Investigation and assessment of Plants for a Future's experiment at Penpol Field

Background

Vegan organics

Ken Fern, co-founder of Plants for a Future (PFAF) and main designer of the Penpol Field system, is a deeply ethical, practical and knowledgeable man, a practising vegan, with a mission to demonstrate the viability and sustainability of growing perennial food plants according to the horticultural principles described on the PFAF website page "Vegan Organics- the Basic Principles" (http://www.pfaf.org/user/PlantUses.aspx?id=20). These have much in common with those of the Vegan Organic Network (VON– www.veganorganic.net), such as working in harmony with nature, avoiding artificial chemicals, livestock manures and animal remains, and ensuring sustainable soil fertility by use of mulches, plant-based compost, seaweed, tree leaves, green manures and deep rooted, mineral-accumulating plants like comfrey. However the VON's Organic Stockfree Standards concentrate far more on annual crops, using rotations and green manures to ensure sustainable soil health and plant productivity, whereas the principles behind Penpol favour no-dig methods, perennial food plants, radically minimal inputs and sharing the land with a wide diversity of native plant and animal life. There is also little sympathy in the PFAF system for the electric fencing, sonic repellents and the like, recommended for excluding animals from crops in the VON's Standards.

Site history and design

With the help of botanist Addy Fern, Ken's wife, the Field site was obtained, designed and run to demonstrate these principles, and to encourage others to create their own perennial food gardens. Other participants have contributed over time, and some areas are managed exclusively by them.

A brief history is given on the PFAF website (http://www.pfaf.org/user/cmspage.aspx?pageid=28), including the establishment of PFAF in 1989, a description of the 28 acre piece of land at Higher Penpol, near Lostwithiel in Cornwall, and the changes produced by the planting design over the years. The land was very exposed, and had been in arable use under a entirely chemical and mechanical regime, including the flailing of the hedges around the thirteen small fields to within a foot or so of ground level. It was thus prone to severe erosion and extremely windswept, to the point where barely any weeds grew and native trees struggled to survive. Although the Ferns had at first sought a site with trees, water and shelter, the idea of healing

this degraded land appealed to them. In the winter of 1990–1991, the northern half of the Field was planted to native woodland trees, mainly selected as suitable by the Forestry Commission; hedges of fast-growing trees, especially Alder *Alnus* species, were planted as windbreaks over the other half. Initially only trees such as the Alder and Seabuckthorn *Hippophae* species flourished but after a few years, the windbreaks created sufficient shelter for both plants and humans to enjoy being there. Ken Fern's designs for the Field focused on placing plants where they would thrive with minimum attention, rather than 'zoning' them according to the amount of attention required and the frequency of harvesting, e.g. plants for immediate use in a zone close to the dwelling, and those grown and harvested for storage further away. He has consistently tried to "plant plants by the nature of the plant", where each thrives most with least attention, rather than primarily by their inputs and outputs, which he perceives as "Permaculture's main failing". Thus, in his designs, plants from shaded woodland habitats are grown there "even if it means a walk of ten minutes" to harvest them. The initial idea was to work the Field as a communal group, sharing everything from it. It was designed to try and take into account the stage at which other people would take over and manage certain areas. Ken Fern wanted to be particularly responsible for the Ornamental area, which was a demonstration garden that would be open to the public. He recognised that other participants might not welcome visitors but he wanted to inspire people to think "this could be my garden, I could do something like this or adapt it" (Ken Fern, interview 2009). He designed the area to be like a number of small gardens, rather than a larger scale demonstration, feeling that the image of a garden is more potent than that of a farm, where machinery is required to create and manage a site, and food is grown on an industrial scale that is unlikely to be truly land-friendly.

