Introducing Ecological Footprinting as a system:

C S Lewis wrote…… "Progress means getting nearer the place you want to be. If you take a wrong turning, then to go forward does not get you any nearer. If you are on the wrong road, progress means doing an about face and walking back to the right road, and in that case the man who turns back the soonest is the most progressive man."

If we are to make our progress sustainable, we need to understand **where we are now**, which **direction** we should be going in and how we will know **when we have arrived**.

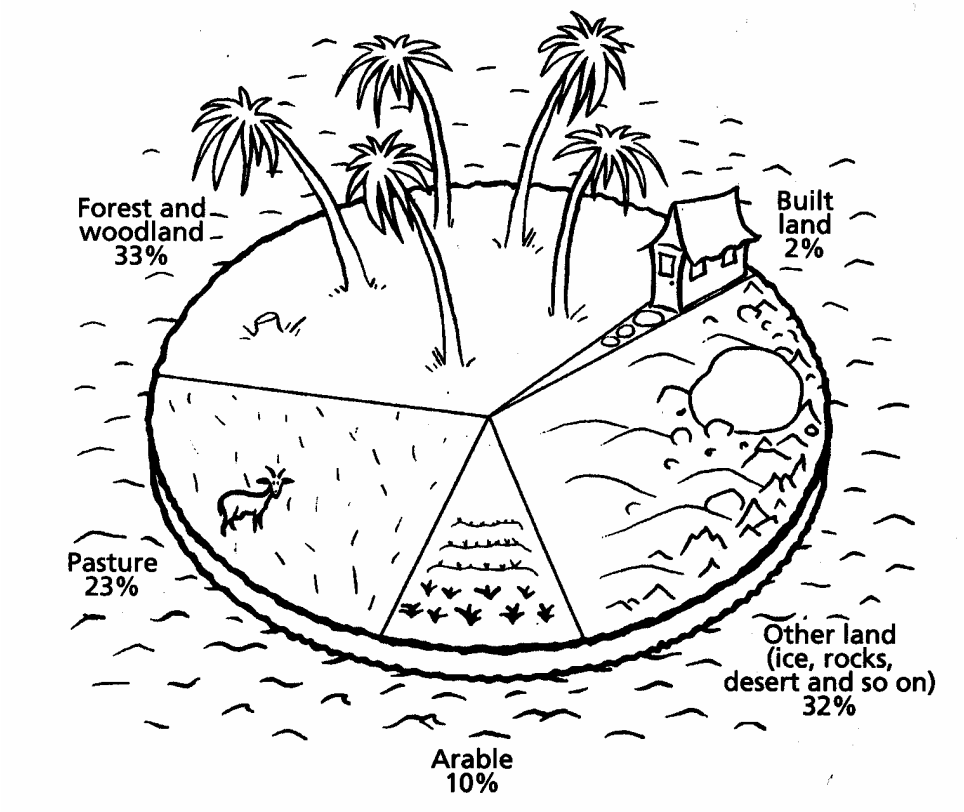
Ecological Foot printing is an accounting system to measure and compare our resource use. We can use it to help us answer these questions.

It was introduced to the wider world by Mathis Wackernagel and Bill Rees from the University of British Columbia, In their 1996 book "Our Ecological Footprint" and developed with Nicky Chambers and Craig Simmons of Best Foot Forward, Oxford in their 2000 book "Sharing Natures Interest" It has been developing as an idea and system for over ten years. Many researchers worldwide are now contributing to it's development.

Introducing our "Fair Share"- HOW MUCH HAVE WE GOT?

"The problem with land is they stopped making it some time ago" Mark Twain.

Looking at the world we can see that the total land area is approx. 15 billion hectares.
Of this the total "productive land " is approx 10.3 billion hectares the total "productive sea" is approx 2.9 billion hectares giving us a total of 13.1 billion hectares to provide all the resources for all the people on the planet AND all the other living creatures that we share it with. We need to provide space for them as they provide resources and life support for us. Arguments rage as to how much land area we allow for other life. Estimates are suggested from 12% to 50%. In our calculations we use 12% to be conservative about human interests.



fish including dog and cat food. To reduce his footprint further he could: Lose the dog and cat! Consume less fish and dairy produce. Make sure those items he does consume are produced and sold locally. Try and find ways of travelling less. An improvement of the energy consumption of the community would also help his footprint.

