other” entails. This was translated into a scale from 1 (highest priority) to 6 (lowest priority). Where responses were left blank or given as “not applicable”, no ranking was assigned to the answer.

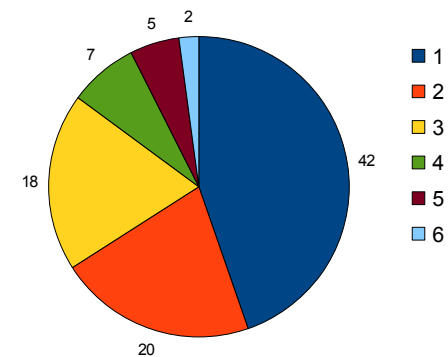
In the next question, respondents were asked to assess their achievements of each of these goals on a scale of 1= Better than expected, 2 = As expected, 3 = Less than expected, 4= Not at all, 5 = not applicable (where the goal was not relevant to the site). A table is included showing this self-assessment for each goal respectively. In addition, I have assessed the performance regarding each goal of sites that give high relatively high priority(1 to 3) to that goal.

Result – Summary

Of the 117 survey respondents, 96 gave answers to the questions on goals. The same 96 respondents, plus one additional one, answered the questions on achievements.

Top priority	Number of sites
Food self-reliance	42
Biodiversity	20
Education	18
Commercial Production	7
Other	5
Research	2
Not answered	19
Total responses	94

Priority goals for forest gardeners



Priorities and achievements

Of a total of 94 responses, 42 sites (45%) saw food self-reliance as their top priority. Education was the second most frequent answer with 20 respondents (21 %), followed by biodiversity with 18 respondents (19%), whereas only 7 sites (7.5%) have commercial production and only 2 sites research as their most important goal.

Food self-reliance is highest on the list of priorities for forest gardeners, and the majority state that their forest gardens contribute to this goal according to their expectations or even better. Biodiversity, the second most frequent top priority, fares even better in terms of achievement. The next highest priority is education, where forest gardens also scores well in terms of performance against expectations.

Commercial production and research are less important to the surveyed forest gardeners. Only seven of 114 respondents marked commercial production as their highest priority. The level of satisfaction with goal achievement is also significantly lower for research and commercial production than for other goals.

However, when asked to define the type of forest garden by choosing between “private”, “community” and “commercial”, 17 sites defined themselves as commercial enterprises. The discrepancy between these two numbers is interesting. The correlation with “education” as a higher priority for the same sites suggests that a number of forest gardens are part of a set-up where education is also a commercial activity, but this would need further investigation.

One significant priority the survey didn't specifically ask about, but which was mentioned several times by participants, might be called “quality of life”, focussing on the forest garden as a place for reflection, relaxation and social time. Future surveys should reflect this by including an additional category to choose from.

Planting structure and species

A total of 84 sites gave information on the species within each layer. Over 200 species are represented in total.

An initial species analysis shows a good diversity across sites, though a relatively small number of sites contributes a relatively large proportion of the diversity. The great majority of sites has several species in most layers, with roots and climbers underrepresented compared to trees, shrubs and herbs. Some species are counted in more than one layer, reflecting their use as root and leaf/fruit crop, or their ambiguous growth habit (e.g. is blackberry a shrub or a climber?).

Layer	Species total	UK	US
Trees	57	41	44
Shrubs	55	21	49
Herbs	77	36	66
Roots	34	14	24
Climbers	29	15	23

Most common species

Looking at tree species, only a small number of sites include tall trees associated with the “canopy layer” of a natural temperate forest. Most trees would be part of what forest garden theory terms the understory. A large number of sites incorporates “traditional” cool temperate fruit trees (apple, pear, plum, cherry) in the tree layer. Hazel, the most common nut crop, has been listed in both tree and shrub layers with a total number of 17 sites. *Rubus* (raspberry, blackberry and their hybrids) and *ribes* (currants, gooseberries and their hybrids) are the most common genera in the shrub layer. Diversity is greatest in the herb and ground cover layer, where no genus or species dominates greatly.