For most of the first decade, they made great progress but then there was a certain amount of internal dissent, especially on how sharing the land was going to work out. The Blagdon site, where all participants would have equal status, seemed a good opportunity to sidestep and thereby resolve the issues of land ownership. Unfortunately their hard-won, time-limited planning permission was not extended, and then Ken needed to concentrate on home-educating his children, and coping with his health problems. Planning permission for any dwelling on the Field was never granted, which has without doubt hampered its development and maintenance. However much of the plant information gained from the Field has been included in both Ken's book and the online database. Proceeds from the sale of the land at Blagdon have funded this survey and other projects.

Since the conclusion of the Blagdon experiment, Addy Fern has taken responsibility for the management of most of the Field, including facilitating and supervising visiting volunteers. She has always managed the Orchard Areas and has invested huge amounts of time and effort into maintaining the Field as an educational and demonstration site. She has not, however,

been able to do the heavy work necessary to develop the design as envisioned by Ken, and struggles to control invasive weeds and natural succession where it disrupts the original plan.

Survey aims and methodology

The surveyors' aims were:

1. to identify significant trees, shrubs and ground layer plants growing in the Field, record as much information as possible about them, and tag them for future reference, be it action or research; to create from that information records that could be useful for the future management of the Field (Carol Wellwood and Klaudia Van Gool);
2. to create accurate maps of the Field, with National Grid coordinates for nearly all the labelled plants marked on them, to ensure they are easy to find in future (Clive Williams and Helen Banks);
3. to assess the general condition of the native woodland, which makes up half of the area of the Field, and record any possible harvests from the trees therein (Liz Turner);
4. to assess the ecological health of the Field by way of bird and invertebrate surveys (Peter Kent and Patrick Saunders, with colleagues);
5. to interview as many of the current and previous participants in the Field experiment, in order to gather as much general information about the experiment as possible (Carol Wellwood and Klaudia Van Gool).

Methodology

1. Significant plants

The information gathered included the plants' location, condition, yields and harvests, source and history, and surrounding plants such as ground cover and larger plants close by them. Addy Fern, currently the main carer for and user of the Field, and a qualified botanist, was the main source of information on the plants. Referring to Ken's original planting maps, she went around the different areas of the Field with one of the surveyors, attaching tags with the plant's name and a unique code to them whilst the surveyor made notes on their dimensions, location, surroundings and Addy's spoken information on where the plant came from, when it was planted, how well it yielded, and its condition; a number from 1–5, agreed between Addy and the surveyor, was also assigned to each plant as a comparative measure of its condition, allowing some rough statistical evaluations. Like most permaculture plots where harvesting is frequent and repeated over the season, yields had never been quantified or recorded on the Field, so only a narrative assessment of them was possible. This depended on Addy's memory of each individual plant, which was extensive but, given the number of fruit-bearing trees on the field, not all-inclusive. Therefore information on yields is partial, and in some areas, non-

existent. Where the cultivar, species or, in a few cases, genus of the plant is unknown, or has been lost from any records accessible to the researchers, it has been termed “unidentified”. Phil James and Frank Schuurmans also spent a day each surveying with Klaudia. Both surveyors took numerous photographs of plants and areas.

The unique codes on the plant tags were devised with Liz Turner at the beginning of the Scoping Study, on the assumption that the land would be divided into numbered ‘transect’ areas of roughly equal area, bordered by the main windbreak hedges of the site, which were numbered starting from the westernmost windbreak, so that the Main Orchard area plants were labelled W1/T, with transect numbers starting from the southernmost section, nearest to the shed. Each transect was to be marked by labelled posts, and indeed, some were put in the Arboretum and Main Orchard area; however it rapidly became obvious that putting the posts in would require considerable survey time, and that the design compartments and sub-compartments afforded suitable transect proxies. In this report, the main hedges running north-south are termed ‘windbreaks’, as they shelter from the prevailing winds, and others are termed simply ‘hedges’. Subdivisions of the named areas are termed ‘compartments’, rather than the potentially confusing ‘transects’. Compartment labels are given in brackets in the descriptions of the survey areas, e.g. (W1/T1) and Ken Fern’s original labels followed by the survey labels for windbreaks and hedges are similarly given, e.g. (H007/W2). The plant label codes, which indicate the design area and compartment, as shown in the Map below, are correlated to the mapping codes, which are simple numbers.

