Designing the World We Want

Global Permaculture Perspectives

PERMACULTURE ASSOCIATION

Coventry University

Research Centre
for Agroecology, Water
and Resilience

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Concept:

This publication comprises a collection of articles based on presentations from the International Permaculture Conference, London, 2015. It aims to showcase a transdisciplinary range of authors, involved in research, policy and practice, across the three ethical principles of permaculture: Earth Care, People Care, and Fair Shares. The publication includes quotes from world renowned permaculturalist Geoff Lawton, and the poem that emerged from the conference.

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Forward

I am delighted to see this collection in print, and to be asked to write the foreword.

Over the last ten years, I have worked with hundreds of others around the world to build the connections between permaculture practice and permaculture research. I have focused my efforts on three things: building the evidence base to convince the sceptical that permaculture really works; improving permaculture practice by permaculture practitioners themselves; and connecting permaculture researchers around the world into a thriving network.

The International Permaculture Conference was both a culmination and a new beginning for this work. A culmination because it was the largest and most focused permaculture research event ever held, with over 600 people from 70 countries in attendance. A new beginning because the energy and excitement the conference generated, and the initiatives it spawned (including this collection) have taken the permaculture research community to a different level of organisation, focus and commitment, ready for a new set of challenges. This was exemplified in the launch of the Permaculture International Research Network at the conference, the first network of its kind.

This collection captures both of those aspects. It is the culmination of so much wonderful, exciting work in so many places by so many fantastic people, and by capturing their words in print it is also the culmination of the conference. It is a new beginning because a collection of this kind has not appeared before; this kind of collaboration between academics and practitioners provides a model for future work, and I hope and believe it will be the first of many such collections. It reminds us how much more there is to find out, how much more we can do, and the passion and desire to do it that is out there.

I look forward to attending more conferences like the IPC, and reading more collections like this one, in the years to come. This publication will inform, encourage and inspire all those engaged in permaculture research, practice and policy, whether they are practitioners, activists or academics, or all three.

My thanks to the editors and all the contributors.

Andy Goldring
Chief Executive, Permaculture Association

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Introduction

This collection of papers was distilled from the broad range of presentations given at the 12th International Permaculture Conference, held in London, September 2015. From the outset, the aim of this publication was to gather together and display examples of the works and perspectives from the full range of stakeholders represented at the conference; from direct permaculture practitioners, teachers and trainers, to other professionals who are weaving permaculture into their practice, including doctors, engineers and researchers. Some authors write as part of their work, others are more practical and have had to make more effort to put across what they do in the written word, and the contributions are an eclectic mixture of story telling, scientific research, documentary, and thought pieces. This document does not therefore set out to be an academic or scholarly text – that task has been undertaken the journal Permaculture Design (Issue 99 Ecological Restoration, Spring 2016) – but instead provides a snapshot of people in society who are using permaculture principles and approaches for change for the common good. In doing so, it demonstrates how anyone can do the same, if they are brave enough to step out of our current conventional paradigm.

Permaculture itself derives from the words 'permanent agri-culture', and is a system of designing for our basic needs – food, water, energy and shelter – through observation of natural patterns and relationships that also regenerate (rather than deplete) our life support systems. The co-founder, Bill Mollison explained: "Permaculture is a philosophy of working with, rather than against nature; of protracted and thoughtful observation rather than protracted and thoughtless labour; and of looking at plants and animals in all their functions, rather than treating any area as a single product system." It is governed by three principles of Earth Care, People Care, and Fair Shares (or return of surplus). In fact another leading permaculture teacher, Geoff Lawton, calls it 'an ethical design science'.

This document is co-published by the Permaculture Association UK and the Centre for Agroecology, Water and Resilience at Coventry University, UK, and aims to provide examples of how permaculture design not only contributes to but also adds exciting new opportunities and solutions for agroecological food, farming and land use. Both permaculture and agroecology are based on the science of ecology and use ecological principles as their guiding thread. Both also comprise equally strong socio-cultural and economic concerns which are often overlooked by 'outsiders' to these disciplines. Agroecology has been termed 'a science, a practice and a social movement'[1], a definition that permaculture would also fit into. Both recognise the importance and equal weighting of traditional knowledge with modern science, in fact both these 20th century concepts arise from knowledge sources and cultures in the Global South that continue to have a living ecological rationale, and both are led at the grassroots by farmers and non-government organisations. Both are anti-establishment in their challenging of conventional food and farming systems as well as conventional modes of living, and are similarly opposed to industrial agriculture and unbridled capitalism. Both are to a great extent aligned with the principles of food sovereignty.

Their differences are respective strengths that combine to build a fuller alternative to the conventional norm. Permaculture's unique contribution is that of its design principles. More than any other alternative ecological approach (including organic and biodynamic) it provides a clear and easy process for anyone to design and develop a garden, a farm, a community or a bioregion where food, water, energy and shelter are all sustainably interconnected. This design approach proactively attempts to reduce the labour-intensive nature of traditional agriculture. The standard 10-Day Permaculture Design Course (PDC) provides a full immersion learning experience. Countless PDC graduates find that at some point during the course, the penny drops, their understanding of the

[1] Wezel A., Bellon S., Dor´e T., Francis C., Vallod D. & C.David. (2009). Agroecology as a Science, a Movement and a Practise, a Review. Agron. Sustain. Dev. (2009)

interconnectedness of everything falls into place, and their perspective or worldview is changed irrevocably. Or as permaculture teacher Geoff Lawton suggested at the Conference: *"I think that's what we do to people when we teach them permaculture, we put that final shine on that neural cortex and the outer brain gets just a fraction bigger, that last fractal, that design mind evolution."*

Agroecology, on the other hand, does not have a written down and globally agreed set of guidelines, coda or training curricula, and as such provides the umbrella term for the host of alternative farming approaches that exist, including organic, biodynamic and regenerative agriculture. It does not so overtly focus on energy and shelter as does permaculture, but does bring to the table more political nous given that the social agroecological movement has come together out of inequalities and injustices in the food and farming system. Given these definitions and relationships, permaculture and agroecology have a symbiotic relationship with each providing a unique contribution to the other, so that together they are greater than if they stand alone.

This publication chiefly categorises the papers into the three permaculture categories of Earth Care, People Care and Fair Shares. Within this it attempts to cover the majority of the seven permaculture domains as far as the presentations allowed: Land & Nature Stewardship; Build Environment; Tools & Technology; Education & Culture; Finance & Economy; Land Tenure & Community Governance; Health and Spiritual Well-Being.

The book is divided into five sections.

Section I: Cross cutting introduction to permaculture.

Despite permaculture's broad international presence and high public profile, the concepts and practices have received relatively little attention from scientists and scholars. **Paper 1** is based on Rafter Sass Ferguson's PhD research over the past five years, which was one of the first achievements filling the gap in scientific research from the social sciences perspective.

Section II: Earth Care

Paper 2 by Joel William and Chris Warburton Brown is written in the context of the International Year of Soil (2015) and with a clear acknowledgement of the growing attention being paid to soil as the foundation of food production. The authors explain some of the existing and new research on soil with regard to the role of living organisms in creating soil health.

Paper 3 by Rebecca Laughton presents the result of a survey of the productivity of small farms and market gardens in the UK. Its aim is to understand more about the range of small holdings, what and how much they are producing, whilst creating a dataset which can be compared with the productivity of larger farms.

Paper 4 by Albert Bates argues that the scientific consensus of climate change is unequivocal and we must cut emissions of

greenhouse gases by 80 to 90 percent within the next decade in order to avoid catastrophe. The Global Ecovillage Network has been pointing the way for the past 20 years. Eco-villages, by combining changes in behaviour with patterns of land use, are creating carbon-negative human settlements.

Paper 5 by Jeremiah Kidd asks how we will adapt in an abundant and resilient manner when climate change presents humankind with immense challenges. He argues that permaculture offers the solutions for whatever our futures holds. Examples from incredibly productive projects in regions with less than 350 mm of precipitation show resilience and give hope.

In **Paper 6** Naomi van der Velden argues that whilst large-scale monocultures have presented economic solutions to food production, it is clear that not all costs have been factored into production, and new environmental and social

challenges have been created. New agricultural systems meet environmental and ecological objectives as well as economic ones, and work within social and cultural frameworks. An analysis of existing alternative systems aims to suggest future opportunities in our food production.

Section III: People Care

In **Paper 7** Marina O'Connell presents the why, what and how of securing Huxham's Cross Farm at Dartington, Tones, South Devon into the Biodynamic Land Trust (BDLT) to address the question "How can we create a farm that produces lots of high quality food, for local people, whist supporting biodiversity, that is low on its carbon usage and sequesters carbon at the same time?" All of this whilst being financially viable for the farmers, selling food at an affordable price and allowing access to diverse people to good quality food and farm based experiences.

Paper 8 by Trathen Heckman illustrates examples and stories of how we can grow more inspired, empowered and effective leaders and permaculture-oriented organizations. It is a call to action to adopt the Community Resilience Challenge program as a platform that creates shared vision and collective impact while supporting and enhancing local autonomy.

Paper 9 by John Nzira shows how and why permaculture for smallholder farmers is key to the future of food, farming systems and land-use communities in Southern Africa. It urges academics and farmers to become research partners in developing new approaches that can foster a sustainable farming systems and viable livelihoods. Based on a case study of an organization and an emerging network rooted in and driven by permaculture, transition principles and practice.

Paper 10 by Katy Fox presents a case study of an organization and an emerging network rooted in and driven by permaculture and transition principles and practice. It explains the transformation and consolidation over five years through a variety of design methods, seeking to address organizational structural and social needs as they arose to the best of participants' skills. Making the process explicit is part of an ongoing design process to adapt governance to the rapidly changing shape of the organization and network.

Paper 11 by Rex Haigh and David Hare argues that permaculture ethics are almost identical to those of 'Sustainable Mental Health', which is a recent initiative supported by the National Health Service and the Royal College of Psychiatrists. Winners of the 2014 'Sustainability in mental health' award, they explain the conceptual and practical ways in which they are undertaking ecologically-minded 'whole systems design' to treat people with severe mental health problems.

Section IV: Fair Shares

While financial permaculture is a burgeoning field within the movement, in **Paper 12**, Mario Yanez shows how each of us consciously participates in our world beyond self-provisioning; and how we finance/manage our personal lives, transact with each other, earn a right livelihood, create a regenerative enterprise, and connect with the Earth economy at large. The paper explores many of the tools available to us via permaculture design, specifically applied to financial permaculture.

Paper 13 by Petra Stephenson illustrates an example of how New Zealanders created their

own sort of people's bank without being a bank. The JAK bank in Sweden was the basis for this system. Savingspools are a group of people who pool their money to help each other eliminate debt. The groups can then join a national group to help each other out over the whole network. An intricate but easy and fair accounting system keeps track of contributions over time.

Section IV: Cross cutting wrap up finishing with two more papers.

Paper 14: Jonathan Code shows us that the study of plants can take on many forms. On the one hand, we can take an 'observer' eye and study the plant as an 'other' out there in the life world. On the other, we can also engage with plants through a participatory approach, taking our cues from their dynamic unfolding in time and space – their becoming. Furthermore, the developing plant offers us a wealth of impressions and imagination for contemplation and mediation. The paper takes a transdisciplinary approach to deepening our practical artistic contemplation engagement with the dynamic life of plants.

Paper 15: While Rosemary Morrow summarizes the attributes of permaculture's successes to fix the mess the whole world is facing now, she is also cautious of the challenges for the future, where she argues that the prospect lies in an expanding of the third ethic, that is, distribution of surplus to the needs of meeting the first two ethics of Earth Care and People Care. With an upbeat spirit she calls for all permaculture communities and beyond to keep the process open, enable the next wave of permaculture and multiply the solutions to create the world we want.

The papers are topped and tailed by the poems of the conference poet Siobhan Mac Mahon, and interspersed are quotes from the keynote presentation of Geoff Lawton. This publication demonstrates the multiple applications of permaculture in order to design the world we want, and inspires those who haven't yet taken a PDC Course to do so, which in the interests of humanity should arguably be an obligatory part of every school curriculum.

Julia Wright and Marina Chang, Ryton Organic Gardens, Coventry, March 2019

Conference Opening Poems

Siobhan Mac Mahon

Forgotten Memory

Let us grieve for the broken body of our Earth,
for the pillaged devastation of our despair,
crying out in her agony
her legs splayed open wide
and all her treasure plundered.

Let us cover our naked bodies
in the ashes of our dead and weeping
kneel upon this blessed Earth
sending up a great lament
imploring her forgiveness.

For this is our body,
this is our blood,
only we have forgotten.

We have forgotten
the Holy Mystery of our lives,
the place where prayer
opens softly in the darkness
of our bodies humming
with sweetness, the place
where every cell and fibre of our beings
is ringing out an Angelus,
an Alleluia chorus, an Ave Maria.

Let us remember
the deep well of our belonging
the Holy Mystery of our lives
and let us dream
a new world into being.

Let us dream
a new world Into being.

Perfect Pitch

There is another place
older than this one,
where the body
keeps a gentle harmony
to the soul's steady beat,
to the deep thrum, thrum
thrumming of the land,
to the waltzing, whooshing
of the waves,
to the rhythmic moaning
of the tides.

There is another place
not far from here
where the soul entwines
with the body
in the rapturous
elegance of embrace
singing a forgotten melody,
resonating without a hitch
in perfect, perfect pitch.

There is another place
not far from here
we used to call home

Section I

Cross cutting introduction to permaculture

Permaculture as a grassroots network and farming system: 5 years of research

Rafter Sass Ferguson

To date, there has been very little critical, systematic assessment of any sector of permaculture. This limits our ability to assess permaculture's potential contributions as a framework or a movement, or to understand its constraints, opportunities, and challenges, as force for socio-environmental transformation. I spent the last five years conducting several research projects intended to help address this gap, as part of my doctoral research at University of Illinois. The overriding question motivating this investigation is: To what extent, and how, does permaculture represent a force for positive change toward socio-environmental transformation?

THE STATE OF PERMACULTURE

The overriding question is embodied in three other questions that each serve as a starting point for a project. How credible and plausible are the proposals emerging from the permaculture perspective on agriculture? Who, in socio-demographic terms, is participating in the permaculture network, and how do socio-demographic factors shape participation? What happens when the principles and ideals of permaculture touch down in production landscapes – in other words, what is happening on permaculture farms?

How credible and plausible are permaculture's proposals?

While permaculture originally emerged from an academic collaboration between Bill Mollison and David Holmgren, since that point it has been largely isolated from the scientific community. Despite a high public profile, broad international distribution, and a voluminous popular literature, the claims and proposals of permaculture's advocates have never been systematically reviewed or assessed. This has created a bottleneck for the emergence of permaculture research. It is difficult to investigate any topic in a rigorous fashion when basic questions about what has been proposed remain unanswered.

I conducted a systematic review of the permaculture literature, relating it to the literature of agroecology and closely allied disciplines (Ferguson and Lovell, 2014). This review addresses foundational issues: What are the major themes and proposals emerging from the permaculture literature? Where does the permaculture literature line up with the agroecology literature? Where the two literatures don't line up, when is it the case that the permaculture literature is shining a light on a topic that agroecologists should be paying better attention to? When is it a case of distortion and oversimplification in the permaculture literature?

The framework permaculture promotes is, in broad strokes, extensively supported by contemporary science. Principles and themes largely complement, and in many cases provide a useful extension of, those in the agroecology literature. Permaculture's focus on site specificity in design, and on principles like diversity and multifunctionality, are widely echoed across a broad swath of agroecological research and theory. There is very rich empirical support for the importance of perennials, polyculture, integrated water management, and land-use diversification. Permaculture also offers an integrating framework for how all of these elements are meant to work together, emphasizing their transformative potential in a way that is provocative and useful.

And in some cases, permaculture does indeed shine a light on a neglected topic. The permaculture approach to site design does not appear to have any parallel in the agroecological literature. For example, the set of tools for thinking strategically about configuration, or arrangement in space - i.e. Relative Location, Zones and Sectors, and related principles. These tools emphasize that it's not only what

land uses we select, but how we arrange them in the landscape, that drives labour productivity, ecological and cultural functions, and whole-farm outcomes. This is a reasonable and plausible direction for research that deserves scientific attention.

In order to build on the existing foundation for dialogue with agroecology, permaculturists will have to re-examine some assumptions. The permaculture literature demonstrates a weakness for extrapolating from ecological principles in a way that oversimplifies mechanisms and glosses over variation, and for making overreaching claims and prescriptions based on those principles. Much of this involves confusion around the relationship between different kinds of productivity: namely, net primary production (NPP) on one hand, and production of harvestable yields on the other. At a higher level, the permaculture literature also underplays the complexity and risk involved in developing and managing diversified farming systems (DFS). Starting or transitioning to DFS is an incredibly complex task - especially in the industrialized world, where farmers must compete directly with the cheapest commodities in the world. Very little of the wealth of farm planning and decision-support materials out there are appropriate for diversified farms, and even less so for those that incorporate perennials. So far, permaculture has offered little to fill that gap.

Who is participating in permaculture, and how?

In the absence of any systematic assessment, our ignorance of who is participating in permaculture, and how socio-demography shapes participation, is a serious constraint on our ability to assess permaculture's actual and potential impact or to identify barriers to efficacy and growth. Discussion of race, class, and gender diversity issues within permaculture itself often display 'demography-blind' thinking, conflating the lack of formal hierarchies or barriers to entry with a lack of any hierarchies or barriers at all.

I conducted a web survey in 2012 which was open to anyone who identified with permaculture in any way (Ferguson and Lovell, 2015). The survey received a high level of response despite being rather long, with no financial incentive, administered only through the web, and only being available in English. It's important to note that this study is relevant to a specific sector of permaculture participants - those with web access and facility with English. This sector warrants investigation in its own right, and I must also note that those excluded from the sample - by technology or language - include important sectors of the permaculture network, in the developing world particularly, including smallholder farmers and other subsistence producers (Terui 2000, Meigs 2004, Felix-Romero 2010, Conrad 2014).

Analysis of results from 731 respondents showed the participation of women at or above parity (53%). Women, however, were less likely than men to identify with professional and practice roles. Our sample also displayed a white supermajority (96%). Lack of diversity was most pronounced in the USA, which also had both the largest sample and the most diverse national population (Figure 1). Through racial exclusivity and gender inequality, permaculture is losing out on critical contributions from groups whose leadership is badly needed in the social project of transition to sustainability.

What is happening on permaculture farms?

Diversified farming systems in the US have been in stark decline for the past 80 years, and face formidable challenges in the contemporary market and policy environment. Facing a lack of programmatic support, many farmers turn to alternative and grassroots farmer networks for support. While historically associated with garden- rather than farm-scale production, it appears the permaculture network is increasingly involved in this role: as farms, as a venue for farmer-to-farmer knowledge exchange, and as a set of resources (workshops, literature) intended for farmers managing diversified systems. Permaculture advocates call for a design-based approach to managing highly diverse multifunctional landscapes, emphasizing agroforestry and perennial polycultures, integrated water management, and the maintenance of semi-wild areas, among other practices (Ferguson and Lovell, 2014). We have no knowledge,

however, of what is happening on farms that identify with permaculture, or that are involved with the permaculture network. I conducted field research to address the gap in our understanding of permaculture's growing agrarian sector. In between June 2013 and January 2014, I visited 48 self-identified permaculture farms on an 18,000 mile route through the continental US (Ferguson 2015, unpublished dissertation). I selected farms based primarily on their level of identification with permaculture, and secondarily to get a broad range of scale of operation in the sample.

Results show that permaculture farmers are managing landscapes with high levels of diversity and multifunctionality (Figure 2). They are adopting key multifunctional land uses such as perennial production systems at a high rate. Additionally, they are frequently implementing a combination of agroecological practices, including perennial production (as above), integrated water management strategies, maintenance of semi- wild areas, and others. More research is needed to quantify the influence of permaculture on conservation and production value and on farms.

I performed an analysis of labour productivity (gross returns to labour) in order to evaluate a key principle of permaculture - namely, that diversification can increase labour productivity through the exploitation of synergies between production systems. For the purposes of this analysis, I focused on the question of crop/animal integration. Based on data from 36 farms, I modelled the labour productivity for six categories of production enterprises: large animals, small animals, annuals, horticultural crops, tree crops, and other perennials. Using distribution of labour as a proxy for crop/animal integration, the fitted model showed that crop/animal integration had a significant effect on tree crops only. This effect was one of the strongest in the model, however, such that the sharing of labour with animal systems pushed tree crops from the least productive enterprises categories to the most. While this analysis is necessarily preliminary and exploratory, this is an important finding - the first non-anecdotal evidence that permaculturists are increasing the value of their labour on one kind of enterprise by investing some of their labour in another.

SYNTHESIS

The projects described here will hopefully contribute to the foundation for a groundswell of permaculture research. One thing we can say with complete confidence is that permaculture is neither static nor monolithic. It is a grassroots utopian project founded by thoughtful and iconoclastic white men from Australia in the 1970s. Inevitably, it emerges from the confluence of tendencies that are radical and emancipatory with others that are dangerously naïve and sometimes reactionary. In as much as permaculture supports an engaged form of ecological literacy and mobilizes people to make and support change – especially in collaboration with their communities – it deserves our support. When permaculture manifests as narrowly conceived (and privilege-blind) goals of 'self-sufficiency,' or the belief that changes in lifestyle are themselves a viable strategy for socio-environmental transformation, we should call out and critique these tendencies. When permaculture supports diversified farmers by informing landscape management decisions, fostering the norms and narratives that inspire diversified farmers, and/or motivating consumers to seek out the products of those farms, it is making a making a meaningful contribution to transformation. The opposite is true when permaculture advocates gloss over the challenges of diversified production, ignores the political-economic context, and gives the impression that thinking permaculture thoughts and applying permaculture practices will empower farmers to magically transcend the hostile market and policy environment they face.

Public discussion of permaculture is often polarized, as opposing parties each focus on certain aspects of a complex reality and ignore others. After years of navigating these unhelpful debates, this author composed a short story to help illustrate the nature of the conflict, and the neglected alternatives in the discussion.

The Parable of the Canoe

So this person has a canoe for sale. It's a good thing too, because the river is flooding. The water is rising fast and you're going to need to navigate it. You go to check out the canoe, and clearly it is something special. They spent years refining their design – for speed, weight, stability, practicality, aesthetics. They searched far and wide for the strongest, lightest, wood,

to painstakingly mill and shape and sand. They researched the finest adhesives and resins that modern technology has to offer, to bind it together and seal it. This is a boat that could last a lifetime, with proper care. It's versatile, powerful, and durable. It's not perfect, but it's beautiful. Just as you are getting ready to shake hands and seal the deal, the seller says: "And if that's not enough, buddy, get this – the canoe can fly."

Debates about permaculture tend to consist of back-and-forth between one group focused on the quality and timeliness of the canoe, and another group that is very annoyed that some are still insisting the damn thing can fly.

Permaculture is growing, and thereby changing, at a rapid pace. There are tendencies developing within the permaculture movement to build inclusion and diversity, to offer grounded and substantive support to diversified farmers, and to foster critical scientific literacy. At the same time, permaculture will continue, in many respects, to reflect its cultural context - in a phase of rapid expansion. In that sense, it is very likely that the permaculture movement will continue to be challenged by low levels of scientific literacy and persistent, witting and unwitting, sexism and racism. The degree to which permaculture can meet and surmount these challenges depends largely on the choices we make through our own engagement.

"Permaculture is the solution: an ethical design science. It's ethical design science in action that will get us out of this mess."

Geoff Lawton

"It starts with ethics.
It's about ethics.
It's about design.
It's about science.
Ethical design science."

Geoff Lawton

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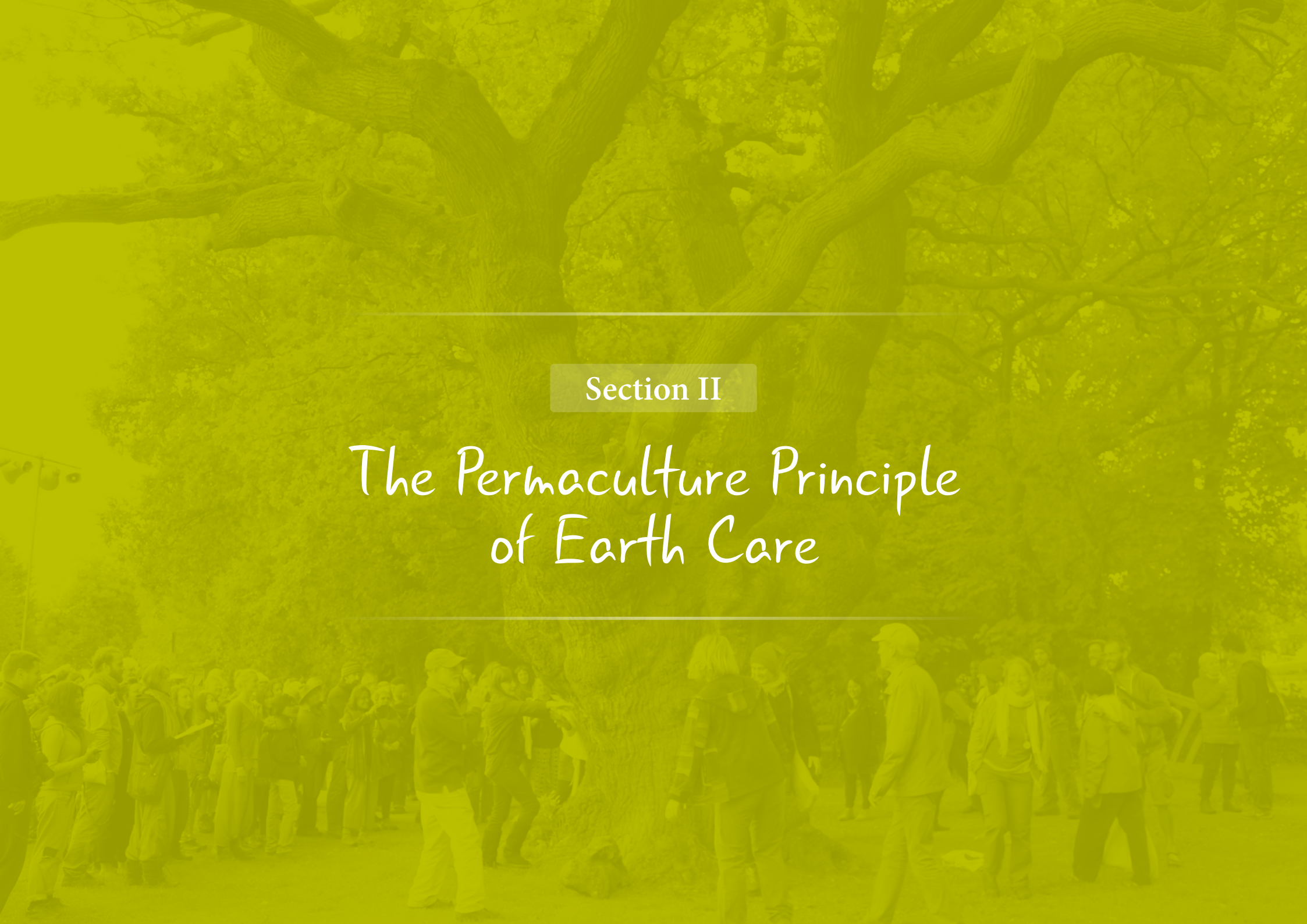


Section II

The Permaculture Principle of Earth Care

The Role of Living Organisms in Creating Soil Health

Joel Williams and Chris Warburton Brown

What is the role of living organisms in creating soil health? How can an understanding of that role help permaculture practitioners build healthier soils? In this short article, based on our presentations in the 'Soil' session of the IPC Conference, we attempt to answer these two questions. We believe that building healthy soil is a central part of permaculture growing, and we hope this article will be useful to all those engaged in that vital work. The article's primary intended audience are 'soil practitioners' rather than 'soil academics'.

In late 2012 the research team of the Permaculture Association Britain began working on soil. This was Chris' first big project in the newly created post of Research Coordinator, so why was soil the right place to start? Because every permaculture author and practitioner claims that using permaculture techniques will improve soil health. This is one of permaculture's biggest claims, but how do we know if it is true? Chris wanted to find out.

