


Forest, Soil, & Other Topics




The Farmers' Handbook



This Volume's Authors : Chris Evans, Laxman Rana, Hari Dhungana, Mrs Malati Lakoul
 Edited, Designed & Produced by: Chris Evans & Jakob Jespersen
 Translated from Nepali by Chris Evans
 Proof reading: thanks to Mike Feingold, Margaret Evans, Ted Albins, Rupert Greville, Andy Langford, Looby Macnamara
 Photos: Jakob Jespersen, Chris Evans
 Additional photo credits are given at the end of this Volume
 Cover illustration: Mr Motilal Phauja
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 The Farmers' Handbook is about techniques for sustainable farming and this is the fifth of 5 volumes. There are 5 techniques and several miscellaneous topics presented here. In five volumes there are 40 techniques and approaches in total.

 This Farmers' Handbook is meant for education and awareness raising as well as practical gardening uses. It is permitted to photocopy for such purposes, but please remember that photocopying can cause pollution to the environment, is expensive & does not give a good quality.

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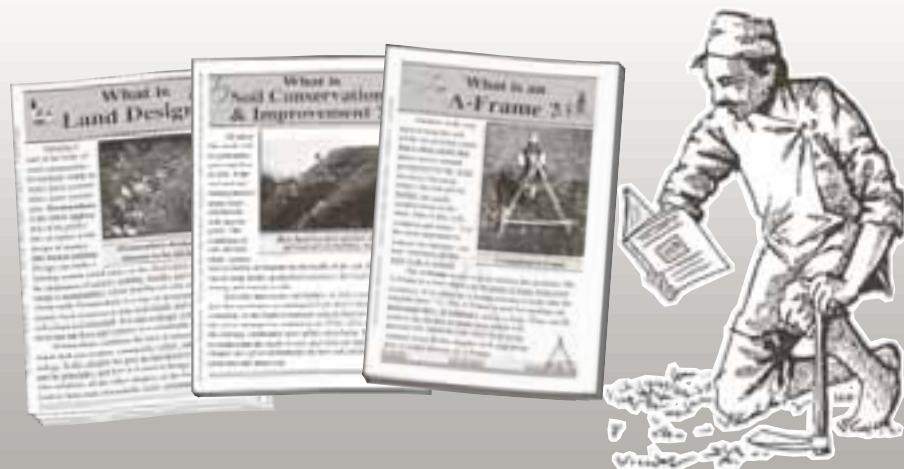
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The Farmers' Handbook - this Volume's Introduction

This is the fifth volume of a five volume production of the Farmers' Handbook. In all, there are forty techniques & approaches shown, of which six are in this fifth volume. Because this is the final volume, its design is slightly different to the previous 4 volumes. At the start of this volume we introduce you to some of the techniques used in community forests, and for regenerating land. The chapter on Land Design then summarises all the chapters in this Farmers' Handbook. Finally, there are some miscellaneous topics.

This Farmers' Handbook has been prepared to provide information about sustainable farming techniques as well as being a resource to run literacy programmes. Information about such programmes and how the Handbook can be used is provided in this volume. As well as technical information, a glossary of new and difficult words is also provided in this volume.



Aims

The main aim of this handbook is to help farmers make their own farms more successful. This is done by providing information about using simple methods which strengthen, rather than damage the environment, and help to create sustainable livelihoods for future generations.

Background

The techniques described in the handbook are the results of research made by the farmers of Surkhet and Jajarkot districts of Mid-Western Nepal. We believe these methods will also work well for farmers of other countries. However, around the world there are diverse climates and soils, and so we expect that small changes will need to be made in the techniques according to this diversity. Similarly, it may be necessary to change plant species according to climatic region, but their function will remain the same. For example, the chapter on the **Living Fence** describes the use of thorny plants as a barrier. In the low altitude, hot Tarai of southern Nepal, "Babool" (*Acacia nilotica*) is suitable for this. But this does not grow in the higher elevations. Here, species such as wild pear, wild blackberry and Sea Buckthorn make a good living fence.

Evaluation & Feedback

Comments and questions about the techniques and approaches described in this handbook will be most welcome. Suggestions for improvement will be used for future editions of this handbook and other similar publications.

Thank You

We would like to say a big thanks to all the friends who helped us to complete this Farmers' Handbook. Apart from those named and pictured here, there are countless others who have supported us throughout the task.



Various farmers' groups have helped to develop and evaluate the Handbook. It is for such groups that the Handbook has been produced.

Proof reader

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Computer support

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Chris Evans

So on behalf of the Farmers' Handbook, here's a **very, very big Thank You !**
From the Producers and Designers



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Appropriate Technology Asia
P.O. Box 8975 EPC 849
Kathmandu, Nepal
tel: +977 1 5549774
nepal@arasia.org.uk
www.atarasia.org.uk

**Distributor and
main contact
addresses**

Permanent Publications
The Sustainability Centre
East Meon Hampshire GU32 1HR
tel: +44 1730 823311
info@permaculture.co.uk
www.permaculture.co.uk

Permaculture Association UK
BCM Permaculture Association
London WC1N 3XX
Tel: +44 845 4581805
office@permaculture.org.uk
www.permaculture.org.uk

Himalayan Permaculture Group, P.O.
Box 19121, Kathmandu, Nepal
1xdfn 1b3f{o' ;d"x, n]v°;f{ — @, k'/fgf] ufp",
; 'v]{t

Nepal Permaculture Group
P.O.Box 8132, Kathmandu, Nepal
Tel: +977-1- 252597

email:- npg@earthcare.wlink.com.np

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What is Forest Management ?

Forest Management is the way that forests and the trees within them are protected and used to provide forest products and other benefits. In order to manage a forest, the different objectives must be decided upon, and a work plan is made according to this. Just like any farm management, the work plan to manage a forest means what work to do, where, when, and how. Before starting forest management, the capacity and working process of those who are to do the work and benefit from it (user group) should be considered. This may be a community, family, individual, or other organisation which will work in and benefit from the forest.



The forest we keep, keeps us.

In Nepal, community forest is a resource of primary importance. That's why it's very important for communities and user groups to learn about forest management. In this chapter, information is given in particular about community and private forest management.

Why do Forest Management ?

Most people already know that the forest gives them many direct and indirect benefits. Daily needs such as fodder, firewood, leaf litter, timber, and various herbal medicines are available in the forest. The forest not only protects and improves the environment around settlements, it even helps to provide us with safe, clean drinking water.

This is something that people have come to understand since early days. It is also why forest management has been part of the local community for a long time.

But for many reasons, the forest has been disappearing before our eyes. As population has continued to increase, on one hand more forest resources are needed, yet on the other



hand, population pressure has decreased the forest area and had a bad affect on the environment. With efficient and appropriate ways of conserving and developing forest products such as trees and medicinal herbs, the well-being and productivity of the family and community can increase, and poverty will decrease.



This Chapter's Author :
Hari Prasad Dhungana
Federation of Community Forest Users'
Groups, Nepal

How to do Forest Management ?

Background

A very important factor together with "how" to manage forests is "who" is managing them. Considering this, the Nepali government has made various regulations. The Forest Department, together with non-government and other organisations have participated in developing a set of regulations to help forest user groups manage their own forests.

The forest law covers the management and use of religious forests, leasehold forests, government managed forests and protected forests. However, community forest and private forest are considered to be the most important types of forest.

In recent years, the amount of community managed forest has increased greatly. However, user groups have still not been able to realise the benefits of truly sustainable forest management.

Over time, there have been many ways that the forest has been protected, developed and its products distributed amongst its users in homes and villages. These management methods have been improved in different places and at different times, but there is still room for improvement. We should now use the lessons of experience, and take forest management forward to cater for the increasing population.

Community Forest

This is where national forest has come under a local management plan, and has been handed over from the district forest office to a village committee responsible for the implementation of the management plan.

Private Forest

This is where trees and forest on any private, registered land may be managed.

Some details of registering community and private forest are given on page 14.



By planting trees on farm land, forest products are brought closer to the home. This saves time and helps to protect the forest. Read the *Agroforestry* chapter to learn more.

Things to consider in forest management

Objectives of forest management

The forest can be managed for various objectives. The main objective of managing community forest is often to sustainably provide for the needs of firewood, fodder, timber, etc. in the community. Management of private forest may, for example, be for the maximum output of good quality timber. There may be many other objectives in forest management. Just as the objectives are different, the management work in the forest will also be different.

Needs and abilities of the community or individual

The different needs of a community or individual will determine why and how to manage the forest. In community forestry, the needs and hopes of the community are most important. But individual or family needs usually take priority in private forests.

In managing a community forest, the opinions of all users of the forest are important to create the management plan. This may include religious or cultural reasons for protecting or using the forest.

This is a map made by the user group for a forest management plan in Kavre district, Central Nepal



What is a Forest Management Plan ?

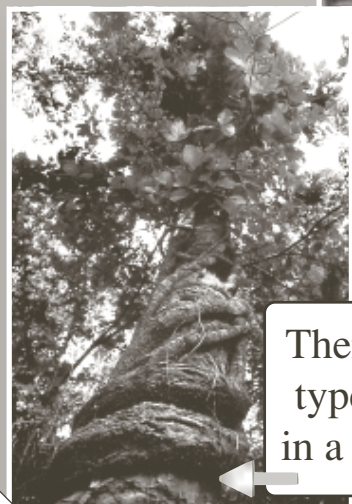
A forest management plan is a written or understood agreement for a programme of work in the forest, in terms of who does it, and where, when and how the work is done. In community forestry terms this can also be called an "**action plan**", and can include issues relevant to national forest law.

Forest Site Conditions

The condition of the forest will differ in different places. Factors such as types and species of trees and shrubs, soil type, moisture, fertility, and aspect all cause great diversity, and affect productivity in the forest. While preparing the forest management plan, an evaluation of the **growing stock** of productive trees and shrubs, and their **growth rates** is an important step. Keeping good records of this will enable the user group to estimate the amount of products which can be sustainably gathered from the forest area.



Here you can see the trees, but it's not a good forest. There are no plants in the ground layer, so this space has no productivity.



There are many types of plants in a good forest.



Important resources such as soil are lost without the forest cover.

Finding the resources to manage the forest

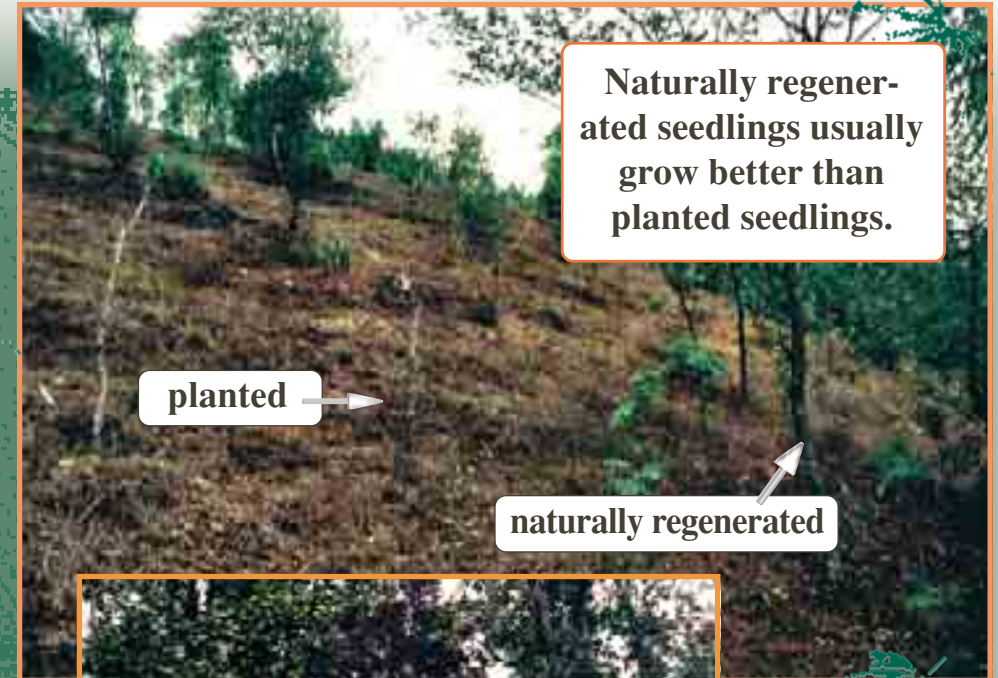
There are various resources needed in the process of forest management. For example, if making a plantation, or other activities, there must be good public participation to form the users' group committee, and agree on the management plan. This can be called the **human** resource. It costs to produce seedlings to plant, and there are many other visible and invisible costs that the people managing the forest will need to bear. These human, financial and physical resources have a big affect on management work in the forest.



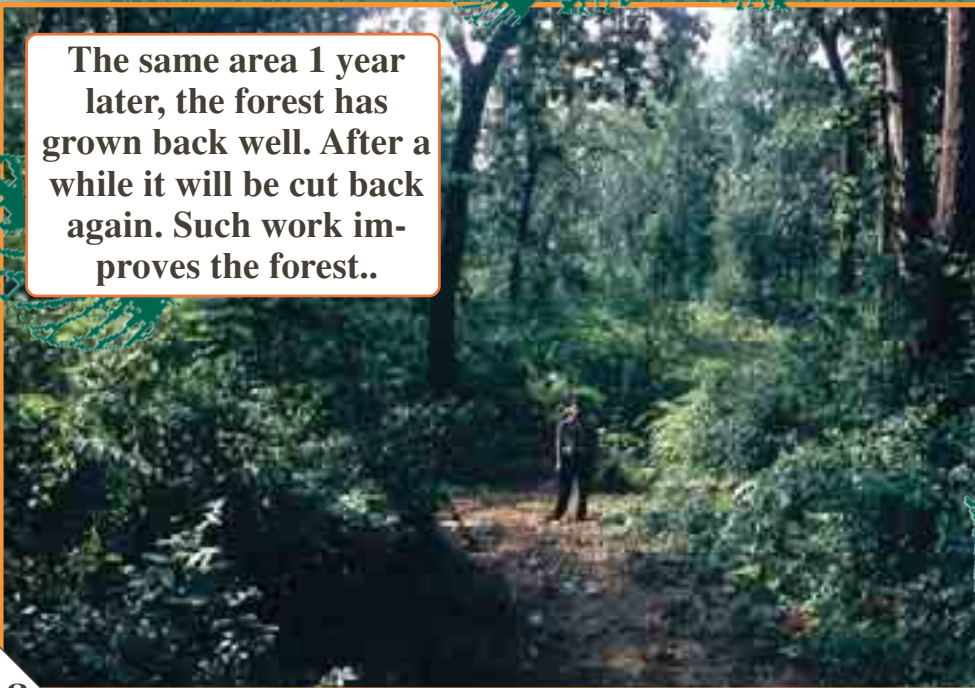
In this community forest, unwanted species have just been cut back, and useful thinnings harvested.



