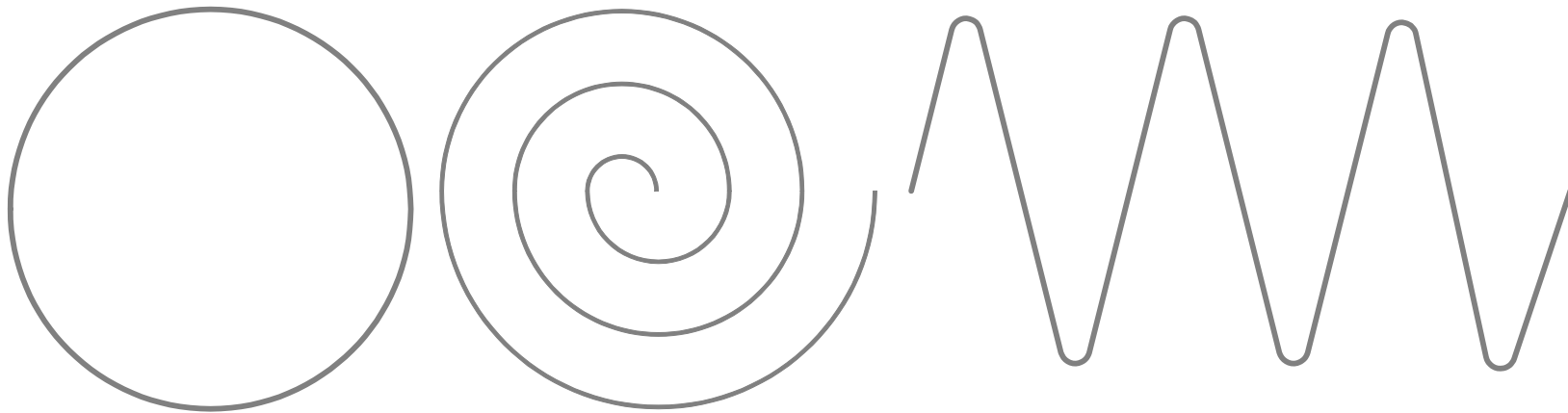


# Design with natural patterns

- *Demonstrating permaculture principles* -



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March 2011  
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## Site Survey

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Type of site:	1 <sup>st</sup> terraced field; 2 <sup>nd</sup> 1 small terraced field.
Size:	1 <sup>st</sup> 30m <sup>2</sup> ; 2 <sup>nd</sup> 10m <sup>2</sup> approximately.
Slope:	1 <sup>st</sup> gentle slope towards south-east; 2 <sup>nd</sup> gentle slope towards south.
Altitude:	1500 meters.
Aspect:	Both sites are south facing.
Water source(s)	Taps at buildings.
Micro climates:	1 <sup>st</sup> west-side shadowed by building in afternoon; 2 <sup>nd</sup> south is a cane-filter which causes reflection and thermal mass, north is a concrete and large boulders surrounding the area which stairs which acts as thermal mass.
Building(s)	1 <sup>st</sup> building on west-side; 2 <sup>nd</sup> building and concrete stairs on north-side.
Pollution:	None.
Access:	1 <sup>st</sup> this is an intensively used area close to a playground and the kitchen, besides there is a fire-hose on the building which needs to be accessible at all times; 2 <sup>nd</sup> Access by stairs located north, it is a less used area.
Soil:	Poor quality, rather silty with some (fine) gravel.
Vegetation present:	Grasses, clover, plantain.

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## Goals Articulation

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- To demonstrate different growing techniques and permaculture techniques;
- To grow herbs and medicinal plants for demonstration, own consumption and selling to the Kathmandu market;
- With the use of permaculture techniques growing bananas in an area where this is normally difficult.

## Work Plan

Activities	Days	1	2	3	4	5	6	7	8	9	10	11	12
Prepare areas	1	■											
Design	2		■	■									
Herb spiral	1				■								
Raised beds	2					■	■						
Banana circle	2							■	■				
Purchase plants	1									■			
Planting	3										■	■	■
<b>Total Days</b>	<b>12</b>												