The decision was made to develop simple soil tests for the permaculture community. These tests would help growers understand their soil without needing a laboratory in their back garden or a soil science qualification. Eventually Chris and his Research Assistant, Tom Kemeny, published these tests online as the Permaculture Soil Test Handbook and the Permaculture Soil Advice Booklet (Warburton Brown & Kemeny, 2015), but that was still a long way in the future. In the short term, the task turned out to be more difficult than expected. While there were some great examples of existing simple soil tests, it soon became clear that agricultural soil science was dominated by laboratory testing, nicely captured in this quote: 'Soil testing is a special chemical analysis that provides a guideline for lime and fertilizer needs of soils when considered in conjunction with post-fertilizer management and cropping history.' (Thom et al, 2000). Of course it is very useful to get your soil chemically analysed, but the idea that this is all that soil testing is, is problematic.

A great leap forward came when Chris met Professor Geoff Squire, from The James Hutton Institute, who said "soil is a stool with three legs; chemistry, biology and structure". Geoff believes that the dominant chemistry focus of agricultural soil science has resulted in what he terms 'the bio-structural crisis of soil', which underpins the desertification of soils and soil erosion. If we want to restore soils, we need to begin with restoring soil biology. Because of this conversation, work began on developing a 'bio-structural approach' to the Permaculture Association's soil tests, focussing on the other two legs of the stool.

The approach to soil that was developed therefore focussed on two key elements: rich life (biology) and good structure (physics). This approach sees soil as a holistic system, where each characteristic strongly interacts with and affects the other. Good soil has rich biological life ranging from bacteria and fungi to worms. All soil types benefit from active biological life; sandy soils are glued and bound together by it, while heavy clay will be opened up. Good soil also has key structural features; water drains during wet weather and is retained when weather is dry; an optimum bulk density allowing fine plant roots to pass through while also anchoring them securely; it is deep enough to allow roots to grow extensively and is not easily eroded by water or wind. Much of this structure is itself created by healthy soil biology.

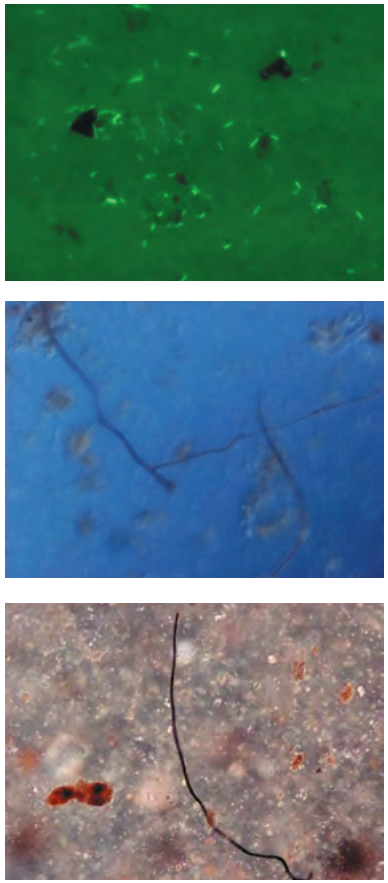
Sadly much conventional farming practice ignores soil biology, or is even directly destructive of it. However, a revolution in soil science has begun in the last few years which will surely change this: 'Recent research has revealed the true nature of soil organic matter (SOM). The prevailing thought was that most of it was comprised of decomposed plant material... [but] it is actually bacterial and fungal remains that make up most SOM. The implications are that building SOM and sequestering carbon are absolutely dependant on the "living" fraction of

the soil. Essentially, biology is everything when it comes to regenerating and sustaining healthy soil. Soil is indeed “living”.’ (Soilhealth.net reviews work in *Biogeochemistry*, 2013). In this article we aim to share some of the key features of that soil science revolution in a way that is easily understandable and usable by growers.

Soils are vast and complex living ecosystems, teaming with an incredible diversity of micro and macro-organisms that function together as one superorganism. The diversity of life that exists within the soil environment perform an array of crucial functions including decomposing organic materials; mineralisation of soil nutrients; fixing atmospheric nitrogen; enhancing soil aggregation and porosity; building soil humus; preying on crop pests and being consumed themselves by higher level predators from the intertwined soil food web.

Within this ecosystem, there are six main types of organism; bacteria, fungi, protozoa, nematodes, insects and earthworms. Bacteria are single celled organisms and reside in the soil in vast numbers. Most bacteria are decomposers of simple carbon compounds but they also hold nutrients in the root zone and filter and degrade pollutants. Fungi are multi-celled organisms that grow as long threads or strands called hyphae. Fungal hyphae can span in length from a few cells to many yards. Saprophytic fungi perform important services related to soil-water dynamics - they physically bind soil particles into aggregates thereby improving soil structure. Protozoa are single celled animals that feed primarily on bacteria, but also eat other protozoa, organic matter and sometimes, fungi. Nematodes are non-segmented tiny worms and many growers are familiar with the nematodes that cause crop losses, when in fact, there is an incredible variety of beneficial nematodes. These beneficial nematodes consume bacteria, fungi or even other nematodes and in doing so release nutrients in plant available form. Soil insects are important shredders of organic materials while earthworms also grind up organic materials in the soil and redistribute them from the soil surface throughout the soil profile. It is this interaction of predators consuming lower hierarchical organisms and recycling nutrients by which highly productive natural ecosystems can maintain their fertility in the long-term without the application of fertiliser year after year. Optimising these natural processes of nutrient cycling to supply food crops is of key interest for low input, agroecological production methods such as permaculture.

The soil food web offers a perfect example of the permaculture viewpoint regarding collaboration and synergy whereby the whole is greater than the sum of its parts. The focus need not necessarily be on any particular organism, but rather the relationships between organisms and how they function as a whole system. The relationship between bacteria and fungi is a noteworthy example. As the primary decomposers of organic materials, these two organisms play a crucial role in the flow of carbon (energy) into the soil food web and consequently influencing soil carbon



Photos: Bacteria, fungi and fungi (source: Laverstoke Park Laboratories)

sequestration processes. There are three important mechanisms of noteworthy mention.

Firstly, fungi comprise a larger percentage of the total microbial biomass than bacteria and quite simply can store more carbon in their biomass pool. Secondly, both bacteria and fungi feed on carbon and via their metabolism they exude a range of carbon based by-products and waste products which can potentially be sequestered into the soil carbon pool. Bacteria produce small chain by-products while fungi produce larger chain products which are more resistant to degradation with an associated increased residence time in the soil. Thirdly, as fungi grow, their fine filaments excavate their way through the soil environment creating channels and tunnels. The physical action of this growth habit thrusts soil particles together; clumping and aggregating these particles and binding them with glue-like substances. These aggregates offer physical protection of soil carbon from oxidation. These three mechanisms mean that a greater proportion of fungi present in the soil can lead to greater carbon sequestration via the synthesis and protection of stable forms of carbon with longer residence times.

Highly aggregated, structured soils contain invaluable pore spaces for the most important element for all living organisms, oxygen. The vast array of beneficial microbes that reside around the plant root system and throughout the soil environment require this life giving oxygen for their growth and survival. Aerobic, structured soil provides the optimum conditions for microbial proliferation, which leads to a healthy soil food web, increased nutrient cycling, greater nutrient supply to growing plants and maximum carbon sequestration.

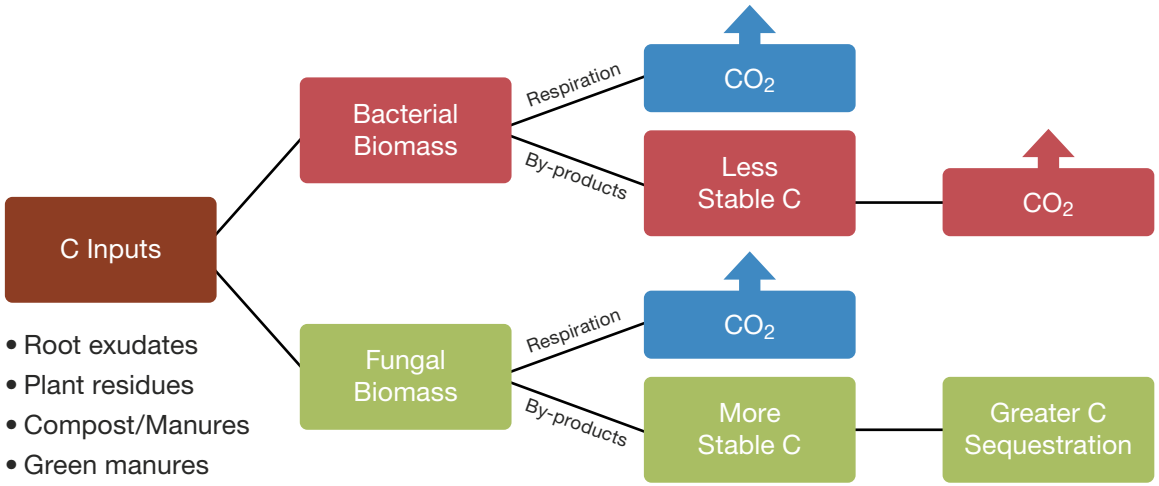


Figure 1: Carbon flow diagram (source: Joel Williams)

Most farm soils are particularly lacking an abundance of fungi and many other beneficial soil organisms at large. Soil disturbance in particular but also surplus soluble nutrients and pesticide applications all suppress fungal and general microbial activity in the soil. Minimising these practices and ensuring there is adequate carbon based inputs (food) for fungi will help ensure they remain active in the soil environment.

A recent article 'Earthworms for Cropping Systems: A Review' (Bertarnd et al 2015) synthesises what we know about the role of worms in building soils. Worms have a positive impact on soil structural stability, soil organic matter and soil nutrient cycling, and also induce the production of hormone-like substances that promote plant growth. How the soil is cultivated can really affect worm populations; direct drilling of soil increases worm abundance, as do bulky organic amendments (compost and well rotted manure), but pesticides damage worm populations.

Another recent article illustrates the benefits of consciously working to build up soil life (Henneron et al, 2015). The article is based on a 14 year comparison of conventional, conservation and organic farming techniques on a single site, and the results are extraordinary. Compared to conventional techniques,

conservation farming increased soil macrofauna up to twenty fold, nematodes up to seven fold, and boosted worms and micro-organisms. This research suggests long term no-tillage systems and cover crops are the best thing for soil, better than periodic green legume manures, pesticides and mineral fertilisers.

Soil biology is the most complicated living system we know about. We do not claim to understand it all, indeed nobody does, and as growers we do not need to fully understand it. Just by looking at soil, smelling it and feeling it, you can see that living soil looks very different to dead soil. You do not need a lab or microscope to tell you that. What we do need to know is how best to support soil life, and in this article we have suggested a number of scientifically proven techniques. For the bacteria, they prefer smaller simpler food sources such as fresh, green matter or simpler sugars such as molasses. For the fungi, provide lots of brown carbon (straw, leaf litter with a higher C:N ratio), avoid disturbing the soil, and prevent excess moisture. For the worms and insects, provide bulky organics and drill the soil occasionally. For all soil life, keep tillage to a minimum, avoid compaction, keep the soil covered with living plants as much as possible (or a mulch if not), avoid excess soluble nutrients and never use pesticides.

As permaculture designers we need to be designing rich, healthy, living soil. During the International Permaculture Conference, Geoff Lawton described permaculture as “Ethical design science”, and we need to ethically and scientifically design our soil. A design for good soil should be a key part of all permaculture growing projects. And central to that is a design for soil biology.

“Soil is the core of sustainability; it’s the ultimate physical indicator that a practical system is sustainable, if you’re neither creating soil nor destroying soil - you may as well be creating more soil in quality and quantity, then you are sustainable.”

Geoff Lawton

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A Matter of Scale: How productive are small-scale (20ha and less), agroecological farms?

By Rebecca Laughton

Introduction

The debate about the future of farming in the UK is highly polarised, between the agri-industrial lobby, who believe that farms must get ever bigger and more high-tech, and the agroecological movement, who argue that mixed farms of varying scales can simultaneously deliver healthy food and sustainable land-use. Underlying discussions about the environmental, social and economic benefits of different types of agriculture is the question of which can provide sufficient food. While organic agriculture has long been criticised for producing lower yields than non-organic farming (Ponisio et al. 2014), the question of how much food small scale, diverse and agroecologically managed farms can produce in the UK, has received less attention.

That there can be an inverse relationship between farm size and yield has been long established in development literature (Cornia 1985), and in his paper "The Multiple Benefits and Functions of Small Farm Agriculture" Rosset demonstrates that when "Total Output", rather than "Yield" is viewed as the measure of productivity, small farms perform rather well in the United States (Rosset 1999, p6). This supports the permaculture premise that diverse, multifunctional systems which mimic nature can be highly productive, as well as being more sustainable (Whitefield 2004, p16-37). Two desktop studies in the UK support this idea (Fairlie, 2008, p21 and Griggs 2012), while in Maxey et al (2011) showed how 8 small-holdings of 10 acres and less could be economically viable.

To find out about the productivity and multiple benefits of small-scale (20ha and less) farms in the United Kingdom, during 2015 two surveys were carried out. This paper takes a preliminary look at the findings of the Spring Survey, as presented at the Permaculture Conference in September 2015. Work on analysing the results from the combined surveys is ongoing, and results published here should be viewed as "work in progress".

Methodology

We set out to obtain data on productivity, barriers to productivity and multiple benefits, from at least 100 commercially run small-scale farms, through the medium of an online survey. Respondents were recruited in a variety of ways, including regional meetings run by the Landworkers Alliance, and short articles in the newsletters of relevant organisations. The online questionnaire asked for data about yields and production areas for all crops (plant and animal), labour inputs, income and expenses, barriers to productivity, productivity trends and general data about the holding which might explain productivity differences.

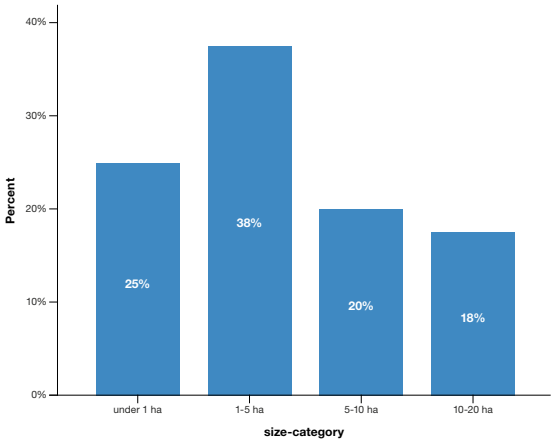

Figure 1 - The distribution of holdings between land size classes

[2] The Landworkers' Alliance is a membership organisation for sustainable farmers, growers, forestry workers and land based crafts workers in the Uk, and is affiliated to La Via Campesina.

Results

Forty smallholders responded to the spring survey, representing a wide range of holding sizes, enterprise mixes and experience profiles. Over sixty percent were under 5 ha, with 25% being less than one ha (See Figure 1). In terms of eco-management systems used, the majority employed organic methods, with over half of these (19 as opposed to 15) being legally certified. Four respondents reported using permaculture methods, while others used biodynamic, no-dig and agroforestry systems. The enterprise diversity demonstrated by the holdings was striking (see Figure 2 over page), with several holdings of less than a hectare running multiple enterprises, and two of 9 and 12 ha operating ten or more.

Respondents were asked for examples of where they used one area of land for more than one crop/livestock enterprise, and numerous examples of polycropping such as companion planting, chickens or sheep undergrazing orchards and agroforestry were cited, helping to explain how such diversity of enterprise was achieved. All forms of horticulture and most forms of livestock were represented, with vegetable production, fruit, laying hens and sheep being the most frequently reported enterprises.

Analysis of the productivity data is still at a very early stage, and data for comparison with larger farms (organic and non-organic) has only been obtained for the ten indicator vegetables to date. Table 1 shows how mean yields for broad beans, French beans, leaf beet, kale and salad leaves appear to be higher than for non-organic holdings, while for potatoes, carrots, leeks and squash, they are lower. It would be premature to draw any conclusions from this, however, before statistical significance is ascertained.Questions about the environmental and social benefits of small-scale, agroecological farming provided few surprises, with issues such as biodiversity, soil care and provision of better food being cited. The perceived barriers to productivity provided interesting insights, suggesting broader economic structural problems being a limiting factor to production capacity (see Box 1). When clustered by theme, the most frequent topics (insufficient labour, lack of time or energy and low wages/income from selling food) indicate that the low price of food makes it hard to employ enough labour to optimise productivity. Similarly, a lack of start-up capital causes inefficiencies by restricting investment in equipment and infrastructure.

	A Matter of Scale Survey (mean yield)	Organic Farms	Non-organic
Potatoes	1.43	2.3	4.5
Tomatoes	4.3	n/a	n/a
Carrots	2.16	2.5	6.11
Leek	1.68	1.2	2.11
Broad beans	0.94	n/a	0.4
Squash	1.65	n/a	4
French beans	2.65	n/a	0.86
Leaf beet	2.06	n/a	0.8
Kale	1.29	n/a	0.85
Salad leaves	1.52	n/a	0.6

Table 1 – Yields of ten indicator vegetables produced on small farms, compared with standard organic and non-organic yields (kg/square metre)

"It's up to us to change our perceptions, it's up to us to allow for unlimited abundance and positivity, with our vision of the emergent future we can all achieve together."

Geoff Lawton

Food Prod'n Area (ha)	0.011	0.1	0.167	0.2	0.226	0.25	0.25	0.5	0.5	0.75	0.81	0.9	1	1.37	1.5	1.65	1.85	1.95	2	2	2.3	2.6	3	3.2	3.6	4	4	4	4	8	8.5	9	9	9.5	12	12.93	17	18	20	20	
No. enterprise/ holding	2	2	2	7	3	3	1	2	5	2	2	6	3	1	4	6	3	6	5	5	2	4	6	2	2	4	6	8	5	6	1	2	8	10	8	12	5	1	3	7	
O/s Veg	●	●	●	●	●	●		●	●	●	●	●	●		●	●	●	●	●	●	●		●	●	●	●	●	●	●	●			●	●	●	●	●			●	33
I/s Veg	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●		●	●		●	●		●	●	●	●	●			●	●	●	●	●	●			●	32
Herb		●	●	●				●	●	●										●						●															8
Soft fruit				●	●	●			●			●	●	●	●	●		●		●			●				●		●	●			●	●		●				●	19
Top fruit				●					●			●		●	●		●	●	●	●		●	●		●	●	●	●		●				●		●		●		●	20
Cereal				●															●																●				●	4
Hens Eggs							●					●				●		●	●			●	●				●	●				●	●	●	●	●		●	●	16
Meat chickens																																	●		●						2
Duck eggs												●						●					●					●					●		●	●					7
Turk & geese																●																	●		●						3
Sheep																●			●			●					●		●		●	●	●	●	●		●			13
Cattle																						●								●				●	●	●	●		●	●	8
Pigs				●																		●						●	●				●	●	●	●					9
Goat meat																												●								●					2
Dairy cows																																		●		●					2
Dairy goats																												●		●				●		●					4
Other						●							●	●					●				●								●			●			●			8

Box 1 - Barriers to Productivity

- Insufficient labour (13)
- Lack of time (10) and energy (3)
- Low wages/income from selling food (9)
- Limitations of land (6)
- Lack of space (5)
- Capital investment
  - Insufficient start up capital (10)
  - Inadequate equipment/infrastructure (5)

Fig 2 - Enterprise diversity among respondents to Spring Survey

Key to Colour Code:

- Most productive
- Second most productive
- Third most productive
- Fourth most productive

Discussion

Early results confirm some expectations and provide some surprises. The number of enterprises found to be operating on smallholdings supports the idea that such farms achieve both their sustainability and economic viability through operating diverse and complex systems. Even if they do not formally define themselves as permaculture holdings, many utilise permaculture principles such as polycropping and designing inter-related enterprises between which resources can be cycled. Such interlocking systems enable efficient use to be made of small areas of land, but require high labour inputs, and may help explain how small farms can achieve high productivity.

This diversity makes measuring productivity very complicated. Even for smallholders, it seems that keeping detailed yield records is not a high priority, and many were not easily able to access the data I was requesting. This came as a surprise, as I had assumed that people running commercial enterprises would take an interest in keeping and analysing records of productivity as part of their business management. On the other hand, the fact that certified organic holdings were better represented than more informal agroecological systems, suggests that those people who keep records were more inclined to take part in the survey.

An explanation could lie within the attitudes to productivity I discovered among a group of ecological farmers to whom I presented early results of the survey. The prevailing reaction to my presentation was, "why bother measuring productivity?" When probed about this attitude, it appeared that many were conflating productivity with productivism, the post Second World War push to maximise food production at any cost. Productivity was seen as a term that needed to be "reclaimed" or "thrown out". Many believed that the definition of farm productivity must be broadened to include the "positive externalities" generated by more sustainable forms of farming, such as educational benefits, community connectedness, soil carbon sequestration and the nutritional quality of food.

Deeper exploration revealed how productivity is a relationship between inputs and outputs, leading to an understanding that there are various parameters that productivity can be measured against – land area (space), fossil fuels (energy), fertility (manure/compost/fertiliser), subsidies/capital (money) and labour (time). Such parameters represent either scarce or abundant resources and efficiency should really measure productivity against the scarce resources, such as land or fossil fuel energy. This represents a shift from the current emphasis on labour efficiency in conventional agricultural economics. As the negative correlation between the number of full time equivalent workers and size of food production area indicates (Figure 3), on small farms labour inputs are high. Grower income is, however, low, indicating a level of self-exploitation. The relationship between productivity and inputs is also skewed in agroecological farms by the emphasis on closed loop systems, which minimise physical inputs, except for labour.

It is important to note the context in which these small farms are operating. At under 20ha they fall below the radar of what is considered to be a "proper farm" by DEFRA, and as such are offered little in the way of financial support in a system where subsidies are distributed according to land area controlled. They internalise the costs of caring for the environment, choosing organic and labour intensive production methods, rather than agrochemicals and high reliance on fossil fuels. While some farms manage to achieve a premium for their high quality produce, the cheap food culture means that it is hard to sell the food they produce at a price that reflects production costs. In addition, for decades the investment in research and development directed at agroecological farming systems has been dwarfed by that directed towards the tools of sustainable intensification (UN FAO). When these relative economic disadvantages are considered, the early signs that for some crops equivalent or better average yields are possible provide encouragement that small, diverse farms are at least in the same realm of productivity as larger ones. It prompts the question, how much better could they perform if allowed to compete on a level economic playing field with large scale agribusiness, with equivalent subsidies and investment in R&D.

Conclusions

To conclude, the difficulties posed by investigating the productivity of highly diverse, small scale agroecological farms should not be underestimated. This paper barely scratches the surface of the volume of data collected from just forty small farms. A challenge lies ahead in amalgamating the data on fruit and vegetable, egg, meat and dairy production into a form in which it can be compared meaningfully with monocultural production from industrialised agriculture. This challenge must be addressed, for governments and policy makers need to know whether, alongside all their environmental and social benefits, small-scale, agroecological farms will be able to keep us adequately fed.

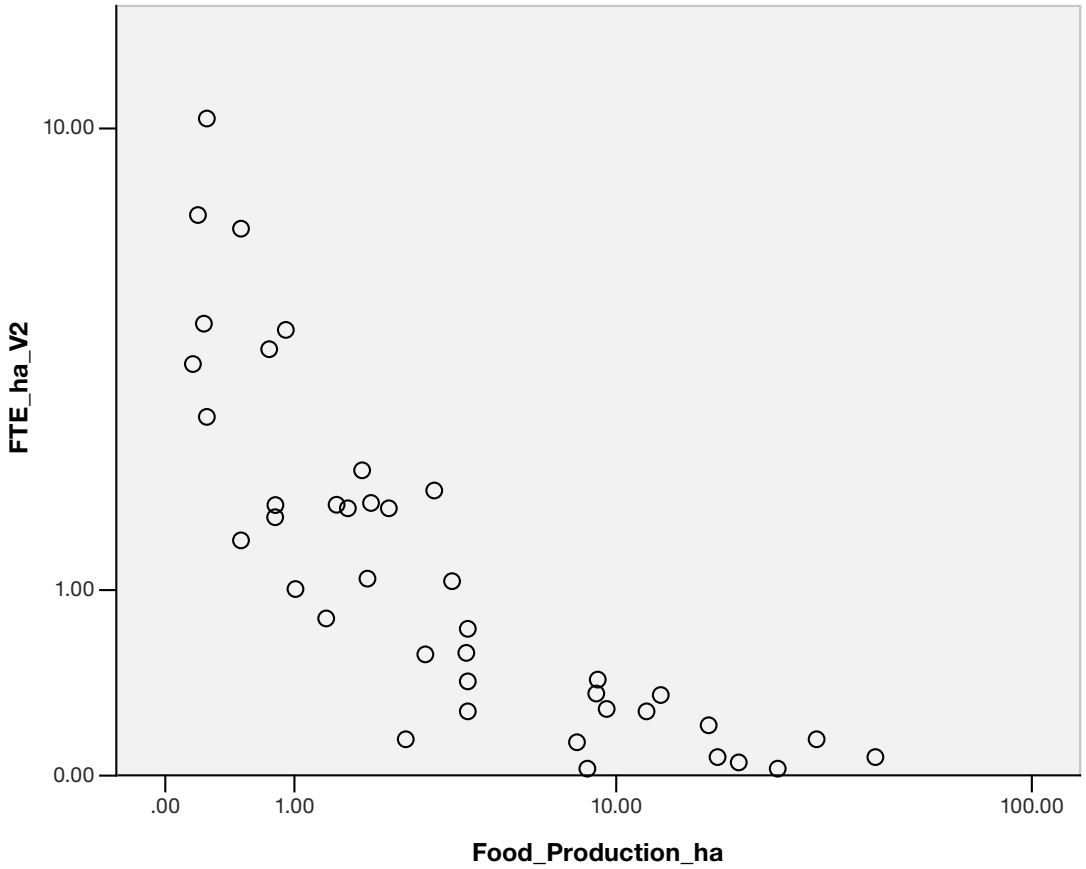

Figure 3 – Graph showing relationship between the size of holding and the number of full time equivalent (FTE) workers per ha (LOG scale)

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Cool Communities: Ecovillages that Change the Atmosphere

Albert Bates

The delay in addressing climate change now compels us to go beyond zero and actively remove more greenhouse gases than we emit. Many of today's ecovillages that are based on permaculture principles have successfully accomplished this and the transformation of the process of land development for the world at large is beginning to be altered by this example. Permaculture begins with three ethics – care of the earth, care of the people, and return of surplus, or equitable distribution of wealth. Each of these ethics depends on the functioning of the others. Permaculture begins with the soil and its stewardship and extends outward to encompass the whole planet and its myriad ecosystems, including our human ecology.

Anyone seeking to ameliorate the crisis of anthropogenic climate change, predicted with remarkable precision more than a century ago (Arrhenius, 1908) and its full potential for human extinction articulated at least 25 years ago (Bates, 1990), would need to first come to grips with the carbon cycle, its sources and sinks. We can categorize sources as either natural, in the sense that they would happen whether humans were present or not, and artificial, or anthropogenic. While natural cycles of volcanism, glaciation, afforestation and other disturbance often perturb the balance of atmospheric chemistry, these natural processes are typically very slow, permitting adaptation by ecological succession. Anthropogenic disturbance, in contrast, is very sudden in biological and geological terms, not unlike an asteroid impact (Hansen, 2013), and consequently beyond easy reach of adaptation, and most so for complex life forms despite advantages of higher intelligence (Bates 1990).

We can place carbon sinks into four general categories: earth, air, water and life. As ice retreated and the climate warmed 20,000 years ago, humans began to modify the surface of the Earth, sometimes in very profound ways, clearing forests for fields, expanding villages into cities, and precipitating mass extinctions (Bates 2010). This human activity began affecting climate almost from the start (Ruddiman 2005), but in recent years our influence – amplified by fossil and nuclear energy – has accelerated.

An unplanned effect of our ecological disturbance acumen as a species has been to remove vast amounts of carbon from both shallow and deep stores in the earth and lodge it in atmosphere, lakes and oceans. Atmospheric concentrations of carbon have increased from 270 parts per million CO_2 by volume ("ppmv") to more than 400 ppmv in less than two centuries. Marine concentrations have also risen dramatically. The other two stores, earth and its lifeforms, have been in steep decline. The drawdown of carbon from coal, oil and gas deposits may be well known, but less obvious is the reduction of carbon in topsoil, a consequence of vegetation clearance, irrigation and the plough. Today's topsoils, forced to produce through the artifice of chemical fertilizers, may average less than three percent carbon, compared to more than ten percent after the glaciers retreated (Bates, 2010, Goreau, 2015).