Trees		Shrubs		Herbaceous		Roots		Climbers	
Apples	33	Blackcurrant	16	Comfrey	16	Jer. Artichoke	13	Grapevine	8
Plum	25	Gooseberry	16	Mint	13	Potato	7	Blackberry	6
Pear	24	Redcurrant	14	Strawberry*	12	Parsnip	5	Kiwi	5
Cherry	16	Raspberry	12	Thyme	12	Garlic	4	Rubus*	5
Hazel	12	Blueberry	9	Rhubarb	11	Oca	4	Akebia	4
								Jap Wineberry	4
								*hybrids and non-specific	

There are several factors that blur the picture of structural and species composition. In most cases, no indication is given of rootstock size for fruit and

nut trees. In some cases there is an overlap between respondents listing crops by genus, while others use species (e.g. *ribes* and currants/gooseberries and hybrids). Certain crops, such as hybrid *rubus*, appear in several layers (in the case of *rubus* species, entries appear under shrubs, perennial herbs & ground cover, and climbers for different sites).

Discussion

Based on the data gathered, it should now be possible to carry out some meaningful data-analysis, especially Some interesting patterns are beginning to come to light when overlaying information on geographical distribution with species composition for the two largest geographical samples, the USA and UK. A comparison between species in the two largest sample areas (UK and USA) reveals significant similarities and differences. While the most common species are similar in both countries, the overall number of species is significantly larger across the USA sites. Whether this reflects the significantly wider climatic and geographical spread of sites in the USA compared to the UK sites or is due to other reasons has not been established. More detailed analysis of the species composition in relation to geographic area and goals could shed light on the reasons for this difference, and its implications.

Currently there is no indication which of the listed species are doing well and which aren't. This is of course important information, but was deemed beyond the scope of a baseline survey among non-professional practitioners. Follow-up studies by academics or other enthusiasts may shed light on this, and could contribute to improved plant health and productivity.

From this survey it is not possible to deduce the exact structure of plantings - this would have to be done by analysing photos and site plans, or by site visits. 22 of the responding sites also included information about specific guilds, which awaits further analysis.

Other information

Maintenance information

With a total of 75 replies to this question there is enough data to warrant further analysis on the maintenance effort required, and how it compares to other horticultural systems. At this point this analysis has not yet been done. Several participants pointed out difficulties with entering answers in the relevant boxes, so there may be a degree of unreliability here.

Challenges

The 75 responses to this question start showing up some trends regarding the most common challenges to forest gardeners. The following table

attempts to group the individual responses in a systematic way.

Factor	No. of sites	Detail
Herbivores	21	Gastropods 6 Grazers - 5
Abiotic factor	21	drought/dry - 6 Wind - 5
Plants	19	Weeds - 18
Soil	13	
Management	8	Distance - 5 Time - 4
Layout	7	
Disease	6	
Other	3	

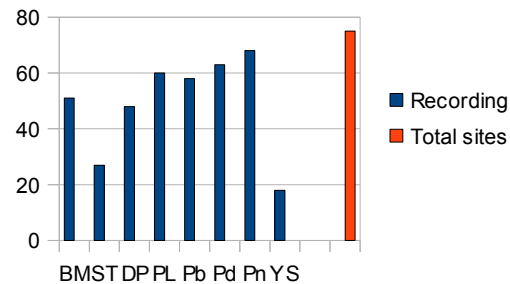
Record keeping

For thorough and meaningful research, keeping records from the start and throughout the life of the project is critical. Participants were therefore asked to indicate the types of records they are keeping in relation to their forest garden.

The most frequent type of record kept by respondents are photographs of the site before, during and after planting. Base maps, plant lists and design plans are also widespread. This provides a promising starting point for further investigation. Less information is available about soil quality before planting and, crucially, about yields (measured either directly or indirectly, through sales). Yield information is absolutely critical if we are to determine how successful polyculture systems work, and I hope that by simply having been asked about it, some people will be inspired to record their harvests. Polyculture yields can of course be difficult to keep track of, and this year the UK Permaculture Association is piloting a recording system that we hope

Record kept	Key	Sites
Base map	BM	51
Soil tests before planting	ST	27
Design plans	DP	48
Plant lists	PL	60
Photos before planting	Pb	58
Photos during establishment	Pd	63
Photos now	Pn	68
Yield/ Sales records	YS	18
Total respondents		75

Record keeping by forest gardeners



to make publicly available in the future.