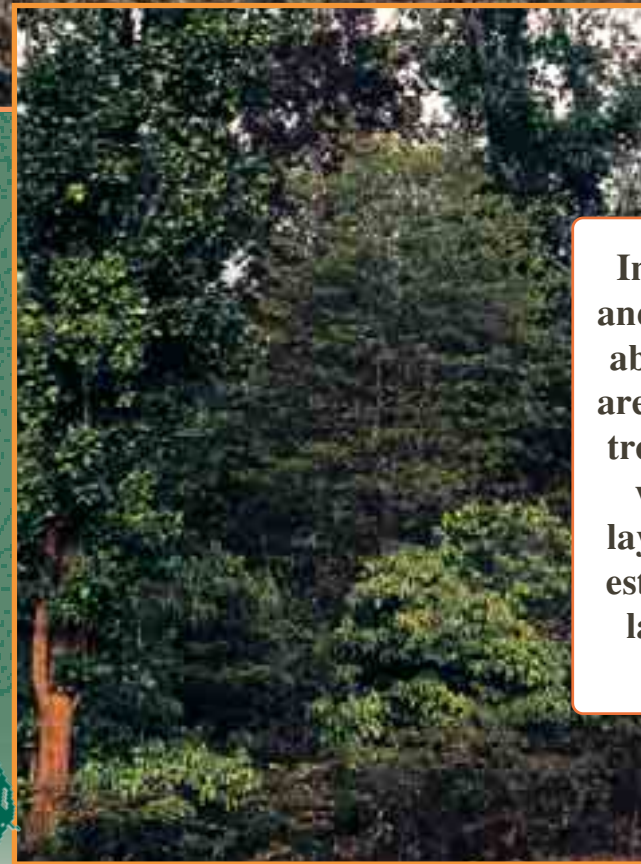
Naturally regenerated seedlings usually grow better than planted seedlings.



The same area 1 year later, the forest has grown back well. After a while it will be cut back again. Such work improves the forest..



In a productive and truly sustainable forest there are many types of trees and shrubs which fill all layers of the forest, from ground layer to upper canopy.



Work in the Forest

Plantation

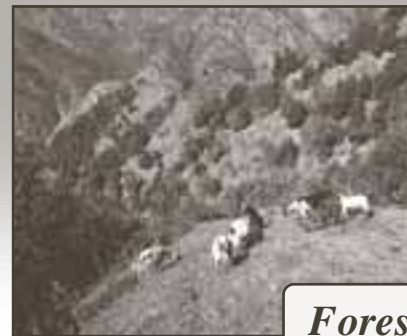
Bare ground, clear glades in the forest, and even terrace edges in fields can all be planted with useful trees. Appropriate non-timber and medicinal plants which are needed by the household and community can be chosen and planted, as well as trees grown for timber. These can be grown in a nursery, or wild plants can be collected from the forest and planted. To learn about species selection, planting distance, propagation and planting methods, you should seek technical advice from the relevant places, such as the local district forest office or appropriate NGO, and request extra training.

Plant more useful plants in bare areas of the forest.



Weeding and Fire Control

Clear weeds from around newly planted or regenerated seedlings to help them grow, and protect the area from the harmful effects of fire and free-range livestock. Some trees may suffer more from fire, while slow growing plants suffer more from weed competition. This work protects trees from pests and diseases, and helps the seedlings to grow faster.



Forest killers



Thinning

Thinning practice is different depending on the different objectives of the forest management plan. For example, if the objective is only firewood production, trees can be grown closer together. But for good quality timber, the lower branches of selected trees may need pruning. Some types of fodder tree are best cut in different ways at different times of the year. To make space for more valuable species, less useful trees and shrubs can be gradually cleared. For example, if there is too much pine, this can be thinned out and other more useful or desired species planted in the gaps.

If many branches regrow from the stumps of cut trees (coppicing), a good tree can be grown by selecting the best one or two stems and cutting the remainder.

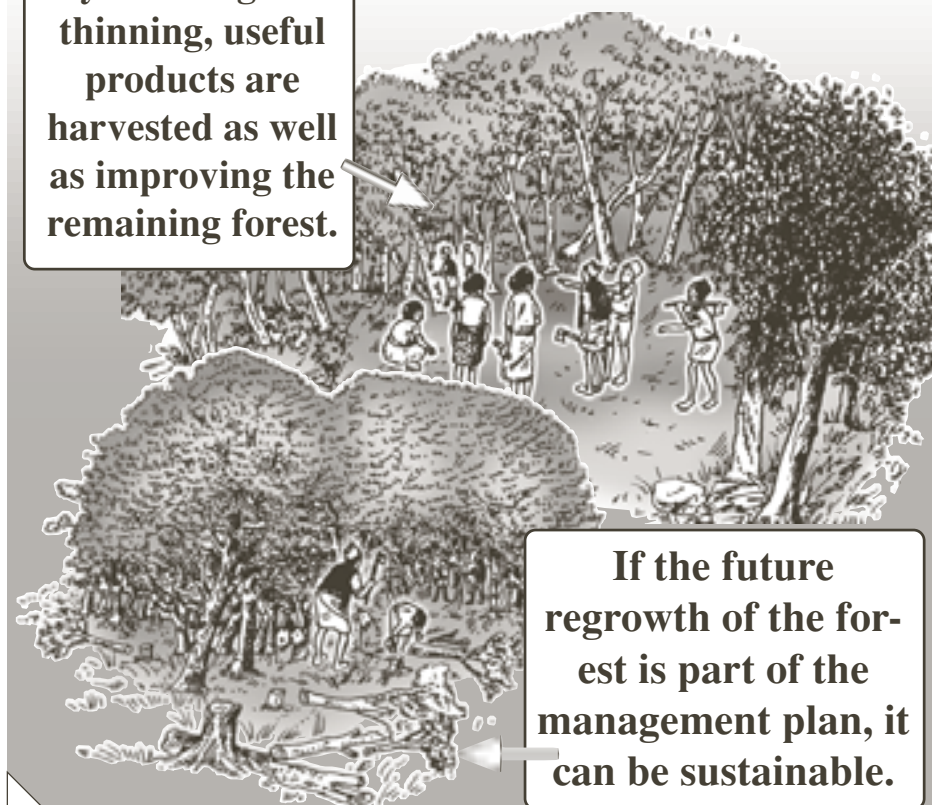


More information about this is given in the *Soil Conservation and Improvement*, *Integrated Orchard*, and *Agroforestry* chapters.

Final Harvest

Fodder trees may be cut several times a year, or once every 2 years, after which they will regrow. Harvesting timber means felling the whole tree. Some herbal medicines come from harvesting roots, some from fruit, or flowers, or bark, etc. In this way benefits are harvested according to the management plan. The management should include planning and preparation for future rotations of crops.

By selecting and thinning, useful products are harvested as well as improving the remaining forest.



If the future regrowth of the forest is part of the management plan, it can be sustainable.

For sustainable harvesting from the forest, products should not all be harvested at the same time. Once an estimate has been made of the growing stock and growth rates, according to this a fixed proportion of the growth can be harvested. This will help to improve the forest without over-harvesting.

Registering a Community Forest

According to the current forest law in Nepal, community forest is given priority for development. The forest user committee is given responsibility for protection of and distribution of products from the community forest. The local community forms the user group to manage all this responsibility.



Bhaisepati Women's Community Forest
Saibu-4, Bhaisepati, 1998

- The community should form a users' committee which can make an application to the District Forest Office.
- Taking advice from the Forest Office and/or related NGOs, the committee should prepare a clear, simple constitution.
- After registering the constitution at the forest office, a forest management plan is made.
- When the plan is approved, the forest is handed over to the community.
- It's a good idea to take advice from related organisations for technical and management advice while managing the forest.

Registering a Private Forest

Farmers' land is often left unused, for example because they do not have the time or other resources to farm it. By planting trees, or by protecting naturally regenerated trees on such wasteland, or even on existing farmland, it is possible to make a private forest.

- Output from the private forest goes to the landowner. When the private forest is registered, these products can be sold or traded .
- To register the forest, the land and its distribution of trees should be described in the application to the forest office.
- The forest office will check your application against what is on the land, then issue you a certificate of registration for the private forest.
- Once the forest is registered, you do not need to go through any other process of registry in order to sell products from the forest.



Mr Surya Adhikari of Begnas, Nepal, changed this land from bare ground to a rich, diverse food forest. As well as producing fodder, firewood, etc. for the home, he also produces fruit for cash income.

Farmers' Experience

Mr Ammar Bahadur Gurung

From Nepal, Surkhet district, Gumi - 4, Mr Ammar Bahadur Gurung is the Vice-Chairman of "Longlake Community Forest". Now let's read about his experiences.



Ammar Bahadur Gurung

“ Our local forest was very good up until 1980. After that, people stopped caring. Livestock were let loose into the forest, and people cut wherever they liked. That led to more landslides and floods, and even whole houses were washed away. Then, in 1994 this forest was handed over to the community as Lampokhari Community Forest. It is 9 hectares in area. After making a forest management plan, various rules were made. Livestock aren't allowed in, and the forest is opened twice a year to cut fodder and firewood, which isn't allowed any other time. Each person pays 2 rupees to be allowed to cut a load. Because of laws like this, the forest has grown and developed very well. Dead and badly shaped branches are taken out, and dead trees can be bought and cut for timber. The cash income from sale of forest resources goes into the local community fund. ”



Read On !



Subjects Related to Forest Management

This book provides much of the information needed to help manage your own forest. However, this information is also linked to other methods. For extra benefits let's read, learn and practice from other related chapters.



Soil Conservation and Improvement chapter

Information is given about the nature of soil, how to protect existing soil, and lots of ideas about how to regenerate damaged soil into productive land again.



Agroforestry chapter

Planting trees on farmland can bring farmers many benefits. But you can't plant any type of tree just anywhere. This chapter gives information on how to plant trees without affecting farm yield.



Integrated Fruit Orchard chapter

Information on how to plant fruit trees with various other multi-purpose trees to give more and quicker benefits for less work is given in this chapter.



Living Fence chapter

By planting a fence made of trees, production can be much more than just a barrier. This chapter tells how to make and manage a living fence.





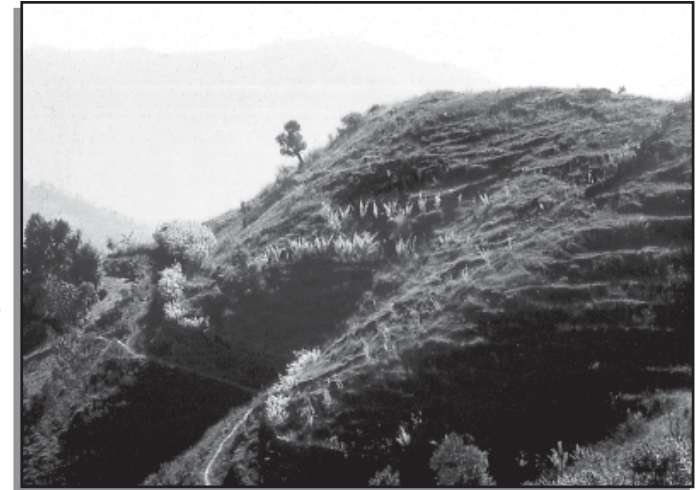
What is Soil Conservation & Improvement ?



All plant life needs soil to germinate, grow and live its life. If the soil and soil management is good, farm production will also be good. The condition of our environment, society

and economy all depend on the health of the soil. If the soil can be kept fertile, production increases, the local economy is strong, and society is safe.

Just like skin covers our bodies, so soil covers the Earth. Just like our bodies are damaged if our skin is broken, or wounded, so the Earth is harmed, and production decreases if the soil is damaged or washed away. If the soil is damaged, the farming community also suffers great harm. So we need to understand the needs of soil, and what can damage it. This chapter also gives information on how soil can be sustainably protected and improved.