Soil Sequestration

An example of natural recovery can be seen in the Loess Plateau of Northern China where fertile soils were overworked until they had to be abandoned. At the time of abandonment organic carbon concentrations had dropped to under 3 percent. Thirty years later Loess soils had regained concentrations of 6 percent by natural processes (Xiao 2013). If natural restoration were accelerated by amending soil carbon in both metabolisable forms (such as crop litter and manures) and recalcitrant forms (such as biochar), the potential to increase soil carbon in a few decades could be raised to 10 percent or greater, virtually anywhere (Goreau, 2015).

Recovering one percentage point of soil organic matter means that around 27 tonnes of organic

matter per hectare would have to enter the soil and remain there. Because around two thirds of organic matter added to agricultural soils will be decomposed by soil organisms and plants and given back to the atmosphere, in order to add permanently 27 tonnes, a total of 81 tonnes of organic matter per hectare would be needed. This cannot be done quickly or it just washes or evaporates away. A slow process is required (Bates, 2010).

A farm that switches to organic, animal powered no-tillage methods can sequester 1 to 4 tonnes of organic matter per acre per year. By employing perennial polycultures, rotated pastures of grazing animals, trees and wild plant strips, that amount can be doubled or tripled (Sacks, et al., 2015).

If the recuperation of soil carbon became a central goal of agricultural policies worldwide, it would be possible and reasonable to set as an initial goal the sequestration of one half ton per acre-year (1.5 t/ha-y). As soil conditions improve, erosion and pests decline and the land comes back into balance, that target goal could be increased. Farming this way globally could sequester about 8 percent of the current total annual human-made emissions of 10 petagrams of carbon (PgC). However, the fertility gains (equivalent to more than all of current global fertilizer production) would mean that chemical fertilizers could be (and should be) eliminated where carbon farming is practiced. By reducing emissions of nitrous oxide from fertilizer (equivalent to approximately 8 percent annual human-made greenhouse gases) and the transportation and energy impacts of fertilizer production, we shave another 1 percent off global emissions.

Moreover, if organic waste is returned to agricultural soils in the form of compost, then methane and CO_2 emissions from its current destinations to landfills and wastewater (equivalent to 3.6 percent of man-made emissions) could be significantly reduced. Even a modest start, such as by elevating the soil carbon content of existing farmed soils by 0.4 percent, would have the potential to offset global greenhouse gas emissions by approximately 20 percent per year.

After 10 years, we can increase progressively the reincorporation of organic matter into soils. By mid-21st century, we could increase the total world reservoir of carbon in the soil by two percentage points, and possibly more. In this way it is conceivable to restore our soil carbon reservoir to 10 percent and even to re-green and reforest equatorial deserts.

Application of Biochar to Soils

All of this, as hopeful as it is, pales in comparison to the advances in our knowledge of “recalcitrant” carbon. As I described in The Biochar Solution (Bates, 2010), physicists like to call the hard form of carbon, whether tarry from low temperature pyrolysis or tar-free from high temperature or pressurized burns, “recalcitrant” because it does not want to bond with anything else, and is quite happy keeping to itself (Lehmann and Joseph, 2006).

The usual form of carbon molecules found in biological systems is termed “labile” because it is much more active, and easily attaches to other organic molecular chains in solid, liquid, and gaseous forms. Plants and animals, ourselves included, need labile carbon to form the building blocks of cellular tissue, including the DNA nucleoprotein helices in all organic living things. But, as there is more than enough labile carbon floating around now to meet the needs of biological systems, what if we could change some of that excess labile carbon into recalcitrant carbon?

At this point it is almost like leaving the world of modern science and entering a world of alchemy. When organic material is burned in the absence of oxygen it is transformed. Instead of going to smoke particulates and ash, the carbon is left behind as a hard, porous wafer that is recalcitrant. It has strong cation exchange capability, meaning that soil nutrients cling to its surface and can be dispensed to plant roots on demand. It has large surface area, providing both a home for microbial life and the ability to soak up and release moisture. These features endear it to organic gardeners who have begun to call this product “biochar.”

Biochar is not new. It is the foundation of the terra preta soils – the dark earths – of the equatorial tropics in the Western Hemisphere. Archaeologists have established that these soils are anthropogenic, going back 8000 years BP and continuing to be produced up until the Columbian Encounter. In areas of the planet that should be deserts, with soils too sterile for

foresting, we instead find dense rainforests and metre-deep topsoil. All of that is explained by anthropogenic biochar – *terra preta do indio* – "the dark earths of the Indians" (Woods, 2008). The oldest known and longest lasting non-anthropogenic (perfectly preserved) biochar goes back to the evolution of the first forests 420 million years ago and becoming more common after 350 million years (Scott and Glasspool, 2006).

When lignous biomass is pyrolized, heat is produced. This heat can be easily harnessed to provide electricity or motive power, as can a portion of the volatile gases. Pyrolysis is very efficient compared to oxidation, and making biochar with a permaculture intention provides multiple services – fuels, heating and cooling, fertilizers, feeds, air and water filtration, and carbon sequestration on millennial time scales. Applying permaculture design to the entire fuel cycle enables identification and manifestation of the potentials: arresting erosion, combating desertification, enhancing biodiversity, managing heavy rainfall events, capturing leaf protein, eliminating wastes, reducing transportation, cleaning sick buildings, improving livestock health and sanitation, providing healthy livelihoods and rewilding the landscape (Schmidt, 2014).

Ecovillages as Dissemination Vehicles

The challenge of scaling up is not one of *how* but one of *if*. Can we take these new developments to scale, quickly, or are there cultural inertias at play that will impede us beyond the point at which climate warming momentum can no longer be arrested? Home gardeners will not, by themselves, stop climate change.

At the launch of the *Stern Review*, Sir Nicholas Stern described climate change as "the greatest market failure the world has seen" (Stern, 2006). It is also arguably the greatest leadership failure in the history of human civilization. A 2009 study by the United Nations University Center on International Cooperation concluded that the institutions that have been tasked with confronting climate change are completely inadequate for the task. UN policymaking architecture is a wishful but unrealizable process of multilateral consensus, one that is all too often characterized by incoherent goals, fragmented implementation, and unreliability over the long time periods in which consistent and sustained effort will be needed (Evans and Steven, 2009, Walker, 2009).

What is required is not a small ask. It is no less than a fundamental redesign of the built environment that I have termed "Civilization 2.0" (Bates, 2011). For the past two decades the Global Ecovillage Network (GEN) has been supporting the development of experimental vessels called ecovillages, "fully-featured human settlements" (Gilman and Gilman, 1991) that prototype ways and means to prepare the built environment for an uncertain but perilous transition. One of the primary challenges is to show more palatable alternatives to Draconian emissions reductions and the social friction they may engender (Bates, 2015).

> *"Life-rich systems are the shock absorbers in the car, taking out the bounces, they allow for points of balance to be restored after massive fluctuations, such as hurricanes and cyclones and other natural catastrophes."*
>
> ***Geoff Lawton***

> *"Our initial action should be to stabilise our systems, only then can we convert these systems into reliable, consistent and permanent resources possessing true and useful value."*
>
> ***Geoff Lawton***

Ecovillages as Dissemination Vehicles

In his book, *The Tipping Point: How Small Things Make a Difference*, Malcolm Gladwell suggests that social movements behave much the same way as epidemics do (Gladwell, 2000). Gladwell points to three elements that cause epidemics to spread, and says that these same elements are fundamental to any large-scale social change. They are:

The Law of the Few — some people spread disease (and ideas) better than others.

The Stickiness Factor — the potency of viruses (or ideas and actions) can become universal. Ideas and actions to reverse climate change need to continue evolving and draw in people from around the world. The greater context of our climate dilemma suggests that if a favorable human tipping point is to occur, it needs to be able to cross cultures, genders, age groups, and races. It will need to be sticky across all those differences.

The Power of Context — the conditions under which the change is considered tend to either reinforce the change or thwart its spread. Commitment is not enough. The committed have to act, and share their commitment with others.

If a cultural tipping point is required, the tools most associated with cultural evolution should be employed. These include artistic movements (visual arts, performance, music, etc.), fashion (attraction to styles), and celebrity endorsements, among others. Humans evolved as herd animals, and we constantly signal to each other our affiliations, tastes and choices. Tapping into this natural process allows memes to propagate more quickly, when stickiness and context cohere.

An example of "cool" branding is provided by the pilot Carbon Minus Project in Kameoka City, Kyoto Prefecture, Japan. A rural farmers' cooperative, concerned about the overgrowth of bamboo that was destroying *satoyama* (managed forestlands) began producing bamboo biochar to amend their soils. Using "Cool Vege" brand to denote the benefit of carbon sequestration, the cooperative was very successful in marketing their produce to climate-conscious consumers (McGreevy and Shibata, 2010). There is no reason that the "cool" brand could not also be extended to any product or service that net sequesters. It is a sticky meme.

The permaculture movement has graduated from designing at the home, urban neighbourhood and farm scale and begun designing at a regional planning scale, integrating master plans for human developments involving multiple settlements, agriculture, forests and bodies of water, with their connecting infrastructures and commerce, and industrial activities that are socially responsible. Permaculture is providing large-scale ecological restoration that preserves biodiversity while offering human settlements that are convivial, enjoyable places to work and live.

One example, now being replicated by ecovillages in several countries, comes from The Farm ecovillage in Summertown, Tennessee. Since 2009, The Farm has been producing biochar from bamboo and applying it to gardens, orchards and pastureland by use of a Yeomans' Keyline® plough. As the plough passes through a pasture or orchard it raises but does not turn over or mix the layers of the soil profile. Cured biochar is slurried in a freshly grown solution of beneficial microorganisms piped from tanks mounted above the plough. The slurry is directed down the shanks and released at the shovel tips as the plough travels, thereby preparing the root zone of the field or orchard for redoubled vegetative growth. The technique has proven to be effective in mitigating severe drought.

Ecovillages have begun to capture the popular imagination and to attract a larger following, but they are still a very small change compared to what is needed. GEN estimates some 2 million people worldwide now reside in ecovillages, less than one-tenth of one percent of humanity. A majority of the remainder, particularly in populous countries like China, India and Indonesia, are still in an accelerating process becoming 20th Century-style consumers, carbon footprint notwithstanding.

Taken to scale, using all the tools in the permaculture kit – biochar, keyline design and management, remineralization, holistic pasture management (mob grazing), compost tea, aerobic composting, integrated aquaponics and waste remediation, animal drawn organic no-till, ecoagroforestry and edible landscaping

“permafuels” for transportation, heating and cooling – we could sequester 120 to 200 percent of the current total annual human-made emissions carbon emissions and begin seeing annual declines rather than annual increases in atmospheric concentrations of greenhouse gases (Bates, 2010, 2015, Goreau, 2015). It is not a full solution. It does not absolve us of our duty to protect peatlands and rainforests, end fossil fuel subsidies, or engage in serious efforts to curtail population growth, but it does immediately take us beyond zero – to net sequestration – and to begin undoing the damage we have done to Earth’s atmosphere.

We have shown we can sequester carbon at a profit even within the current industrial growth paradigm, whether or not that paradigm continues or fails under the weight of its own impossible goals (McGreevy and Shibata, 2010). We can, taking permaculture design to scale, restore the atmosphere and oceans to pre-Anthropocene balances and buy ourselves time for the transformative work that remains.

There are many possible routes that these steps can take and they are not mutually exclusive. Before petrocollapse or ponzicollapse, we can install CPOs – Chief Permaculture Officers – in both large and small firms working in any of these fields – biomass, food, fertilizer, energy, waste management. Everything is food for something, and the first step in recapturing waste is to assign it value. The opposite is also possible, which is to re-inhabit remnant sanctuaries (areas bypassed by development) and secure them from all types of commercial enterprise, setting aside nature preserves protected by indigenous ecovillages. In the first case you redesign businesses to become more resilient by closing the cycle of resource extraction, use and return and by embodying cultural sensitivity, and in the second you simply disappear your culture into the fabric of the forest and become virtually invisible, quietly restoring the Pre-Anthopocene climate as nothing out of the normal for you. There will be people who incline towards either of those. Even if it is too late, there is no possible way to spend our remaining time in more enjoyable activity.

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Community Drought Solutions – Building Resilience and Abundance Through a Holistic Design Approach

Jeremiah Kidd

We are in an age of uncertainty, with all the information and technology at our fingertips we yet know so little about the sources of our food and the sustainability of its production. This is at least partly due to our distance from our food and the uncertainty of our changing climate. We do know that our world is getting warmer and that for the first time in our history as Homo sapiens we are a large part of that pattern. What we don't know is what this warming will mean for our overall, and specific, weather patterns. Experts say some regions will become wetter and many others more arid, and that the extremes will become more extreme. The amount of water on Earth is a fixed quantity, and the amount of freshwater is 2%-3% of that overall water. This 2-3% includes the world's glaciers and ice as well, leaving about 0.04% as accessible fresh water for human use. Fresh water is a vital, finite and limited resource. As the world's population continues to grow it is essential that we become increasingly efficient with how we use and manage our freshwater supplies. By slowing storm water down as it moves through the landscape, infiltrating it into the ground to percolate towards rivers and lakes, and matching its use to its quality, society becomes better and more efficient stewards of our planet's fresh water supply. As populations

Permaculture perennial polyculture landscape in Santa Fe, NM USA irrigated by grey water and collected rain water. Photo by J. Kidd

increasingly migrate to areas with warmer and drier weather there is an exponential stress on fresh water supplies and more limitations on the use of that water for irrigation and food production. There is a growing trend in western countries where people want to know where their food is coming from, to increase their health while decreasing the miles food travels to get to their table, and even to produce their own food. Many people see these things as being an increase in quality of life.

So how can we merge our desire to produce our own food while mitigating the effects of uncertain weather patterns to provide resilience and abundance for our families and communities? In this article I offer five key strategies to do just that.

Rain Gardens and Passive Water Harvesting

We cannot control droughts on a community level, but at the same time do not need to increase desertification by draining arid landscapes of storm water. The approach of civil engineering in the management of storm water in development and infrastructure projects typically focuses on moving storm water out of and away from developments as quickly as possible. This approach to storm water management leads to the unintentional design of desertification in communities and watersheds. In arid environments this design pattern is even more catastrophic than in others. In addition to wringing out all of the water in the sponge below our feet (the landscape), decreased soil moisture, along with increases in the amount of storm water run off and its velocity, creates major issues with erosion and soil loss. While it is true that infiltrating large quantities of storm water within 3 metres of residential structures is not recommended for the longevity of the buildings, why not infiltrate this water into the soil, at a safe distance from the structures, to reduce the volume of storm water entering treatment facilities and slow the speed at which it moves, passing it through the soil sponge on its way to the river? This slowing and spreading of storm water also reduces the risk and amount of flooding down stream.

Providing potable water has a huge economic and energy cost; in my community of Santa Fe, New Mexico, almost half of the city's energy cost is allotted to the production of potable water and the treatment of wastewater. The energy required for the pumping, storage and treatment of water is huge, not to mention the chemicals involved and their production costs. By simply designing the grading so that water pools in areas used for planting, we have the positive effects of increasing biomass in the area and reducing the demand on municipal water systems to provide additional potable water for irrigation and reducing the amount of water entering treatment facilities. This technique is as effective on the scale of a single household as it is at the community or municipal level, as in Tucson, Arizona in the USA. A shift in the design of impermeable surfaces of the built environment towards the use of storm water as a resource for the irrigation of street trees and landscape plants, moves us away from desertification by design and towards a more abundant future.

Active Water Harvesting

Portland, Oregon is known for being wet and lush; I grew up there but now live in Santa Fe, New Mexico, a community known for its arid climate with half the annual precipitation of Portland. These differences sound extreme but consider this; if I can harvest 3,000 square feet (278.7 square meters) of rainwater from the collective impermeable surfaces of my home, and infiltrate the same area of productive growing space, I am basically providing this growing space in the arid southwest with the same quantity of water as would have fallen on an equal sized plot of land in Portland. This water harvesting strategy greatly expands the possibilities of what can be grown in the southwest without the expense of additional irrigation supplies. Collecting and storing rainwater can help ensure water security as well as reduce the demand on water wells or municipal water systems.

Rainwater is basically distilled quality water as it falls from the sky, and with well-designed collection and filtration systems this water can remain clean and provide domestic water for dwellings as well as irrigation water for the landscape. The demand for active water harvesting systems for both potable and non-potable water use is rapidly increasing in arid regions. This increased demand is fuelled by a growing and more educated population and

can be stimulated by government incentives. In fact, the county where I live requires a rainwater harvesting system for any new construction over 2,500 square feet (232.3 square meters).

Water Reuse

According to the United States Geological Survey, 37% of the USA's potable water is used for irrigation. We could dramatically reduce the use of fresh potable water for irrigation through the use of lower quality water that has been used once for bathing or cleaning. This type of re-used water is commonly called greywater. Greywater is wastewater from sources such as showers, bathtubs, sinks, washing machines and dishwashers, that is typically fed directly into a community waste water system. Despite greywater having been used once, it is still considered clean enough to be used in the landscape without purification. Taking advantage of this greywater resource is an example of water reuse, which is another important tool in developing a sustainable water use and a food abundant world.

Greywater application in the landscape increases people's access to irrigation water and consequently increases the production of useful plants. It does so while simultaneously decreasing the demand on the planet's freshwater resources and water treatment systems. Because greywater has already been used once it can be considered free water when used a second time in the landscape.

According to the United States Environmental Protection Agency, the average American family of four uses 280 gallons (1,060 liters) of water per day for indoor use. An average of 204 gallons (772 liters) of this used water is of a quality that could be used as greywater. According to the University of California's backyard orchard guide, this is enough to irrigate an average of 12 semi-dwarf fruit or nut trees. Retrofitting existing houses to separate the greywater from the wastewater is relatively simple and can be completed by a homeowner and in most situations powered by gravity. In the American state of New Mexico, greywater systems are encouraged and a properly installed system that manages a daily production of 250 gallons (945 liters) does not require a government permit.

Non-biodegradable soaps and large amounts of biodegradable soaps are not beneficial to plants, but there are now soaps being marketed that are "bio-compatible" meaning they are biodegradable and salt free. Using biodegradable soaps or small amounts of traditional soap is usually not a critical problem, as natural rainfall also helps flush the soil of salts. Safely applying greywater to the subsurface of the landscape can have a huge beneficial effect on water availability to increase food production and self-sufficiency.

Living Soils

The most effective and economic water storage system that we have access to exists below our feet: soil. By developing landscapes to infiltrate storm water into the soil through which it slowly percolates downslope towards the nearest body of water – be it a lake, river, pond or stream – is another effective tool in creating a water efficient and abundant lifestyle.

There are various methods for increasing the water capacity of soils. We can achieve this through diversifying soil biology, applying mulches to the soil surface and increasing the soil's organic matter content – these are all prime examples of such strategies. In addition to improving the soil's ability to hold more water, these strategies also increase the availability of essential nutrients by collectively creating an environment that promotes robust plant growth and thus allowing for the production of more high quality produce.

The primary activity of all living organisms is to grow and reproduce. Through various processes, symbiotic organisms give and take, share and receive by-products from each other, which allows the process of growth and reproduction to continue. The living soil ecosystem includes bacteria, algae, fungi, protozoa, nematodes, arthropods and larger earthworms, insects and plants. This soil community works together to decompose complex materials and convert them into the essential nutrients that all plants, animals and humans depend on for survival while simultaneously supporting the sequestration of carbon. Healthy soils produce healthy plants. Healthy plants produce healthy animals. Healthy plants and animals produce healthy humans.

Actively increasing the health and diversity of soil life by adding mulch, mycorrhizal inoculant and activated compost teas will increase the humus and organic matter in the soil. This increase in organic matter then assists in the management of water, allowing for increased infiltration while also aiding in the purification of water in the process.

Multi-Function Perennial Polycultures

Creating a more abundant and resilient future for ourselves and our community will force us to move away from beauty being our landscape's sole function. Incorporating into the landscape the concept of stacking functions, where each element of the landscape provides more than one service, creates more cohesive and productive landscapes than those that are designed to be merely beautiful. Why not ask more from our surroundings and create landscapes that can provide food for our community and animals? Landscapes that provide habitat and forage for bees and other pollinators? Why not do all of these things to create healthy and productive landscapes that are also beautiful? To overlook the importance of multi-functional perennial polyculture landscapes is to miss an amazing opportunity to create more resilient communities. Multi-purpose perennial polycultures should be an integral part of a resilient design.

The plant varieties we select for the landscape should be chosen with this concept of multi-functionality and polyculture in mind. We should consider how each plant can and will fill specific niches in the overall landscape, how each plant will beneficially interact with the others, and what services they will provide to people, to wildlife and to the natural environment. Nitrogen fixing plants can be placed to provide nitrogen for their nitrogen hungry neighbours. Pollinator-dependent trees and shrubs can be surrounded by nectary and flower heavy varieties to attract bees and other pollinators. Growing a diverse perennial polycultural landscape can provide a plethora of benefits to the natural world but to people as well. Such landscapes are also rich sources of fruits, fibre, nuts, roots and berries, which can and will increase our nutrition and food security levels.

Holistic Community Design

A holistic design approach, as in Permaculture, focuses on the relationship of these strategies and how they are much stronger and productive when incorporated together. Installing a rainwater harvesting system on its own to provide irrigation to a lawn will most likely not pay off economically, yet if it's also a backup for a potable water system, contributes to the development of healthy and rich soils that then collectively support an edible forest garden that produces nutrient dense foods, then the value of that water harvesting system increases exponentially. We must, as individuals as well as a community, advocate and influence local and national governments to implement these strategies on a larger scale, or at least implore them not to inhibit these practices. What is the value of collecting your own food from your garden and sharing the surplus with your neighbours? In a world facing so many serious issues that are broadcast by the media 24 hours a day, these things are priceless, and focus on the solutions and positive actions we can take to increase our quality of life.

> *"In extreme climates and landscapes, water is the priority in design."*
>
> ***Geoff Lawton***

> *"Designed life systems that harvest, pacify and allow access to ample clean water, all while providing for our needs, is the ultimate indicator of our ability and intelligence."*
>
> ***Geoff Lawton***

Biodiversity, productivity, and scale in resilient food production systems

Naomi van der Velden

Whilst large-scale monocultures have presented economic solutions to food production, it is clear that not all costs have been factored into production, and new environmental and social challenges have been created. New agricultural systems must meet environmental and ecological objectives as well as economic ones, and work within social and cultural frameworks. An analysis of existing alternative systems aims to suggest future opportunities in our food production.

Integrated systems of food production are examined, including case studies from Nepal and the UK. These give practical counterbalance to ecological theory. Ecological literature and agricultural trials of mixed crops suggest that more diverse systems can be more productive than monocultures and with significant enhancement of ecosystem services. They may also be more profitable, and crop diversity can help to spread economic risks associated with disease, crop failure, or rejection by supermarkets. Integrated systems may include several different crops, trees, and/or animals, giving a wide range of flexible options to producers.

Simple, innovative ideas for future systems are presented, along with consideration of feasibility of implementation and related socio-economic challenges and opportunities.

Overview

This paper explores the scientific evidence on polyculture productivity and benefits, addresses barriers to uptake and considers appropriate scales of implementation. It presents work on polyculture production trials in the UK and considers how observed yield levels from these might meet European food needs. Finally, it explores the benefits of permaculture.

Multi-species food systems

The benefits of multi-species food-producing systems are no longer in doubt. Although such studies are inherently complex, there is increasing evidence that multi-species systems confer a number of benefits to growers and to the environment. Such systems are often referred to as 'polycultures', highlighting their contrast with the monocultures of industrial farming and the environmental consequences of this now widespread production approach. Benefits include greater overall productivity and profitability to growers for many mixes (Malézieux et al., 2009; Pilbeam and van der Velden in *prep*.) whilst also conferring enhanced ecosystem services, including biodiversity (Tscharntke, et al., 2005), nutrient cycling [van Noordwijk et al., 2015), soil and water conservation [Altieri, 1999; Brussaard et al., 2007], and carbon sequestration (Montagnini and Nair, 2004), and improved regulation of pests and diseases (Letourneau et al., 2011). Agricultural biodiversity is also closely linked with food security (Thrupp, 2000). This recent wave of post-monoculture interest in alternative agricultural systems belies the long history of such growing methods.

Polycultures – growing multiple species together in the same space and time are used around the world. They dominate family-scale farming, often considered 'subsistence' farming, in the tropics. Agroforestry is a form of polyculture which arose in the tropics and has spread to temperate zones and includes intercropping or more complex forest garden designs. The cottage or peasant gardens of mediaeval England are a well-known temperate example, and allotment gardens – plots of land originally designated to landless peasants to enable them to grow food (Allotment Extensions Act, 1832) – have become widespread and popular in the UK (Jones, 2009; Smith, 2011). This resurgence of interest in home scale food production is mirrored across Europe (Church et al., 2015). There is little evidence of commercial production using polycultures but also few published studies on the barriers to use amongst farmers, although some, like Lithourgidis et al. (2011), suggest issues but provide little substantive evidence for these. This leads to the question – given the apparent

advantages, why aren't they more widely used?

Scope and scale of polycultures

Informal consultation with experts in agroecology research (van der Velden, 2012), suggests some obvious answers to the lack of uptake of polycultures, and areas of focus for progressing their use. Growers of monocultures have often made significant financial investments in specialist farm equipment, particularly for harvesting, as well as time investments in learning particular techniques. Switching to alternative systems may be seen as complicated and unfamiliar, requiring specialist knowledge new experiences and skills, and further time to understand complex systems. It may be a risky proposition in a competitive market; are yields predictable for example? What is the opportunity cost? Time and resource investments made to specialise in single crop production in a larger area may be difficult to move away from once committed. Perhaps, then, it is in smaller farms that the benefits of polycultures may currently be most viable and desirable.

Data on farm sizes shows that of the 570 million farms worldwide, 84% are small (less than 2 ha), yet these cover only 12% of the total farm land (FAO 2001; FAO 2013). A large amount of farming land is therefore held by a small number of much larger farms (over 100 ha). Larger farms mainly occur in higher income countries with some in lower-middle income countries in South America (FAO 2014b). Most investment in research and development of farming techniques since the 1950s has been geared towards larger farms (Vorley et al,.2011) with the millions of small farmers receiving very little support or attention until fairly recently (FAO 2014a). Despite this major investment in mechanisation and promotion of large farm monocultures, small farms appear to be more productive when considered per unit area of land (FAO 2014a; FAO 2014b). In Bangladesh, Bolivia, Kenya, Nepal, Nicaragua, Tanzania, and Viet Nam small farms use only 20-42% of the agricultural land yet account for 52-68% of total production (FAO, 2014a) giving clear evidence that small farms are more productive, although they also tend to have higher labour inputs.

Not only are small farms more productive, they are also more diverse than larger farms. They tend to grow a variety of crops and cultivars (Altieri, 2009) and so provide greater nutritional diversity. Diversity can increase productivity - there is evidence that polycultures can yield 20-60% more than monocultures (Francis, 1986) – and can also increase resilience. Landraces (a locally adapted traditional variety of a domesticated crop) tend to be more genetically diverse than formal modern crop varieties, and thus offer harvest security (Clawson, 1985). In the Andes, for example, farmers may grow fifty different types of potato, with more diversity likely at higher altitude where there is more climate variety and hence greater risk to cope with (Altieri, 1999). Climate change is having a significant impact on crop yields. Lobell et al. (2011) suggest that the impact of climate trends on cereal production from 1980-2008 led to global declines of around 3.8% in wheat (33 MT, equivalent to France's annual production) and 2.5% in maize (23 MT, or the annual production of Mexico) with climate impacts often exceeding 10% of the rate of yield change. Needless to say, reliance on a few commercial crops with little genetic variation leaves us susceptible to further impacts of climate change.