It is currently difficult to separate out individuals varying energy consumption and waste generation at Keveral farm due to the co-operative nature of our housing set up and the lack of individual measurements of waste. However all our footprints were less than the average in the UK which was a relief for us "Greenies". We can certainly do more to reduce our footprints without loosing quality of life. It would be true to say that, at first, many of us were disappointed that our footprints were not smaller.

We are now using Ecological footprint analysis to try and determine the most sustainable way to heat our home over the next 25 years.
Our Choices are:

- A conservatory to provide a passive solar solution backed up by the existing wood burning Stoves.
- A combined heat and power boiler system which would burn local farm wastes and biomass.
- A central heating system powered by gas.
- A central heating system powered by woodburner
- Thermostatically controlled electric heaters powered by wind generated electricity.
- New and improved insulation and double glazing for all options.

Check our website as time passes to see how we handle these, and other, calculations. www.keveral.org

information than Oak. Most of his 'Luxury' consumption would be for travel & books. He flies very occasionally. Food contributed 60% of his footprint, 30% of which was dog food. Transport was 26% and overall 45% of his total footprint was energy based. To reduce his footprint further he could: Lose the dog! Make sure those items he does consume are produced and sold locally. Try and find ways of travelling less. An improvement of the energy consumption of the community would also help his footprint. Better data for a longer period would also reveal more.

Richard (again): Had a well-paid professional job in London before moving to the farm to learn more about organic production and sustainability. He still had the dog and used public transport to go every where. However less of the food he ate was produced and sold locally adding 30% to his 'country' footprint and his electricity was supplied by a fossil fuel burning generator unlike the wind power we consume (too much of) on the farm. These factors plus more flying and a busier lifestyle account for the larger footprint.

Bethan: Works in wood crafts and setting up local produce markets. This means that she has to have her own van to get around in for work. She has a small room in our energy inefficient farmhouse. She eats mostly locally produced produce and uses her work journeys to shop. She is non-smoking and drinks a little. She has a dog. 67% of her footprint was for food and of this 90% was contributed by dairy produce, meat and fish. To reduce her footprint further she could: Lose the dog! Reduce / replace her consumption of dairy products and fish, making sure those she does consume are produced and sold locally. An improvement of the energy consumption of the community would also help her footprint. Better data for a longer period would also reveal more.

BILL: lives in a poorly insulated static caravan and works for the housing co-op. He travels in a shared car for shopping trips and visiting friends. Flies occasionally every few years. He collected information over a six month period and this gave a 30% reduction in footprint from the one initially calculated after one month. This is as consumption of things only bought occasionally balanced out with seasonal variations etc. He has a dog and a cat. Likes tasty food and eats 60% locally produced produce. Food accounted

SO HOW MUCH CAN I USE?

So 13.1 billion Hectares, between 6 billion people = 2.18 ha each
2.18 ha minus 12 % for other life = **1.9 ha each** now.

But what if the population continues to rise to the estimated 9.5 billion in 2050?

Then 13.1 billion Hectares, between 9.5 billion people = 1.4ha each
1.4 ha minus 12 % for other life = **1.2 ha each.** By 2050

- So with an idea of what our fair share might be – to achieve sustainability we need to live by consuming in one year only the products and services that can be produced by that land's biological growth in one year AND producing only wastes that can be absorbed by the natural recycling processes that take place on that land in one year.

- We could call our land and it's resources our "Biological Capital" and the sustainable produce of that land over a year our "Biological Interest"

- If we consume more than can be produced by "our" land in one year then it's productivity will be lowered the next year and so on……. A destructive downward spiral.

If we produce more waste that can be subsumed by "our" land in one year then it's productivity will be lowered the

- next year and so on…… another destructive downward spiral.