Bare land becomes greener as the soil recovers in Surkhet, Nepal

Soil and its Needs

Different climates have different types of soils . Often, one type of climate will also have many different types of soil. But whatever the soil, they all have similar ingredients in them. Such as :-

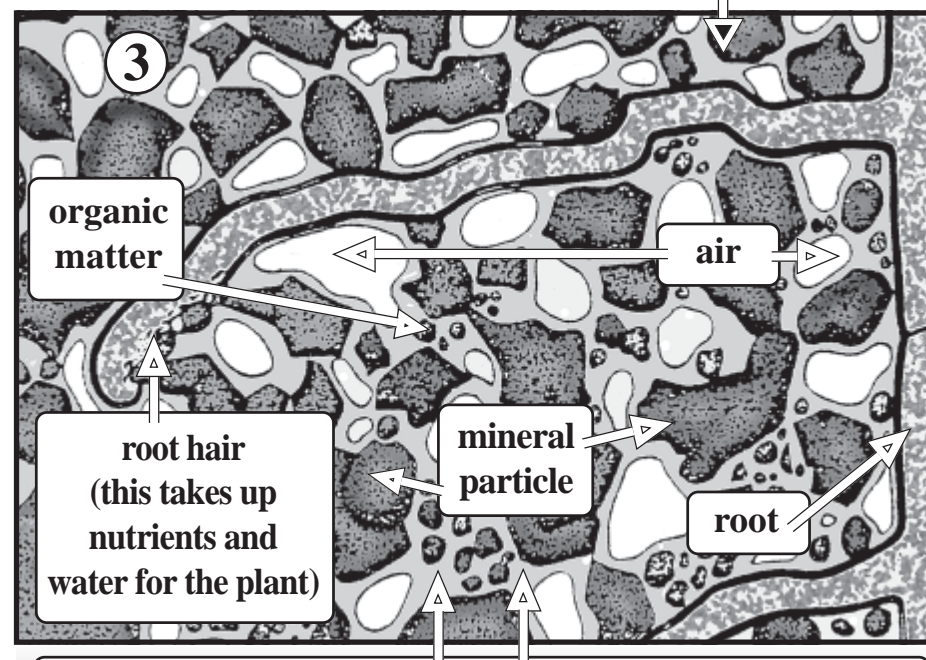
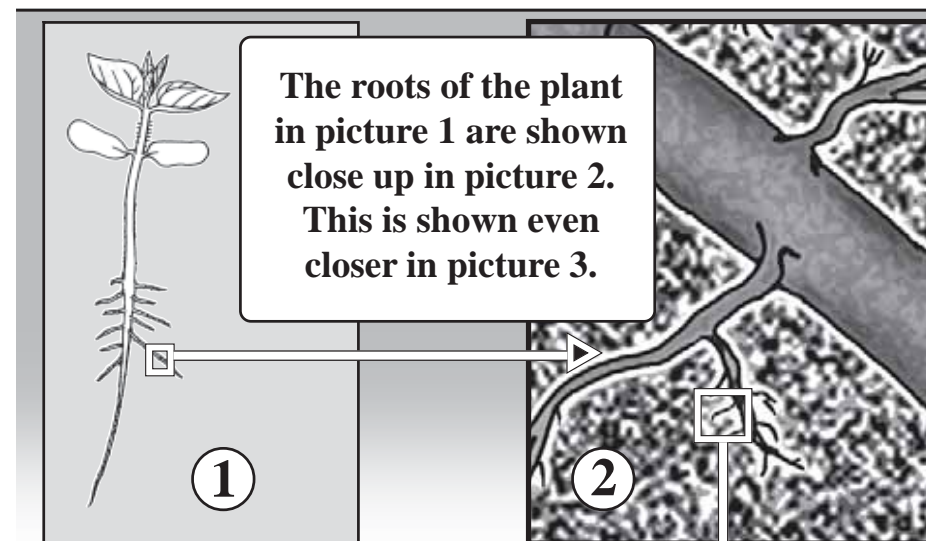
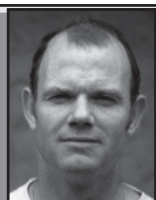
- **mineral particles** - these forms the main part of soil
- **air**
- **moisture (water)**
- **animal life** (visible and microscopic)
- **roots of living plants**
- **organic matter** (dead plants and animals that are in the process of being broken down)



Fertile soil gives good production for all the farm's crops

The ingredients listed above are found in all soils in a greater or lesser amount. When they are in the right amount, the soil is naturally fertile.

This booklet's author
Chris Evans, advisor,
Himalayan Permaculture Group, Nepal
www.designedvisions.com



Everything else is soil water, or moisture. In the water are many nutrients, and countless microscopic organisms are also active in this water.

According to the soil type, these different elements are present in different amounts. For example, let's compare sandy and clay soils.

Sandy Soil

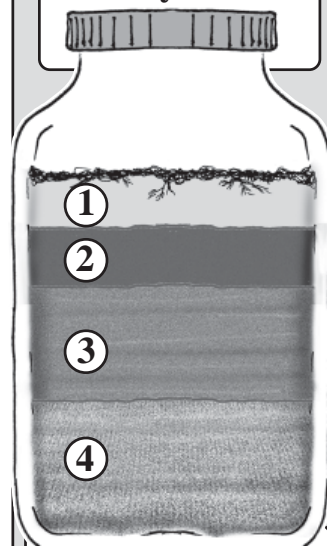
- mineral particles are large
 - air spaces between the mineral particles are large
 - lots of air in the soil
- As a result of this :-**
- soil is light and well aerated
 - the soil doesn't hold water, and dries out faster
 - nutrients are washed out quickly

Clay Soil

- mineral particles are small
 - space between the particles is small
 - less air in the soil
- As a result of this :-**
- the soil is heavy
 - as soon as it rains, the soil is saturated and stays wet for a long time. But when it dries, the soil is very hard
 - nutrients are held in the soil but if there is less air in the soil, plants can't get the nutrients so easily

Testing Soil

Put a handful of soil in a jar of water and shake well. Leave it to settle for 4-5 days. The different types of mineral particles will settle into separate layers



1. Organic matter
2. Clay particles
3. Loam particles
4. Sand particles

Needs of the soil

What is needed to protect and maintain fertility in the soil ?

The contents of the soil described above - air, minerals, organic matter, living roots, moisture and living organisms - are all essential in the right quantities for healthy soil. When they are all present, soil is naturally self-fertile. Adding the right quantities as needed also maintains the quality of the soil. But if any one ingredient is present in a lesser or greater amount than normal, the quality of the soil can be harmed, or it can also be improved.

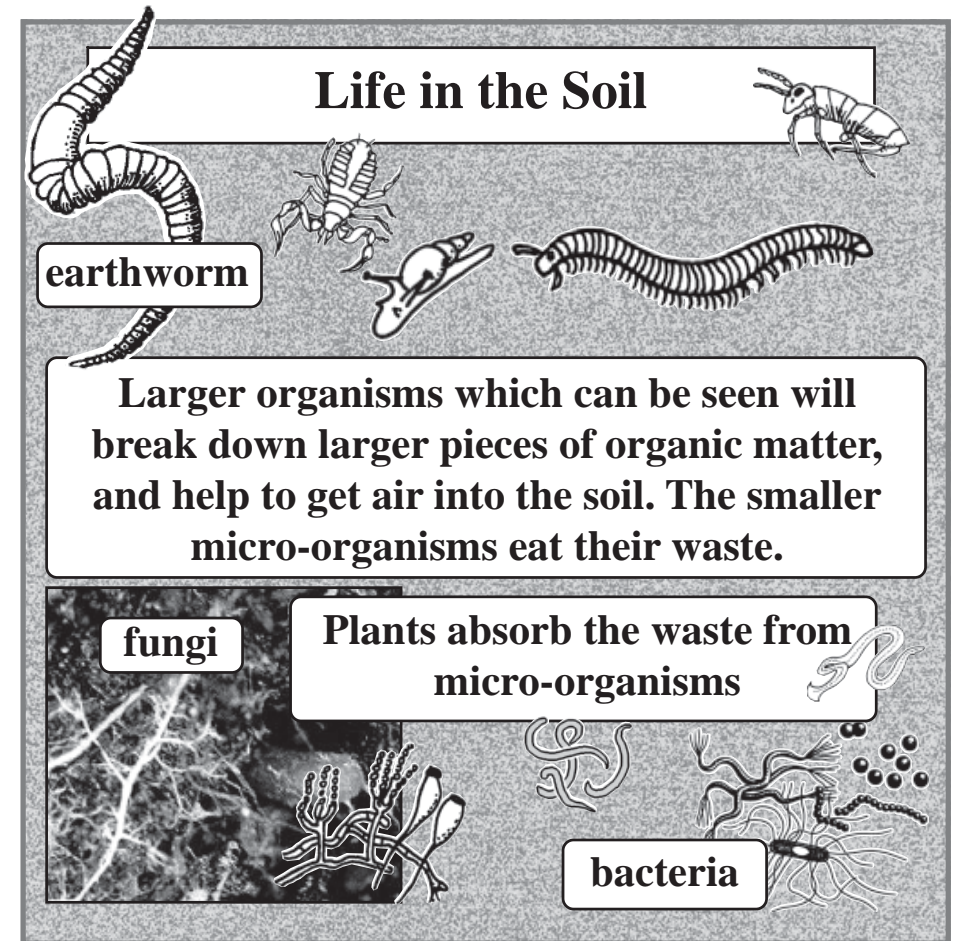
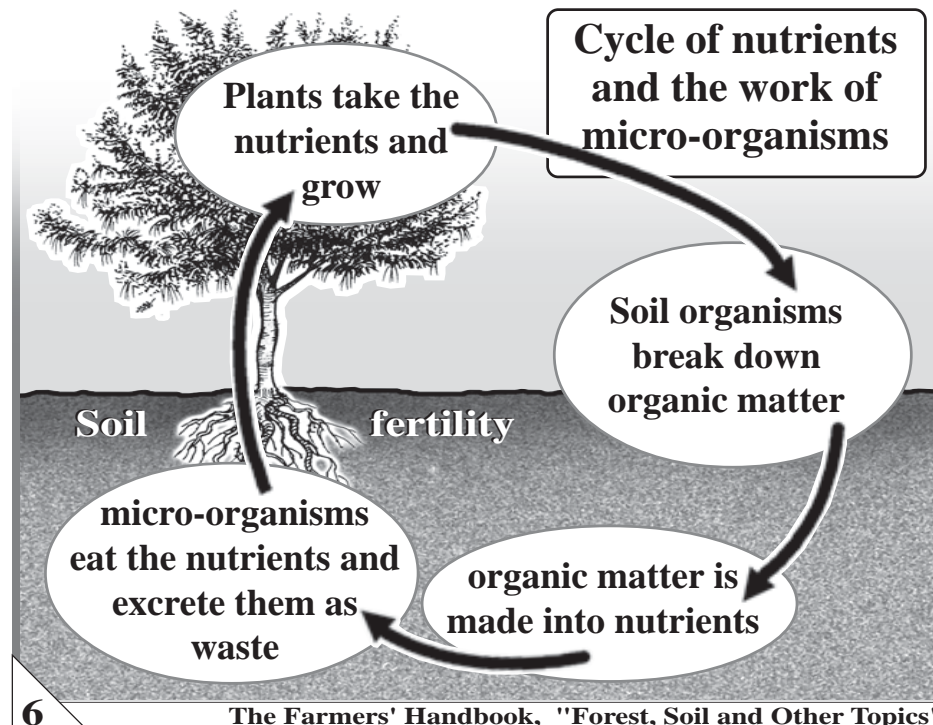


All the different ingredients in the soil work together to help plants to grow. But more important than these minerals, living roots, organic matter, etc. are the living organisms in the soil. In particular, the tiny, invisible organisms, such as bacteria, and fungi play a huge role in maintaining and increasing soil fertility. These are collectively called **micro-organisms**.

Soil life and micro-organisms

Actually, micro-organisms are probably the most important life on our planet. Living in one teaspoon of fertile forest soil there are **2 billion** micro-organisms. Larger organisms, and many types of fungi are also responsible for breaking down dead plants and animals. This forms **organic matter**. Then, the smaller micro-organisms - mainly **bacteria** and **fungi** - take the organic matter and change it so plant roots (the root hairs) can absorb the nutrients, as we cook bread from flour. Even if there is plenty of organic matter in the soil, without the work of micro-organisms, this cannot be taken up by the roots of living plants until it is "cooked".

Leaves and branches, dead animals, etc. fall on the soil and are broken down. Micro-organisms eat them. Then, it is their waste in the soil which plant roots absorb as nutrients. This allows the plants to grow and continue the cycle of life.



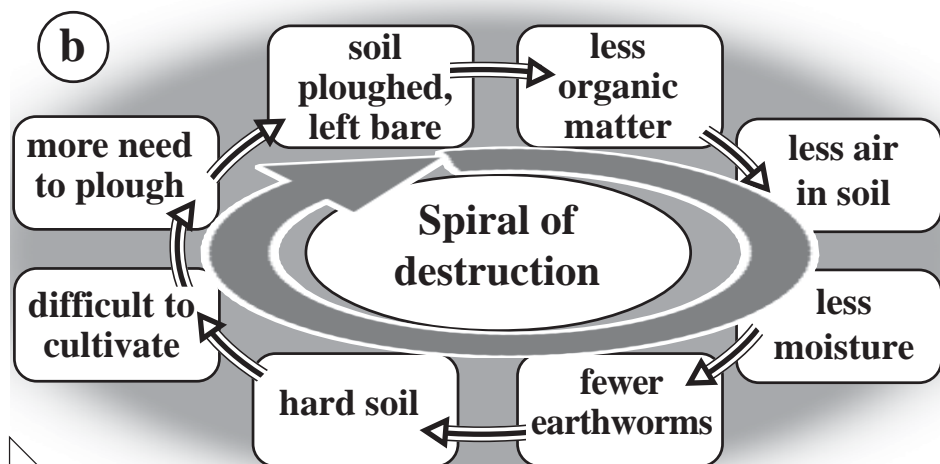
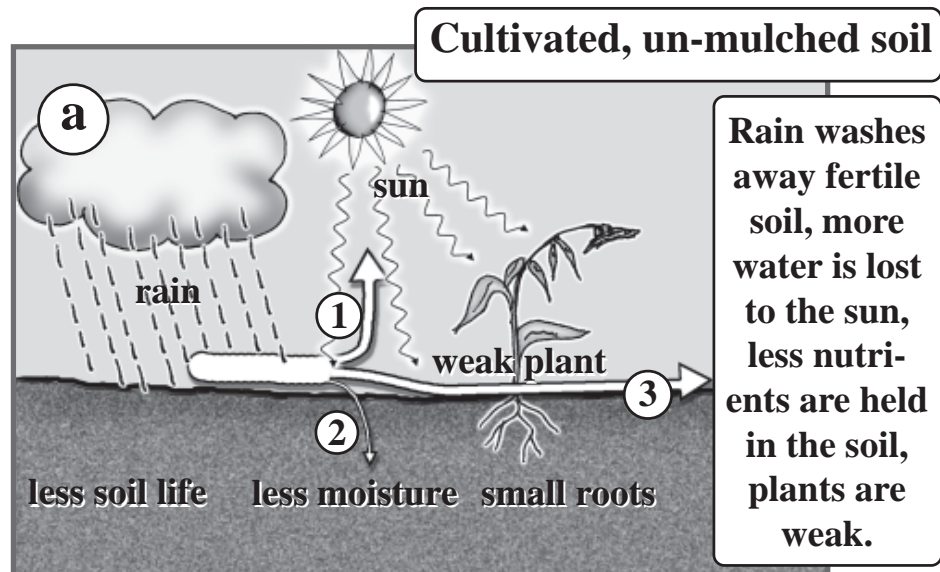
How soil is damaged

When soil is left bare, it can be damaged very easily. Many things can damage bare soil, such as :-