Innovative approaches to agricultural diversity

Given the advantages of multi-species systems to the environment, and potentially to the global food supply, is there scope for increasing diversity in agricultural systems? Innovation in farming at both commercial and home scales can favour crop diversity. Technological solutions offer one route to facilitate this. Precision farming, or site specific crop management is one option for more complex systems. It uses satellite data to observe, measure, and respond to variability in crops within and between fields. Although this has largely focused on fertility and pesticide application to date, there is potential to develop individual crop planting, watering, and harvesting mechanisms using similar technology (e.g. Aronson, 2013).

Concurrently with innovation in technology, integrated farming systems are being developed and promoted as a sustainable solution. These produce a diversity of yields (food, feed, renewable energy and more) by linking all elements of the farm including ecological, environmental, social, and economic aspects.

This holistic management system seeks to minimise inputs and waste whilst maximising yields, food security, and environmental enhancement.

In home and urban environments, we are seeing many innovative growing methods that apply polycultures in order to use limited space more efficiently, as well as some legislative provision to support this. Examples include maximising the use of space on top of large buildings such as legislation passed France to ensure new commercial buildings have green roofs or solar panels (Le Figaro, 2015), and designing vertical gardens with mixed crop systems.

Polyculture production and potential – results of a trial in the UK

Drawing from this growing interest in polycultures in household food production, the Permaculture Association (Britain) and I designed a public participatory polyculture trial in 2011. We compared a low-diversity three species mix (*Psium sativum* L. cv. "Onward" (peas), *Raphanus sativus* L. cv. "Farito" (radish), and *Beta vulgaris* L. var. "Cicla" (perpetual spinach)) with a high diversity twelve species mix (adding *Allium cepa* L. var. "White Lisbon" (spring onion), *Allium cepa* L. (onion) sets, *Beta vulgaris* L. var. "Armenian", (beetroot), *Brassica oleracea* L. (kale), *Coriandrum sativum* L. var. "Leisure" (coriander), Eruca sativa L. (rocket), *Lactuca sativa* L. var. "Little Gem" (lettuce), *Phaseolus vulgaris* L. cv."Kew Blue" (runner beans), and *Tagetes patula* L. var. "French Disco" (French marigold)) (Fig 1). Seeds and growing instructions were sent to fifty UK households. Twenty six returned data. They weighed all harvests of each crop and provided information on crop quality and the effort needed to produce them.

Figure 1 Layout of the two plots for the polyculture trials. Plot sizes were adjusted to maintain seed densities

Results showed geographical variation in yields, although these did not follow expected patterns and there was no link to the better growing land in the south east and the more marginal land in the uplands of the northwest and Scotland (Fig. 2). Overall, the high diversity plot yielded a small but insignificant amount more per area (High 3.5 ± 0.6 kg m-2, Low 3.1 ± 0.6 kg m-2 ($z = 1.154$, $p = 0.130$)), and the low diversity plot yielded more when input effort was considered but this was also not statistically significant, (High 2.3 ± 0.6 kg m-2 hr-1, Low 3.4 ±1.0 kg m-2 hr-1; ($z = 1.680$, $p = 0.093$)) (Fig. 3). An important factor in this lack of difference is growth compensation; the three species common to both mixes were significantly more productive in the low mix than when combined with other species in the high diversity mix. This additional growth therefore balanced the total growth from the high diversity mix. Although there were no overall differences in productivity, the high yields obtained are an interesting result.

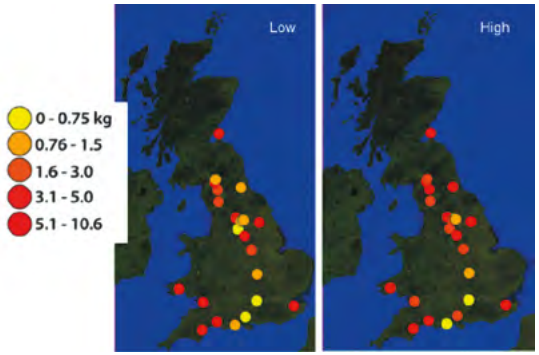

Figure 2 Productivity and distribution of plots. Values in kilograms per hectare.

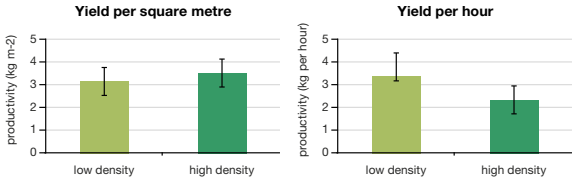

Figure 3 Comparative yields of low- and high-diversity polycultures by a) area and b) input effort

The average yield was equivalent to 35 tonnes per hectare and the maximum to 101 tonnes per hectare (van der Velden et al., 2011). In the same year, UK field vegetable yields were around 19 tonnes per hectare (DEFRA, 2012). The only available growing data at a similarly small scale was from 1948 when allotment yields were around 16 tonnes per hectare and accounted for 10% of UK food supply (Stamp, 1948). This leads to the question: how much food could currently be produced from home garden polycultures?

There are 216 million households in Europe (Eurostat, 2015) of which 15% grow some of their own food (Church et al., 2015). If these grew a 10 x 10 metre plot (100 square metres) and produced 3.5 kg per square metre, they would collectively produce 1.134 million tonnes of food, or around 4.4% of Europe's 25.797 million tonnes of tomatoes, carrots and onions[3] produced in 2014 (Eurostat, 2015). If all households were growing this way, 75.600 million tonnes would be produced. It is worth noting that these are fairly heavy crops and the production from our experimental plots favoured lighter, more expensive, crops like lettuce, peas, and beans so the overall impact could be much higher. Realistically, not every household would have the desire or skills to grow or be able to access this land but, for those that do, a significant contribution to their own vegetable consumption could be made.

Figure 4 Family farmers in Surket, Nepal 2013

Impact of permaculture on family farming in Nepal

In 2013, an investigation was made of permaculture farmers in the rural mountain region of Surkhet in Nepal (Fig. 4). Families were interviewed about their food production and implementation and about the impacts of permaculture or other growing techniques. Nepal has a high population of poor rural farmers with around 78% of the population reliant on subsistence farming for their livelihoods (Samriddhi, 2011) and 60% being unable to meet their own food needs, especially in the higher mountains (NARC, 2010). Permaculture intervention and training in this area has enabled families to diversify their crops, produce surplus to sell, and enjoy additional benefits.

Permaculture courses and training have been delivered in this area for over twenty years. These were initially led by permaculture teacher Chris Evans, from the UK, who trained (and continues to support) permaculture teachers who now deliver a wide range of courses across a large area. These provide simple but holistic design approaches and introduce new growing

[3] These are the only vegetables for which yield data is available to make this comparison.

techniques and novel plants for food and fodder. The methodology is ‘learning by doing’, and this has allowed for extensive peer-to-peer learning. Even those people we spoke to who said they weren’t practicing permaculture had gained knowledge and practices from these courses?

Most families worked around 0.5 ha of land to feed about five people, plus an ox, cow, buffalo or two, and three to five goats and chickens. They grew most of their own food and sold any surplus (especially garlic, honey, oranges, and goats) in order to purchase foods that couldn’t be produced in the mountains (e.g. rice, salt, sugar, and oil) and items that met other needs such as soap and clothes.

The main innovations brought about by training on permaculture techniques were: 1) a shift to the use of manure produced on the farm, rather than purchased chemicals which were widely advertised but expensive to buy and difficult to transport (there was a 4-6 hour walk from the nearest road); 2) growing fodder trees on their own land and stall-feeding of animals which allowed forests to recover from over-grazing and prevented soil erosion and associated damage; 3) irrigation of farmland through community schemes; 4) construction of toilet facilities which improved hygiene and health; 5) production of biogas from animal waste which provided fuel for cooking that was much cleaner to use than the traditional firewood; 6) longer and more varied crop production which improved food security.

As a result of these changes in practice, the area has seen enhancement of the surrounding environment as forests have recovered from overgrazing and soil erosion has lessened, as well as human health improvements. People have more opportunities for income generation and have reduced expenditure on farm inputs such as costly chemical fertilisers. One trainer was proud to announce that he was paying for his daughters-in-law to receive an education (this being uncommon in the existing patriarchal society). Permaculture educators are well-respected and foster innovation not only in food growing, buildings and structures, and fuel provision, but also in social change in their communities.

The role of permaculture in resilient food systems

Permaculture offers a flexible design system. It incorporates and makes available many elements and techniques; it is not restricted to mandated and rigid protocols or procedures. The ethos of learning by doing is conducive to peer-to-peer learning. It empowers as well as educates. These aspects have undoubtedly contributed to its rapid and widespread global growth over the last forty years. It is about more than just producing food; it supports lifestyle changes. These are the kinds of changes that we need if we are to create viable and sustainable systems that tackle some of the most pressing environmental challenges of our times whilst allowing more people to benefit from improved health, nutrition, education, and aspirations.

“I have a better garden every year - we all should have, shouldn’t we?”

Geoff Lawton

“A sustainable system produces more energy than it consumes and enough to maintain and repair its component parts over the life time of the system, end of story.”

Geoff Lawton

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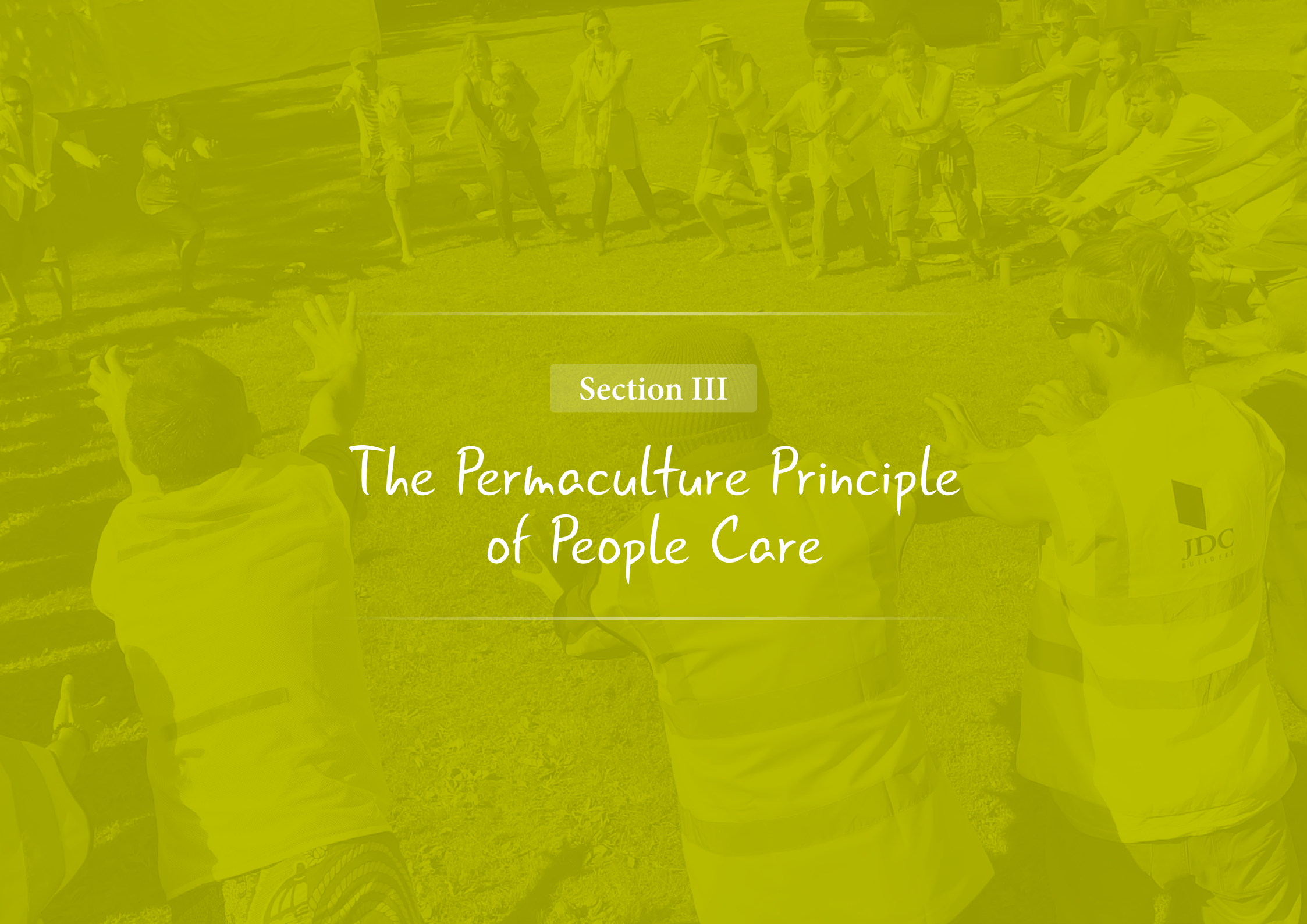

Section III

The Permaculture Principle of People Care

Designing the world we want - a Permaculture / Biodynamic perspective

Marina O'Connell

Behind the invitation to "design the world we want" is a more challenging question, "What world do we want?" The Apricot centre and the Biodynamic Land Trust (BDLT) have been working in partnership since spring 2014 addressing this question in a multi-disciplinary way, developing a new farm but also the methodology to do so.

The Biodynamic movement has explored this question in a four-fold method: How do we develop (1) a culture of freedom that enables everyone to develop and maintain their potential? How do we develop (2) a human rights based political system that respects equality and social justice, and (3) an economy that works for everyone based on mutuality whilst (4) caring sustainably for our planet? (Rehm et al 2002; Large 2010). Similarly, the Permaculture movement uses the three ethics of "Earth Care, People care and Fair shares" to inform design.

Our answer to 'Designing the World We Want' has been the creation of Huxhams Cross Farm, Dartington Totnes South Devon. (www.apricotcentre.co.uk) We are working on a small scale, and we are beginning a process that will evolve in time as we collaborate and develop the farm. This farm aims to address Earth Care namely, climate change, peak oil, the loss of biodiversity, and the rise in population. It begins to addresses the question of how to develop an economy that works for everyone, in the capital investment for farms and in the longer term in the governance of the farm. We will begin to address how people can develop and maintain their potential in a culture of freedom, or People care.

To frame it in another way is: "How can we create a farm that produces lots of high quality food, for local people, whist supporting biodiversity, that is low on its carbon usage and sequesters carbon at the same time?" All of this whilst being financially viable for the farmers, selling food at an affordable price and allowing access to diverse people to good quality food and farm based experiences.

The Apricot centre is currently based on a 1.5 ha farm in Essex, the UK, that is productive, bio-diverse, financially viable, low carbon. The centre has diversified into training, design, farm visits, education for children and therapy packages to raise further income based on the skill base of the core team. The Strap line is "Local Food, Wellbeing and Creativity"

In April 2014 the BDLT invited the Apricot centre to put in a proposal for a 34 acre site they intended to buy from the Dartington Hall Trust (DHT), and in 2015 the site was bought by over 100 share holders and the Apricot centre signed a 15 year lease. DHT are creating a "learning campus" of sustainable farming techniques with the Schumacher College at the centre. This college is internationally reknown, where people come from all over the world to study sustainable systems. The joint proposal would fit into this campus offering a unique farm on the edge of the estate. (Land Partnership Handbook, 2014)

Community buy-out of farms

The Biodynamic Land Trust's purpose is to secure farms into long-term trusteeship for farmers and communities. However, farmland prices in the UK have more than doubled in the last five years, fetching £7-12,000 an acre putting the price of the average small sized farm with a farmhouse and buildings on it out of the reach of most. The capital required for farm purchase does not make financial sense given the limited profits that can be generated from farming, especially the investment and time required to build sustainable systems of food production. One alternative is to buy 30-40 acre sized plots made up of 5-7 fields, costing somewhere between £200,000-£370,000. In order to make a living on this size of farm, there

has to be a mix of horticulture, with small-scaled agriculture producing high value produce, as well as appropriate diversification. Diversification can sometimes account for up to 80/90% of farm income.

The BDLT pioneered the farm community buy out method using a layered cake of 'community shares,' gifts and loans. The Biodynamic Land Trust is a "Community Benefit Society" and has charity at law status. To buy a farm, the BDLT offers withdrawable shares to individuals in the farm's local geographic community and nationally.

Depending on the warmth of local support and fundraising effort, the BDLT has raised from a third to 75% of the sum required to fund three small farm purchases, with the rest of the money coming from member interest free loans and from an endowment. Shares deliver no financial reward, only the knowledge that you are a "trustee" or a shareholder of a farm, and the environmental and social returns. Initially it was thought that mainly local people would invest in local farms but it turns out that national and international investors like the idea of owning a bit of a farm somewhere in the UK if the vision is clear enough.

The BDLT success formula for a community buy-out of farm land is ideally: a supportive community, an active local biodynamic group, good farmers with a viable business plan that is well located with patient vendors (Large, 2015).

Designing the Farm

Huxhams Cross Farm has been designed using a "toolkit" of methods. Permaculture design, Agroforestry and Biodynamic methods are woven together. This approach can also be called "Agroecology" and is proven to be effective in delivering sustainable food production (The Guardian, 2014).

The design methodology is based on the permaculture system of Survey, Analysis, Design Implementation and Maintain (SADIM; Fergerson, 2013). The Apricot centre developed a method of doing this "live" with the BDLT so others could see how the farm was designed. This process has been developed further to facilitate the design of the BDLTs newest farm in Stroud.

Huxhams Cross farm is designed to be a closed loop system. The site will support approximately 100 families with vegetable fruit and eggs, with some surplus for wholesale. Diversity is planned at all levels for resilience, with one hectare of "population wheat" (Woolf, 2000) with inbuilt genetic diversity to adapt to the damp Devon climate. There is sequential cropping of more than 50 varieties and types of fruit. Agroforestry rows, which will sequester carbon, mine minerals, provide windbreaks and habitat for beetles, and a more human scale farm, as well as fuel for a biomass boiler for the training centre (McAdam et al. 1999). All year round vegetables will be grown in between the rows for with a two-year clover rich ley for bee fodder and nitrogen production and building the organic matter in the soil. One hundred chickens will be fed by the wheat that we can grow on one hectare. These systems are perfect for continual supply to a CSA model direct to the consumer.

Biodiversity on the farm

20% of the farm will be given over to biodiversity and a central species rich meadow will be grazed by two Shetland cattle to maintain the mosaic sward. Within these spaces we will create specialist habitat for endangered species in the area namely Cirl bunting (RSPB, 2015) and Brown hairstreak butterfly (Butterfly conservation, 2015). These habitats will also support a hierarchy of other species below them. This also gives the Farm "points" under the new Countryside stewardship scheme giving it valuable financial support. This also engages local people to take part in bird/worm count as the scientific research aims of the farm. Ecological diversity starts with the soil upwards, if the soil is rich with bacteria and fungi it increases the beetle and worm population, which then supports bird and bees and butterflies. Biodynamic farms have been proven over long term trials at FIBL in Switzerland to support the most biodiverse soils of all the farming systems (Mader et al., 2002). The farm has been put into conversion to Biodynamic systems and the first preparations applied to the soil with volunteers in October 2015.

Wellbeing strand of work

The Farm will offer a strand of Wellbeing work. For many years the team have worked in schools creating outdoor classrooms and delivering curriculum via the garden. One member of the team is a therapist specialising in family and child psychotherapy. The range of farm activities are offered as education, recreation or therapeutic activities depending upon the need and structure of the interaction. The team believe that all children should have more time to be outdoors and experience food and nature first hand and that most children do not have enough of this in their lives, the modern term of "Nature Deficit disorder" describes our work (Louv, 2005).

Local food, wellbeing and creativity

It is proven that activity in nature enhances its outcomes (Ulrich, 1999; Pretty, 2003). The aim to site the therapeutic room on the farm is done in the belief that it will have better outcomes. The educational access to the farm currently funded by DEFRA. These activities include a Forest school, farm trail, picking cooking eating a meal, picking and making craft activities, farm tours wildlife tours, general farm work and gardening activities.

For inclusive community engagement a diversity of engagement of methods are used; great care to use inclusive mainstream language that everyone can understand. In addition, pictures and visuals, tastes of food, farm walks, meetings in village halls, conferences are also adopted.

Collaboration and team work

The Apricot team are skilled practitioners with a horticulturist, project manager and a therapist who can work in groups and off set potential conflicts. The BDLT team are skilled in legal and financial issues, company structures, share offers, negotiating sales and leases and work at a national level for support and funds. It is the ability to collaborate and work together that has made this project successful so far, and our observation that for this kind of collaboration will be more required in the future.

Opportunities

Huxhams Cross farm project has been given access to land that the Apricot centre could never have afforded and with support and mentoring to scale up their work. The BDLT is pioneering the way with this farm to create a "meme" of how to create new small farms combining permaculture design methods with the BD farming systems. The Permaculture Association UK will have a demonstration farm of which there are few in the country and this is one of their strategic aims. DHT will have a Biodynamic and Permaculture demonstration farm within their learning campus. Research wise it is an opportunity to see how the farm and land changes over the long term.

> *"Through our enhanced observation skills [with permaculture], anyone can see the very obvious cause and effect reactions in all biological systems, using climatic moderation and ecosystems species' richness as gauges. Positive feedback loops intensify beneficial effects, which is what people and the environment need."*
>
> ***Geoff Lawton***

Sample Research questions and metrics

How does the Biodiversity of the site increase over the initial three years and ten year periods?

Measured by;	Time of year/ Frequency	Method / Agency
Soil biodiversity - worm count (indicator species)	April / Sept	Field Studies Council method sheet
Soil organic content I arable and 1 permanent pasture field	April	NRM soil test
Soil fertility 1 arable and 1 permanent pasture	April	NRM soil tests
Plant survey - transepts across permanent pasture, 2 x arable fields	April Sept	Transepts across 2 fields 1 sq m plant / species count.
Hedgerow survey in depth	June	Plant identification, count, approx age
Small mammal survey	TBA	Small Mammal Society
Bird Survey (RSPB)	April /May Jan/Feb	RoyalSocietyProtectionBirds volunteers
Pictorial record of the farm development from marked photo points.	March, June, Sept, Dec	Photo points on map

Constraints

The financial constraints are such that the Apricot team need to work at least two years unfunded on the project. This is normal practice for most financially sustainable businesses and farm, the farmer has to invest in their work and intermediate cash crops. This translates into time constraints and stress. However this also makes future income by working for a few years at the start for very little. Sustaining themselves on loans, part-time the project very real and replicable.

In terms of research the farm has a set of research questions and metrics that are being collected with the aim to form a partnership with academic institutions in the future. The team perceive themselves engaged in Action Research, pioneering these methods as the project develops the project reflecting on the practice, and writing and training others.

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Building Community Resilience Through Collaborative Action: the Work of Daily Acts

Trathen Heckman

Faced with larger than life social and ecological crises, people across the planet are realizing the need both to live sustainably and for wide-scale change. While every day there are more permaculture and sustainability enthusiasts taking action to make a difference, the issues seem so daunting it can be hard to fathom our small actions having any real impact. The simple truth is, there has never been a time when our small choices have mattered more. Nonetheless, individual action alone won't get us there.

Margaret Mead said, "Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it's the only thing that ever has." [4] Building upon this insight, the authors of "Forces for Good" (Crutchfield & McLeod Grant, 2007) write "As field-wide thinking evolves and more emphasis is placed on fostering networks, understanding ecosystems, and galvanizing collective impact, local NGO's must be at the forefront of adopting these changes. …They are the vanguard of social change. It is imperative that they maximize impact."

What if the real vanguard of social change lies at the intersection of sustainability enthusiasts and engaged groups of people rooted in the wisdom of nature and community, wisdom learned and lived in homes, gardens and neighbourhoods? In Gaia's Garden, Toby Hemenway (2009) writes about a point in an ecological garden when the whole place suddenly goes pop and surges with vitality. With the right elements in place, it accumulates a richness that is able to transform sun, rain and nutrient into a thriving community of healthy plants, people and critters. By mimicking natural plant communities and accelerating nature's succession, a regenerative oasis emerges that replenishes and grows itself. The direct transmission from entering a garden like this can change lives. But can it change the world?

The Emergence and Growth of Daily Acts

About 20 years ago, I began waking to our social and environmental crises. At the time my career wasn't doing much for the planet or me, so I quit my job to follow my passion for snowboarding. Over the next few years I met people who were doing incredible work to regenerate farms, forests and communities. Not only that, they emanated this infectious sense of vitality and purpose. As I discovered first at herb symposiums and then the Bioneers' Conference, it wasn't just inspired individuals, but a vibrant ecosystem of organizations, networks and communities.

Then I walked through the gate at the Permaculture Institute of Northern California and got my mind and senses blown. It wasn't a regenerated farm or forest, it was someone's backyard transformed into a lush jungle of food, medicine and wonder. Like dry earth soaking up a quenching rain, it seeped into my pores. I instantly felt nourished by the fecundity as I was plunged into this vibrant paella of colours, textures, scents and sounds. I knew my life and our world were deficient in this sort of aliveness and that I had to somehow live and share it. What was once a water thirsty, chemical intensive lawn was now exploding with fruit, herbs and life galore, a living classroom rooted in billions of years of nature's wisdom.

A couple years later, I founded Daily Acts, a non-profit organization based on the belief that by reclaiming the power of our daily actions, we can transform our lives, our homes, gardens and neighbourhoods and that through inspired action, education and collaboration, we can create more nourishing, connected and resilient communities. It was the deep inspiration from being exposed to transformed people and places that began rewiring my sense of possibility.

[4] Attributed in Curing Nuclear Madness (1984) by Frank G. Sommers and Tana Dineen, p. 158

[5] Bioneers is an annual sustainability conference held in October in Northern California with satellite conferences occurring around the world.

Having read about a Bike Garden Tour in the Permaculture Activist magazine and remembering the impact touring such places had on me, offering tours so that people could experience the practical vision of Permaculture, felt like the perfect place for Daily Acts to start. Soon after, we added presentations, event outreach and skill-building workshops. With our core vision, programmes and partnerships in place, starting in 2008 we had a series of firsts. This began with installing the 1st permitted household greywater system in Sonoma County, and happened through reconnecting at a permaculture workshop with a friend who was a civil engineer; the relationship we had established with the city of Petaluma, and an example of a permitted greywater system at the Eco House in Berkeley California. The next year, we partnered with the city again and with permaculture designers Erik Ohlsen and Patrick Picard, mobilising 150 people over three days to install the first public food forest in northern California. This set the stage to partner with two other organizations, the city and 250 volunteers to transform the landscape around Petaluma City Hall in a day. We sheet mulched [6] 25,000 square feet of turf, installed community garden beds, rainwater catchment, and a diversity of food and medicinal plants, while also building soil and a more skilled and engaged community. The project saved the city over one million gallons of water and $60,000 in installation costs. To stack functions, the event was organised in solidarity with 350.org's [7] first International Day of Climate Action, said to be the largest mobilisation in human history.

Further inspired by Portland's Village Building Convergence, and the Gardens of Gratitude 100 Garden Challenge, a small group of organisers set an outlandish goal of planting and revitalizing 350 gardens in one weekend in Sonoma County. Seventeen weeks later, over 40 agencies, schools, churches, businesses and organisations came together to register 628 gardens. There were many amazing things about this mobilisation, from the Water Agency sponsorship to utilizing the Challenge to launch a county programme to support home food growing, to the 100 "salsa gardens" with salsa ingredients such as peppers, tomatoes and basil installed in half wine barrels at low-income apartments. Of particular influence was just what we learned in the garden by taking a holistic approach: building soil to make things flourish, in this case was community; having a beneficial diversity of plants and critters as well as all of the cross-sector partner organisations; and having a clear, compelling vision and goal that integrated growing food, saving water and building community while supporting the local economy.

One greywater system led to our involvement with one of a handful of groups that provided input into the proposed California state greywater law changes. After the law was changed, we partnered with Greywater Action[8] and the City of Petaluma to install five greywater systems in one neighbourhood over a weekend. The next year, we installed 13 systems in two days in two cities. After that, we launched the 100 Greywater System Challenge and organized what was said to be the largest greywater class in the United States. We helped foster collaboration amongst partners while installing more greywater systems, educating citizens, training installers and catalysing a bit of a laundry water revolution.