Some of Addy’s information came from Ken’s original, detailed maps and plant notes; many of these were scanned in at the beginning of the survey (Appendix 1b), although their condition had, in several cases, deteriorated to the point of partial illegibility. Later comments had been added by Ken to many of these documents but are quite often too faint to be legible.

The information gathered by surveying was recorded and collated in a set of spreadsheets (Appendix 1), which are organised so that they are easy to search through, evaluate and update. These spreadsheets have been used to collate the information on plants in this report and could be useful for future management of the site. There are occasional gaps in the recorded data: unidentified plants, species or cultivars, dimensions or condition not noted during the survey, time of planting not known. Many of these could be remedied either with information from Ken or others, or further surveying, and the spreadsheets updated.

2. Accurate maps

To enable the easy location of labeled specimens in the future, and comparisons with the scans of the available original maps and notes, Clive Williams, a qualified surveyor and frequent, long term volunteer at the Field was invited to create a series of maps of the Field. He has been assisted by Helen Banks, also a long term volunteer at the Field. Their survey has created a framework of ‘stations’ positioned across the Field, from which they have recorded

the National Grid coordinates for the labeled plants and allocated a single, unique number to each. Clive plotted these on an Ordnance Survey map of the site, which was then fitted to an aerial image file using a Computer Aided Design (CAD) program. The maps can be viewed with or without the aerial photo background, and can be produced at any scale. Clive has also produced a spreadsheet with latitude, longitude and coordinates of the labeled plants. In the future these plants can be located by using one of these maps with or without a handheld Global Positioning System (GPS) receiver.

3. Native woodland and Coppice

Although Liz Turner was unable to continue managing the survey project after completing the Scoping Report (Appendix 2a), she did interview Ken and Addy Fern regarding the Native Woodland and Coppice areas, and was able to survey them again in late May 2009. She submitted a report in note form, with supporting data in spreadsheets, in July 2009 (Appendices 3,4 and 5). In this, she noted which of the trees that she could locate were producing yields, including seed, and some notes on their growth and condition.

4. Bird and invertebrate surveys.

In order to help assess the ecological health of the Field without incurring the expense of a complete ecological survey, brief surveys of bird and invertebrate life were undertaken. Breeding birds were surveyed by Peter Kent B.Sc., M.Sc., of the Cornwall Wildlife Trust over two visits to the site, in April and May 2009. His report is included as Appendices 6 and 7. Invertebrates were surveyed, without harming them or removing them from the Field, by Patrick Saunders, Cornwall County Recorder of bumblebees, and his colleagues John Nichols and Leon Truscott, in August 2009. Mr. Saunder's report is included as Appendix 8.