- We may not notice that we are using more than our fair share because we can go on over consuming our "Biological Capital" until suddenly it is gone or unusable.

- ********Imagine a barrel…….

LET US LOOK AT THESE RESULTS MORE CLOSELY.
Most people's income is around £55.00 per week, mostly from the farm's workers co-operative, plus a housing support payment worth approx £38.00 per week with some additional benefit money for children. This low income affects our lifestyles and our ability to consume fancy products. Let's look at some sample Keveral residents to see what we can learn from their footprint analysis.

It is important to recognise at this point that Ecological footprint analysis does NOT judge your lifestyle. It lets you look at your ecological reality and allows you to weigh the contribution of different consumption choices against the fulfilment you get from that life choice.

Oak: Works as a woodsman. Submitted reasonable data, however nutritional analysis of his reported food consumption (a handy part of the spreadsheet) would suggest he is likely to be slightly malnourished. He is a big healthy bloke so maybe he forgot something? Lives a simple lifestyle. Shares vehicles. Travels little, mostly for work and uses these opportunities and other people's shopping trips to do most of his shopping. Hardly ever flies. He occupies an average room in our energy inefficient farmhouse. Much of his food is produced locally with the exception of canned fish and imported grains / wholefoods. He doesn't smoke, drinks little alcohol and his diet is not extravagant. Most of his 'luxury' consumption would be on books, magazines and music. Food contributed 83% of his footprint. Of this 40% was for dairy produce and fish. To reduce his footprint further he could reduce/ replace his consumption of dairy products and fish. Making sure those he does consume are produced and sold locally. An improvement of the energy consumption of the community would also help his footprint. Better data for a longer period would also reveal more.

Richard: Works on the farm. His interests take him distances for meetings, some of which require that he use a shared car due to poor public transport links. He also drives on occasional shopping trips. He has a pet dog who loves eating meat-based dog foods. His diet is vegetarian using many locally-produced products, except imported grains / wholefoods. He doesn't smoke, drinks little alcohol. He submitted more comprehensive consumption

Keveral farm is a housing co-operative and Permaculture-based organic farm in southern England. We like to think of ourselves as "green" and we actively try to act in an ecologically responsible way. We have a population of approx. 20 adults and 6 children.

Individuals and family groups in the community were asked to record their consumption information as detailed above. After a few months, without too much hassling, information of various degrees of accuracy was submitted for 10 of the adults and most of the children. We then used this information to produce an Ecological Footprint league table. More importantly for individuals, their consumption and results could be examined to see which areas were contributing what to the footprint. Waste, recycling and energy consumption were based on the community's average figures.

THE KEVERAL FARM ECOLOGICAL FOOTPRINT LEAGUE TABLE

NAME:	Data over PERIOD:	FOOTPRINT Per capita:
Kate, Aseling & Merla	One month	1.2
Sean	One month	1.4
Ben	Three months	2.0
Gina	Six months	2.2
Bill	Six months	2.3
Oak	One month	2.4
Babilli & Wilf	One month	2.7
Margaretta , Lowena & Cicely	One month	2.8
Bethan	One month	3.5
Richard	One month	4.2
Richard (in London)	One month	5.7

Keveral Farm average (of data submitted) 2.4 Hectares
UK AVERAGE 4.6 Hectares
12

SO WHERE IS "MY" LAND THEN?

Our fair share land might be anywhere and many different places at once. It is a concept… virtual land if you like. We all use resources from many different parts of the world and it is not always possible to get what we need locally. The important thing is that Ecological Footprinting helps us to determine how much of our fair share we are using even if we consume something from the other side of the world.

HOW DO WE CALCULATE HOW MUCH LAND WE ARE ACTUALLY CONSUMING FROM?

The ecological footprint boffins have devised two main ways depending on how we want to use the results.

So if you want to calculate the footprint of your nation state or region you can use commonly published statistics in a process something like this:

1. COMPOUND CALCULATION is good for the bigger picture and calculations of footprints on a large scale like national averages.