Through these efforts, we helped establish sheet mulching as a soil-building alternative to ripping out lawns and 500 years' worth of topsoil with it. Previously "turf removal", in which the lawn would often go to the landfill where it would create methane gas, was common practice in municipal rebate programmes. In this way, simple community and garden-based efforts helped shift everything from programmes and policies to landscaping norms, affecting behaviour and culture change. Sheet mulching is now a common practice promoted by cities, compost companies, and even landscape management companies. In this process we worked with several cities to launch their sheet-mulch focused lawn rebate programmes, including the City of Petaluma's *Mulch Madness programme*. This programme has already provided free resources to transform over 550 lawns. As Dave Iribarne, former Resource Conservation Specialist from the City of Petaluma said at a Daily Acts event in November 2014,

"Government is often perceived as a slow moving hurdle to change….not in my town. Not anymore. Together with Daily Acts we have engaged citizens, sheet mulched nearly one million square feet of turf saving over 23 million gallons every year through our Mulch

[6] Sheet mulching is a no-dig gardening technique that attempts to mimic natural forests' processes. In this case composting turf is used to build soil rather than remove it.
[7] 350.org is a non-profit organization working to build a climate movement [8] A non-profit organization that provides greywater education and installations

Madness program; transformed City Hall and other facilities to food forests, rain gardens, and community gardens; and installed rain water catchment systems and greywater systems throughout our city. And the transformation train is still rolling!"

As for the 350 Garden Challenge, beyond our local success the idea quickly caught on with the Victory Garden Foundation launching a similar challenge that same year. The next year, we included Home Actions, registering over 1,000 local actions and projects. Word spread and we worked with Sustainable Contra Costa, a local non-profit organization (which started as a chat in the garden while pruning and grafting fruit trees), and the Victory Garden Foundation and Transition U.S. nationally.

And the Transformation Train is Still Rolling

What started out as a goal so outlandish that we were nervous to even say it, six years later has turned into a *100 times* the number of gardens, actions and projects; each one reclaiming the power of one's actions to grow food, health and community, with many stories of transformation, both small and large. These stories included the father who was in tears because his family's Challenge action was the first time he connected with his daughters in a deeper way, or Jim and Nancy who turned their lawn into a water-wise native and edible landscape with community benches and a free library, saving tens of thousands of gallons of water and meeting more neighbours within a few months than in three decades of living in their neighbourhood, or the action at the Health Center to start a garden that is used to educate young folks vulnerable to diabetes. Churches planted rows for the hungry, community gardens were revitalised and much more.

In the summer and fall of 2015, amidst historic drought in California, we transformed more turf, saving more water in three months (2,347,500 gallons), than in six years. All of it was possible because the power of community and collaboration, rooted in nature's solutions. Activities ranged from partnering with Conservation Corps North Bay (CCNB), local agencies and the Sonoma County Youth Ecology Corps to transform 30 lawns in 30 days, saving ¾ of a million gallons of water, to collaborating with Clear Blue Commercial Real Estate and diverse partners to co-host "Mulchstock", the largest community-powered lawn transformation we know of, with three bands, and over 150 volunteers transforming 60,000 square feet of turf in a day to save 1.6 million gallons of water per year. As Cate Steane of CCNB said at our Ripple the World Breakfast in October 2015, "Some of these Corps members are homeless and most grew up in poverty, but because of Daily Acts and this collaboration, they have moved from focusing on survival to seeing themselves as part of a movement. **That is nothing short of a miracle."**

Does this mean it's all been peachy and trouble free? Is it ever when humans are involved? Over the years, we've had issues galore… all of which is fertile ground for "egosystem restory-ation", and for practicing the things that make our inner garden go pop. We do this by finding what's most important to our communities and us; managing ourselves to be and do those things; honing our vision and putting priorities first. From here we are better able to nurture collaboration and develop the trusting relationships and shared vision that can unleash the regenerative genius of nature and community.

Given the scale of challenges we face, I like to think that it's possible to change the world in a garden, or lots of gardens. That by thinking, acting and organising like a garden; small, simple efforts and small groups of people can rebuild and regrow the spirit and resilience of people and place. As we reconnect to the power of our actions and the power of community while regenerating nature, we build the skills and relationships to recreate these lush, productive and resilient landscapes. We can then apply this to how we mobilise and transform our neighbourhoods, communities, even our movements.

> *"All children and adults willing to learn can be completely fluent in this pattern language to a level of understanding that can be expressed with eloquence."*
>
> ***Geoff Lawton***

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Permaculture for Smallholder farmers: Future of food, farming system and land-use for communities in Southern Africa

John Nzira

UNICEF Generation 2030/Africa estimated that Africa will have a population of 2.4 billion people by 2050, the majority women and youth. This prediction summarises the scale of our agricultural and urbanisation challenges: to feed and shelter Africans, to create wealth for them, and to conserve resources for future generations. In this scenario, smallholder farmers in Eastern & Southern African countries are resorting to various counter strategies to meet the growing demand and to avert food and nutrition insecurity and famine. The vast majority of smallholders live in rural areas, although there is also an increase in urban and peri-urban areas. Women play a crucial role within the smallholder system and are commonly responsible for the production of food crops, especially where the farming system includes both food and cash crops. Smallholder farmers' land size vary from as small as 10m2 to 10000m2 in urban and peri-urban areas, whilst in rural areas it varies from 49002 to 50 000m2. The urban areas are mostly irrigated fields throughout the year, whilst in rural areas most fields are dry land and rain fed. Smallholder farmers aim to provide their own food, income, vital goods and services, promote rural development, create employment and accept their responsibilities as a custodian of the ecosystem. Hence they engage in understanding and respecting ecosystem services as the pillar to support on farm or off farm abundant food production. Ecosystem services are including the ecological cycles (nutrient, water, etc) soil formation, plants, water etc. On farm, they integrate modern and traditional / indigenous crop farming, fruit production, market gardening or small livestock, poultry, fish, forest, insects or bee production, that are all enhanced by ecosystem services. Off farm, farmers engage in diversification from other farms in neighbouring communities. Non-farm activity entails the household's farmers or individuals engaging in non-agricultural or farming activities, which include carpentry, basket making, vending etc. For smallholder famers, this self-reliant system has no specific name and it doesn't matter what activities are practiced as long there is diverse food and enough food for families, sharing locally and produced in harmony with nature.

Based on modern theories, this could be called a regenerative system. The regenerative system describes a process that restores, renews or revitalizes its own sources of energy and materials, creating sustainable systems that integrate the needs of society with the integrity of nature.

Regenerative is intertwined by what Bill Mollison, who defined Permaculture, as the conscious design and maintenance of agriculturally productive ecosystems, which have the diversity, stability and resilience of natural ecosystems (Mollison, 1991). The definition and practice of permaculture links very well with the Southern African way of living in harmony with the ecosystem. The smallholder farmers in Southern African survival systems have been sustaining societies for thousands of years, but the introduction of industrial agriculture or the so-called Green Revolution, after the Second World War, increased habits of various technologies such as the use of pesticides, herbicides, and fertilizers as well as hybrid seeds, all of which seem to have disturbed the system. However, organisations in Sothern Africa who are applying a permaculture design approach have positively influenced the lives of smallholder farmers, schools and through lobbying the government.

Ukuvuna Urban Farming was founded in 2005 to establish a permaculture farm and to engage smallholder farmers with environmental awareness towards permaculture food production systems. Ukuvuna believes smallholder farmers are the true medium of change and should take responsibility for

designing systems that feed themselves and caring for the environment, which is key to healthy, fulfilling and happy sustainable living in these unpredictable and volatile times. Ukuvuna Farm, located in the municipality of Midrand in Gauteng, the most urbanized province in South Africa (96% urban population), is an innovative, educational outdoor laboratory demonstrating sustainable solutions to permaculture food production.

We're just now starting to feel the negative environmental effects of over 60 years of industrial farming in the form of heavily depleted water reserves, reduced biodiversity and degraded soil qualities (due to mono-cropping), the accumulation of toxic pesticides in ground and surface waters, and the runoff of synthetic fertilizers into rivers and ultimately estuaries. In our daily duties of working with indigenous, elderly smallholder farmers in Southern Africa, we learn a lot about rapid environmental degradation, droughts, desertification and climate change. These farmers shared with us that environmental degradation escalated from the 70s and is a concern for the future. This period linked very well with the introduction of the Green Revolution in Africa, in the 60s. This seems to have pushed out our relationship with nature; now smallholder farmers adhere to the uncontrolled cutting down of indigenous trees and as a result we experience bare fields, soil erosion, endangered wild animals, climate change, fragmented ecosystems and increased pollution etc.

Industrial agriculture fails to understand the dynamics and diverse systems of the indigenous people of Southern Africa.

In Southern Africa we used to live with wild animals, hunting, gathering roots and wild fruits, but technology never integrated its approach to our way of life. Instead, with this industrial approach, government institutions and corporates pressurized the smallholder farmers with expensive synthetic external agricultural inputs, like seeds and fertilizers. Some of the seeds and fertilizers are distributed freely to smallholder farmers around election dates in order to buy votes. The most freely distributed seeds in rural communities in South Africa are maize which is the staple food in the Southern Africa region. According to Andrea Teagled (2015), between 70% and 80% of maize is consumed in South Africa and it is the only country in the world whose staple is primarily genetically modified.

In my perception this indicates that seed laws in South Africa are forcing farmers to plant genetically modified and patented seed, while ensuring dependence on foreign seed imports, pesticides, fertilizers and other synthetic chemicals. As a result, our indigenous resources become endangered and then extinct. As smallholder farmers we are not protected by government laws, but in South Africa we have the Human Rights Commission (SAHRC). According to FAO, Rome (2011), SAHRC is an independent and impartial body mandated to develop an awareness of human rights among the population, make recommendations to organs of state on the implementation of human rights, investigate complaints of violations and seek appropriate redress, and monitor the progressive realization of economic and social rights by the state.

Ukuvuna supports the human right movement, in South Africa we work with the African Centre for Biosafety (ACB). ACB is a Non-Governmental Organisation (NGO) based in South Africa and works in the Southern African Community (SADC) states. It campaigns against genetic engineering, privatization, industrialization and corporate control of Africa's food systems and the commodification of nature and knowledge. It supports efforts towards food systems that are equitable and ecologically sustainable, built upon the principles of food sovereignty, agro-ecology and permaculture. The ACB provides research, policy, analysis, advocacy and knowledge sharing with smallholder farmers.

The concept note of the SAHRC, Department of Agriculture Forestry and Fisheries (DAFF), indicated that one of the challenges presented in achieving the Right to Food in South Africa is the issue of ownership of seeds. Only four companies own the seeds that are sold to farmers. Therefore, farmers have to buy their seeds each year from these corporations, being pushed further into poverty. These companies are Pioneer Hi-Bred, Pannar, Klein Karoo Seed and Monsanto SA. Monsanto is taken to be the largest maize seed company in the country by sales. Therefore, our local, native seed varieties

are eroded in exchange for an unaffordable farming system based on genetically modified products. Some local variety seeds that are cultivated near GMO farmers are polluted by GMOs crops through cross-pollination and they lose the vigour to resist pest or drought. The end product of the farmers' crops is polluted and this violates human rights. The fear is that if the local variety seed is polluted there is no chance of recovery, hence it is endangered and eventually extinct. Therefore, the lack of diversity in imported varieties means that hundreds of years of local agricultural development is being eradicated in exchange for an unaffordable farming system based on genetically modified products.

Programs like the Seed and Knowledge Initiative (SKI) fight back at private companies who promote and donate external agricultural inputs to smallholder farmers in the SADC region. They focus on building on past and on-going joint activities with long-term collaborations around seeds and knowledge. The primary aim of the SKI is to revive and enhance traditional seeds and knowledge systems and to deepen understanding about their functioning, in the context of supportive agricultural, cultural and ecological practices. The programme is a synergistic relationship between Biowatch South Africa, The Mupo Foundation and the NRF Bio-economy Research Chair and Environmental Evaluation Unit (EEU) at the University of Cape Town (UCT). Ukuvuna urban farming plays a social transformation role with smallholder farmers in partnership with SKI actors.

Land grab and land tenure in Southern Africa are another challenge. In 2007 to 2009, Ukuvuna worked in Mozambique in Nampula Province with Cooperation Canada Mozambique (COCAMO), and learned that in Mozambique nobody can actually buy land, as the government owns the land. The government has the right to give or lend land to anyone on a lease agreement of 50 – 100 years. This system favours multinational companies with greater buying power than local farmers and smallholder farmers. However, indigenous smallholder farmers do not own land, they have no title deeds and therefore they are victims of land grabs whereby they are forcibly removed. There are no policy commitments to protect peasants and pastoralists from the growing number of land grabs taking place. There have been hundreds of conflicts – some of them violent – between marginalised peasant communities and powerful foreign companies over access to Africa's lands and water for agriculture. The voice of the smallholder farmers is not heard; the rights of the smallholder farmers are violated.

La Via Campesina is an international movement with a constituency of the world's largest grouping of smallholders and farmers, representing about 200 million farmers worldwide. It comprises about 150 local and national organizations in 70 countries from Africa, Asia, Europe and Latin America. It has a long track record of lobbying and working in the global institutional spaces of the United Nations to fight for, propose and defend policies and positions in favour of smallholder-based sustainable agriculture and fisheries and food sovereignty. Despite the strength and spread of La Via Campesina, land grab by politicians and private companies in partnership with heads of states in Africa is still going on. Currently La Via Campasina's secretariat is hosted in Zimbabwe with Zimbabwe Smallholder Farmers Forum (ZIMSOFF). Ukuvuna's off-spring community based organisation called Dzvairo Organic Farmers Association (DOFA) is in partnership with ZIMSOFF on issues of reviving local variety seeds and awareness on climate change. Ukuvuna is in solidarity with La Via Campesina movement in Zimbabwe and worldwide.

Ukuvuna's permaculture model farm in Johannesburg, South Africa is a node for sustainable food systems (e.g. edible insects, fruits, vegetables, renewable energy systems, on-going water supply, water and soil management system and micro savings) and this can be replicated in any settlement, as long there is fair resource distribution and willing farmers. A permaculture approach to agriculture weaves people with the landscape; at Ukuvuna, cultural biodiversity is encouraged through intergenerational knowledge transfer between elders and children. The relationship between land, food, culture and biodiversity emerges through identifying local, traditional seed varieties and conserving them by sharing and replanting, focusing on strategies for a regenerative future.

We promote permaculture in urban areas, encourage city dwellers to grow their own vegetables in containers or available open

spaces, harvest rainwater, plant fruit & shade trees, and manage waste. As people of diverse indigenous backgrounds come together in cities, they maintain their cultures through the foods they plant and the traditional dishes they prepare. Indigenous people bring their agro-biodiversity and ethno-botanical knowledge to cities; urban gardens preserve crop and cultural diversity (Galluzzi et al., 2010).

We support urban communal gardens. They are an emergent feature in South Africa; some self-organised community gardeners reclaim and reuse land for gardening activities in order to eradicate the effects of degraded land becoming a hub of crime and illegal activities in the neighbourhood, such as Soweto Mountain of Hope in Johannesburg (Shava & Mentoor 2014). Small livestock like domestic fowl, rabbits, and guinea pigs are part of many backyard gardens to enhance diets and provide income; cattle, goats and donkeys often graze on undeveloped land. Smallholder farmers tend to develop diversified food systems (permaculture) around their farms for extra nutrition, mitigating hunger, enhancing cash flow and addressing environmental challenges.

We also work with schools and colleges to encourage competitions to promote “green” schools and environmental education, resulting in hundreds of urban and rural food gardens and thousands of trees planted in schools to enrich environmental education. Ukuvuna’s tree planting school programme focuses on trees as a symbol of life; educators and learners find that trees provide shade, fruit, nuts, medicine and habitat, prevent erosion, clean the air and water, and mitigate and adapt to climate change. Composting and household waste management are integral to the environmental education programme, and engage unemployed parents in participating in permaculture gardening and school greening activities. Apart from working in South Africa, Ukuvuna acknowledges and supports the work of other organizations who are working in Southern Africa.

In Southern Africa, the Regional Schools and Colleges Permaculture (ReSCOPE) Programme is an example of an organisation that also works with Ukuvuna on an ad hoc basis and it encourages schools to establish their own food systems through a process called Integrated Land-Use Design (ILUD). ILUD adapted its approach from permaculture design systems. ReSCOPE was established to promote the sharing of experiences by partners who are committed to assisting schools and colleges to demonstrate sustainable land use with a view of enhancing healthy environments in and out of school. Currently Re-SCOPE is working in over six (6) countries in Southern Africa.

The future is to create both healthy environments and human beings by enabling farms to make the transition to sustainable production systems. A more sustainable food system would involve closer connections between producer and consumer, meaning more direct marketing of foods to local consumers e.g. through farmers’ markets, food fairs, community-supported food systems, farmer cooperatives, creating a stable economy etc. These localized marketing strategies and platforms mean shorter distances from the farm to the dinner plate and therefore less energy use. Localised network platforms help to create free dialogue between farmers and civil society organisation, helping to connect farmers to farmers and farmers to organisations. The system can be similar to Local Exchange Trading Systems (LETS), non-profit exchange networks in which all kind of goods and services can be traded or shared without the need for money. Ukuvuna is in dialogue and free exchange of ideas with the Zimbabwe Traditional and Organic Food Forum. The forum shares issues on traditional food and seeds, issues about GMOs, and workshops and training in the region. Further in South Africa, Ukuvuna is a stakeholder to Co-operative and Policy Alternative Centre (COPAC) initiatives. COPAC has the ambition to contribute, through a bottom-up practice, to reconstruction and development in post-apartheid South Africa. It has thus orientated itself to build capacity amongst poor communities to achieve self-reliant, collectively driven, sustainable, economically independent and participatory development.

Ukuvuna envisage to lobby the South African government to invest in sustainable development in rural areas and to prioritize the needs of smallholder food producers, including women, indigenous peoples, peasants and the rural poor. Systems should commit to increasing support for participatory approaches to farmer-to-farmer training, and participatory extension programmes.

There is a need for the academics and farmers to partner in research to develop new approaches that reward farmers for ecosystem services that also foster sustainability and address poverty by enabling smallholder farmers to break the subsistence cycle and include women farmers in these approaches. Permaculture design systems are the future food system that nourish all people, smallholder farmers and communities, both today and in the future, with healthy, diverse and culturally appropriate food that respects animal welfare and the integrity of natural ecosystems at both the local and global level.

"The core requirements of true prosperity are an abundance of clean air and water, and an abundance of clean, nutritious food. With these fundamentals in place we can continue on to create an abundance of sensible, passive, low energy design housing, then we provide an abundantly supportive community, unified in action by permaculture ethics, which will create the ultimate evolution in humanity's potential. The revolution is no longer disguised as gardening, but obvious sedition and people power."

Geoff Lawton

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A Portrait of a Chaordic Organisation: providing the space for the unexpected, the uncomfortable and the truly new

Katy Fox

Introducing the Centre for Ecological Learning Luxembourg

The Centre for Ecological Learning Luxembourg (CELL) is a national and regional hub for permaculture and Transition.[9] It was designed by myself, the author, and has been legally structured as a non-profit organisation since late 2010, and was launched in January 2011. CELL operates as a commons, i.e. it is accessible as a cultural and material resource to all members of society, and also supports the establishment of new organisations for the creation and management of common pool resources.[10] Its members work collaboratively to elaborate an initial mission based on permaculture ethics and principles, and to devise operations that can support learning of the type necessary for constructive responses to climate change adaptation challenges. Its governance employs Sociocracy, an established social technology for self-organisation, distributed authority and inclusive decision-making.[11] Ethics of inclusion and equality are designed into processes at all levels, including founding documents, strategy, meetings and trainings, using methods that enable meaningful participation and expression of creativity. Relationships with related organisations are cooperative in nature, employing an ecological model in which each helps create conditions for the success of others. Internal financial redistribution, systems support, ongoing learning and skills development, along with documentation and sharing of knowledge and skills is undertaken to ensure continual improvement in practices. CELL is currently developing a design and consultancy service as an income-generating regenerative enterprise, with financial surpluses to be redistributed through its organisational ecology towards citizen groups whose activities are non-remunerative. In this way, it cultivates conditions for the emergence of a constellation of organisations with diverse legal forms that pursue different specific objectives within a common aim of supporting citizen-led responses to climate change that promote societal and environmental health.

CELL is a learning organisation, within which rapid and regular feedback loops are in place to go from action to reflection in a spiral of improvement. Double-loop learning (see Figure 1) enables transformational learning, which is its mission. CELL uses permaculture, transition and collective intelligence design tools to structure and speed up learning processes. Aiming at a cultural shift on a massive scale to curb our current unsustainable ways of living and regenerate our ecosystems, it is assumed that personal, organisational, social and 'technical' learning are deeply intertwined and one cannot happen without the other in a setting of transformational learning.

CELL evolved between 2012 to 2014 from a volunteer-run scattering of local and thematic groups (e.g. the Permaculture group or Transition Bonnevoie, see Figure 2 for an overview) that were all facing similar issues around learning, groups and resources, and is currently in a consolidation phase as a mycelium-like network of Transition groups. It hasthree government-funded employees. The current phase has required a redesign of our governance structures and processes (see Figure 3) and we have adopted a Sociocracy constitution that widens our collaborative engagement and possibilities for participation by our volunteers as well as providing a great decision-making tool for understanding and using conflict as a necessary means for consent.[12]

CELL as a Chaordic System

In this paper, the question of designing an organisation as a living system will be investigated through an analysis of the chaordic properties and practices in CELL. Chaords are living systems that are functioning on the

[9] The Transition movement is a social movement that originated in the UK around 2006 and has spread to hundreds of places around the world since. It is comprised of vibrant, grassroots community initiatives that seek to build community resilience in the face of such challenges as peak oil, climate change and the economic crisis. [10] www.cell.lu [11] www.sociocracy.info , http://participedia.net/en/methods/sociocracy

edge of chaos with enough order to give them a pattern. Using this as a way of being and thinking in an organisation, provides a good basis for providing new ways of organising in a context of large-scale institutions. A common definition of a chaordic organisation is an 'enterprise in which the two most fundamental properties of reality (i.e. chaos and order) are maintained in dynamical balance by virtue of an intentional process of management' (Fitzgerald & van Eijnatten 1998: 264). Key features of a chaordic enterprise comprise discontinuous growth, organisational consciousness, connectivity, flexibility, continuous transformation and self-organisation (van Eijnatten, 2004; The Chaos Thinksite, 2004), and each of these terms will be explored below. It is argued that chaordic organisations, together with integral perspectives on transformation (see Esbjörn-Hargens 2010), can provide the space for the unexpected, the uncomfortable and the truly new, and befit the design of systems that are conducive to the flourishing of life

The term '*discontinuous growth*' refers to the cyclical nature of organisational development from birth to growth, stability, decline and instability through to growth again. Development and learning are seen as discontinuous in this process. Organisational consciousness places importance on the organisational mind (collective vision) as the driving force for change. CELL has been going through various cycles of development, from early, unfocused, unspecialised structure to a more differentiated, complex structure, with historical processes coming into being partly through design and order and partly through emergence and chaos. Discontinuous growth can be sudden, such as when CELL experienced the birth of an inclusive financial policy through engagement with the issue at an early workshop. Another example of discontinuous growth was the shift from being a volunteer-run organisation to managing a substantial government grant.

Connectivity is the principle in chaordic organisational theory that emphasises the nature of an organisation as a whole, and as a part of a wider system. This is more than just interdependence: the relationship is holonic: an element is both whole and a part. No part can exist independently of the whole, nor can any whole be sustained separately from its parts. Each part is by itself a whole and this whole is part of a bigger whole. In practice, this means that CELL provides a lot of edge for engagement by a diverse range of people: those interested in hands-on, local projects such as community gardening and learning about permaculture design, and others who may be drawn to CELL as they are seeking a new kind of political or societal engagement. The governance is also designed to foster a culture of connectivity in the sense of sharing gains and losses fully within the platform, having transparency policies as well as a resilient, clear and robust conflict resolution mechanism in place.

Flexibility in a chaordic organisation points toward the fact that the future is unpredictable and unknowable. Consequently, organisational focus should be on preparing for change, not planning for change, and the how is to be made up according to context. Continuous transformation through double-loop learning refers back to the cyclical nature of organisational development from birth to growth, stability, decline and instability through to growth again. This is a complementary mechanism to 'discontinuous growth' in the sense that here the emphasis is on feedback loops and continuous improvement of existing systems from the 'inside' – while the discontinuous growth corresponds rather to shifts in the entire context of one of these systems due to new factors coming into play from the outside. How is this different from the extreme flexibility demanded from employees of companies competing on the global market? Mere adaptation does not secure sustainability, which is a dynamic state. It requires the capacity for individuals to be critical about and proactively co-create the environment in which they are supposed to thrive, and, at an organisational level, to find ways to deal with challenges and to create new opportunities for a productive existence (see Kira & van Eijnatten 2008: 4).

CELL is very much working with the flexibility of an autopoietic[13], living system (see Maturana and Varela 1974), where those involved are shaping the decisions that affect them, and are not simply forced to function in a world not of their own making and shaping. With Sociocracy's policy criterion of 'good enough for now, safe enough to try', we are effectively making policy that can be revoked at the next

[12] Sociocracy uses 'consent' decision-making for all policy decisions. Consent is defined as 'no objections'. Objections must be reasoned and paramount. Consent does not mean you fully agree, only that you will be able to work toward the aims of the decision, that you can 'live with it' until the policy is reviewed. The word consent is used to emphasise the difference between the traditional full-group consensus model and the delegated consensus model. In full-group consensus decision-making, all members of a group make all policy decisions. [13] The term 'autopoiesis' refers to a system capable of reproducing and maintaining itself.

review date, if the context for it has changed to a point that we can no longer live with it. According to this element of a chaord, organisations like CELL create fast-looped feedback mechanisms that enable them to initiate change very early on in a decline phase in order to avoid steep falls, and review the changes that have been implemented on a regular basis. In this way they can constantly monitor evolution in a certain area and give rapid feedback on it, to achieve an order akin to homeostasis of a living system: a *dynamic* equilibrium in a shifting environment that is constantly seeking to adapt to new realities. At CELL, we acknowledge that constantly building and rebuilding organisations from states of deep instability often creates novel forms, and we are guided in this process by our shared collective vision and arising needs that drive our innovation.

Consciousness within CELL is about two things: (1) seeing organisation as a life-giving system and (2) practising consciousness with regards to witnessing new situations and challenges that emerge. As far as (1) organisation as a life-giving system is concerned, this equates to tracing ever-expanding circles of who and what needs to be included in our compassion. This means that not only the organisation as a self-perpetuating structure is paramount, but also people's wellbeing. It means that not only charismatic megafauna needs to be included in our considerations of living lightly on the Earth, but our compassion needs to be extended to less charismatic beings that are equally vital to life-giving processes, e.g. the soil web of life, plankton and mineral 'life' that may be only indirectly perceptible to our senses and everyday lives and that may move along very different time rhythms than we do. This aspect emerged rather strongly from the first CELL reflection process in 2012, when its mission and values were established. With regards to (2) practising consciousness gives rise to awareness and presence, and is the source of confidence in one's ability to get things done – even in the face of adversity. Awareness is the capacity to witness life in all its aspects without evaluating or judging the patterns being witnessed, and without needing to control the outcome of an event. It is a position of nonattachment. It is neither rational nor emotional. It is simply a point of reference that objectively witnesses what is. It is a shift in consciousness to ask what the teaching in a certain situation is, and how to proceed with the most bundled collective intelligence possible and without attachments of personal, historical of cultural nature getting in the way. This takes practice, of course, and not everyone is up for this kind of fundamental questioning and re-rigging of how we personally operate in everyday situations. One simple illustration of how we have built 'awareness' into our meeting structure is to have an internal 'weather report' at the beginning of each meeting, so that everyone is aware of everyone else's current journeys. However, this can be taken much further with regards to how our policies are designed and re-rigged according to awareness arising from specific situations.

Dissipation here is taken in its physical sense of loss of energy through conversion into heat. Our cultural idea about organisations as solid structures (e.g. organisation 'building') is somewhat misleading as in every process of creation its opposite ensues soon enough, and the cycle of creation is flows into a cycle of destruction. Like cells, we need to fashion permeable boundaries that allow certain aspects to dissipate and leave, in order to make space for the new. This way, the organisation allows for fluidity of change, for new and surprising kaleidoscopic forms to emerge and settle into being. Treading the edge between complexity and chaos is not always easy at CELL, as a certain kind of structure is needed to operate within the law, yet the forms that we may have adopted in the past may have a short shelf-life and need to be adapted to new situations (e.g. cooperative forms acting in the mycelium to complement the activity and scope of action of non-profits such as CELL).