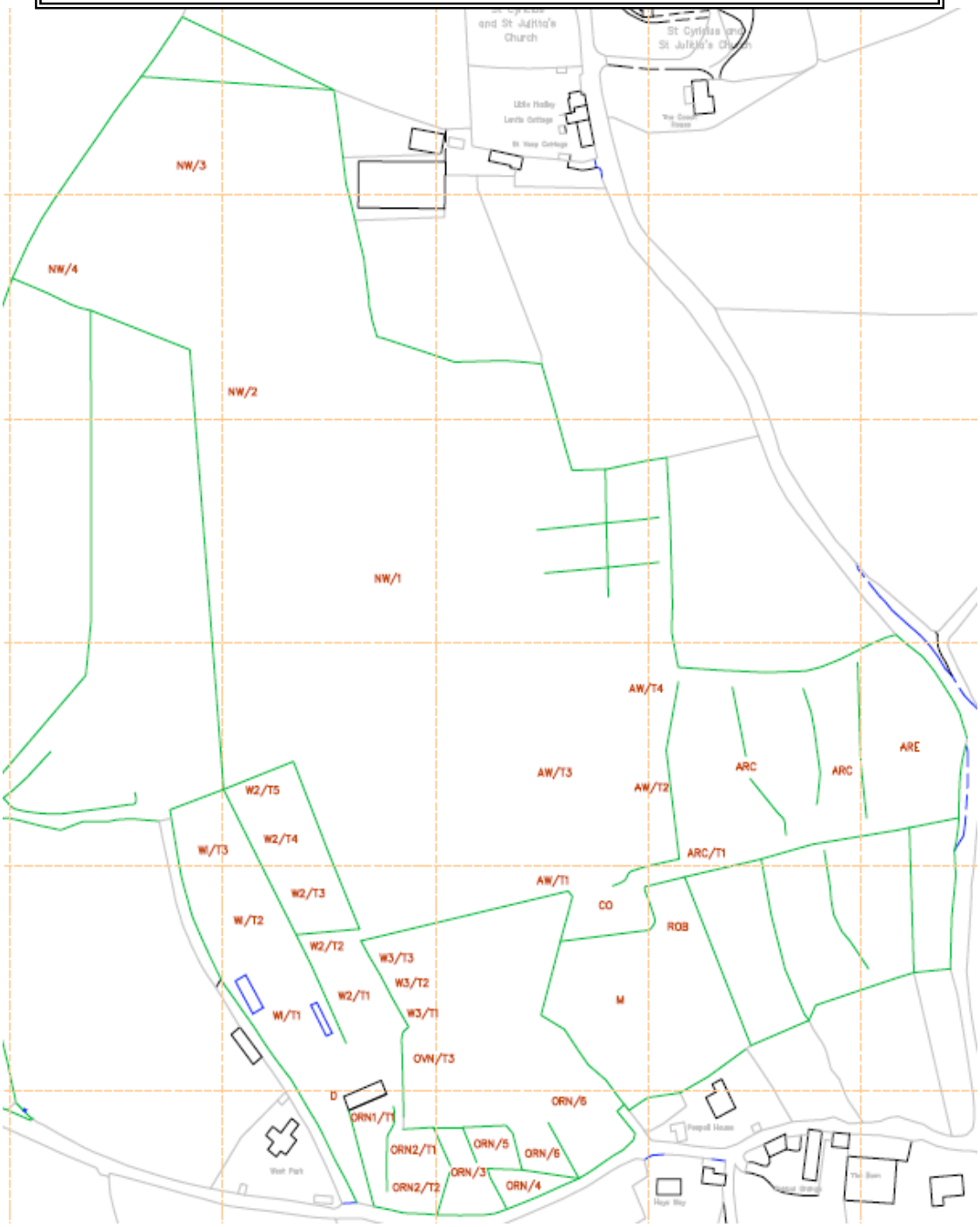
5. Interviews

In order to gain more general, rather than plant-specific, information on the plants and areas of the Field, a questionnaire (Appendix 9) was drawn up, being more a list of keywords to elicit information than a set of specific questions, as information was likely be given in a narrative form. Klaudia interviewed Phil James in August 2009, and Carol interviewed Addy Fern in July 2009 and Ken Fern in November and December 2009. Interviewees were then given the opportunity to read through and edit their interviews before inclusion in this report. The interviews with Phil James and Addy Fern are included as Appendices 10 and 11. The final edit of Ken Fern's interview, to be included as Appendix 12, is still awaited.