2. + An **ENERGY BALANCE** (= locally generated consumption + embodied energy in over 100 categories of traded goods)

3. A summary of the average footprint is then produced in 6 ecological land use categories and summarised as a total per capita figure which is adjusted to present the result in terms of "world average productive land".

These types of calculations use world average land biological production figures. The land areas produced are adjusted using an "equivalence factor" which recognises that, for example arable land is more productive than just any average old land. Areas from produce and services are altered using a "yield factor" to adjust local productivity and technology to the world average. So if your technology is super efficient and your sustainable yields are twice the next countries then this will be taken into account.
Energy is primary fuel adjusted for carbon content and then converted to an equivalent area of world average forested land that would be required to sequester the CO_2 produced.

THE ADVANTAGE OF USING THIS TECHNIQUE IS…….. AS THE SAME ASSUMPTIONS ARE USED FOR DIFFERENT COUNTRIES THE RESULTS ARE COMPARIBLE IN RELATIVE TERMS.

2. COMPONENT BASED CALCULATION……..Is a more detailed analysis which produces a breakdown of footprint by activity. It is applied to individual lifestyles, families, schools, communities, businesses and projects.

Due to the breakdown by activity it is often more instructive and easier to communicate. Making it useful for policy making, education and for comparing different potential schemes for projects.

The ecological footprint values for components are pre-calculated using regionally factored, direct and indirect lifecycle impact data. Consumption is then monitored for 24 major components, which have been shown to account for the majority of consumption. Depending upon the sensitivity required some components, food for example, can be subdivided further.

The total footprint is then calculated as the sum of the component's footprints.

accurate average monthly consumption over say six months or a year. Be consistent and soon you will be able to get a picture of **where <u>you</u> are now**.

I recommend that you go through the data/record keeping above, as it will be hugely revealing about your lifestyle. If you can't be bothered with all of that there are several simple Ecological Footprint calculators available on line which only ask you 13 questions about your lifestyle and estimate your footprint.

WHICH DIRECTION SHALL WE GO IN?

If you start to monitor your own consumption and regularly calculate your footprint you will start to recognise the different areas of your lifestyle and how much they contribute to your overall footprint. You can use this information to make judgements about any areas of your life where you could happily reduce or change your consumption pattern to reduce your footprint.

Ecological Footprinting can be used to compare different possible future projects. For example infrastructure development or business plans.

It can also be used to compare different systems for producing/ processing products.

It could also be used to label products to help people make purchasing decisions.

HOW WILL WE KNOW WHEN WE HAVE ARRIVED?

Assess your own footprint and take action to reduce it. As it approaches the magic 1.4 hectare footprint (the UK average is 4.6 ha!) and you have found ways to enjoy a quality life within this level of consumption you will know that you are getting there.

When we see the world's footprint returning to what it was somewhere in the 1950's then we will have possibly have found the road back to sustainability as a species.
THE KEVERAL FARM CASE STUDIES!

consumption to a footprint. PROVIDED we can get the required data from the: person, family, town, organisation, region or product.

BUT HOW CAN WE USE ECOLOGICAL FOOTPRINTING?

Let's get back to our questions about progress……

WHERE ARE WE NOW?

We can start to answer this question by…… using Ecological footprinting to compare nations and regions globally.

There has been considerable work in this area and you can find various different comparisons of nations published. It is this research which has led to newspaper articles telling us that we are now consuming the production of 2.5 planet Earths each year. Or put another way, it takes the biosphere at least a year and three months to renew what humanity uses in a single year[2]. (Surely not sustainable)

We can also examine in more detail the breakdown of regional, personal and institutional consumptions.

TRY IT YOURSELF!

To do this for yourself you can start by keeping a record of everything that you consume. **Keep** your receipts from shops, note the weight of the goods you buy and even where they came from. **Keep** a record of your travel, how many miles by what form of transport. **Keep** a record of your energy use (electricity, gas etc.) and how the power is generated (ask your generator) **Keep** a record of what you recycle and what you throw away, weigh your bin bags and even go through them and weigh the different types of wastes you are sending to landfill.