No comment can be made at this point as to the quality of the records kept by survey participants – this might be part of future surveys of sites that seem particularly interesting from a research angle.

Participation in future research

Encouragingly, the vast majority of respondents showed an interest in contributing to future research by taking part in phone or skype interviews, welcoming site visits and by being part of an online network of forest gardeners.

General feedback

Responses here fell into three general categories: additional comments about the respondents' sites, feedback on the layout and technical aspects of the survey that will be useful for future iterations, and expressions of thanks and encouragement to continue the research work.

Discussion, Conclusions and next steps

Temperate forest gardens exist in many sizes and locations across the northern hemisphere, and for a variety of purposes. They seem to be well suited to contributing towards food self-reliance, as a biodiversity resource and a place for education. Their commercial use appears to require further development work, and few sites currently place much importance on research. A sufficient base of records kept across the surveyed sites, combined with a great willingness to co-operate in further research provides a starting point for a deeper and more systematic exploration of the temperate forest garden concept.

Much of the information gathered in this survey may need to be verified via personal contact, photographic and other evidence, and in some cases through site visits. It is unlikely that goals were explicitly defined at the outset of garden establishment in every case, and some respondents have specifically indicated that their goals changed throughout the lifetime of the site and its users. Only a subjective rating from respondents themselves is available for how well they have achieved their stated goals. Information about the health of individual plants and the overall system was not asked about in this survey.

Emerging questions

Here is a very brief list of questions following on from the information gleaned so far. Of course the list could be endless, it is in fact only limited by our imagination!

Are there distinct geographical patterns in species composition and structure?

Is there a correlation of goals and achievement of priority goals with forest garden size?

Is there a correlation of goals and achievement of priority goals with type of use?

What are the barriers to the use of forest gardens in a commercial context and in public spaces, and how can they be overcome?

What effective planting patterns exist, and how do they relate to location, site conditions and system goals?

In order to be able to compare the outputs and characteristics of perennial polyculture systems with those of alternative food production systems, an effective methodology for recording yields, and its uptake by a significant number of sites would be vital. This is currently being addressed by the Permaculture Association's participatory research programme.

While there is still an awful lot we don't know about forest gardens, I hope that this survey has made a start in supplying some baseline data and highlighting areas in further need of investigation. Some of the questions posed by the gathered information could be answered tentatively with simple statistical analysis based on this survey and its successors, while others will require in-depth interviews, site visits and other analytical methods. I hope that this survey will serve as a starting point for many such investigations.

In general, an analysis of this exercise may help us answer a wider question: What would a more general baseline survey for permaculture sites look like? In fact, to me it seems likely that it will be necessary to have more than one survey to capture sufficient depth of information across the whole breadth of activities on permaculture sites.

Information sharing

The data gathered by the survey will be held by the Permaculture Association Britain, and can be made available to anyone interested in taking this research further. A more detailed report can be downloaded from the Association's website's research section, which also presents the first findings of the Association's own ten year forest garden trial programme.

This baseline survey has highlighted a further need for systematically gathering data about polyculture systems. Two distinct pieces of work that could further our knowledge in this area could be:

A rolling baseline survey for anyone setting up or maintaining a forest garden, possibly an improved version of the initial effort presented here.

A regular review survey sent out to respondents to the baseline survey, which could go out in two cycles – a simple annual review questionnaire, and a less frequent and more detailed survey investigating the long-term evolution of the sites.

As the oldest examples of temperate forest gardens are approaching maturity, it is time to take stock, follow the lessons they hold for us and take a co-ordinated approach to developing the next generation of perennial food systems. Collaboration is key to increasing our understanding. The best time to begin systematic research into permaculture systems was forty years ago. The second best time is now!

Get involved

If you have your own forest garden, please visit the ongoing forest garden baseline survey at <http://surveymonkey.net/s/forestgardenbaseline>

I welcome any feedback on this article, as well as offers and requests for future research collaborations. Please contact me via email

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