Map of Field areas with tag label codes described

The survey label codes are as follows:

Main Orchard	W1/T1-3	Area around drive and shed:	D/
Addy's Orchard	W2/T1-5	Robert Hart Garden:	ROB/
Central Orchard	CO/	Arboretum East:	ARE/
Meadow:	M/	Arboretum West:	AW/T1-4
Arboretum Central:		ARC/ (includes ARC/T1)	
Ornamental area:		ORN1-6/T1-2	



Bar charts of condition ratings of specimens at Penpol

The numerical ratings used for the qualitative assessments of health and general condition allow for a simple statistical evaluation of the overall health and vigour in groups of plants, whether by area or by genus (where there are sufficient numbers of specimens). The information for each area and genus is presented in the report in bar chart format, with uniform colour-coding for each condition level, and for the lacunae in the data, as given below:

no data	0.5—1	1.5—2	2.5—3	3.5—4	4.5—5
No data gathered	0.5—1: dire	1.5—2: very poor	2.5: poor 3: moderate	3.5: reasonable 4: good	4.5: very good 5: excellent

Notes for Trustees— I have tried to observe the following conventions in the text:
Only the first word of a plant's common name is in capitals
Latin names are used only at the first mention of a species, except where no unique common name exists, or in the section on the Native Woodland and Coppice areas
People's names: at first I used full names each mention but am not sure whether this is necessary
I am not entirely certain that the species and variety names are correctly formatted, and hope for advice on this.

Results

Soil

The soils of the area are formed from the folded and faulted, slate and siltstone Cornish Killas rocks, which give rise to slightly acidic brown earth soils which are well-drained and of moderate fertility (Howard and Roberts, 1997; cycleau.com, 2004). Topsoil is thinner on the hilltop at the northern end of the Field because of solifluction during the Ice Ages, when the top layers of the frozen soil would melt flow downslope with partial summer melting, forming thick deposits at the bottom of slopes. The soil has undoubtedly suffered further erosion from ploughing, which destroys humus and soil structure, and the substitution of added organic matter, the traditional source of replacement humus as well as fertility, by synthetic fertilisers during the 20th Century (e.g: Hopkins, 1948). Early on in the project, the Field's soil pH values were determined as neutral, an average of pH7 (Ken Fern, 2009 interview), which is less acid than natural for the area, indicating that limestone had been applied shortly before. The survey found no other information on soil conditions at the Field.

Soil in the Native Woodland at the northern, top end of the Field, where little leaf litter has accumulated, showing the slaty, stony nature of the unimproved soil.

Windbreaks and hedges

The windbreaks are the element providing the most noticeable improvement to the site and the experience of being there, creating not just shelter but a peaceful, secure atmosphere noticed and commented on by visitors. As the windbreaks established, plants all around grew increasingly rapidly. The trees generate an environment that protects everything else, and

each other, providing shelter for humans and other creatures, creating a better habitat for wildlife, insects, mammals and birds. Their roots reduce soil erosion by rain or wind, their fallen leaves add humus to the soil, making it more fertile, and they reduce the impact of hot sun in summer (Addy Fern, 2009 interview).

The most effective plants, which grew well and rapidly, were Escallonia *Escallonia* species, Leyland cypress *Cupressocyparis leylandii*, along with nitrogen-fixing Red and Italian alder *Alnus rubra* and *A. cordata*, which were outstanding. However, the Alder hedges were meant to be short term, and cut down to make space for other wind-resistant species, but this did not happen. A line of slow-growing Austrian pine *Pinus nigra*, was grown in the lea of the westernmost Alder windbreak, and would have taken over to make an extremely good windbreak, as they will resist winds of 150 mph without damage. Because the alders were not removed, they have competed with the pines, and, whilst the latter have continued growing, they now have a dead side to their windward, against the Alders, which will not regenerate. Some of the very tall windbreaks have now been pollarded, to allow light into the Orchards, losing the wood crop potential of the whole tree (Ken Fern, 2009 interview). The Penpol hedges can be very productive but have suffered from the lack of proper maintenance, because of the lack of people power. Many hedges have spread outwards into adjacent compartments, shading and competing out desirable plants.