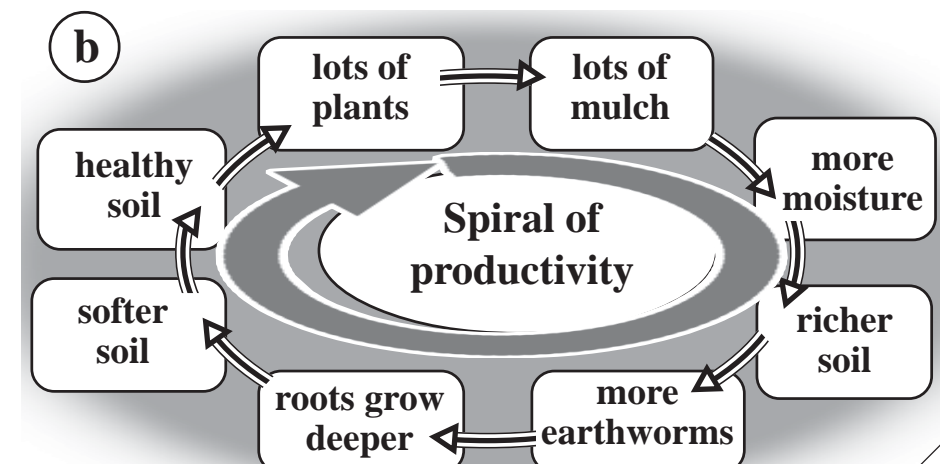
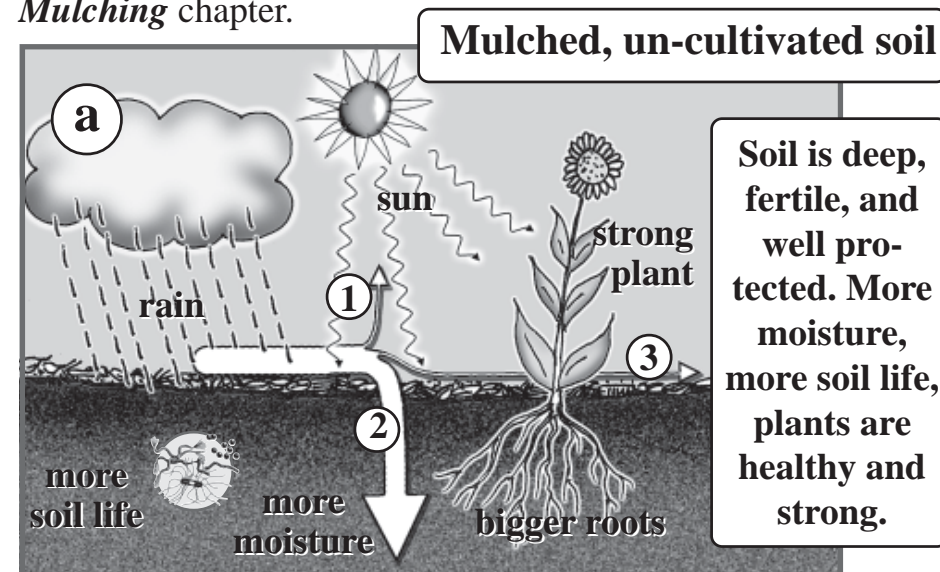
- **sun** :- strong sun will dry out the soil. Dry soil hardens and cracks the soil. Micro-organisms will die in dry, hard soil.
- **water** :- when it rains on bare soil, the top layer will set hard. On slopes, the topsoil is washed away downhill.
- **wind** :- wind will dry out all the moisture from bare soil, and can actually blow the top soil away.

Comparing soil with and without mulch

On these 2 pages the effects of mulching and not mulching are compared together. The left page diagram (a) shows what happens with no mulch on the soil, while the right page diagram shows the example of a mulched soil. The top diagram shows water ① lost to evaporation, ② running off the soil, and ③ soaking into the soil. The cycle below each drawing also shows the effects of mulching or not mulching on soil quality.



Protected from the sun, wind and rain, the organic matter, soil moisture and beneficial micro-organisms all benefit from mulching the soil. You need to consider where resources for mulching can be found, such as leaf litter, straw, etc. Leaves can be brought from the forest, but this takes time. To produce more resources for mulching, its best to use *Agroforestry* and a *Living Fence* - see these chapters for more details. Learn more about the methods and benefits of mulching in the *Mulching* chapter.



Other things which damage the soil









- **Chemical fertilizers** :- these harm the soil micro-organisms and so cause the soil structure and nutrient uptake to be damaged.
- **Artificial poisons** :- as well as killing pests, these kill many beneficial insects and organisms which work in the soil.
- **Big, heavy machinery** :- big machines such as tractors compress the soil so that there is less air space. They destroy the structure of the soil, as well as damaging soil organisms.
- **Large livestock** :- on wet soil, the feet of large livestock such as cows and buffaloes also compress the soil and damage soil structure.

Nutrient management for plant growth

Symptoms of lack of certain nutrients

<i>Symptoms seen on mature leaves</i>	<i>lack of</i>
Leaves yellow, starting from tips	nitrogen
Leaves die from the edges	potassium
Leaves yellow between the veins	magnesium
Grey/white spots on fruit and grain	manganese
Leaves and stems turn red colour	phosphate
<i>Symptoms seen on young leaves</i>	<i>lack of</i>
Yellow spots on leaves & veins yellow	sulphur
Yellow spots on leaves & veins green	iron
Grey spots on seed, pods and fruit	manganese
Newest leaves die back or have white tips	copper

So, what to do if nutrient deficiencies are recognised by these symptoms ? The chart below gives examples of plants which accumulate greater amounts than usual of certain nutrients. These can be used in mulch, compost or liquid manure so those nutrients which are lacking can be added to the soil. They are called **dynamic accumulators**.

plant	contains lots of
mustard	phosphate, nitrogen, iron 
buckwheat	phosphate 
carrot (leaf)	potassium, magnesium 
comfrey	nitrogen, potassium, magnesium, iron 
legumes	nitrogen 
marigold	phosphate 
nettle	nitrogen, potassium, iron, sulphur, copper 
amaranth	nitrogen, phosphate, potassium, manganese 

The main thing to consider in soil conservation and improvement :-

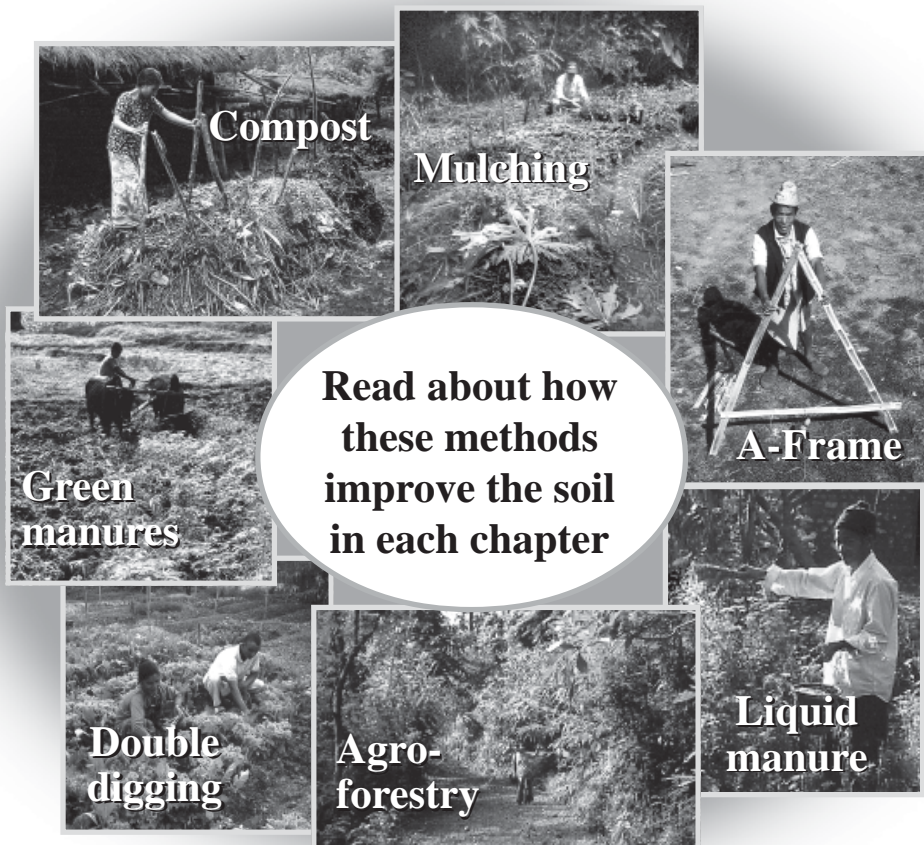
We need to understand what benefits the soil as well as what that damages the soil, and plan our work according to this.

There are 3 main strategies :-

1. We need to **feed** the soil micro-organisms, and allow a **good habitat** for them to live and work in.
2. The soil should not be bare. We need to keep it **covered** as much as possible. Especially, take care to cover and protect the soil when there is strong sun, rain and wind.
3. Stop water from **running off** down a slope for any distance - it runs faster, and carries off much soil and nutrients with it.

Methods of soil conservation and improvement ?

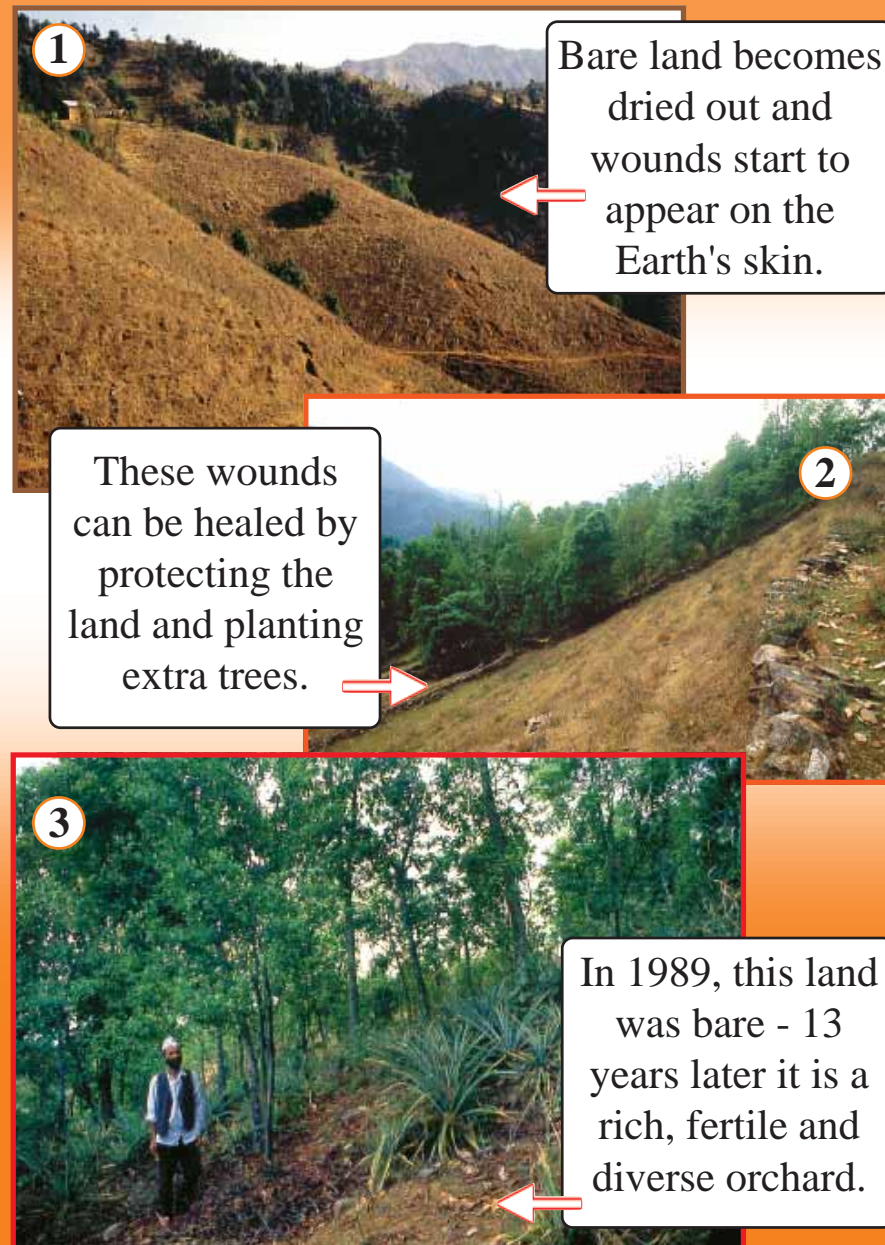
1. **For the micro-organisms :-** mulching, good compost, liquid manure, green manures, agroforestry, afforestation.
2. **To cover the soil :-** mulching, green manures (when land is fallow), agroforestry, afforestation, etc.
3. **To stop water running off :-** mulching, green manures, agroforestry, afforestation, use A-frame to make contour ditches, terrace maintenance.