## 1<sup>st</sup> site

### Herb Spiral

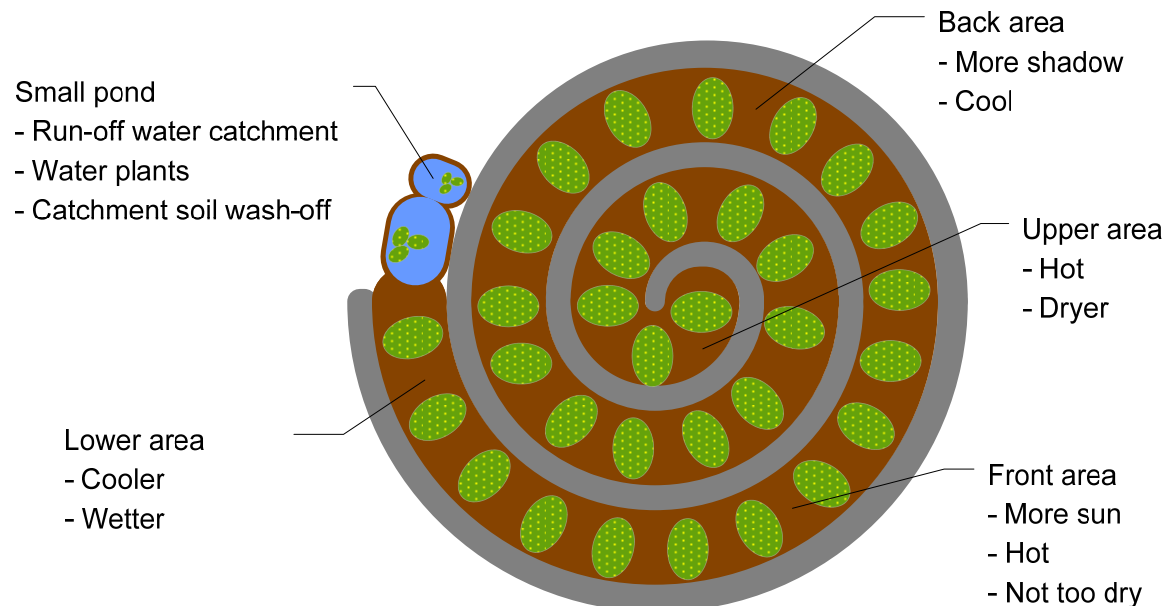
- ⇒ High productivity on a small space;
- ⇒ Diversity of conditions in one place;
- ⇒ Easy watering;
- ⇒ Easy access and to take care of;
- ⇒ Easy harvesting.

The location of the herb spiral is chosen so it is close to the kitchen. In relation to the centre of activities this area will be in Zone-1 of the Zone-planning. At the same time the kitchen building protects the spiral from the very hot sun in the afternoon. The herb spiral makes use of a natural pattern where a large number of species of herbs can grow.

It is positioned from north to south, perfect for the sun cycle as well as the moon cycle. This positioning and the spiral's different heights create different *microclimates* -and this on a very small space. Up it is the hottest and driest place, down is the wettest and coolest place. The stones, where the spiral is made from, warm up by the sun in daytime and release this heat slowly at night-time, this is called *thermal mass*.

The spiral ends with a small pond to capture any excess water. To just use natural materials, clay is used to seal the bottom. Water plants are grown in here.

To prevent grass from growing into the herb spiral the first layer is wetted carton. For good soil drainage rough gravel and then finer gravel is put on the bottom. This is then topped with soil and a good layer of compost. Straw is used as *mulch*. In between the *mulch* the herbs can be placed as plants or sown as seeds.



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## Keyhole pathway

- ⇒ Less pathway, more space for plants
- ⇒ Use of water run-off
- ⇒ Easy access and to take care of
- ⇒ Easy harvesting

The kitchen area is located at the back of the kitchen and playground. Herbs, medicinal plants and other edible plants are grown here and are close to this intensively used area. Plants are placed in *guilds* to help each other and become a stronger eco-system.

The following plants create a guild which is used:

<i>Albizia julibrissin:</i>	<i>nitrogen fixer; fodder; bee forage</i>
<i>Amaranth:</i>	<i>support plant; breaks up soil; windbreak; fast growing biomass; edible seeds</i>
<i>Chamomile:</i>	<i>dynamic accumulator; attracts/repels beneficial/harmful insects; medicinal; bee forage</i>
<i>Comfrey:</i>	<i>dynamic accumulator; ground cover; breaks up soil; fast growing biomass; medicinal</i>
<i>Garlic:</i>	<i>repels insects; repels rodents; suppresses grasses; edible/medicinal</i>
<i>Hazelnut:</i>	<i>windbreak; supportive shrub; attracts birds; edible nuts</i>
<i>Hibiscus:</i>	<i>supportive shrub; windbreak; medicinal; attracts birds; bee forage</i>
<i>Lemongrass:</i>	<i>repels harmful insects; edible/medicinal, fast growing biomass</i>
<i>Lemon balm:</i>	<i>repels harmful insects; edible/medicinal leaves</i>
<i>Marigold:</i>	<i>attracts beneficial insects; edible flowers</i>
<i>Mint:</i>	<i>bee forage; repels harmful insects; edible/medicinal; ground cover</i>
<i>Nepali basil:</i>	<i>repels harmful insects; edible/medicinal leaves; considered as holy</i>
<i>Nasturtium:</i>	<i>attracts beneficial insects; disease control; fast growing biomass; edible/medicinal</i>
<i>Pigeon pea:</i>	<i>nitrogen fixer; fodder; fast growing biomass; edible seeds</i>
<i>Wild strawberry:</i>	<i>dynamic accumulator; ground cover; edible fruit</i>

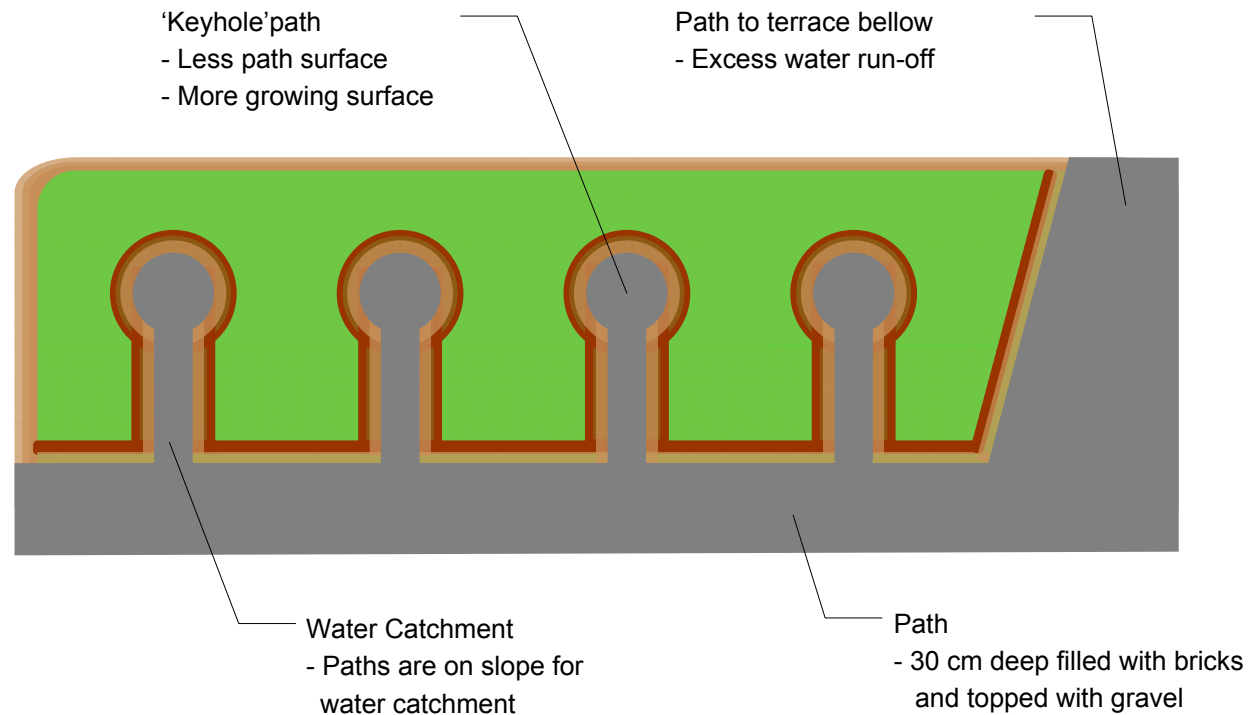
The plants are placed in raised beds, which make it possible to control soil condition and drainage for excessive water. The beds are covered with a thin layer of *compost* and topped with a layer of *mulch*.

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Access to the kitchen, solar cooker and especially the fire hose is very important. The main paths had to stay wide enough, accessible and prevent slippery surfaces.

The paths in between the raised beds are made in such a way that they take less space than conventional straight paths. The most efficient one is the keyhole pathway. This is a narrow path with at the end a round where it is possible to serve a lot of space from just one spot.