Nonetheless, many of the windbreak and hedge species at Penpol are fruitful, including various Barberries *Berberis* species and Ramanas rose *Rosa rugosa*, which thrives but will spread out, so is better next to mowed grass areas rather than beds. Two fruiting nitrogen-fixing genera, Elaeagnus *Elaeagnus* and Seabuckthorn species, also have medicinal properties and are therefore particularly useful. At Rosewarne research centre in north Cornwall, they grew Elaeagnus in windbreaks underneath large pines, which lose their bottom branches after about 20 years, when the Elaeagnus was planted, and succeeded there in really dry, poor conditions, filling the gap under the pines and yielding fruit (Ken Fern, 2009 interview). The genus does not grow tall but does get very wide, so is easier to cut back, and needs protection from rabbits, which eat the shoots (Addy Fern, 2009 interview). The Seabuckthorns are very succesful as trees in the Field, and are grown commercially as fruiting hedges in China. Two lines of trees are planted parallel and cut to the ground in alternate years; the stems can grow five to eight metres tall in a year, and fruit best on second year wood. At the end of a year's growth, the fruiting stems are cut to the ground, and put into large freezers, fruit and all; the fruit falls off and is collected from underneath. The remaining bark and leaves are used for medicine and fodder, and the wood for fuel. There is a Goji berry *Lycium barbarum* hedge at Penpol that has not fruited, probably because the self-sterile plants are all of the same variety, but it has good dense growth and makes a nice hedge. Three medicinal species, Yew *Taxus baccata*, which bears edible fruit, the culinary Bay *Laurus nobilis* and Holly *Ilex*

aquifolium are slow growing but make excellent hedges once tall enough. The native Beech *Fagus sylvatica* makes very good hedge, as its canopy and shallow roots suppress undergrowth, even where the hedge is narrow, such as at RHS Wisley, where there are 50–year old Beech hedges kept trimmed to only one foot wide. It keeps its dead leaves in winter and so makes a good windbreak (Ken Fern, 2009 interview). Tawhiwhi *Pittosporum tenuifolium* is another fast–growing, wind–tolerant hedge tree that rapidly reached a good height at Penpol, and bears honey-scented flowers (Addy Fern, 2009 interview).

Areas and compartments

As long as windbreak and hedges are kept from growing too tall, dividing the Field into compartments has worked well, creating "different rooms", although there are only two places where you can look to the distance, where the land slopes down to southeast by the pond, and at the top of the land at the Upper Glade. The land is not easier to maintain in compartments but it helps to have barriers to slow the movement of diseases and pests, and give their predators somewhere to overwinter (Addy Fern, 2009 interview). It also creates many edge zones, called ecotones, where one ecosystem meets another, and both systems are most productive. One such is where woodland meets open grassland or scrubland, which "attracts more wildlife and more of the fruit-bearing trees" (Ken Fern, 2009 interview). The Woodland edge garden was developed to mimic this ecotone using edible and other useful plants. However, edges, although they are more productive, need more work, especially where the transition is abrupt, as in keyhole beds, a permaculture design element neither of the Ferns ever understood. At the Field, where many grasses and weeds are vigorously invasive, edges need to be minimal; even if there are barriers, like logs or something, grass and weeds always encroach. Addy Fern feels that spiral or keyhole beds would not work at Penpol unless edged with concrete, which would defeat the purpose of a natural growing environment. Sharp differences do not occur in Nature, where ecotones create a far more gradual change, as one system transforms into the other.

Beds within compartments allow for different levels of management within the same environment. The compartments also allow very different styles of planting, and thus different ecosystems, to co-exist within the Field, such as the Arboreta, Ornamental Area and Orchards. Species and cultivars growing in more than one environment there offer more opportunities to learn from these plants, comparing their ability to thrive under different degrees of shade, grass cutting or other management regimes. The difference between the Apple trees in the Central Orchard and those in Arboretum East is one example; all were planted in the early 1990s and both are shaded areas but the Apples in the Central Orchard have rough grass growing around, and those in Arboretum East have been mulched, and are healthier for it.