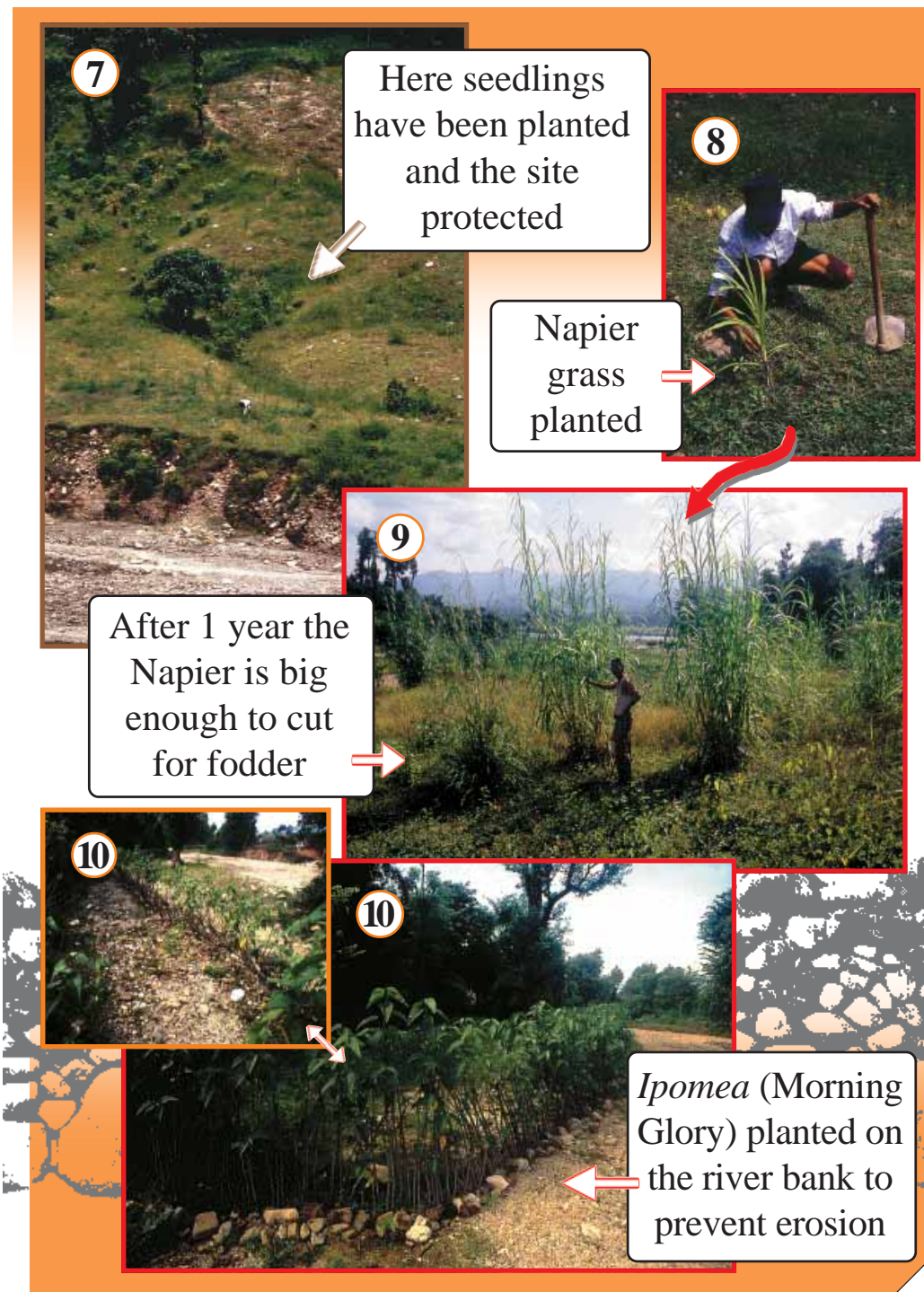
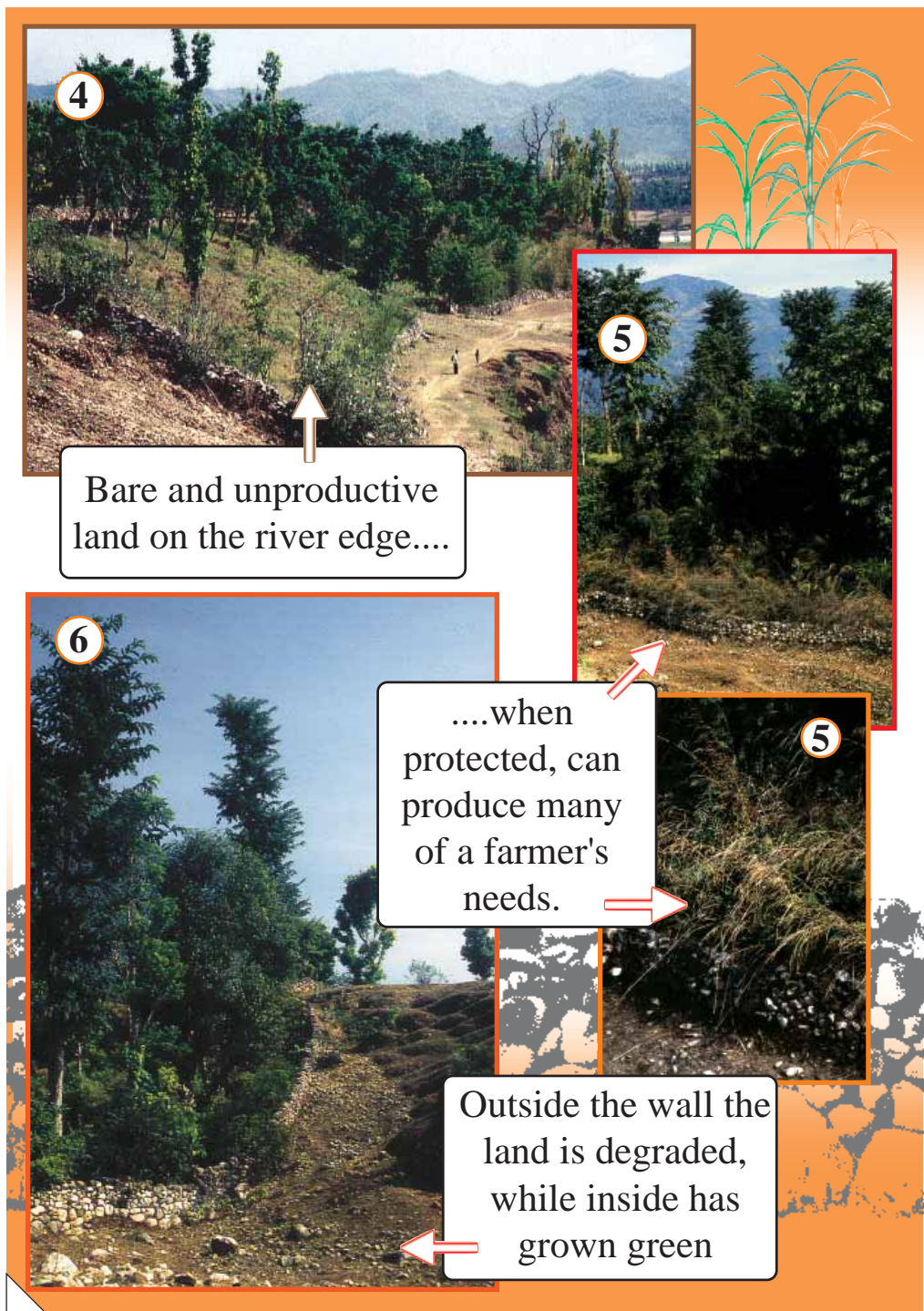


In this chapter, up till now we have read about soil, what it needs and how we can increase its fertility. Now, we look more at regeneration of damaged soil.

Let's See

how to conserve and improve the soil





Repair of Damaged Land

Up until now in this chapter, information has been given to assist in good soil management. If there is good soil on the farm, it is not difficult to maintain and increase soil quality. Where soil has become degraded, the difficult work is to improve it again. But this is very important work - no community can claim it is poor as long as it has degraded land in its region, because they can improve productivity simply by repairing this land.

All the things discussed above will help in the repair of damaged soil. But before putting much work into land regeneration, we should first understand how nature does the job.

This is a poor village. No forest, no soil, no wealth.

But the ability to improve the land is in the community's hands. Nature also wants to improve itself.

11

A high altitude Resource Centre farm being started in 1990 in Jajarkot, Nepal

The canal, made using an A-frame, allows the water to infiltrate the soil

This means bare land improves very quickly (this picture in 1993)

12

13

Maize stalks are used to strengthen the terrace and stop soil erosion

Soil Improvement and Succession

Improving the soil doesn't take so much work. It's often enough just to prevent it degrading. Left alone, soil will gradually improve itself, in a process called **succession**. For example, when any bare land is protected, special ground cover plants called **pioneers** will start to grow first. They will start the soil improvement process. Then, larger shrubs and trees will start to grow. Eventually, a mature forest will develop, and the soil will get a new life.

So the first need for improving the soil is protection. The easiest type of protection is a "**community fence**" - the community decides to protect an area of land, and prevent livestock going into it. After that, stone walls, thorny brush, etc. can be used to make a fence. Most difficult is the individual protection of trees, by surrounding them with thorny branches.



Communally protected land grows through *succession*



A walled area

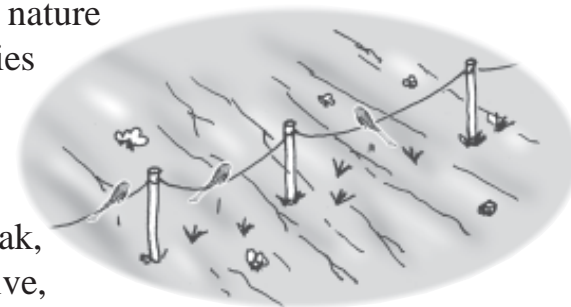


Each tree is protected by thorny branches

The seeds of many pioneer plants are already in the soil. Many types of fruit, such as *Ficus*, mulberry, etc. are eaten by birds and spread on the land through their manure.

We can speed up this process by providing perches over a bare area for birds to sit on. Bury tall posts on a contour line, and tie string between them. Under the string where birds sit, the seed they carry will germinate.

On bare land, it's much easier to work with nature. With a few years' protection, nature will plant the best species to improve the soil. Then people can plant the larger species they need, such as walnut, oak, etc., and they will survive, and grow much better.



This improvement doesn't cost much and the land will improve sustainably. The right plants will grow according to site and climate. Making a plantation on a bare site is very expensive, and more trees will fail. It's much cheaper and more effective to use **succession** for soil improvement.

Land improvement - who benefits?

The aim of improving community land is to prevent erosion, and produce more fodder, firewood, etc. But we must consider who benefits from this work. There are many examples where resource-poor people gain less than they should. So we must make sure from early on that benefits from land improvement are shared equally amongst the community.

①

When land is bare, there are no benefits except a few handfuls of grass for livestock. In fact, the soil will be

degrading in the opposite direction. At

first it's most important to protect the site.

By allowing natural plants to grow the soil will improve by itself.

②

When an area is protected from grazing, within 1-2 years grasses and small shrubs will start to grow. These

cover the soil, conserve moisture, and start to improve the soil. Livestock must be fed at home. Grasses which grow on the protected site can be used as fodder for them.

③

After another 1-2 years other seed will be brought to the land by the wind or by birds, and start to grow. As well as providing fodder, these shrubs and trees can also provide small firewood.

Succession on bare land

④

Within 3-4 years small trees will start to grow on the land. The soil will have improved well by this time. Now we

can start planting large types of tree. In between, smaller, shade loving species such as coffee, pineapple, cardamon, medicinal herbs, etc. can be planted.

⑤

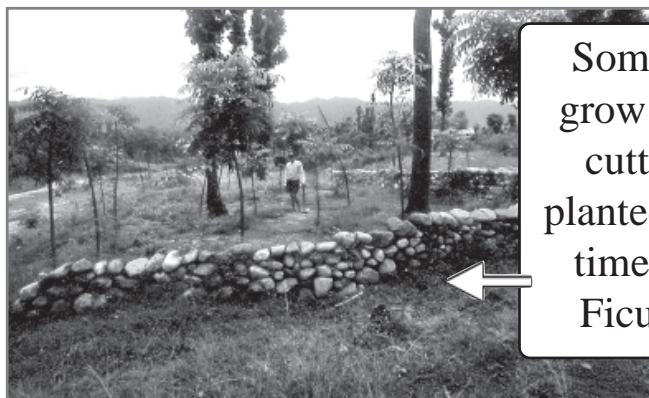
Eventually, both nature and the community can provide for more of their needs. Nature is protected, and human benefits also increase. When nature and the community work together, such benefits are sustainable.

One piece of land improvement

A stone wall protects the land where seedlings have been planted



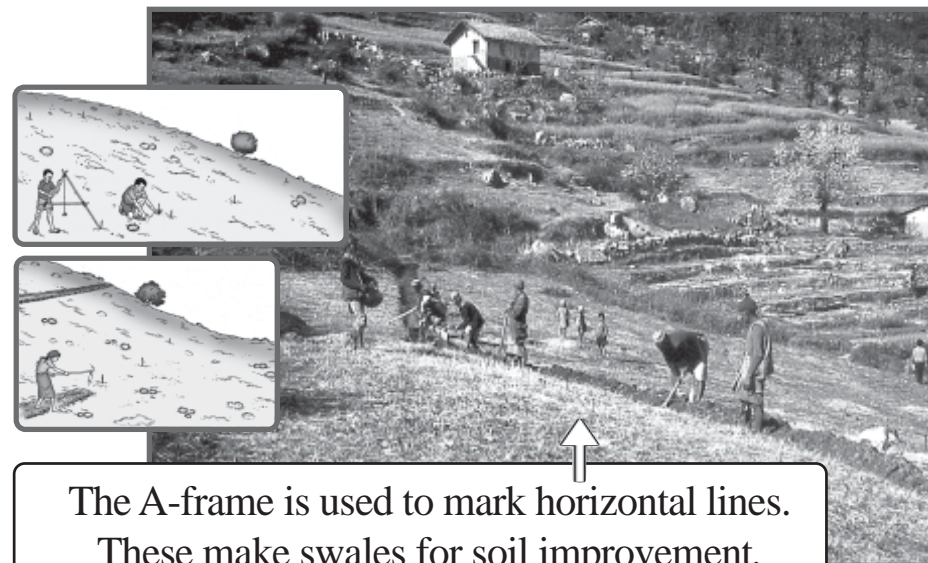
Some trees will grow easily from cuttings when planted at the right time. These are Ficus cuttings.



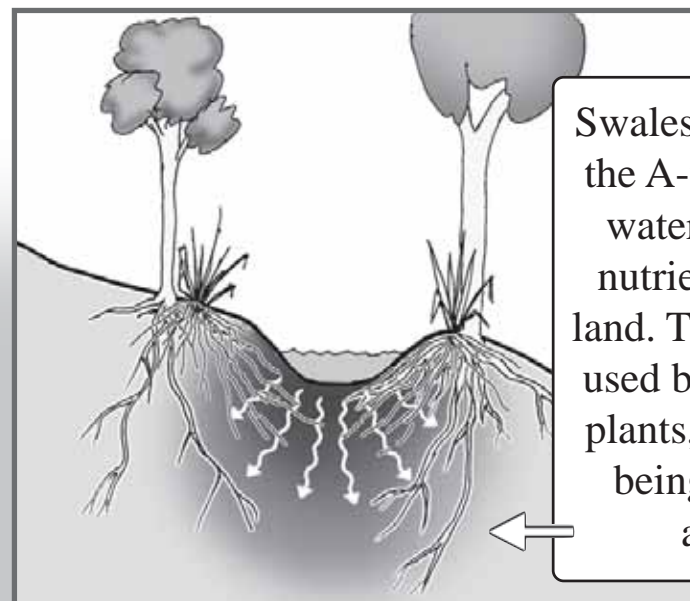
After just 2 years, the area is green and productive



It is important to prevent water from running off a bare slope. This can be done by using an A-frame to mark out contour ditches, or **swales**. This is described in the *A-Frame* chapter. Let's see how the A-frame can be used.