These paths are slightly lower than the main path so rainwater runs into them and the water will slowly infiltrate when it becomes dry. This makes manual watering less necessary.



## 2<sup>nd</sup> site

### Banana Circle

- ⇒ Large production on a small space
- ⇒ Multi-crop system
- ⇒ Easy access and to take care of
- ⇒ Use of organic waste
- ⇒ Use of water excess water
- ⇒ Easy harvesting

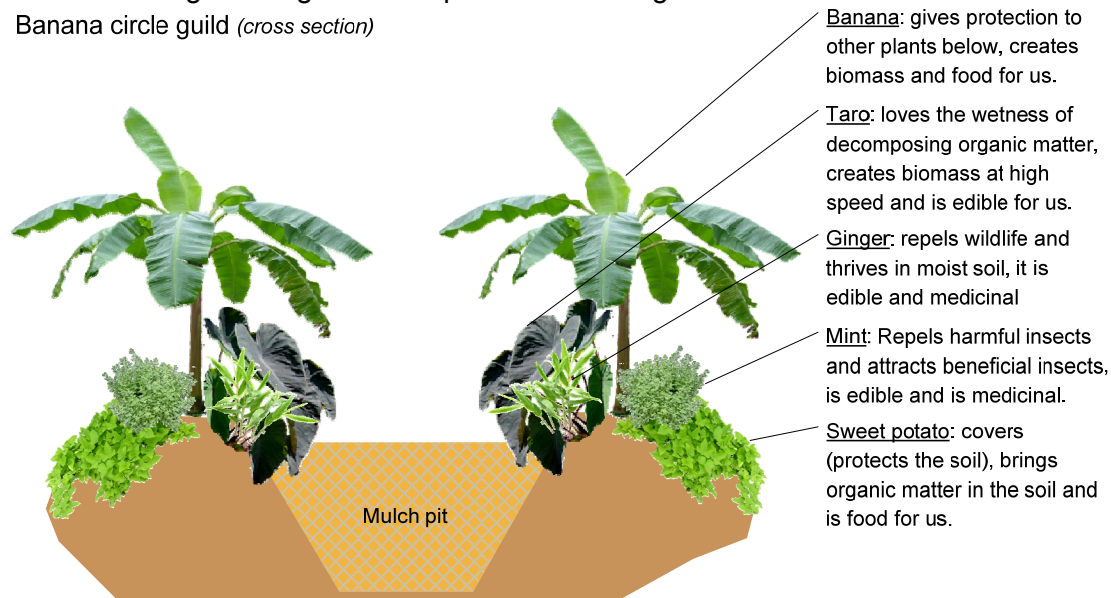
A banana circle is a circular raised garden bed with in the middle a *mulch* pit. In this pit, garden cuttings, sticks, leaves, kitchen scraps, carton, old paper and even tin cans can be put in. Rainwater comes from the farmhouse and excess water from the biogas tank. In relation to the centre of activities this area will be in Zone-3 of the Zone-planning.

The banana circle is placed in a location that is protected from the northern, north-eastern and eastern winds by the farmhouse, hill and surrounding trees. In the hillside as well as under the circle are big rocks and a concrete stairs is nearby. These rocks and stairs heat up by the sun in daytime and release this warmth slowly during the night, this is called *thermal mass*. Heat is also generated by the decomposing *mulch*. The cane-filter reflects sunlight.

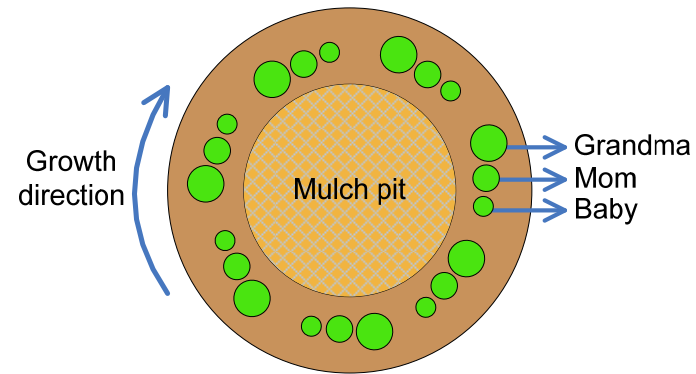
Banana plants do not produce fruit when exposed to too much frost. By using the protected location, *mulch*, sunlight reflection and *thermal mass* we create a *microclimate* which will reduce the chance of frost and thus increases the chance of fruit.