Concluding on Emergence and Transformation

In conclusion, I would like to provide the following reflection. When I first designed CELL in 2010, I was operating under a different paradigm than the one I shifted into a few years later. This has led to an adaptation of my language and narrative, that was not conscious to me until a little later. The first definition of what CELL did on our website used the word 'holistic'. However, this concept did not capture the idea of part and whole interaction. It still functioned in mechanistic terms that

assumed a kind of integration of individual, even specialised parts into something bigger and whole. What I had attempted at the time to capture with the word 'holistic' was a way in which to seek to remedy more specialised, positivist and empiricist approaches, through abundance thinking of both/and (as opposed to more linear either/or thinking) that I took from permaculture design. However, I was unsatisfied with the esoteric ring that 'holistic' had for some ears. Also, it did not capture the ways in which any and all of our actions aimed at being fundamentally transformative through emergence. Since the mid-2000s I had been very much interested in the nature of change (social, political, economic, cultural, personal,…) as prospected, planned, and as it actually happened in our culture or society, and this topic was very much at the heart of my anthropological research on agricultural livelihoods and EU integration in Romania (see Fox 2011). As I was familiar with the Transition model of change based on Ken Wilbur's four quadrants, I very much felt resonance with the idea that one needed to capture both individual and collective perspectives, as well as inner and outer dimensions in any successful attempt at transformation. Permaculture design's relationship with chaordic design is not a direct one, as permaculture is not a unified field, and one that is in rapid evolution towards a diverse, scientifically-sound set of practices. As I have tried to show, however, there is a lot of alignment between permaculture's aspiration to think beyond conventional cultural or disciplinary categories while paying close attention to ecological and social context. Furthermore, I felt that emergence (methodological) and transformation (teleological) were two concepts and practices that found their way into CELL's consciousness and ways of working only a few years ago and constitute the basis of the new paradigm we are operating within. The emergence framework, in conjunction with the chaordic model, creates a space for truly transformative practices and processes, and that it is able to integrate participatory social technologies that are able to hone our collective intelligence. This framework might just hold the space for the unexpected, the uncomfortable and the truly new and befitting the design of systems for life's flourishing.

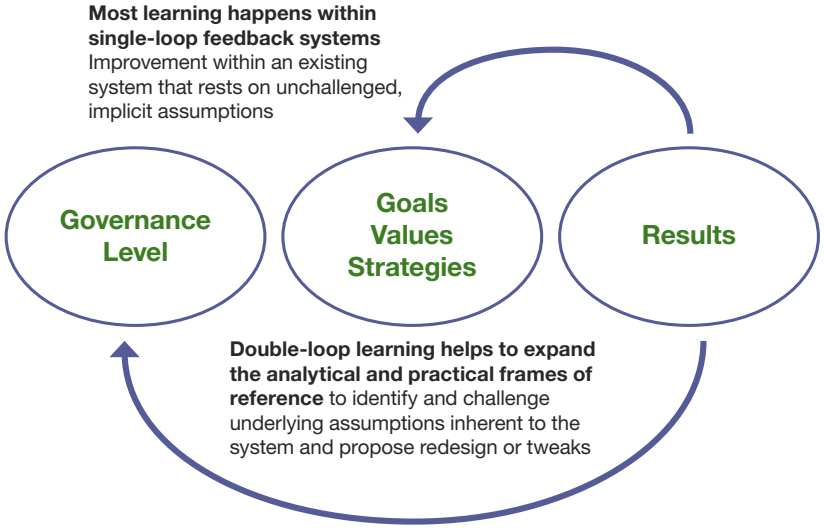

Figure 1: Double-Loop Learning

Figure 2: The CELL Mycelium in mid-2015

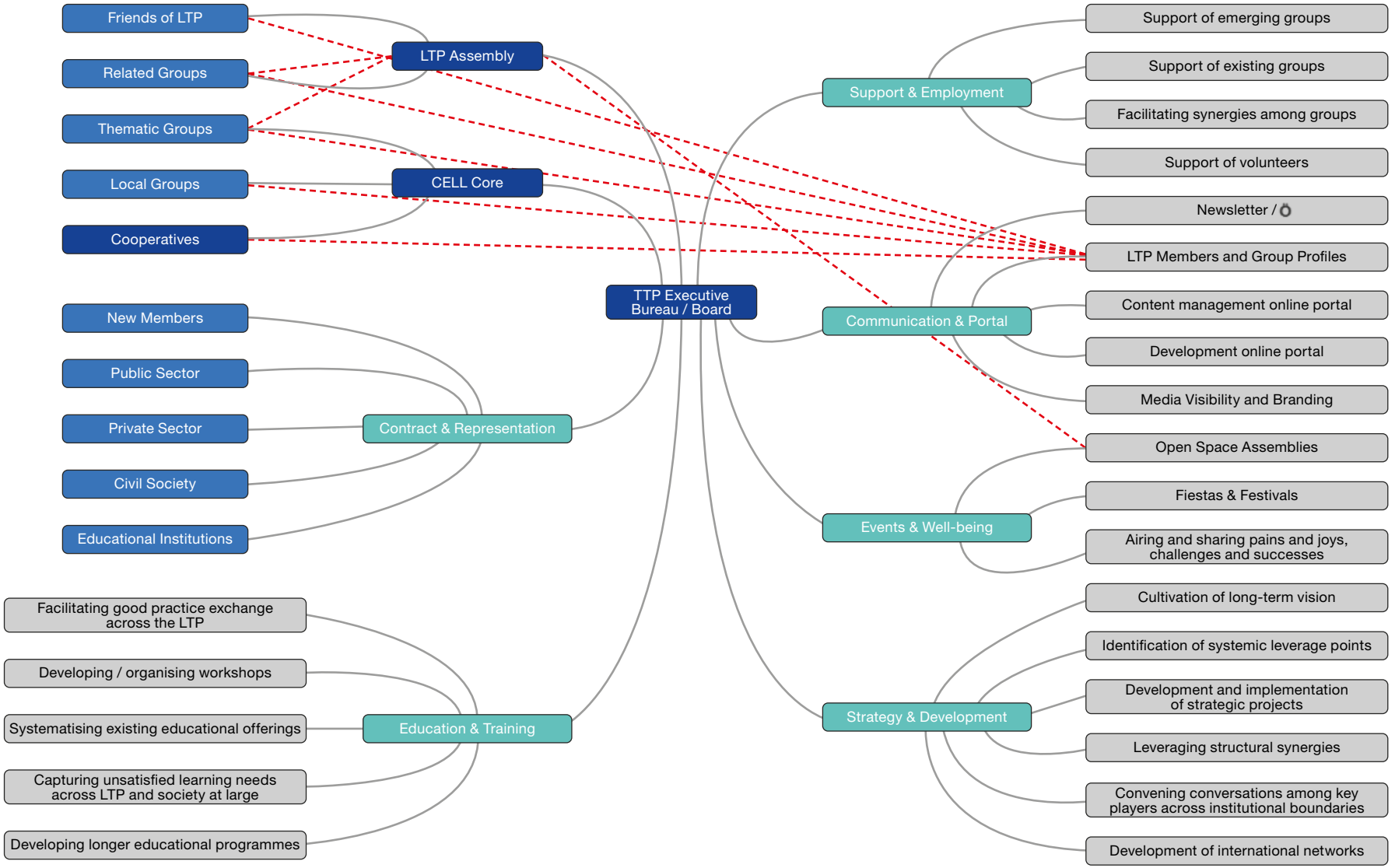

Figure 3: Part of the design for the new governance structure of the CELL mycelium

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The Philosophy of 'Greencare': why Permaculture matters for our mental health

Rex Haigh and David Hare

The Retreat is a mental hospital in York which is famous throughout the world for being the start of 'Moral Treatment'. It has been run by a Quaker charitable foundation since the 1700s, and moral treatment became a worldwide movement which recognised that people with mental health disorders were not a race apart, and that they deserved to be treated in a humane way with compassionate care. Contact with nature was recognised as an important factor:

'The general effects of fine air upon animal spirits would induce us to expect especial benefit from it, in cases of mental depression; and to pay all due respect to the physician, who, "Gives melancholy up to Nature's care, and sends the patient into purer air" (Tuke 1813, p130)

In many ways, we have gone backwards since the early days of moral treatment, and our modern ways of dealing with human distress is as if we are dealing with faulty machinery (based only on disorders of brain biochemistry). We need a new response to restore a human and spiritual dimension to modern mental health care. What we call 'greencare' or 'ecotherapy' is that.

The environmental parallel is easy to make: in the headlong rush for greater efficiency and productivity, everything has been simplified, separated and reduced to disconnected parts. We have fertilisers and insecticides to deal with 'problems': we have medications and physical treatments to deal with 'diagnoses'. The interrelationships between living things and the soil, air and water are not given much thought: the connection between people and their social world, relationships and nature are rarely taken seriously. The level of control we think we can assert over nature is frightening: the level of control the state has over people and their mental health is just as frightening. Industrial scale technological solutions predominate in farming: standardised and fragmented elements of treatment have replaced continuity of care in psychiatric services.

The Concept of Greencare

'Greencare' covers a wide range of activities which include various aspects of nature in the maintenance of health and wellbeing, and prevention, amelioration and treatment of illness. The main activities are social and therapeutic horticulture, animal assisted interventions

Figure 1. The scope of greencare (after Bragg 2014)

(including equine psychotherapy) and care farming; others include rural crafts, green gyms, wilderness therapy, forest schools and environmental restoration.

'Ecotherapy' is often used synonymously with greencare, but it carries the 'ecological system' inference, and therefore strictly speaking implies a two-way feedback relationship with nature, whereby something is given back as well as taken from the natural environment. This could be the production of compost in horticultural therapy, restoration of natural drainage by groups doing it for health benefits, building infrastructure that works with nature such as dry stone walls, or various therapeutic activities which help the environment in other ways – such as planning and installing solar panels, or keeping warm with a wood-burning stove.

The European Union 'Cooperation in the field of Scientific and Technical Research Action 866'

(Braastad et al., 2010) published a 'conceptual framework' for greencare, which concluded that:

"greencare" is a useful phrase summarising a wide range of both self-help and therapy programmes

Research to date has demonstrated correlations of well-being in greencare settings

Research that would demonstrate cause-and-effect relationships between greencare interventions and improvements in health and well-being has not yet been carried out

It also drew up a value base:

- Contact with nature is important to human beings.
- The importance of this is often overlooked in modern living conditions.
- People can find solace from being in natural places, being in contact with nature and from looking after plants and animals.
- In addition to this solace, contact with nature has positive effects on well-being, with physical, psychological and spiritual benefits.
- Existing or new therapeutic programmes could be improved by incorporating these 'green' elements.
- The planning, commissioning and delivery of all health services would be enhanced by consideration of potential 'green' factors.

This, together with the writings of established greencare researchers such as Joe Sempik and Rachel Hine, provide a substantial foundation upon which to develop a wider scope and deeper understanding of greencare and its role in human experience. Research evidence for the positive effect of nature on health is growing, and becoming increasingly recognised (Bragg 2014).

Therapeutic Communities

As mental health services become more 'industrialised' (Haigh, 2014), they are becoming psychologically and spiritually impoverished, and are losing important aspects of 'ordinary humanity'. Therapeutic communities, with their holistic ethos that 'everything is part of the therapy' and with a primary focus on relationships between members, are a powerful way to deliver intensive group therapy with psychological depth and 'therapeutic ordinariness'.

Therapeutic communities were developed in psychiatric services for battle-shocked soldiers in the Second World War (Haigh & Lees, 2008). They provide a group therapy setting where people with emotional problems can learn from each other about better ways to cope, and more effective and satisfying ways to relate to others. This comes from experiencing a sense of belonging, being in an emotionally safe environment where people can be open and honest with each other, and where everything is open to enquiry and challenge. Through the strictly democratic procedures and processes of a therapeutic community, members can feel empowered to act in more responsible and mature ways by finding a secure idea of their own identity and a fulfilling place amongst others. The theoretical constructs used to describe this are communalism, democratisation, permissiveness, reality confrontation and a culture of enquiry. In this way, the community itself – with all the feelings, behaviour and relationships within it, are the primary therapeutic instrument (Haigh, 2013).

Our clinical work

Obstacles in the NHS

In developing a therapeutic community programme for the NHS in Slough, the regulatory structures prevented the use of 'greencare' as part of the therapeutic programme: it was not seen as a relevant part of statutory services, and it did not meet numerous health and safety physical requirements such as 'absence of ligature points'. We therefore started a social enterprise and community interest company, called 'Growing Better Lives', to provide a treatment programme which combines elements of therapeutic communities and the principles of greencare. We were successful in bidding for one of the EcoMinds grants in 2010, which were funded by the National Lottery and administered by Mind (Farmer, 2014). This marked the beginning of our clinical work.

Nature as a part of intensive therapy programmes

By adding to therapeutic community practices to a greencare group (such as horticultural therapy or animal assisted interventions), powerful programmes can be developed which are holistic, sustainable and effective. We have done this by installing a large yurt (7m diameter) in a local environmental centre where we hold weekly greencare sessions.

Our yurt at Iver Environment Centre

The circle of chairs for the group therapy

Our team was awarded the Royal College of Psychiatrists' 2014 award for sustainability. The extensive scope that we believe is possible for this work is illustrated in our statement of purpose:

"We offer a holistic and economically viable alternative to treatment with medication and hospitalisation. Sustainability is about connecting people to each other and to nature, helping people to see that there is a life worth living, and on a planet that is worth living on."

The greencare programme has been incorporated into the development of a local 'Recovery College' in which the underlying principles of relational practice and sustainability are fundamental.

The group therapy programme

Our main group at the moment is a one day per week therapy programme, every Thursday from 10am to 4pm, for up to 15 people and with three regular staff – an 'expert by experience' (who has graduated from an NHS therapeutic community herself), a horticultural therapist and a psychotherapist. A researcher and a medical psychotherapist attend on occasions, and the staff team have monthly clinical supervision from an external psychotherapist. The therapy is run as a 'slow open' group, meaning that it has a rolling membership, with members staying in it as long as they wish. Members all have longstanding emotional difficulties, often with diagnoses of personality disorders, and have not been sufficiently helped by statutory mental health services.

The staff gather at about 9.30am to prepare (and light the wood-burning stove in winter), and members start arriving at 10am. When everybody is present, we have a community meeting. The main part of this is the 'check-in' – where everybody says what their last week has been like: how they have been feeling since the last meeting and whether anything important has happened to them. There is a ritual to start this: once everybody has sat down, whoever first mentions that we need to do the check-in gets to choose who starts. After their turn, they choose whether to pass it to the right or the left – and it progresses round the circle. Once everybody has spoken – however much or little they choose – the members of the group spend a few minutes supporting each other, if they need it. Then the staff, generally led by the horticultural therapist, discuss the options for what people can do for the rest of the day. The community meeting usually finishes within an hour, and the members then get on with the activities they have chosen.

The group chooses the activities from what is on offer, plus any other ideas that they come up with. So that everything is done in groups, we have an expectation that an activity does not take place unless at least three people are willing to do it. In summer, most of the activities are horticultural; in winter the popular options are cooking, art and craft work, administrative tasks, planning and research. Lunch is always a central part of the day where everybody comes together – in warm and dry weather this is usually outdoors; otherwise we eat in the yurt.

At about 3.30pm, half an hour before leaving time, we have the closing community meeting. This comprises another go-round where everybody makes a brief comment about how they have found the day, and how they are feeling. For the last few minutes, we check that everybody is feeling safe to go home, and offer support if needed.

Initial research

Some introductory qualitative analysis of the programme and its impact on mental health service users has been undertaken. The thematic analysis identified the importance of the therapy taking place in a natural setting that was 'not a clinical setting', which was a 'sanctuary' which was 'safe', 'lush and green' and 'non-stigmatised'. The variety of activities on offer, the importance of choice and the shared lunch were cited. Particular qualities that were valued were 'togetherness', 'stillness', 'socialisation', 'catharsis', 'calm' and 'restful' (Jones, Maurya & Haigh 2014).

The most common words being mentioned in the qualitative analysis

Ethics and Principles

The permaculture ethic of 'care for people, care for planet and fair shares' closely fits with our underlying beliefs and values, and those of Growing Better Lives CIC. 'Care for people' is our primary task: to provide therapy for people with longstanding and severe mental health problems. We do so using a model which is at the forefront of sustainable practice - which is how we care for the planet. The thoroughly democratic processes of therapeutic communities embody the idea of fairness and fair shares.

There are further developments of ecological principles we intend to pursue, notably sustainable construction of a therapy centre in partnership with a local animal sanctuary, and the growth of a transition town project based on therapeutic community principles and the idea of a 'recovery college for all'.

Small-is-beautiful projects like this demonstrate that we can all be responsible for many aspects of our own mental health, through an interdependence that could be seen as an ecology of human relationships. By working with the NHS statutory providers, we can add a holistic, sustainable and compassionate dimension to the bare minimum that the state provides – and do it in the same way that we will all need to live and think by, if the human race manages to survive our destructive actions on the Earth's atmosphere, climate and soil.

"The problem is the solution. Every problem is a potential opportunity."

Geoff Lawton

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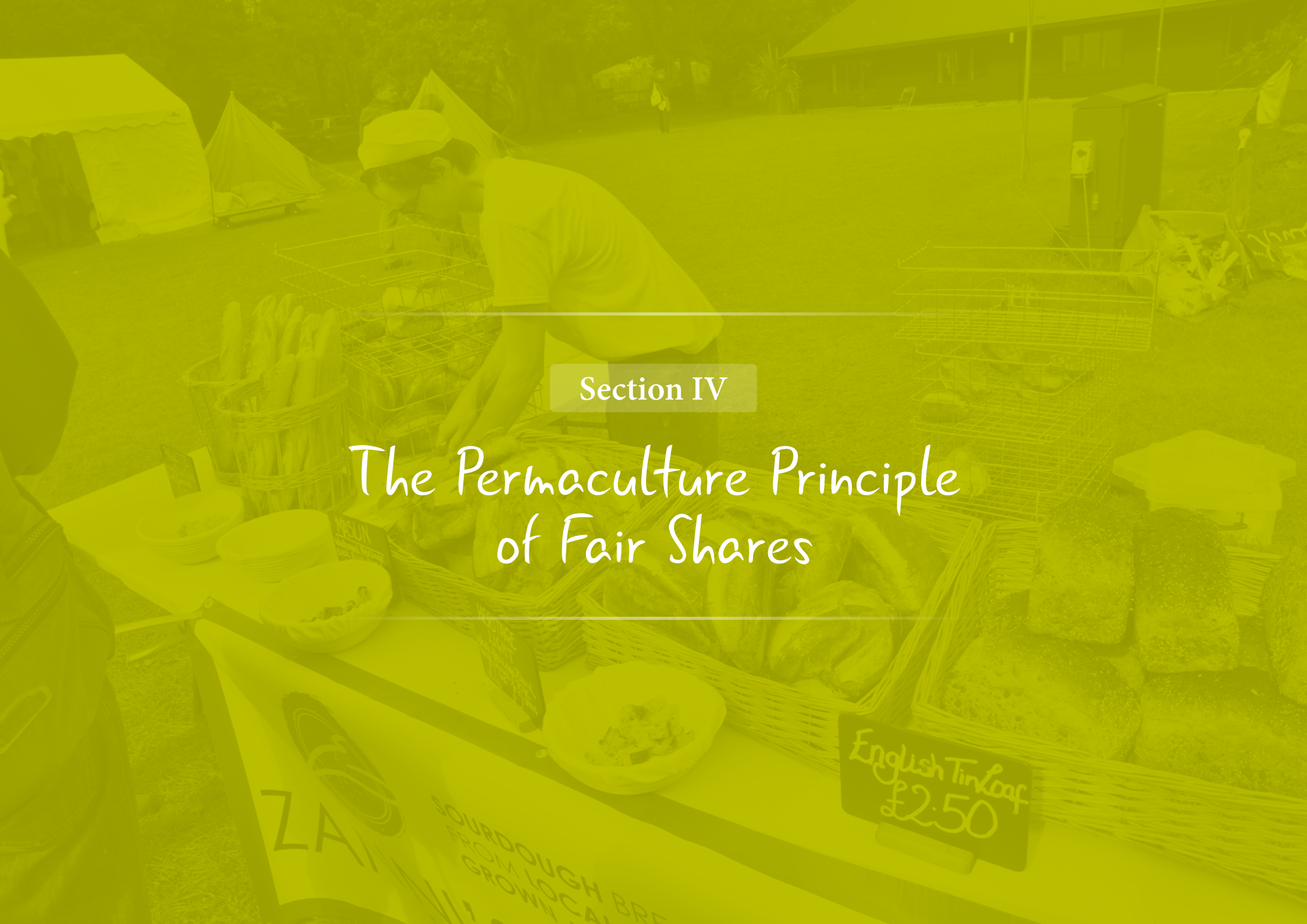


Section IV

The Permaculture Principle of Fair Shares

Oikos (Financial) Permaculture: Adapting permaculture design for right livelihood. regenerative enterprise, and local living economies

Mario Yanez

The purpose of this article is to propose a sub-discipline that could contribute to the Permaculture design movement. This new field, which I have called Oikos Permaculture, addresses how we could apply permaculture design to economics to approach the long-term management and sustainability of our Permaculture designs. My goal is to frame Permaculture design so that it can easily and readily be applied beyond the physical site and at different levels (personal to collective).

Several decades ago, when I studied finance and information systems in college, I never imagined I would be doing ecological design work. Years later, when I studied ecology and dedicated myself to Earth-based work, I never imagined I would be doing anything related to finance again. Life is surprising that way. Here I am integrating these two seemingly divergent fields.

I have been involved in several Permaculture design projects where I was not only in the fortunate position of facilitating the designs, but I also had to operate them after they were installed. I quickly realised that the design process had just begun --and if I was to sustain these projects for any amount of time-- I had to design what we call 'invisible structures' in Permaculture. As I quickly found out, any guidance on how to design these has been largely invisible too.

What's in a name?

Oikos is the ancient Greek word for "eco," used as a prefix in English words like ecology and economics. It basically means "household" and it is often used to refer to how we organise and manage our household. I have started to use it in this context, because I find the word financial is restrictive and does not fully describe how one transacts with and participates in the world. In this case, household can range from the personal to the collective, as it is termed in ecological economics, it is the 'Earth household'.

Why Oikos Permaculture?

Everything we do as permaculture designers, and one could argue as humans, aims to provide a yield. This could be food from a garden, an equal value for an exchange, a beautiful view in exchange for a difficult climb up a summit. It's my observation that all species operate by this principle, this ensures energies are not expended in vain. So, if we want to take permaculture design beyond our homesteads and gardens out into the world, then we need to be viable economically, within the parameters of Earth economy. I am suggesting we consider our Earth household, so that Oikos becomes about how we consciously participate in our world in and the web of life; how we fit into nested eco-social systems (self-family-community-bioregion-continent-earth-universe) by re-creating healthy relationships with our ecosystems, cycles and seasons that allow us to satisfy our material needs. Beyond that, I would argue, that we also have a need for self-realization, to create purposeful and meaningful work. Although most of this is basic ecological economics, Permaculture offers us a way to make it a real part of our lives.

I strongly believe that the ecological repair work that Permaculture, as a movement and a field of practice, has to offer the world is needed now more than ever. So how do we reach broader audiences, activists, businesses and decision-makers to let them know what we have to offer? More importantly, what do we have to offer them beyond design and installing a garden, farm, or homestead? How will people living into these sites, sustain themselves economically over time?

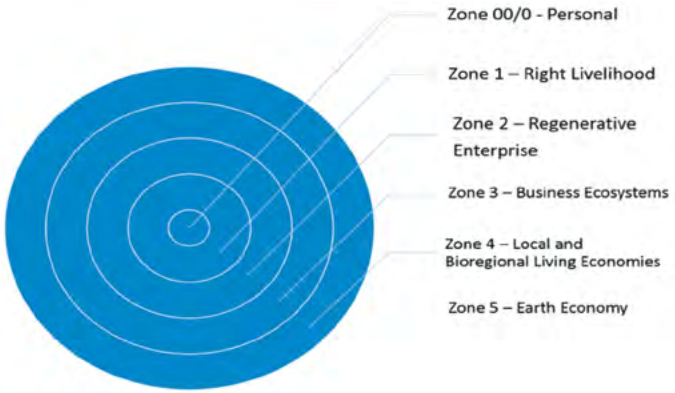
Moving beyond the site design

Many of the design approaches and tools that we have at our disposal are site-based. They help us analyse, assess and design a site-based system. However when planning for long-term sustainability, it is important to look beyond the site, to consider the site to be at the heart of a larger 'project' and design organisational/ social systems, enterprises, and programmes that are integrated and emerge from actual site design. There is an opportunity to extend the ethics and principles of Permaculture, particularly that of the third ethic, which has historically been less well defined i.e. "Fair Shares" or "Sharing the Abundance." Although it has been expressed in many ways, using Oikos Permaculture as a frame of reference gives us a chance to explore this concept and create systems that integrate the third ethic by design. Fortunately, every single permaculture principle we have lends itself beautifully to being extended beyond the garden into social, economic, financial systems design. For example, the principle *Use and Value Diversity*, which refers to having many diverse elements in a garden can be adapted personal finances or running a business; indeed, it is often more resilient when one diversifies its income streams. We begin to realise the inherent wisdom in nature and in the way these principles were articulated when attempt to apply them creatively to any domain in life; I would encourage everyone to try extending any of the principles. It can be a powerful practice.

Here I would like to review three design tools of Permaculture and demonstrate how we can use these as a foundation for managing our Earth economy, not just small sites.

Design Tools: Zones

One of my favourite permaculture design tools, zones, is highly adaptable for this purpose. Here I will suggest using it to represent how we design nested economic systems from the inside out, beginning with zone 00 the inner most space out to the largest context, Earth economy. As examples, I have decided to state everything in the positive, in ways that reflect healthy patterns.



Zone 00 – Personal, Interior: At our very core, we form most of our beliefs, attitudes and values. These affect how we carry ourselves in the world. These are the pioneers; they build our soil and lay the foundation for a healthy household. For example, to what degree we have a sense of belonging to the Earth community; an abundance mentality; clear values and ethics; a willingness to self-provision and to live into life-sustaining practices. These are our foundations and here is where we design our life goals and potentially find our life's work. These can inform project-specific goals. Our Personal Interior is where we have the ability to formulate a clear sense of "enoughness." This enables us to set concrete goals, achieve them and not be left wanting more, and more, and more!

Zone 0 – Personal, Exterior: This is our household's kitchen garden. This zone is where we begin to manifest our beliefs, attitudes, values, and goals. We cultivate these in our financial practices by designing/leveraging debt/creative financing while having a clear exit strategy; closing loops on expenditures and avoiding leaks; creating and sharing resource abundance, and saving towards a future goal. This might also propagate these in our Life practices by having a thoughtful tenure/ ownership strategy, leveraging community and exchanging value, and committing to some degree of "DIYness" or self-provisioning.

Zone 1 – Work/Livelihood: In Zone 1, we move out beyond our kitchen garden and into the farm. This is where we grow what we are going to sell or otherwise make available to the outside world in exchange for money to buy the things we do not provide ourselves. Here it is critical for us to know what we have to offer. We take stock of our talents, passions and interests, we take steps to design our lives as the perennial polyculture it could be, and we can commit to

walking the path of right livelihood. In terms of Permaculture ethics, this means we dedicate our working life to Earth care, People care, and Fair shares. At this point, our commitment to right livelihood becomes more than a way of making ends meet, but a true guiding example for others to do the same.

Zone 2 – Regenerative Enterprise: In Zone 2, we are making a clear step out beyond the personal household and into the collective realm. Here we are transitioning our right livelihood into a regenerative enterprise. We could say this Zone has an internal and an external component. Internally, we can look at each enterprise as a stand-alone organism typically made up of more than one person. It pays to take a design approach on decision-making and social processes, by specifically identifying participatory roles for all stakeholders to feel a real sense of belonging, ownership, and coordination. Externally, it is important to be conscious of how we interact with the outside world by distinguishing the enterprise through various qualities: local ownership; degree of responsibility, local-first sourcing; stating a holistic mission and vision; committing to net-zero energy and/or waste policies; people care and animal care strategies. It is important to think well beyond triple bottom line, by establishing regenerative eco-social capital goals and strategies. These begin with setting up mutually beneficial relationships (think organisms within an ecosystem) that are not merely sustainable but are explicitly life-sustaining.