This all sounds like quite a job but it is amazing how easy it is to do and after a short time you will probably start to see patterns in your consumption. After a month you will have enough data to try your first footprint analysis on yourself or your household. However you will get better and more accurate results the longer you keep your records. You will get a more

The main disadvantage of this approach currently is linked to the variability and reliability of lifecycle analysis data for components, which can make national and international comparisons problematic.

However for different consumption choices whether for a family or a project, provided the same assumptions are used for all choices, the results will help compare the different options in relative terms.

Improved data recording for the direct and indirect lifecycle analysis of components in different parts of the world will make this a more and more powerful tool as time passes.

IT IS IMPORTANT TO NOTE THAT NEITHER METHOD TELLS THE WHOLE STORY. THEY ARE NECESSARILY SIMPLIFIED TO CREATE A TOOL THAT CAN BE WORKED WITH. BUT…. THE EFFECT OF THIS IS TO UNDERESTIMATE THE HUMAN USE OF NATURE…

HOW DO WE CALCULATE A COMPONENT'S ECOLOGICAL FOOTPRINT?

In essence you examine your component. Make decisions as to which land categories are utilised to provide it's raw materials and to absorb the CO_2 emissions from the fuels/energy necessary to process and transport the materials/component throughout it's lifecycle, including what happens to it at the end of it's life/use.

The land categories used are: Energy land, Built or degraded land, bioproductive land, bioproductive sea and biodiversity land. These were originally suggested by Mathis Wackernagel based on commonly published international statistics.

For example: FOOTPRINT OF A LOAF OF BREAD

How much grain is required for 1 Kg of bread?

Based on recorded figures for cereal yields, this will relate to a certain area of land (bioproductive land) required to grow the grain.

We then have to examine the energy used to
a) grow the grain on the farm and harvest it.
b) Transport and mill the grain to flour.
c) Transport the flour to the bakery and bake the bread.
d) Transport the bread to the retailer and sell it.

Depending upon the various fuels used this will relate to a certain area of forest growth (Energy Land) required to sequester the CO_2 produced.

The sum of the two areas is then the EF for your 1Kg of bread.

Lets take it further…….

We eat the bread so we then get sewage to deal with. However we would not deal with the sewage from the bread directly as its too messy a job to sort out how much has come from just the bread. However we could do a separate EF analysis of the sewage treatment used ……

Assume we buy the bread from a shop and the flour is made in a mill. Again we don't try to analyse how much area is contributed to the bread's EF by the shop and factory themselves. However we could do a separate EF analysis for the construction of the buildings etc.

In either of these instances there will be a certain area of land used for obtaining raw materials (mining = Built or Degraded Land), (timber = Bioproductive Land). Another area for the processing and transporting of these materials (Energy Land). A certain area of land will be used to build the roads, car parks and buildings at the mill/shop/sewage works (more Built

Land) Energy will then be used to build and maintain the buildings (more Energy Land).

(In practice the Ecological Footprint analysis of these buildings, due to their complexity, would involve looking at a more detailed breakdown of their components.)

Hopefully from this brief introduction you will start to understand how we can look at a component (product, building, process etc) and break down it's contributing parts, allocate them a land use category and then assess what areas of land would be required in which categories.

To really understand how various component's footprints are calculated you will have to do some further reading. I recommend "Sharing Natures Interest" [1]

However for mere mortals the important things to note are ……..

- Work has already been done to calculate estimates for the ecological footprints of various materials, foods and energy sources. It is published and it is possible to use this research.
- These footprint estimates are being updated and added to as time passes.
- If you examine and understand the assumptions used in calculating these estimates then even if the final footprint given is not absolutely 100% guaranteed correct you can still compare like with like in your own footprint calculations and therefore make judgements to guide you towards sustainability.
- You can download sophisticated Ecological Footprint spreadsheets from the web. Try www.ecologicalfootprint.com, www.bestfootforward.com, www.rprogress.org.

SO……We can use compound calculations to give us figures to compare nations/regions and we can use a component based calculation for more specific information about the contribution of different areas of