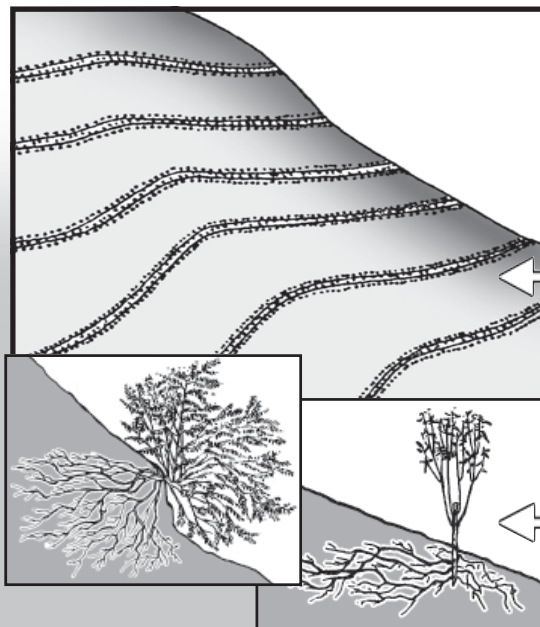
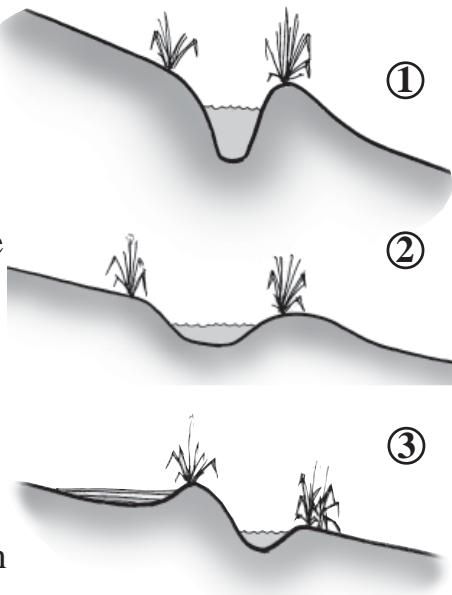


The A-frame is used to mark horizontal lines. These make swales for soil improvement.

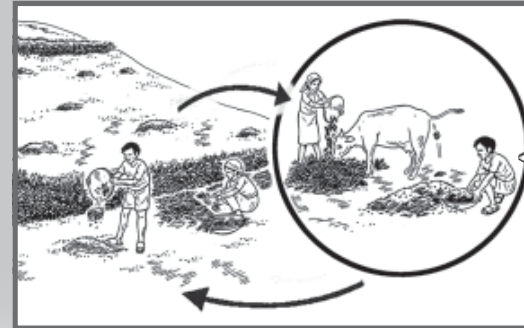


Swales made with the A-frame hold water, soil and nutrients on the land. These can be used by growing plants, instead of being washed away.

The distance between swales depends on the steepness of the slope. The steeper the slope, the closer together the swales should be. In diagram ① the slope is steeper, and the swales are dug deeper and more narrow. In diagram ② the slope is less steep, swales are less deep, and wider. In diagram ③ the soil dug from the swale is put above rather than below the ditch. This can be used to make terraces for cultivation as the soil accumulates above the ditch.

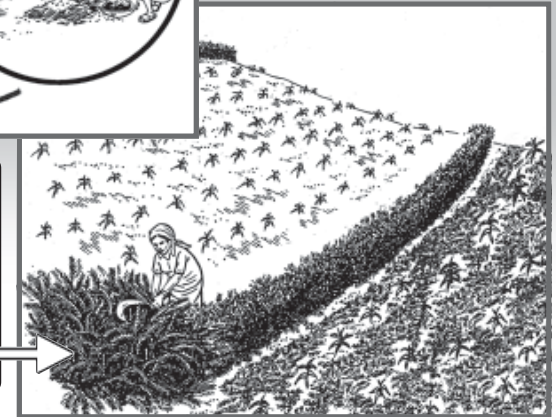


Instead of digging swales, rocks or branches can be laid out on the contour lines marked by the A-frame to prevent soil erosion. Small shrubs can also be planted. Their roots will bind the soil and won't fall over and cause more erosion, as big trees may do.

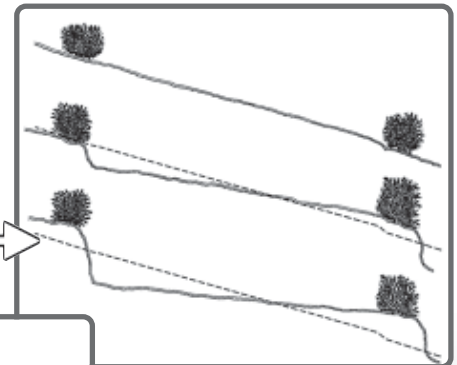


Planting of fodder species will increase compost production....

....or the trees can be cut and leaves put directly on the land (mulching).



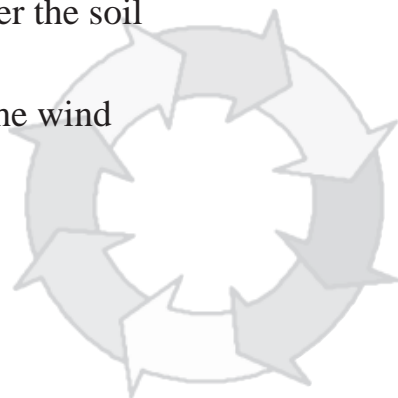
Soil will collect above trees planted like this, and slowly level land will be formed for easier farming.



By stopping soil erosion in this way, hill farmers can make their own land more fertile and productive.

Ways to increase soil fertility

- livestock compost
- compost made of sweepings from the house and yard
- legumes to fix nitrogen
- earthworms
- silt from ponds, streams, etc.
- silt and dust collected from the run-off of the first rains
- deep-rooting trees to cycle fertility
- mulch using leaf litter to cover the soil
- dead insects, birds, etc
- soil and leaves blown in by the wind
- human excrement
- laying turf
- green manures
- rotation cropping
- keeping land fallow
- no-tillage, to allow natural soil fertility



If farmers can use as many of these various local resources as possible to increase fertility, they can help to protect and improve the soil themselves. In this way they can increase production locally and make the homestead strong and productive.



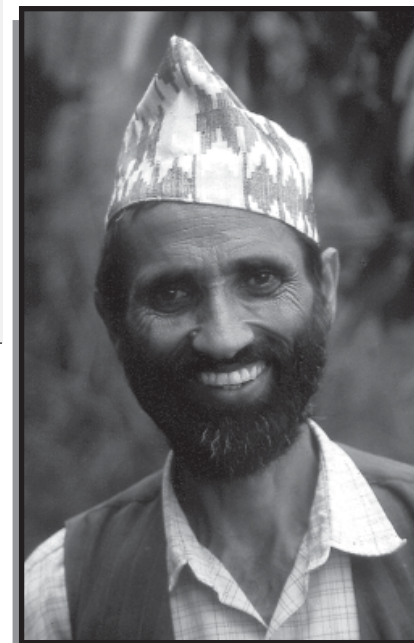
**The soil is our life.
Protect it and be happy !!!**



Farmers' Experience

**Mr Surya Prasad
Adhikari**

From Nepal, Kaski district, Lekhnath - 10, Begnas village, Mr Surya Prasad Adhikari has worked to improve the soil on his own farm. Now let's read about his experiences.



Surya Prasad Adhikari

✿ I started my mixed orchard in 1988. My aim was to work with nature to improve the soil and make it more productive. The area is 1.5 acres, and it was completely bare and degraded, with hardly any grass. First I planted seedlings and mulched all the land with leaves and compost. In the second year I sowed legumes and planted bananas. I cut the bananas and used them for mulch. Then I planted oranges, pineapple, fodder trees, broom grass, and so on. In total there are 55 species I've planted. It's all protected from livestock. The annual production has increased each year, and I even sell seedlings which grow there. There are 800 fruiting coffee seedlings, and I sell oranges and pineapple too. I produce all the fodder and firewood needed at home as well. ✿



Read On !



Subjects Related to Soil Conservation and Improvement



Agroforestry chapter

Plant more trees on farmland to increase production without affecting yields of field crops



A-frame chapter

An easy method of saving soil and water on sloping land



Compost chapter

Make good compost for the soil faster and easier



Mulching chapter

Mulching protects and improves the soil



Green Manures chapter

A method of increasing soil fertility and crop production



Sweepings Pit chapter

Make great compost from domestic waste resources



Living Fence chapter

Make not just a fence, but a productive part of the farm



Forest Management chapter

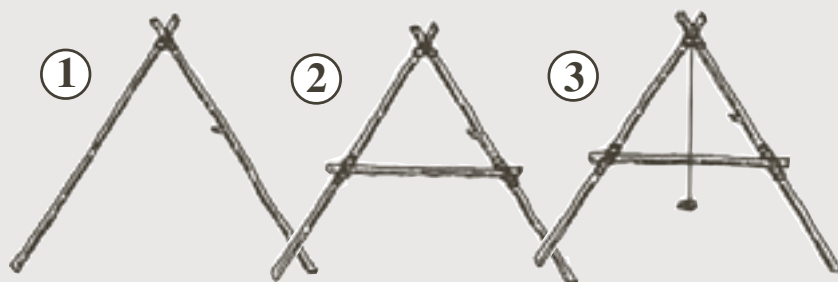
Good forest management is essential for the soil



Double Digging chapter

Dig twice as deep to get 4 x the vegetable production





These pictures show how the A-Frame is put together. More details are given along with the colour photos.

The A-Frame is constructed by joining the legs, level stick and string as in drawings 1, 2 and 3 above. It is **NOT** essential that the long sticks which make the legs of the A-frame are exactly the same length, nor that the middle stick is exactly horizontal. It doesn't matter if lengths are different, or if the sticks are not exactly straight. As in the drawing below, some A-frames can be more uneven, but they all do the same work.

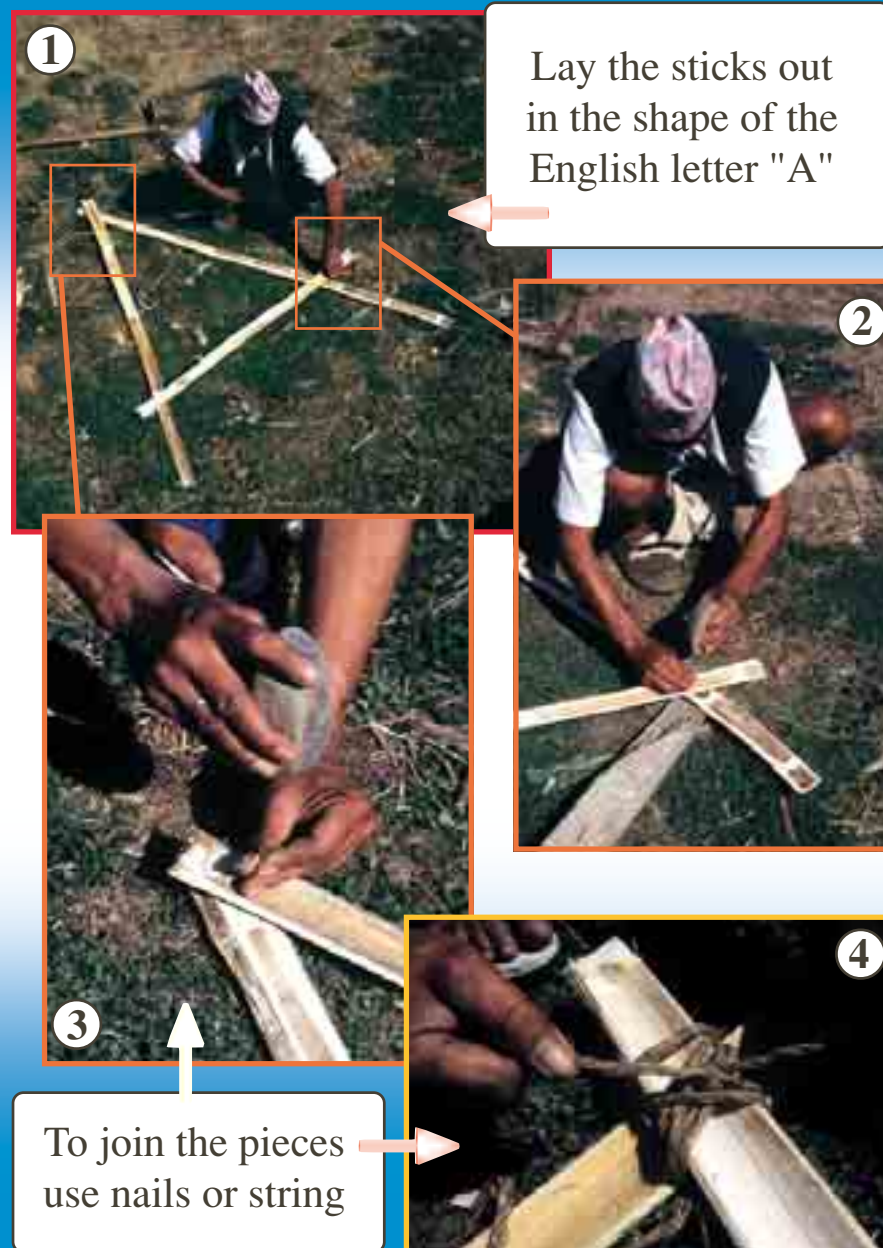


The most important part of the A-frame, so it can mark out contours accurately, is the relationship between the string and the horizontal stick. The way that this is done is shown in detail in colour photos 7 to 14

Now the A-Frame is ready to use

Let's See

how to make an A-Frame





What is a Community Fund ?

A Community Fund can be started by village men and women agreeing to make a group, and collecting money from all the members of the group according to their capacity. When the group has an objective of making loans and charging interest as needed from this fund, this is usually called a savings and loans group. These groups can be made up

of men and women, some are made up of women only. The members of the group discuss and decide on when to meet and how much money to collect. Usually they meet once a month, on the first Saturday, or any other day they decide on. Everyone agrees to pay an equal amount, which can increase over time. Members can then take a loan according to their needs. A rate of interest is payable on the loan, which increases the fund. This has proved to be very successful in allowing communities to control and improve their own local economy.