Zone 3 – Ecosystem of Regenerative Enterprises: Zone 3 recognizes that there truly can be no regenerative enterprise in isolation. Ecosystems of regenerative enterprises strive for complexity and diversity that make for an abundance of healthy relationships which results in resilient long-term relationships. These are analogous to ecosystems, representing communities of related yet differentiated regenerative enterprises. As an example, let us consider the launch of a regenerative bakery business. Questions that need to be asked include: Who will grow the grain locally and responsibly? How will these grains be milled and by whom? Is there a deli that serves sandwiches with mainly local, responsibly-grown produce/meats? This is the ecosystem your regenerative organism must live in, if it is to reach its ideal level of regenerative being. By being part of a larger ecosystem, there is a better chance of collectively becoming self-sustaining by close material cycles and ensure renewable energy use. Ideally we do this by having distinct organisms (species) play specific roles (niches) in this regenerative foodweb, so that each transaction ensure a healthy, sustainable system. These are things for us to consider at the outset of the project.

Zone 4 – Local Living Economies: At this next level, are designing for at the bioregional level. A bioregion is a way to identify the places we inhabit on nature's terms and not by using political lines on a map. Please note that in the spirit of not reinventing the wheel, I am heavily borrowing from BALLE (http://bealocalist.org) in defining Local Living Economies. These Economies are made of networks of interconnected regenerative enterprise ecosystems (REEs) that are tied to a place. Indeed, the greater the density of interconnected REEs, the greater degree of community resiliency that can be achieved. We measure our success by what really matters, the ability to be profitable within the Permaculture ethics. In designing for Local Living Economies, we make a commitment to the third ethic by eliminating inequalities that only bring about unhappiness and eventual system collapse; in other words, we internalize that *we're all better off when we're all better off* and that real security comes from community. Indeed, we recognize and value being part of our larger natural community by respecting natural boundaries and renewal rates because all true wealth comes from nature. Ultimately, we achieve this by being awake and alive to the mysterious beauty of interconnected natural world. Only creating a multitude of healthy relationships in cooperation with each other, will local food distribution or renewable local energy become possible. Only then can we reconnect eaters with farmers, investors with entrepreneurs, and business owners with the communities and natural places. No one can do it alone. Why would we want to?

Zone 5 – Earth Economy: Earth is a recycling planet. With the exception of occasional meteors, no new matter enters this system. Earth is our ultimate reference point for all Earthlings. Everything we value, all wealth, stems from her. A human economy that does not have this as a central tenet is doomed to fail eventually. An Earth Economy sets certain,

absolute parameters for us; we have to live within her means. These means are best lived within at the bioregion level. This means we mainly provide for our needs locally and responsibly. If we manage this, then we are less likely to run up against global limits, like excess CO2 in the atmosphere or desertification.

Design Tools: Scale of Permanence

Here is another example of how we might adapt a very useful permaculture tool. We can adapt the 'Scale of Permanence[14]' for the design of financial/economic systems:

Scale of Permanence

--most permanent--

Connectedness of Life Systems (air, water, soil, biodiversity/life web)

Endowed abilities and gifts

Sense of belonging to Earth community

Sense of life's work/passion/vocation

Social units / community / sphere of influence

Patterns of organization (personal life/finances/ degree of debt)

Concept of enoughness / Life goals / values & ethics

Personal attitude towards/relationship money

Skills and Knowledge

Degree of participation (in self-provisioning right livelihood, regenerative enterprise, local living economies)

--least permanent--

As practitioners we will propose or make interventions in any given situation or system. As designers of elegant solutions, we will make the smallest possible change (i.e. expending the least amount of effort) to elicit the greatest effect. The Scale of Permanence is a useful tool to help us to understand where to find the most impactful leverage points in a system in order to assess where to best make that change. This tool requires us to list all the components in that system that we might change in order of how permanent or difficult to change they might be. For example, it would be easier to teach someone a skill than it would be to shift his or her more deeply-rooted worldview.

Design Tools: Sector Analysis

Often, when planning projects, we focus on financial considerations (money) at the risk of ignoring other energies that can inform our approach. But just as it is wise to plant a diverse garden that is resilient, so it is wise to consider, quantify, and map all the diverse energies that can move our project to fruition in a resilient manner.

A useful Permaculture design tool, which allows us to map energy flows in and out of a project is the Sector Analysis. Here we will use the term capital to mean very specific types of energies that can be brought to bear to carry out a given project. Sector Analysis in this context allows one to decide how much of each type of capital is present, missing, or present but not in sufficient quantities. It also allows for a way to track if we are tapping into as many resources

as possible over time to make our projects successful.

The use of the tool I am proposing here, is built on foundational work of Rolland & Landua, the Eight Forms of Capital[15] (see drawing). Let's say we are starting a grain mill, it will use of mix of resources including money invested, an old mill, energy from a flowing stream, wheat produced in farm down the road, volunteer time, wise advice, etc. How often do we stop to think about these strategically with the exception of money needed?

As we begin to map these diverse forms of capital, we can be nuanced. For example, with financial capital, the energy is money, but it can come from income, debt, or savings; with Social Capital, the energy is connection, and it can look like relationships, community, or influence. There's much more detail to this, but the usefulness of this tool becomes clear as you

[14] Scale of Permanence is a permaculture design tool adopted from P.A. Yeoman adapted here by the author.
[15] The Eight Forms of Capital is a concept developed by Ethan Rolland and Gregory Landua and expressed in their book Regenerative Enterprise; the above drawing is theirs.

attempt to appropriately incorporate or deflect any of these energies that may be available for your project.

Oikos: A Pattern Language

A pattern language is a method of describing good design practices within a field of expertise through a set of interconnected expressions arising from wisdom. The term was coined by architect Christopher Alexander and popularized by his book *A Pattern Language*[16]. In developing pattern languages for permaculture, it is helpful to employ metaphors that others can relate to in order to communicate these complex functional concepts. In permaculture design, we look at natural systems as models to guide our design and employ metaphors to describe the functions that we intend to mimic. For example, in designing a regenerative enterprise, it may be useful to visualise it as a perennial polyculture garden. In a these systems, you need nitrogen fixers and mineral pullers (which are analogous to components that draw in local financial nutrients), mulch and groundcovers (analogous to mechanisms to ensure the flow and regeneration of different forms of living capital, while blocking out unwanted "weeds"), the vines/climbers (analogous to the structures that guide and temper growth so the businesses remains life-sustaining), and the canopy trees (analogous to organizational structure, overall system health and protection, and flow of needed resources throughout). This is the aim of Oikos Permaculture, to provide a pattern language to support us over time thereby enabling us to document and catalogue the possible component solutions and how they may be used to design healthy economic and financial systems that are life-sustaining instead of life destroying.

Conclusion

To ensure sustainable living in the coming years we have the task of redesigning almost every aspect of our less-than-ecologically-sound culture. From a Permaculture perspective, we believe this is possible and we are gathering the knowledge of how to apply this design system and suite of tools to all areas of life in order to sustain a habitable planet.

Although these ideas I have presented are not new, indeed the idea of ecological economics has been around for several decades, I strongly believe Permaculture is the vehicle to transform our world and to implement many ecological systems and appropriate technologies. After all Permaculture is an amalgam of the best ecological design practice, both traditional and modern.

In conclusion, I would like to suggest that using Oikos Permaculture as a lens through which we consider the economic aspects of project design has potential to support us in meeting our highest ecological standards that are economically viable for all involved.

I need to acknowledge a handful of brilliant Permaculture people, who have been pushing this field forward within our movement over the last few years, and I owe them much gratitude for the seeds they have planted within me. Two of the most influential have been Eric Toensmeier and Jennifer Morgan. Eric is best known for perennial plants and forest gardening (and now Carbon Farming), but has done quite a bit of financial planning for urban farming projects and Jennifer has founded the Financial Permaculture Institute along with colleagues Ethan Rolland and Gregory Landau (eight forms of capital); Jennifer has been instrumental in facilitating design processes for local regenerative businesses in. The community at Gaia University has been extremely supportive, as we collectively begin developing a diploma program to begin expanding this new field of practice.

> *"There is no limit to richness in natural systems. We will inevitably create a world so abundant it will exceed the edges of our present imagination."*
>
> ***Geoff Lawton***

[16] Alexander, Christopher et al. A Pattern Language: Towns, buildings, construction. Oxford University Press. 1977. Oxford, UK.

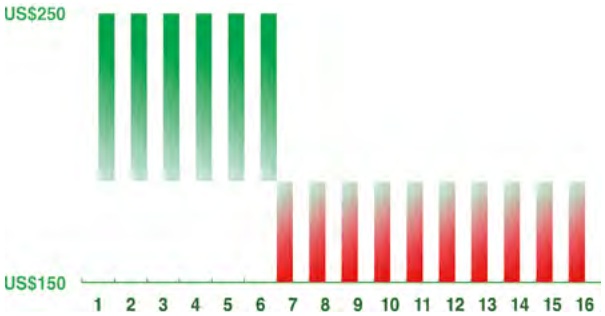
Savings Pools - Power in numbers. How groups in New Zealand pool their money and help eliminate their debt

Petra Stephenson

A Savings Pool, simply put, is a group of people who get to know each other over dinner each month, discuss finance issues, develop trust and become the bank for each other. The ethics of Permaculture are Earth Care, People Care and Fair Share. A Savings Pool covers 2, and often all 3 ethics. Working together in groups to talk about money and eliminating interest bearing debt, falls into the ethics of people care and fair share and the results are often earth care.

How does a Savings Pool work with a clever accounting system making it fair?

Any money deposited is accounted for at the end of each month. The longer the money is in, the more it is worth, because the calculation is dollar per month. Say you deposit $250 today, after 6 months it is still only $250, but you have accumulated 1500 dollar-months, or as we call it in our pool, 1500 Goodwill points. The more goodwill points you accumulate, the easier it is when it comes to drawing money from the group. Savings Pools are based on reciprocity. The dollar-month/goodwill points you borrow from the group (red area below the graph) needs to be equal to the dollar-month you make available to the group (green area above the graph). If you save up your dollar-months beforehand, i.e. make your money available to others first, this makes the payback of any loan really easy.



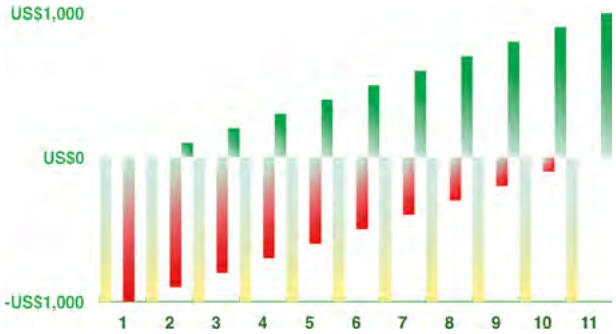
Borrower's contribution = months

Having $250 in the pool for 6 months earns you 1500 dollar points. Drawing down $400 after that allows you to not pay anything for 10 months, or pay back small amounts over a longer period (usual pattern).

Pool's contribution

Or if you use money from the pool right at the start, you pay back and make more money available to the group as you pay off your loan. In the end, the area (dollars *x* months) below the line needs to equal the area above the line.

If you borrow before you saved, you pay back twice the amount of money you borrowed, but as soon as the dollar *x* months is equal, you can withdraw this money again. It feels great getting a lump sum back at the end.



Borrower's contribution = **Pool's contribution**

Paying $200 a month reduces the debt by $100 and makes $100 available to the pool. After 11 months, the area of the pools contribution equals the area of the borrowers contribution and the money (=additional savings) can be drawn out, or left to make available for others for longer and earn more dollar-month or good will for later use.

Setting up a pool is easy. It is a question to just spread the idea amongst friends, colleagues or family, and form a group of no more than about 16 people. Anything bigger is hard to coordinate each month. With today's technologies such as Skype and Loomio, it is easy for pools to meet monthly, discuss and vote. And what is important to understand is that there is no interest earned or paid with a savings pool.

Achievements? Many! It is a learning to talk openly about money, especially debt. Helping start up businesses, buying cars and other goods interest free, retiring crippling credit card debt, and buying homes. But the People Care goes beyond financial. Being able to help, often with labour or goods, happens even more when people have learned to talk openly about financial difficulties and have learned to ask for help.

A challenge can be when you have a pool of only savers. The system is created to make money go round. If you don't have people who need it, it's not working well. But for cases like this and for the bigger items like houses, whole pools can join to help each other. So we have a pool of pools in New Zealand. One or two members of a pool join the pool of pools (SPA – Savings Pool Association). If another pool has request for more money they bring this request to SPA and other pools around the nation can give money to that pool whose member needs extra money. (Unfortunately in New Zealand this system has recently been shut down by the government. The government does now not allow people to handle money for other people unless you are a big bank or a accredited financial advisor. So now we have a SPA that just handles the requests and any loan is done directly between members of different pools. – but with other legislations, it might be possible to lend between pools).

For non-monetary items or services we have a "timebank". If I spend an hour giving you for example a haircut or a lesson, I have an hour time credit to spend with someone else. This is a computer/internet system where I log that I have earned an hour from someone and that someone logs that they have spent an hour with me. It is very simple.

For food and goods we have a complementary currency. This system is again on computer/the internet. Our complementary currency/green dollar is equivalent to our national currency. No money changes hands but the administrative team monitors that no one gets into too much debt.

It has been discussed to use a savings pool to finance a permaculture site / business to make a return for the group but we haven't used it that way. I can envisage that a group could pool money to help someone set up a permaculture site, if the site is then used to make money and pay the money back to the pool. If no money is intended to be made from the site, then maybe a timebank or green dollar system is the better system to use.

Some concrete examples

"My introduction to Savings Pools took place at a public meeting in March 2013.

The idea sounded innovative and I loved the concept of being able to have access to interest-free funds and also to support others to have this same access. What finally sold me was the 'group consensus decision making policy' that offered me security, in as much as nothing could happen to the fund unless I agreed.

So it was with a sense of apprehension and also adventure that I joined with 12 others, some of whom I'd met in passing and others whom I'd not previously met, and we agreed to form a group.

I started depositing small amounts of excess money into the shared bank account to see how it would go while not risking too much. It soon became apparent that participating in our Savings Pool had some unanticipated spin-offs. At the time I was experiencing huge stress with credit card debt of up to $30,000 accumulated over the years, and for the first time I am now credit card free! Where I used to pay interest on loans (credit cards) to purchase essentials (medical bills) and non-essential goods and services (shoes) I can now access non-interest bearing funds and be self-disciplined in my spending and saving.

I now choose to save into the pool (instead of the bank), but because I have to apply and get agreement to draw out funds (never any problem), I am no longer subject to the

impulse buying of the plastic cards. This year I formed a second pool with my children and grandchildren. Together we look forward to a future free of the crippling effect interest has had on our lives. As a family we've become closer and more supportive of each other than ever before. There's now trust and respect that didn't have an opportunity to grow when we lived such separate lives, each dealing with financial stress independently. I find it immensely satisfying that Savings Pools have been a doorway to my financial freedom and that I'm now able to support and contribute to the financial freedom of others."

"In May 2013, I heard of a Savings Pool through Living Economies and the Green Dollars association I belong to.

I had done the round of the banks trying to consolidate my debt and had been turned down by them all. My life had become a downward spiral of escalating debts. A divorce followed by a tragic family loss had escalated the emotional turmoil and hardship I found myself in. All felt hopeless until I attended the first meeting of the newly formed Savings Pool. After introducing myself, I mentioned upfront that I had neither savings nor money available to contribute to the pool and due to my present situation was actually looking for a loan to get out of debt. A week later, the group had not only agreed to my joining but also lent me $12,000.00 allowing me to get rid of my credit card debt in full, the balance of my car repayments and some major outstanding bills. In return my car was accepted as security while I continued to drive it and I started repaying to the Savings Pool the amount of money I had been paying the finance company for my car - a single shift of where my money was going.

I felt such relief and was smiling from ear to ear when I left the bank after paying all those debts off and when I met one of the group that day, was told it had been a privilege to have been able to help and how good it felt for the group to have been able to contribute to my improved situation. I had not realised at the time this situation could be seen from that angle. Being the happy receiver of such help when you are in need always feels good, even when it is quite hard to ask for it in such difficult circumstances. It was a totally new concept to me that it could feel so good for others to be offered the opportunity to help. This emotional link created through the act of lending and borrowing between friends was truly gratifying for both parties and an unexpected benefit of being part of the group.

It turned out for me that being a member of the Savings Pool has not been just about the money but also about making new friends, sharing ideas and resources, brainstorming practical solutions together. It felt very supportive and I am highly grateful to have been accepted as part of the group. The cherry on top of the (already iced!) cake is that at the end of repaying my interest-free loan, I will have accumulated a similar amount in savings – something that would have been impossible while I was in debt. So while helping myself, I am also helping others, as my loan repayments and savings contributions are made available to the pool, to lend to someone else right away. This is a very satisfying system as it gives me a sense of instantly being able to pay it forward, when I had nothing to contribute originally. A truly win-win and uplifting situation."

Empowering people, showing options of how we can work together and be better off has a huge potential for the future. Just imagine no one having a 'death contract' (which is the literal translation of 'mortgage'). This would mean for every 10 families having a $300,000 home with mortgage, an extra 3 million dollars would stay in the community instead of being syphoned by the bank. Having this extra money would allow people/communities to do a lot more earth care and people care, sharing their free time and labour for the common good.

True wealth is achievable by design and now is the time. Our ethos of taking action is to make sure that we care for the Earth, care for each other and leave a positive legacy for future generations.

Geoff Lawton

Section V

Cross cutting wrap up

Thinking Like a Plant

Jonathan Code

Imagine this: It is late May in the foothills of the Sierra Nevada, California. The days grow very warm, the earth increasingly dry.

I have been undertaking plant observations of potted basil (Ocimum basilicum) and love-in-a-mist (Nigella damascena) for some weeks.

I started the plants in their pots from seeds, and each day I spend time observing new stages of growth as they unfold. I sketch and draw leaf shapes, paying attention as accurately as I can. I follow a self-appointed task and schedule and I have been doing so for several weeks. My sketchbook is filling up with drawings of ever more complex images and arrangements of leaf, and stalk, and…

…I am getting bored.

I go out for a walk.

My boots brush through brittle, dessicated undergrowth.

Only the tenacious manzanitas, tall pines and live oaks show a dusty green in a landscape already parched brown by seasonal drought. Understory plants clearly anticipated the looming lack of water - they sprouted, flowered and set seed long before the intense Central Valley dry season set in. Their life process was a brisk spring-time burst, all too briefly spent, resulting in a retreat into seed, rhizome and root as the foothills succumbed to the relentlessness of a California summer.

Dropping down below the brow of a hill my path takes me into a sun-withered meadow. I scan the scenery around me dreamily, feeling light drunk and heat dazed. I walk this trail regularly and its plant community is all too familiar to me…or so I like to think.

All of a sudden I am stopped in my tracks - my stride checked, my eyes pulled earthward. I am brought up short by the sight of a pair of tightly clasped leaves, drought defying, new green, life filled, big as a child's hands, bursting spear-like out of bone-dry ground. I am plant-struck, enraptured, taken in hook, line and sinker.

What the….What are you…Where have you.... Why now?….Who are you? Don't you know that there won't be rain now for MONTHS?

OK, you've got my attention. I don't know what - or WHO - you are but I am going to come and visit you, follow your unfolding, see how you leaf, and flower, and….

I wonder what you will look like tomorrow?...

~

The workshop *Thinking Like a Plant* held at the IPCUK in September 2015 invited participants to join in a participatory enquiry into *ways of knowing and ways of seeing*, with particular attention paid to (and with help from) the plant world.

Now, we did not set out to think like basil or think like love-in-a-mist, and there is no proposal in the title or approach to the workshop that plants *think* – certainly not in the way that we normally understand the term 'thinking'. The workshop was, rather, informed by a re-engagement with a text that is likely to have receded into the mists of time for many readers but which, I propose, is as relevant now as when it was first published in 1977 – perhaps more so.

The text I refer to is *A Guide For the Perplexed*, by E.F. Schumacher. The choice of this text as background for the workshop was taken for a number of reasons.

First and foremost this choice was made due to the way in which Schumacher provides a lucid examination of our current science (read "way of knowing"), our habits of thinking and seeing and the shortcomings of our everyday

cognition. Schumacher takes pains to describe his own experiences of these inadequacies, and does so by reflecting on his own education and encounters with the gaps in the 'maps' that we use to make sense of our environments (both natural and cultural). My proposal is that before we can seriously consider questions of *reclaiming diversity and designing worlds we want*, I think the themes raised by Schumacher in his book need some serious consideration. I leave interested readers to re-visit *A Guide For The Perplexed* for themselves, and will but briefly explore some of the threads that I think are significant in this important book.

Thinking like a mineral

A central theme that concerns Schumacher is, in his words, 'the loss of the vertical dimension'. What does he mean by this loss?

To attempt an experience of what Schumacher is referring to with this phrase, begin by placing your attention on a plant and asking yourself; "What do I know about this plant? What aspects of the plant do I focus on when seeking to come to knowledge about it? How do I come to this knowledge?"

These may seem to be strange questions to ask, however, you may find that attempts to answer them often take the form of descriptions of static *forms* (leaf shapes, forms of flowers, position and shape of fruit), *quantities* (numbers of petals, stamens etc.) and generally physical descriptions (shape, spatial arrangement, surface characteristics). If we pause for a moment, we can consider that this type of description arises out of the tendency that has developed over the last few centuries to embrace a mineral thinking, a tendency to *think like a mineral*.

When we look at a plant in this way we configure our relationship in terms of a subject ("me"[17]) looking at an object ("it"[18]) and between us lies (or arises?) the chasm of 'objectivity'.

Out of this stance the sciences of physics and chemistry emerged, and they have – over time – yielded a wealth of insight about features of the inorganic world. They have done so on the bedrock of several pillars or 'stances' adopted by the observer. These include; objectivity, abstraction, reduction, quantification and classification.

This is all well and good, until these cognitive gestures are taken not as ONE way of knowing, suited eminently to the static nature of the mineral aspects of the world (and of ourselves), but as THE way of knowing – suitable to all phenomena.

Recognizing that, in fact, this is a widespread tendency in our contemporary science, Victor Frankl gave the following words of caution; "The present danger does not really lie in the loss of universality on the part of the scientist, but rather in his pretense and claim of totality…What we have to deplore therefore is not so much that scientists are *specializing*, but rather the fact that specialists are *generalizing*"[19].

Restoring the Vertical

Try now to engage once again with a plant, only this time draw your attention to the plant's growth process, to the observable fact that it reveals *changes in forms and structures through time*. To use a phrase that we could attribute to J.W.Goethe – place your attention on the becoming of the plant – not merely or strictly on what it has *become*. The shift is akin to diving into the *verb* nature of the plant, where we are normally habituated to engage with it as a noun – an 'it'.

Approaching a plant in the way described above takes us a step closer to restoring the vertical dimension that Schumacher refers to. It takes us closer to an aspect of the plant which we now must intuit and ascribe to being part of the plant world (and not to the mineral) but which we do not have direct and immediate access to. We could follow Schumacher and begin (exercising caution) by referring to this aspect that differentiates plants from minerals as x. This 'x' is the 'something' that informs plant life and which is absent in the mineral realm. From a purely observational point of view, Schumacher proposes that if we can refer to the mineral as 'm', as we observe a plant growing and changing over time we become aware of 'm + x' – both mineral and plant are composed

[17] Actually my 'subject' is an object – the object of my attention, I am (for the most part) only aware of my thoughts, feelings etc after the fact of their occurrence – "our consciousness is a consciousness of the past – conscious of its own past" G. Kuhlewind, From Normal to Healthy [18] In the IPCUK workshop we explored this relational quality by observing a plant and writing a short descriptive passage about the plant from the 'it' perspective, treating it 'objectively' and as a distinct and static arrangement of 'parts' and forms in space. [19] This statement was made by psychologist Victor Frankl and is quoted by Schumacher in A Guide for the Perplexed, p. 15.

of sense perceptible, material aspects, but the plant has an additional aspect (x) which contributes to the accretion and dissolution of substances, and the metamorphosis of forms through time.

For the sake of brevity (and at risk of doing an injustice to the care taken in *A Guide for the Perplexed* to build these descriptions up carefully) similar observations can be made about differences in animals and humans. These observations lead to the following ladder of ascent (or descent) and a re-engagement with what for millennia was known as the Great Chain of Being.

Mineral	m
Plant	m + x
Animal	m + x + y
Human	m + x + y + z

Schumacher elaborates on these terms by ascribing 'life' to x, 'consciousness' to y and 'self-awareness' to z. This can, in this brief synopsis, be the merest of indicators of what considerations such as these could contribute to a revolution in our thinking (and doing). Such a revolution hinges, however, on the development of new sciences (ways of knowing) that would be adequate to a comprehension of x, y and z, as much of our current science – so deeply rooted in 'mineral-like' thinking - is up to the task of revealing aspects of 'm', but not of the others.

Physics and chemistry deal with the lowest level, 'mineral'. At this level, x, y, and z – life, consciousness, and self-awareness – do not exist (or, in any case, are totally inoperative and therefore cannot be noticed). Physics and chemistry can tell us nothing, absolutely nothing about them. These sciences possess no concepts relating to such powers and are incapable of describing their effects. (Schumacher, p. 29)

Reclaiming Diversity

As a further exercise or exploration (and one that we worked with at the IPCUK), having shifted your attention from 'looking at the plant' to 'looking with the plant' (i.e. engaging your attention with the plant as a process of unfolding in time), try out a stance whereby instead of describing the plant as we did from the 'it' perspective, write a short passage or poem that addresses the plant – as 'you'. This is an experiment or exercise, and not at this point a proposal for an exact science – but it can be the seeds of such. It should not be seen as random or frivolous, as observing a plant in the way proposed gives rise – over time and repeated attention – to the experience that you are engaging another 'being' not just an abstract *thing*. The creative writing exercise of working with 'you' as an informing voice is offered for 'trying on' a new perspective, but one that can be developed – again to quote from Goethe – to be the basis for an exact imaginative cognition. This initially exploratory exercise and approach to studying the plant world can be developed very far indeed, and it amounts to nothing less than fostering new modes of consciousness (ways of seeing/knowing) that are adequate to understanding plants as living organisms[20].

Now, what does this first tentative foray into a 'restoration of the vertical' contribute to *reclaiming diversity* and *designing the world we want?*

I propose that the *diversity* that now needs reclaiming is not restricted to shifts away from the monocultural landscapes developed in the industrial agricultural practices of the last century. Rather I suggest that the very fact that these systems arose is due in no small measure to the collapse, in human consciousness and cognition, of the 'vertical dimension' and a tendency to homogenize the complexity of the natural world into discreet parts (m) that can then be manipulated at will.

I suggest that to reclaim the diversity inherent in the differentiated Chain of Being, to develop ways of knowing 'adequate' to this task, is as great a need as that of creating environments that once again include a diversity of species and complexity of organisms, and a task that is no less pressing. The very nature of our initiatives to design alternatives to the many monocultures of our time may well hinge on our addressing this fundamental loss of diversity. Sensible and sensitive design would also be furthered by this restored awareness of the vertical dimension, and a step taken – thereby – away from our tendencies to *manipulate* and toward a new conscious *participation* in the being and becoming of the 'lifeworld'.

~

[20] A very thorough and considered study of exact imaginative approaches to the study of natural phenomena as evident in the work of J.W.Goethe is provided in Henri Bortoft's The Wholeness of Nature.

California – August. For the longest time I didn't let myself get wrapped up in trying to 'know' what my plant companion was called. I didn't want to fall into the trap of thinking that because I had its common and/or scientific name that I would somehow 'know' it.

Instead I kept visiting this plant as it grew, put out leaves in pairs along its stalk, and began to extend clusters of flower buds into the late summer sunlight. Whereas astonishment never left me in witnessing the vigor of growth in stalk and leafy shoot, the emergence of flowers quite bowled me over.