The plants planted in and around the banana circle are edible and are placed in a *guild* where all plants work together with their beneficial properties. See the following drawing for the explanation of the guild.

Banana circle guild (cross section)



The bananas and other crops can easily be harvested by walking around the circle. It is important to avoid stepping on the circle and *compact the soil* which disturbs the biology. For maintenance the bananas plants can be tidied and kept growing in a circle. The plants can be divided in 3 groups, the grandma's which will bear fruit and will be cut after bearing fruits, the moms which will take the place of the grandma's, and the babies which is kept when growing in the wanted direction. See the drawing for the growth direction.





## Plant lists

<b>Banana Circle</b>				
<b>Species</b>	<b>Type</b>	<b>Yearly</b>	<b>Use</b>	<b>Edible parts</b>
Banana	Herbaceous	Perennial	Fruit	Fruit, flower
Sweet potato	Herbaceous	Perennial	Vegetable, groundcover	Root
Taro	Herbaceous	Perennial	Vegetable	Root, stems, leaves
Ginger	Herbaceous	Perennial	Spice	Root
Mint	Herbaceous	Perennial	Pest control, herb	Leaves

<b>Herb Spiral</b>				
<b>Species</b>	<b>Type</b>	<b>Yearly</b>	<b>Use</b>	<b>Edible parts</b>
Mint	Herbaceous	Perennial	Herb	Leaves
Marigold	Herbaceous	Annual	Flower, pest control	Leaves
Savory	Herbaceous	Perennial	Herb	Leaves
Thyme	Herbaceous	Perennial	Herb	Leaves
Basil	Herbaceous	Annual	Herb	Leaves, stems
Dill	Herbaceous	Annual	Herb	Leaves, stems
Parsley	Herbaceous	Perennial	Herb	Leaves, stems
Chamomile	Herbaceous	Perennial	Herb, flower	Leaves, stem, flower
Lemon Balm	Herbaceous	Perennial	Herb	Leaves, stems
Chives	Herbaceous	Perennial	Herb	Stems, root
Sage	Herbaceous	Perennial	Herb	Leaves
Salvia	Herbaceous	Perennial	Herb	Leaves
Oregano	Herbaceous	Perennial	Herb	Leaves
Rosemary	Herbaceous	Perennial	Herb	Leaves
Aloe Vera	Succulent	Perennial	Medicinal	Leaves
Water Lettuce	Aquatic plant	Perennial	Mulch, shadow	not
Tira (nepali)	Aquatic plant	Perennial	Vegetable	Leaves, stems
Sedge	Aquatic plant	Perennial	Shadow	not

<b>Keyhole raised beds</b>				
<b>Species</b>	<b>Type</b>	<b>Yearly</b>	<b>Use</b>	<b>Edible parts</b>
Hazelnut	Shrub	Perennial	Nuts, mulch	Nuts
Wild strawberry	Herbaceous	Perennial	Fruit, groundcover	Fruit
Thyme	Herbaceous	Perennial	Herb	Leaves
Basil	Herbaceous	Annual	Herb	Leaves, stems
Amaranth	Herbaceous	Annual	Windbreak, shadow, seeds	Seeds
Aloe Vera	Succulent	Perennial	Medicinal	Leaves
Nepali Basil	Herbaceous	Perennial	Medicinal	Leaves
Albizia Julibrissin	Tree	Perennial	Nitrogen fixing, fodder, mulch	
Comfrey	Herbaceous	Perennial	Medicinal, pest control, cover	
Lemongrass	Herbaceous	Perennial	Herb, pest control	Stem
Hibiscus	Shrub	Perennial	Flower, windbreak, mulch	Flower for tea
Pigeon pea	Shrub	Evergreen	Nitrogen fixing, fodder	Seeds
Sage	Herbaceous	Perennial	Herb	Leaves
Salvia	Herbaceous	Perennial	Herb	Leaves
Rosemary	Herbaceous	Perennial	Herb	Leaves
Chamomile	Herbaceous	Perennial	Herb, flower	Leaves, stem, flower
Mint	Herbaceous	Perennial	Herb	Leaves
Marigold	Herbaceous	Annual	Pest control	Leaves
Lemon Balm	Herbaceous	Perennial	Herb	Leaves, stems
Garlic	Herbaceous	Perennial	Herb	Leaves, stems