Controlling your own finance

Why make a Community Fund ?

- protection from the high interest rates of merchants
- to have access to funds at times of emergency
- to be able to pay for family commitments, such as weddings, school fees, funerals, etc.
- to be able to take loans easily whenever needed
- so that marginal families with minimum incomes can get access to credit and cash
- to make managing the household's finances easier



Discussing the business of the Community Fund



This Chapter's Author :
Mrs Malati Lakoul
World Education,
Kathmandu, Nepal



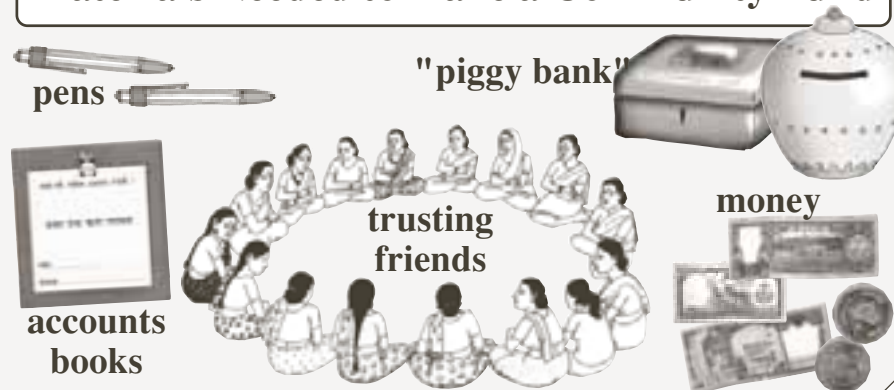
How to make a Community Fund ?

In this chapter, first we'll look at selecting the group and how it manages itself. Then we'll look at examples of simple ways of keeping and managing accounts. Finally, we'll briefly look at some good ways of investing the fund, and see case studies of successful women's groups and their funds.

Where does savings money come from ?

- from a certain percentage of income taken at the start, before any spending (produce, save, and then spend)
- from increasing the fund by income-earning work
- from giving up being lazy and improving work habits
- reducing unnecessary expenses
- reducing consumption of damaging items such as alcohol and cigarettes
- from community or social work, such as festivals, cultural programmes, bulk buying and marketing, etc.

Materials Needed to make a Community Fund



How to start a group

The various responsibilities of the group should be divided up, so that savings and credit groups can manage themselves effectively. Not everyone has the same skills, and it should be decided and agreed who is best to do which job.



Things to consider when selecting members

Group leader (Chairperson)

- able to lead the group
- able to manage the group successfully
- able to listen, and understand inputs from the group
- able to explain about the group and how it works to other people and groups.

Treasurer

- able to read and write
- able to keep accounts

Secretary

- able to read and write
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Choosing the group's leaders

The group chooses the chairperson, treasurer and secretary by consensus, election, or by whatever method is appropriate. For example, here are 2 methods of selecting the posts



Method 1

The group selects people with the right qualities to play the leadership roles, who then state whether they wish to have the post. When there is consensus and everyone agrees, the posts are given.

Method 2

A selection of suitable candidates are presented or present themselves. There is a vote, and whoever gets the most votes gets the post.

How to keep the group's accounts ?

The keeping of the group's accounts means the group can keep a record of funds saved, loans given and interest earned, so the total amount of the fund is always known. The treasurer has the responsibility to keep the accounts clear and transparent. On the following pages are samples of a group's accounts.

Keeping the group's accounts

To keep accounts of the group's savings, the chairperson records the names and savings of the group members, with each signing their name against the account. Everybody watches as accounts are written, and the accounts are read out as well. Below is an example of the records kept.

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S. No:	Date	Name	Item	In-come	Loan taken	Loan left to repay	Amount in bank	Amount in Group	Signature
1.	1.4.01		Last month's items					200/-	
2.	1.4.01	Dhanmaya	April's saving	10/-				210/-	
3.	1.4.01	Sunmaya	April's saving	10/-				220/-	
note : due to lack of space not all accounts are written. After Dhanmaya and Sunmaya there are another 12 members whose savings are not shown, but the method is the same.									
15.	1.4.01	Sita	April's saving					340/-	
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Phulmaya is the Treasurer

Savings and loans pass book

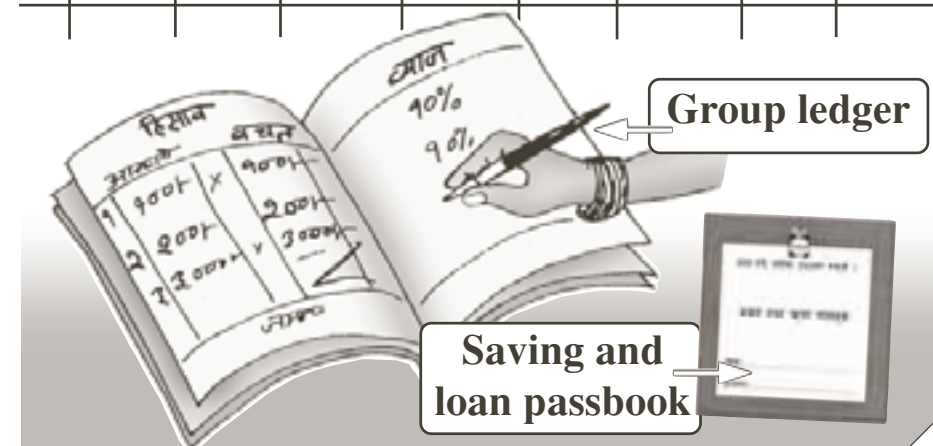
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Savings Passbook

S. No:	Date	Item	Savings deposited	Loan taken	Total Savings	Signature
1.	1.4.01	April	10/-	-	10/-	
2.	1.5.01	May	10/-	-	20/-	
3.	1.6.01	June	10/-	-	30/-	

Loans Passbook

S. No:	Date	Item	Loan taken	Interest to pay	Paid back		Left to pay	Signature
					Loan	Interest		
1.	1.4.01	April	180/-	9/-				



Providing loans from the fund

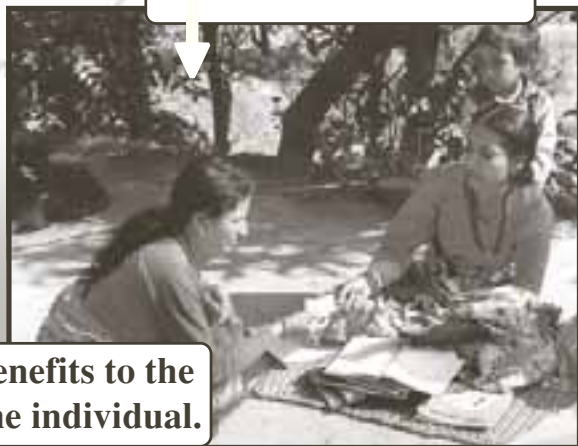
- Decide what type of work loans can be given for.
- Decide the amount of interest to charge, depending on the type of loan.
- Decide how and when the loan will be repaid.
- Prioritise which types of loan are available.
- Discuss and decide regularly how to keep the group and its finances running well.

Coordinating the group's activities

1. The group meets regularly to make decisions.
2. Work is divided among the group.
3. Bylaws are made :-
 - how much to save ? (per member)
 - when to save it ? (monthly, etc.)
 All decisions are recorded.



Usually, the group members will meet once a month.



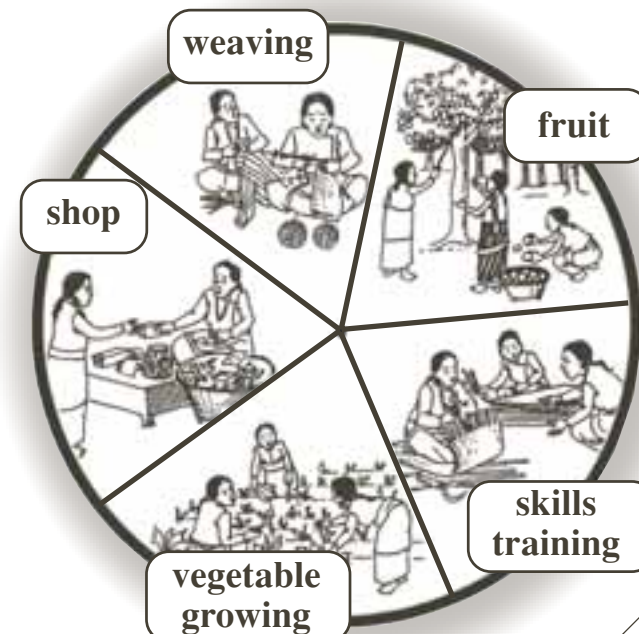
There are benefits to the group and the individual.

4. Managing the fund's ledger :
 - How much does each member have?
 - How much loan have they taken?
 - How much is kept in the bank ?
5. Keeping the savings :
 - Hold formal meetings;
 - Provide details of accounts to the group.
6. Agree interest rates :
 - How much interest is charged on different types of loan ?
7. When will loan repayment start ?
 - How will the loan be paid off ?
 - When will the loan be paid off ?



By using the loan to start a business, the local economy benefits, while loan repayment also increases the fund.

8. Plan for the future. Discuss how to get access to relevant techniques and resources to make programmes connected to areas of health, education, farming, etc.



Joining in community work related to the fund

Why should an active and well run savings group only manage a fund ? They can also be involved in community work such as maintaining paths, drinking water systems and plantations.



Women's ability and awareness increases. They can participate in making decisions about various community issues along with the men.



A success story of a community fund

In 1994 in Gauripara village in Bardiya district, of Western Nepal, the women started a savings and credit group. At first the members raised 5 rupees a month and invested this in various activities. They grew a potato crop, and raised pigs successfully. Then they rented some land and grew rice, which also produced well. Now they have started to build a community hall, and plan to open a community shop. Even though they invested this much, as of 2000 they still had over 50,000/- rupees left in the fund. Now this active and successful group also advises and teaches other groups.



Members of Gauripara Group

Farmers' Experience

Mrs Purnakala Gharti

From Nepal, Surkhet district, Gumi - 5, and chairperson of "Protect the Forest" women's group, Mrs Purnakala Gharti has experience in running her local group's community fund. Now let's read about what she says.



Mrs Purnakala Gharti

Grihasthi Communications

“ We learned how to form the group from the Homestead Programme (JPP). First all the members raised 4 kg each of grain, then on the first of every month we meet and each pay 10 rupees into the savings. We give loans if someone has sickness, or runs out of food, and the loan is collected with a small interest. Up until May the interest was 2 rupees per hundred. Since May it's now one and a half rupees per hundred. At the moment we have 500 rupees in the fund, and 7000 rupees is out in loans. This has made things very easy for us. There's no need to take loans from the merchants, who charge interest at least 5 rupees per hundred. For one thing, we don't have to go searching for a loan, and we can use our fund. For another, when we pay the interest, it increases our own fund. ”





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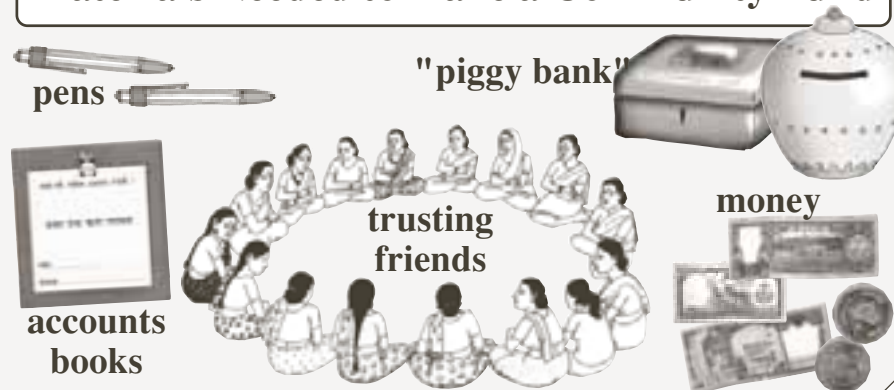
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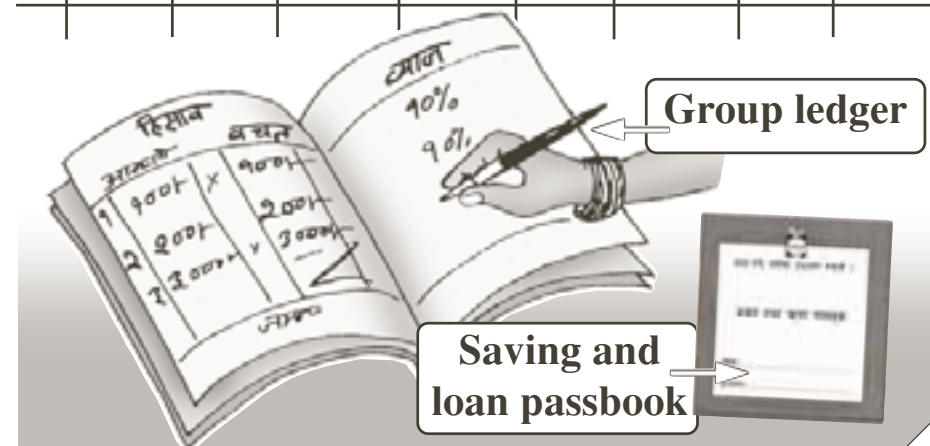
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S. No:	Date	Item	Savings deposited	Loan taken	Total Savings	Signature
1.	1.4.01	April	10/-	-	10/-	
2.	1.5.01	May	10/-	-	20/-	
3.	1.6.01	June	10/-	-	30/-	

Loans Passbook

S. No:	Date	Item	Loan taken	Interest to pay	Paid back		Left to pay	Signature
					Loan	Interest		
1.	1.4.01	April	180/-	9/-				



Providing loans from the fund

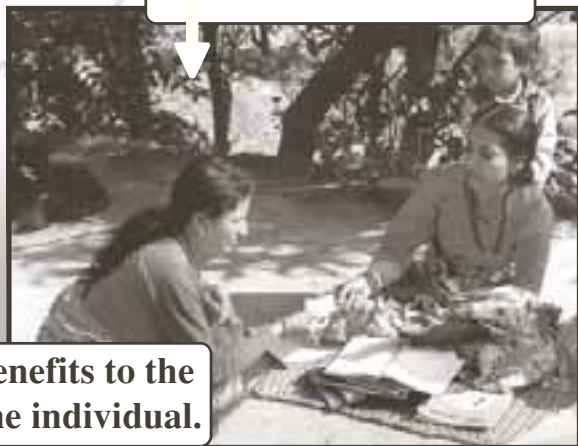
- Decide what type of work loans can be given for.
- Decide the amount of interest to charge, depending on the type of loan.
- Decide how and when the loan will be repaid.
- Prioritise which types of loan are available.
- Discuss and decide regularly how to keep the group and its finances running well.