I had never seen such a remarkable flower and would never have suspected that so sweet a scent would be produced by such a primitive looking plant. Despite the abundance of flowers produced that season, none of them were fertilized and no 'fruit' was set. What would this look like? How could there be no fruits for me to observe following on from this flowering extravagance?

I left California late that summer, bound for the very different climes of the Cotswolds. I realized that I had formed an unbreakable bond to this plant, and a deep curiosity to witness the fruiting fullness of its being and becoming at another time. That encounter would have to wait, however, for now…we had met – Asclepias tuberosa and me – me and milkweed.

The following texts were written by different participants who participated in a workshop on plant phenomenology that I ran during which we studied the Milkweed. The first text was written where the author engaged the plant through the lens of 'it', the second attempted to address milkweed as 'you' (having first paid close attention to how the milkweed grew) and the third attempted the very difficult task of speaking as milkweed - 'I'. The authors have been anonymized.

Milkweed

It is tall with one sturdy stem and a root that holds it firmly in the soil, the stem is thickest at the bottom and maintains thickness to its height of 3-6 ft It has large flat broad leaves spaced approx 3" apart on the stem.

The leaves are a medium green with a sturdy red tinged middle vein and light branches from this that diminish before the end of the leaf and a pointed tip that extends past the edge of the leaf.

The leaves are thick with a velvety underside, white milky liquid appears at the stem where leaves have broken off.

The flowers appear in a multi-stemmed starburst of deep dusty pink and strongly fragrant.

DM

You Milkweed

So Strong; so certain, so definite.
I see stalk say: I will hold up.
I feel Leaf say: I will receive the sun's strength
I sense Flower say: I will bring that absent-minded butterfly to help me fulfill my destiny.

I feel, see, sense your strength, milkweed. I, too am attracted to your scent and to the helpers coming to you. Even your sap is a sign of how you nurture me.

GI

I Stand Tall

I stand tall
holding back
constant form
Two by Two
remembering Noah
and his promise to me.
I bear life in many forms
Close friends bear me
Away.
Scent cast far afield
Is me, in truth
Shield above, soft fleece below
Break me and see what insect will be
eat me and know my holding back will
flow ethereal light
flutters past
remembering mothers milk
remembering ancient home
torrent in two…in time… me with you.

LJ

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Permaculture: The Big Idea that grew itself

Rosemary Morrow

Bill Mollison, co-originator of permaculture said: “To create a mess in which we perish by our own inaction makes nonsense of our claims to consciousness and morality”.

Formal institutions had a tendency to search for a single solution to global warming and the destruction of the Earth’s resources. Whilst their approach is today more nuanced, the solution has not been found because there is no one solution. Permaculture is the transitional and adaptive process that offers personal and integrated solutions through a systems approach. Its solutions are diverse, and it offers local and regional diversity to its practitioners. Whilst relatively little research has been undertaken, so far its strategies and techniques are proving to be scientifically verifiable. (See PIRN Permaculture International Research Network)

Permaculturists have been active for forty years working to fix ‘the mess’ and have been successful in providing viable and resilient examples of transformation from unproductive to productive and sustainable landscapes and livelihoods.

Attributes of permaculture’s success

Specific elements and patterns have made permaculture successful and enabled its infiltration into many countries and professions in the world. With its great diversity and inherent democratic processes, its reach and impact have been often unpredicted and broad. The main elements responsible for permaculture’s extraordinary spread have been:

- Need for different models and practices which rebuild resources and restore the environment
- Content which is flexible, enduring and responsive rather than prescriptive
- Structure and patterns which scale up from very small to very large, and are primarily opportunistic rather than planned and managed

These three elements will be looked at in turn.

The Need

Across the world there is an accelerating understanding that we are on the edge of something potentially environmentally and economically cataclysmic. Many students of permaculture arrive expressing hopelessness. They regret the loss and potential loss of all that created a glorious world. They grieve, yet are motivated to search out solutions. This feeling for those of us who have experienced it, now has words: The Great Grief named by Joanna Macey.

Fears and grief create opportunities to find solutions and prevent people falling into despair. Permaculture stimulates engagement, big and small, according to individual concerns, experience and passions and provides opportunities to work with creative responses. Fundamental to finding permaculture solutions are the guiding ethics and principles.

The readiness to act is sharpest in countries where people live close to precarious essentials i.e. where the need is greatest. However, the growing need to act in consumer countries puts pressure on governments, and creates active social movements. A good example is the importance of social movements in influencing COP21 deliberations held in Paris in December 2015.

A Solid and enduring content

The Permaculture Design Course (PDC) has solid and enduring content. This content is my generation’s gift to succeeding generations. I hold that the permaculture curriculum with its ability to teach repair of ecosystems and human societies is sacred knowledge.

It teaches:

- Analysis of elements and systems such as soils, plants, animals and people
- Seeing and interpreting the natural world

- Restoration processes for soils, waters, re-growth of forests, and integrated agriculture
- Retrofitting cities and towns for a better quality of life than achieved with affluence
- Design processes applicable for all cultures and climates

And, it provokes a deep appreciation of Life's processes.

The content is beautiful and teaches us to see and repair land and human systems.

Figure 1. Bioregional elements in social permaculture

We, teachers, are constantly in awe of how well the PDC content has served its practitioners in the tumultuous years since Bill Mollison and David Holmgren gave it to us. The content has evolved out of success. The more teachers work with it, the more the curriculum grows in depth and potential. Over decades, every part of the curriculum has proven accurate and strongly substantiated by evidence across the world, and none has been discredited.

However, the question is whether the permaculture content is adequate and appropriate for a future with issues unforeseen at the time when Bill and David evolved permaculture. The syllabus has grown and consolidated. But today, there are new areas that were unforeseeable in the 1970s, and urgently need specific permaculture analysis and solutions. Most are related to accelerating climate change and its worsening effects e.g. ocean rise, marine acidity and forest destruction.

Some of the emerging areas in permaculture needing design principles include:

- Social 'swarm' movements such as perma-occupy
- Alternative economies e.g. slow money, perma-money
- Non-violent communication (NVC) and useful feedback
- Mariculture and coastal protection repair strategies
- Rehabilitation of degraded rivers and replenishment of aquifers
- Strategies for megacities with over 20 million people
- Relief and disaster planning especially islands and coastal settlements
- Elaboration of the third ethic of fair share
- Develop guilds/associations for practitioners in fields other than design and education e.g. media, ethical investment

Bill Mollison listed six Diploma fields for applicants, but included none of the above. The original disciplines were:

- Media
- Community development
- Ethical finance
- Design implementation
- Education
- Design consultancy

Only two, design and education, developed systematically, and education is the strongest and most organized. However, permaculture media, fundamental in today's world, is under-resourced and lacks coherence. Effective permaculture media would enable permaculture to reach larger numbers of people than the present teaching model which has done an outstanding job but is not sufficient for the foreseen 9 billion people who will populate the planet.

To be effective at the scale that is needed, permaculture must strengthen networks and resources and add new and original subject areas. Some examples of new networks and resources are:

- Dana Wilson: a worldwide network of permaculture media people
- Lis Bastian: with The Big Fix.org a solutions based website
- Nick McGuigan and Thomas Sterne, university accounting lecturers, are teaching future generations of accountants and bankers to change their language from one of money to one of accountability
- PIRN: providing methods and results of collating permaculture research
- Six people at an IPC event developed Designed Resilience for Disasters course materials for several world climates
- IPC Convergence workshop developed a course in Permaculture as Refugee Friendly

These last two are a response to the increasing climate related disasters and, the tragedy of refugee movements in southern Europe/ Asia due to military engagements. It is most likely both these will increase in the future and Permaculturists need to engage with them now. Both are being developed to be released in 2016.

The Enabling Pattern and Structure

Permaculture knowledge spreads through inspired people teaching the PDC. Bill Mollison said that if a student wanted to teach the PDC s/he should simply do it because s/he would know more than anyone who had not studied permaculture.

The first teachers were "random pollinators", who with a curriculum, courage and perseverance, launched themselves. They confidently walked out and taught. They had not been trained to teach. They were committed and motivated, and many abandoned comfortable lives to pursue this. The results were unpredictable and astounding.

And they all gardened. They designed and built keyhole gardens, herb spirals, filled yards and public places with food, planted food forests, built dams, ponds and swales. They mulched and composted. They produced food and turned lawns into lunch. And permaculture mothers taught children in schools. They produced the early evidence that permaculture teachings worked.

No one sent them out to teach. No bosses or structures existed. Teachers went to plazas, market places, community centres, carports, and even hospitals. There was no organization behind them. This autonomy was their strength. The first waves of pioneer teachers unconsciously developed two highly effective processes: the network and infiltration. The network, a basic pattern in natural and social patterns enables growth and adaptation. Infiltration was through joining, co-operating and working with most other disciplines. Neither of these entail permaculture setting up its own organization or structure except for local organisations.

In hospital: One of my students couldn't attend her permaculture class because she had a chemotherapy appointment, so we went with her and set up the whiteboard and continued learning while the doctors administered her chemo. Carolyn became a leader for permaculture in schools.

The success of the permaculture course can be attributed in a large part to the processes followed by the teachers: those who taught the students who became the teachers who taught the students; moving in an exponential way spreading the teaching and learning and translating it into effective practice. They designed gardens, grew food and kept teaching. They followed the need and their intuition. Did they teach the same thing to the same people in the same way? Were they 'credited' or approved by institutes or governments or a central organisation?

Was their curriculum approved? Of course not.

A second wave of pioneers in the late 1990s opened new ground and consolidated existing knowledge. Their motivation was to deepen and provide evidence of permaculture's worth. New emerging nodes provided 'grunt' in the form of evidence and specialised research and they added depth to curriculum topics. No one directed them.

They flourished because of their need and the freedom to act. They accelerated permaculture and gave it depth and often credibility. They were never planned and managed by anyone. Like the first teachers, they were not directed or resourced in any way except by their insight and

passion to go further. Permaculture has always been citizen-led.

Topics became new disciplines when inspired permaculturists initiated practices and research. They deepened curriculum knowledge through testing, adapting, stretching and developing topics. They rigorously examined the adequacy of content in permaculture courses and provided the detail that enabled local and bioregional implementation.

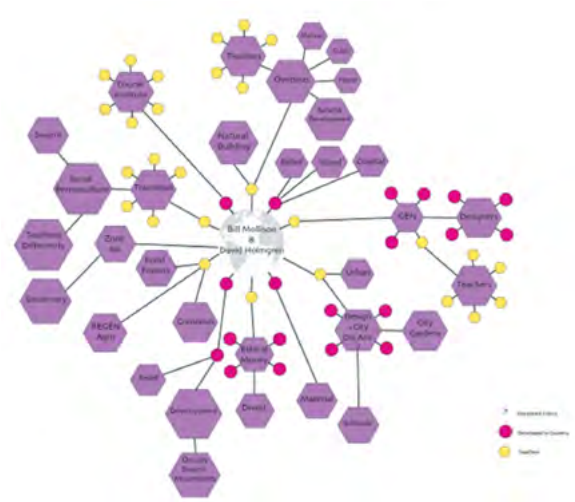
Sometimes topics/nodes floated away and remained only loosely linked to their permaculture parents. Today there are in-depth courses and even conferences on Transition Towns, Global Ecovillage Network, Eco-cities and ethical money and Community Gardens; all permaculture offspring.

While permaculture was developing other individuals were developing strategies and techniques which harmonized and added evidence to permaculture.

The teachers added these new ideas and practices, such as Sepp Holzer's work in Austria and Peter Andrew's river restoration work in Australia. They added regional strategies and techniques e.g. Hugel beds (raised planting beds with composting) and cell grazing (holistic time controlled grazing system).

Above all, permaculture's strength is its network pattern (pattern language basic to all permaculture design) and in this case it simultaneously permits initiative, expansion and consolidation of practices and teaching. Formal education is characterised by a branching (dendritic) pattern. The table shows the differences.

Dendritic pattern	Network pattern
Top down	Egalitarian
Fixed curriculum	Open to new ideas /concepts
Difficult to change	Evolves with changing conditions



Has invisible boundaries	Equality of authority and experience
Slow to respond	Responsive to needs

Unplanned, permaculture's first wave grew a network pattern with nodes and dispersal links randomly taking root where required or where there was an opportunity. This was democratic and open to anyone.

We permaculture teachers, researchers, innovators in permaculture are the links, and the nodes are the content. It is fluid, moving out in any direction and across boundaries. Bill taught while David rigorously tested the content, producing an enduring and integrated model. Both created nodes – one of curriculum and the other of working models.

Is the movement controllable? Because it is a 'people's movement expanding with freedom and simplicity according to practitioners' passions, concerns and invitations, it expands where there is a need or vacuum. Because permaculture is in heads and hands, it is difficult to control bureaucratically. The movement is now almost indestructible and at the same time, uncontrollable. Strange courses sometimes appear under the name of permaculture. And there are always individuals wanting to 'manage' or control permaculture.

Challenge for the future

Can permaculture adapt and survive the threats of climate change and resource depletion? In July 2015, the United Nations gave the world a new set of development goals that replaced the Millennium goals of 2000. Their 17 goals are more conservative and equivocal than the permaculture principles and practices developed in the 1970s. However, permaculture faces a future different from its past. The

present curriculum is always relevant and if everyone on Earth practiced it, then almost certainly catastrophe could be avoided. However, reaching all people of the world and having them act in ways that disrupt consumer lifestyles is unrealistic. The two week PDC courses for small groups of fee paying students is unlikely to be effective nor realistic.

Future 'edge' permaculture faces needs different tools. In my opinion, the future lies in an expanding the third ethic (Distribute surplus to needs to meet the first two ethics of Care of the Earth, and Care of People). It requires all practitioners to accelerate the succession of the next waves of pioneers to:

- Use media compellingly, make films, write, argue, support, advocate for, photograph
- Stay open, accepting and adapting positively to change
- Establish quality of permaculture trainees
- Learn from teachers producing the 'best' permaculturists
- Train more trainers
- Use the web, research, do, establish more evidence that what we do works
- Find the best models - large, small in every environment and let people know and multiply them
- Establish community models where we live
- Work with everyone who is for Life

Because acceleration works through networks, we must understand our networks better.

From a permaculture perspective, we have the elements: processes and the content. We are not alone as there are many working with other solutions which we can use and pass to the next generation. We are the alternative with almost forty years' experience, the right structures, the right content and we are here at the right time. We weave the ribbons of systemic change. We love this world, we love Life and we have a vision. We must keep the process open and multiply the solutions. We have the capacity to solve the challenges and enable the next wave of permaculture.

It's essential that international permaculture design is adopted as the core of all relevant science, with our ethics at the core as we go into action. Then and only then will we engage as a serious effort and effect for all people.

Geoff Lawton

With the ethical design framework and the principles inspired by nature and emphasis on low-cost solutions, we can meet our everyday needs across the globe. We can be very optimistic that this can be achieved, as everything we need to know is available to us. After 40 years of testing and experimentation, permaculture is ready to scale up.

Geoff Lawton

I.P.C.U.K 2015 Conference Poem

Breaking All The Rules

We cannot un-know what we know to be the truth;
The fear we hold,
This sweet life poisoned at the well.
Mother Earth cries out in grief
Our tears water the ground
Creation denied -
The hungry and the starving and the locked-in mindsets
The tree-less spaces and the swirling of the plastic waste.
No more, no more, no more.

Chorus

We're breaking all the rules
There's a revolution going on
Empower the women, educate the youth,
For this is the time of the great Remembering,
Return again to the land of your soul
(And you can tell the riders from the apocalypse they can piss off home!)

We are changing the story,
Hearts beating in rhythm with the Earth,
She is showing us her ways.
Earth is our Mother, Earth is our Lover
'Hear me, she cries, as I sing and laugh
Rising and falling in rhapsody
Who will hold my heart?'
For we are one, we are one, we are one.

Chorus

Oh this sweet life.
In the quiet hinterland of the spirit
A small light is shining, getting brighter,
Gaia's abundance is feeding us all,
The heritage of Africa has been restored
The rights of passage for the youth -
At last a consciousness of stones.
Oh this sweet life – four and a half billion years of it
And the circles we walk leave a gentle footprint to follow
And the circles we walk leave a gentle footprint to follow.

Chorus

This poem was created using words and phrases (both written and spoken) contributed by delegates and speakers from the I.P.C.U.K 2015 Conference and woven together by Poet Siobhan Mac Mahon. The Poem was performed collectively, at the end of the Conference, by many members of the International Permaculture community, in many different languages.

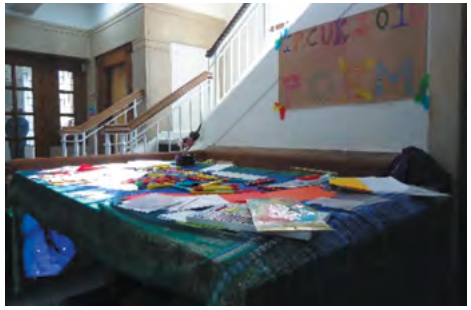


Photo: The poem in the making at the conference (S MacMahon)

Author biographies

Albert Bates

Albert (USA and Mexico, B.A. Syracuse U., LL.B, J.D. NY Law School) is past President of the Global Ecovillage Network and one of the GEESE (Global Ecovillage Educators for a Sustainable Earth). He has taught human ecology and integrated development to students from more than 60 countries, including more than 50 Permaculture Design Courses. He is author of 16 books on energy, environment and history, including Climate in Crisis: The Greenhouse Effect and What We Can Do (1990), The Biochar Solution (2010), and The Paris Agreement: The Best Chance We Have to Save the One Planet We've Got (2015).

David Hare

David graduated from Reading University with an Agricultural Systems degree, but, after a life-threatening accident trained as a social worker and decided to work outside with animals, plants and people. He saw the power of dogs, horses and small animals in therapy, and how animals can reach places no person can. He has been with Growing Better Lives since it started with monthly conversations in a pub in Reading. After winning lottery grants he and the team brought a yurt, and have used it as their 'therapy centre' since. Although the initial grant has run out, he continues as a volunteer, believing that working outside, becoming attuned to nature, forming relationships, interacting with other people and the environment is the best way to support, enable and heal people with personality disorder.

Chris Warburton Brown

Chris has been the Research Coordinator for The Permaculture Association Britain for four years. He coordinates the Permaculture International Research Network and organised the programme for the International Permaculture Conference. He holds a PhD in Urban Studies from Glasgow University. Previously he has worked in anti-poverty work, community development, history and archaeology teaching, organic food retailing and farming. He is married with two young daughters and lives in Newcastle upon Tyne.

Contact: Chris Warburton Brown, Research Coordinator, The Permaculture Association Britain, research@permaculture.org.uk

Geoff Lawton

Geoff Lawton is a world renowned permaculture consultant, designer and teacher. He has undertaken thousands of jobs teaching, consulting, designing, administering and implementing permaculture, in 6 continents and over 50 countries around the world. Clients have included private individuals, groups, communities, governments, aid organizations, non-government organisations and multinational companies. He has currently educated over 15,000 students in Permaculture worldwide. Geoff has established permaculture demonstration sites that function as education centres in all the world's major climates — information on the success of these systems is networked through www.permacultureglobal.org. Geoff established the Permaculture Research Institute and the www.permaculturenews.org website to network mainframe information worldwide. Geoff Lawton's official website, where he shares his videos and blog posts is located at www.geofflawtononline.com.

Jeremiah Kidd

Jeremiah's passion and education in Permaculture, natural building and alternative technologies began in the late1980's. He completed his first Permaculture Design Course in 1992 and many advance classes leading to a Diploma from the Permaculture Institute. In 2000 he established San Isidro Permaculture in Santa Fe, New Mexico, a design and installation company focused on water catchment, permaculture education, grey water systems, native and edible plant landscapes, erosion control & land restoration. He has volunteered and consulted in the USA, Latin America, Caribbean, Africa and Asia on several projects.

John Nzira

John Nzira was born in Zimbabwe, in Manicaland Province in a rural village in the Makoni district. He studied agro-ecology and permaculture and received international sponsorship for training in Environmental Education and Ecological Agriculture in Canada, USA and Israel. He is an internationally accredited permaculture facilitator, received his Permaculture training in Zimbabwe at Fambidzanai Permaculture Institute and further training with Bill Mollison the founder of Permaculture in the late 1980s. John was instrumental in bringing Permaculture to Zimbabwe, Lesotho, Swaziland, Mozambique and South Africa. He founded Ukuvuna in 2005, and has a history of successful implementation of many community projects in the SADC region, and believes in "working together" to make a difference.

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Joel Williams

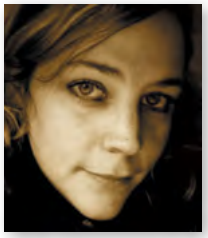
Joel Williams spent 3 years working for the soil foodweb in the UK, training and consulting with farmers on soil biology – he has an in-depth knowledge of soil biology and has been told his presentations pitch soil biology in an easy to understand, practical and real world viewpoint. From a practical point of view he has implemented biological principles on farm in both intensive horticulture (vines, field veg, market garden) and agriculture (cereals, pasture).

Joel Williams, Director, BioLife Ag, www.biolifeag.com

Jonathan Code

Jonathan is a lecturer with Crossfields Institute International. He lectures on the MA Researching Holistic Approaches to Agroecology and the BA Philosophy, Arts and Social Entrepreneurship. Jonathan has a deep interest in consciousness studies, western esotericism, the natural sciences, and education. These interests informed both his bachelor's degree (Integral Studies, CIIS, California) and his M. Ed (Social and Environmental Education, RSUC Oslo). Jonathan has taught practical chemistry, phenomenology, and nature study to learners of all ages for many years, and he continues to contribute to adult and higher education initiatives both in the UK and abroad. Jonathan's book *Muck and Mind: Encountering Biodynamic Agriculture* is published by Lindisfarne Press.

Author biographies

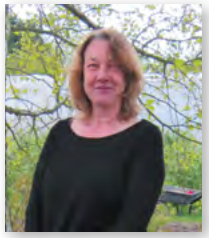


Katie Fox

Dr Katy Fox is a social anthropologist, permaculture designer and educator passionate about social and cultural transformation. She founded CELL, the Centre for Ecological Learning Luxembourg, an underground mycelial network for nurturing transition projects and a laboratory for permaculture. She situates her thoroughly transdisciplinary work somewhere between systems theory, ecology, political economy, social science, permaculture design, art and radical pedagogy. She is particularly interested in putting resilience research into practice, participatory workshops, organisational development, methods of collaboration for bringing about change and is currently developing the eco-social consulting branch of CELL.

Mario Yanez

Mario Yanez has dedicated his life's work to envisioning and inspiring a transition toward life-sustaining, resilient human communities. He has a professional background in finance, information systems and ecology. Mario has several decades of experience applying systems thinking in nonprofits, developing and funding cutting-edge programming. As an educator, Mario creates provocative and relevant active-learning curriculum supportive of a much-needed cultural evolution. As a Permaculture practitioner, he is applying design at various scales, implementing regenerative productive landscapes, enterprises, and organizational and social systems. Mario is native to the Greater Everglades bioregion and is well versed in tropical/sub-tropical food production.



Marina O'Connell

Marina is a horticulturist BSc Hons (Bath) and has studied Permaculture design (DIploma) and Biodynamic and Agroforestry systems for over 25 years. She has a Masters of the Environment from Essex university that has provided a theoretical underpinning of these systems. She has practiced working on farms with these methods for 25 years in her work at Dartington Hall South Devon, Otley College and at the Apricot centre in Essex. She is a director of the Apricot centre and is currently working on developing a new farm at Huxhams cross in South Devon that is a part of the new Dartington Hall learning campus. She is also a trainer of these systems.

Naomi ven der Velden

Naomi is a Senior Lecturer in Ecology and Sustainability at the University of Cumbria, UK. Applying a sound understanding of plant community ecology to develop effective agroecological solutions at appropriate scales has become a key focus of her research work. She enjoys collaborative multi-disciplinary approaches to understanding diversity and dynamics in annual and perennial food producing ecosystems, and the human communities around them.

Naomi also works for the Permaculture Association (Britain) on an international project to better understand a worldwide dispersed, yet highly effective, grass-roots movement of permaculture designers, farmers, educators, researchers, and entrepreneurs. There are an estimated 3 million practitioners in over 125 countries. The aim of this project is to better enable organisations, individuals, and networks to operate efficiently and effectively to achieve greater impact at local and global scales.

Petra Stephenson

Petra Stephenson lives in New Zealand and designs permaculture properties. She has instigated various community activities, starting from community recycling schemes long before recycling was a common word, to bringing the idea of Savings Pools to the Top of the South and setting up a timebank and the first food forest in her home town. Petra is passionate about community resilience and was taken by the idea of Savings Pools, an idea which Bryan Innes evolved for NZ from the Swedish JAK bank.

Rebecca Laughton

Rebecca is Campaigns Researcher for the Landworkers' Alliance and runs a small organic market garden in Dorset. She holds a MSc in Sustainable Agriculture from Wye College, and has been working on local food and farming issues for eighteen years, resulting her writing the book, "Surviving and Thriving on the Land" (Green Books 2008). She also conducts agricultural appraisals for smallholders trying to get residential planning permission, and it was this that motivated her to start research into the productivity of small farms.

Rafter Sass Ferguson

Rafter is an agroecologist, focusing on the political-economy of diversified farming systems. He recently completed his PhD (December 2015) based on a dissertation entitled "Permaculture as international grassroots network and farming practice: a multidisciplinary study." He came to graduate study after a decade in the global justice movement as organizer, participant, and scholar. Since 2005 Rafter has been developing and sharing the Liberation Ecology workshop, a curriculum that helps participants develop strategies for integrating social justice and sustainability goals. He is currently a visiting researcher at the Center for Ecology, Evolution, and Environmental Change at the University of Lisbon. In 2016-2018 he will be a Mellon Fellow at Haverford College in Philadelphia, PA. You can find him at liberationecology.org

Rex Haigh

Rex is an NHS Psychiatrist who uses therapeutic environments as a treatment. He founded the 'Enabling Environments' project at the Royal College of Psychiatrists, and uses 'greencare' in his clinical practice, where nature is an important part of therapeutic programmes. He believes that this has the potential to offer a radical alternative to traditional psychiatric approaches in a way that 'gives people a life worth living on a planet that is worth living on', by avoiding the institutional, industrial and corporate trends of mainstream mental health. The 'Growing Better Lives' social enterprise, of which he is chair, won the Royal College of Psychiatrists 2014 Sustainability Award.

Author biographies

Rosemary Morrow

Rosemary (Rowe) has been teaching permaculture since the 1980's, not only in Australia but overseas in Vietnam, Cambodia, Uganda and Ethiopia to name a few of the many countries she has travelled to. Rowe is author of "The Earth Users Guide to Permaculture", "The Earth User's Guide to Teaching Permaculture" and newly published "Permaculture Teaching Matters". Her present concern is to make teaching sustainable and encourage others to succeed her as teachers so as to ensure that every course counts. Blue Mountains Permaculture Institute, www.bluemountainspermaculturеinstitute.com.au

Trathen Heckman

Trathen is the founder of Daily Acts Organization, Board Chair of Transition U.S. and on the steering committee of the NorCal Community Resilience Network. Trathen works to harness the wisdom of nature and power of community to rebuild personal and community resilience. He is an award-winning writer and leader and a founding member of the Sonoma County Food System Alliance. Trathen lives with his family in the Petaluma River Watershed in Northern California where he grows food, medicine and wonder while working to compost apathy and lack.

Siobhan Mac Mahon

Siobhan is Irish Performance Poet living in Yorkshire. Her poems, powerful and often funny, celebrate our sacred connection to the Earth and the return of the Divine Feminine. She performs widely in England, Ireland and Europe and has been creating Spoken Word projects for over 20 years, combining Spoken Word with music, dance, art and with film including -The Mouth of the Cave, Voices of Women and Echoes of a Spiritual Nature. She is actively involved in the 100 Thousand Poets for Change worldwide movement. Her recent multi-lingual poetry film Forgotten Memory has been shown at the Cork Film Festival and at the Cyclops Film Festival, Ukraine. - http://youtu.be/daY7jljjQUM

Her poetry has been published both online and in print – most recently in a Bloodaxe/ Raving Beauties Anthology – Hallelujah for 50 Foot Women. Siobhan runs writing and performance workshops, focusing on poetry as a tool for self- expression, healing and creative growth. www.siobhanmacmahon.co.uk