Coordinating the group's activities

1. The group meets regularly to make decisions.
2. Work is divided among the group.
3. Bylaws are made :-
 - how much to save ? (per member)
 - when to save it ? (monthly, etc.)
 All decisions are recorded.



Usually, the group members will meet once a month.



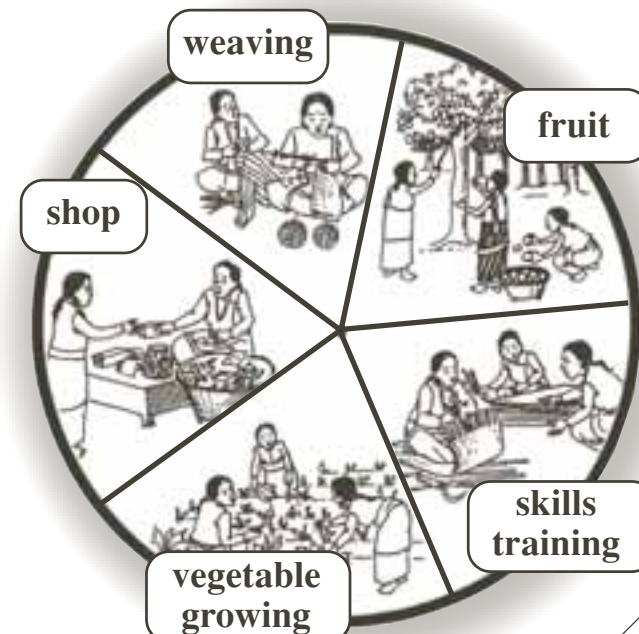
There are benefits to the group and the individual.

4. Managing the fund's ledger :
 - How much does each member have?
 - How much loan have they taken?
 - How much is kept in the bank ?
5. Keeping the savings :
 - Hold formal meetings;
 - Provide details of accounts to the group.
6. Agree interest rates :
 - How much interest is charged on different types of loan ?
7. When will loan repayment start ?
 - How will the loan be paid off ?
 - When will the loan be paid off ?



By using the loan to start a business, the local economy benefits, while loan repayment also increases the fund.

8. Plan for the future. Discuss how to get access to relevant techniques and resources to make programmes connected to areas of health, education, farming, etc.



Joining in community work related to the fund

Why should an active and well run savings group only manage a fund ? They can also be involved in community work such as maintaining paths, drinking water systems and plantations.



Women's ability and awareness increases. They can participate in making decisions about various community issues along with the men.



A success story of a community fund

In 1994 in Gauripara village in Bardiya district, of Western Nepal, the women started a savings and credit group. At first the members raised 5 rupees a month and invested this in various activities. They grew a potato crop, and raised pigs successfully. Then they rented some land and grew rice, which also produced well. Now they have started to build a community hall, and plan to open a community shop. Even though they invested this much, as of 2000 they still had over 50,000/- rupees left in the fund. Now this active and successful group also advises and teaches other groups.



Members of Gauripara Group

Farmers' Experience

Mrs Purnakala Gharti

From Nepal, Surkhet district, Gumi - 5, and chairperson of "Protect the Forest" women's group, Mrs Purnakala Gharti has experience in running her local group's community fund. Now let's read about what she says.

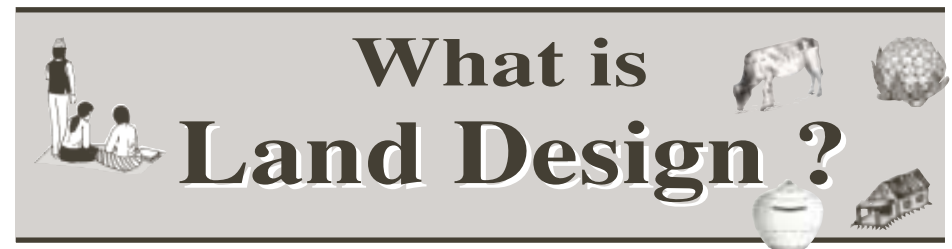


Mrs Purnakala Gharti

Grihasthi Communications

“ We learned how to form the group from the Homestead Programme (JPP). First all the members raised 4 kg each of grain, then on the first of every month we meet and each pay 10 rupees into the savings. We give loans if someone has sickness, or runs out of food, and the loan is collected with a small interest. Up until May the interest was 2 rupees per hundred. Since May it's now one and a half rupees per hundred. At the moment we have 500 rupees in the fund, and 7000 rupees is out in loans. This has made things very easy for us. There's no need to take loans from the merchants, who charge interest at least 5 rupees per hundred. For one thing, we don't have to go searching for a loan, and we can use our fund. For another, when we pay the interest, it increases our own fund. ”





Farming is part of the body of rural communities. Everybody wants to make these communities more sustainable. **Permaculture** is the direct application of the principles of nature in the design of sustainable human habitats. Design can make a



Permaculture designer Govinda Sharma in his kitchen garden

farming system which relies on the observation of nature and the adaptation of nature's stability, fertility and resilience to create a sustainability which benefits not only people, but the whole earth. Permaculture is a way of designing which uses mainly local resources to help individuals and communities be self reliant and abundant. It is also a design system which helps us to run our lives and cultures in a sustainable way .

Permaculture combines the best of natural systems, traditional skill and wisdom, community values, and modern technology. In this chapter we give an introduction to Permaculture and its principles, and how it is used in design. This chapter also combines all the other chapters of the Farmers' Handbook to help make households more sustainable.

Benefits of using Permaculture design

- To repair degraded land and make it productive again
- to produce more benefits from less land
- to protect basic natural resources of soil, water, biodiversity, etc.
- to reduce the cost of farm production
- to create sustainable life systems
- to design a sustainable agriculture.



What is "Sustainable" ?

Nowadays the word "sustainable" is widely used, like "sustainable development", "sustainable economics", and so on. But we must only use this word when we understand it. What is a sustainable place like ? What do we gain from it ?

A "sustainable" system is permanent, stable, resilient and self sustaining, never breaking down and always meeting the needs of its populations of plants and animals.

Actually, in modern times people have never made a truly sustainable system, so where do we get our "sustainable" vision from ?

If we wish to be truly sustainable, where can we go to learn how, when we have never done it ourselves ? Modern development has given us billions of dollars and thousands of politicians and scientists, but still we are not sustainable.

So where to go and what to do, to be sustainable ?

Where can we see sustainability ?

If we really want to create a sustainable lifestyle for ourselves, and for future generations, we must learn from places where systems *are* sustainable. These are the self-reliant, self sustaining, resilient, stable and productive natural systems of the world.

An example of a sustainable natural system can be seen in a natural forest. But traditionally the forest is a dark, forbidding place, where crops can't be grown and tigers hide to take our livestock. That's why we are more accustomed to clearing forest in order to grow crops. But at the same time, most people understand that without the forest there is no life, because so much of what we need in life comes from the forest.

But have we ever thought how the forest is a teacher of sustainability ?



These training participants learn about sustainability from the forest

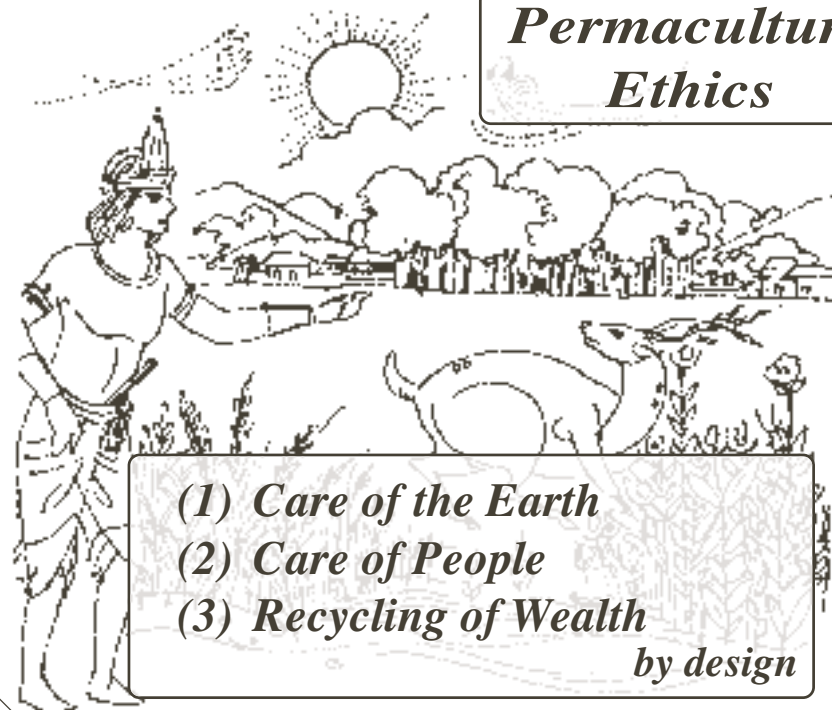
Go to the forest and see !

- **The Forest** needs no work but is always productive.
- **The Forest** never degrades itself, and is always growing.
- **The Forest** does not need fertilizing or irrigating, but it is always fertile and moist.
- **The Forest** is warm when it's cold, and cool when it's hot.
- **The Forest** is permanent, resilient, and self reliable.

And the forest is sustainable !

So how would it be if we could make our homes, communities and economies as sustainable as the forests ? To make our homesteads as sustainable as nature, we need to understand the importance of natural systems, and use that understanding in our lives. Permaculture is a way of designing the land using this knowledge.

Permaculture Ethics



Natural Systems and Permaculture Design

How is a Natural System Sustainable ?

What is a Natural System ?

A Natural system is made up of living and non-living elements.

In a natural system there are various elements, such as trees, shrubs, insects, ponds, rocks, birds, etc. These elements have their own different characteristics, habits and qualities. Some trees are short, some tall. Some are thick, some thin. Some need full sunlight, some grow in the shade. All the elements, with their own habits, live in a functional relationship to the other elements around them in any place. That is called a natural system.

Natural System

element
local environment
elements' characteristics
relationships between elements

In some languages, a system may have a different name if it is made by people, e.g. a farming system.

Principles of Natural Systems

Natural Systems follow a group of principles which enable them to be sustainable. By using the same principles in the design of farming systems, the objective is to work towards a sustainable agriculture. Permaculture is used as a design system to enable this.

Principles of Natural Systems and Permaculture Design

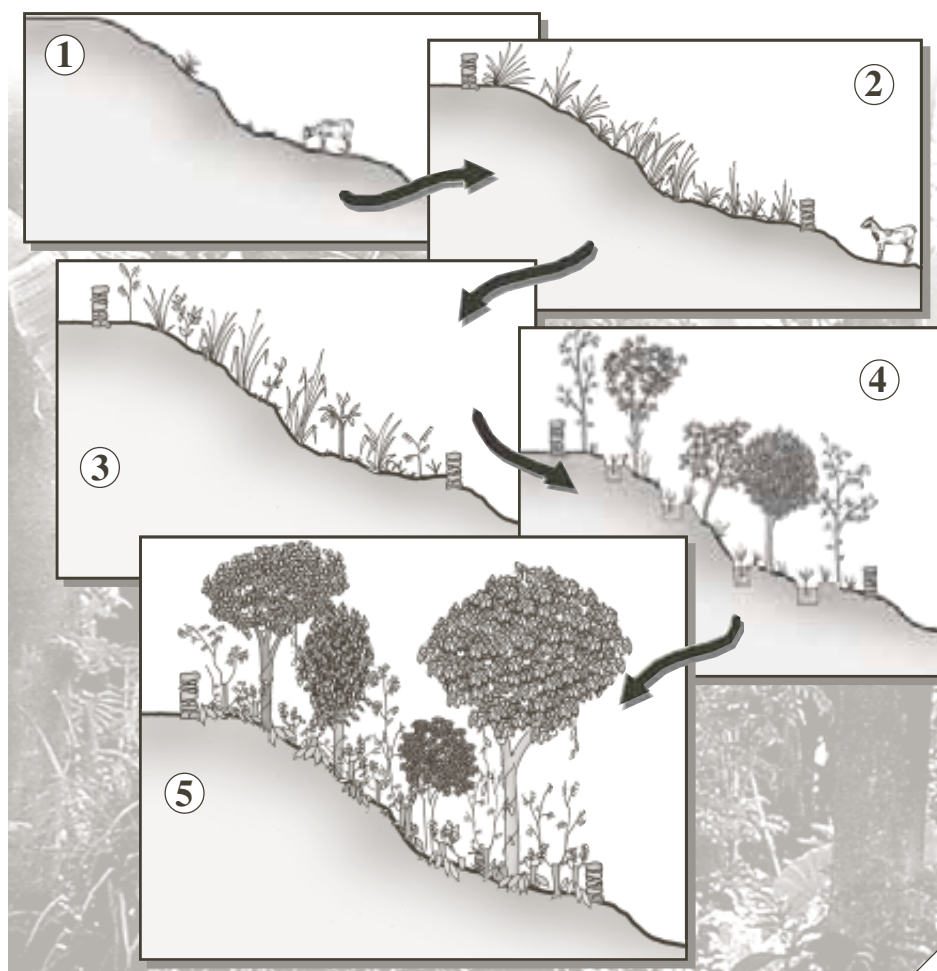
- ✿ Succession
- ✿ Beneficial, functional relationships between elements
- ✿ Diversity
- ✿ Cycles and Re-cycling
- ✿ Use of local resources
- ✿ Each element performs multiple functions
- ✿ Each function is supported by multiple elements
- ✿ Stacking for efficient use of space
- ✿ Use of biological (living) resources
- ✿ Use of microclimate
- ✿ Energy efficient planning

There is information about the history and founders of Permaculture at the end of this fifth volume.

Permaculture design uses these principles to make agriculture more productive and sustainable. That's why the principles are the same for permaculture as for natural systems.

✿ Succession

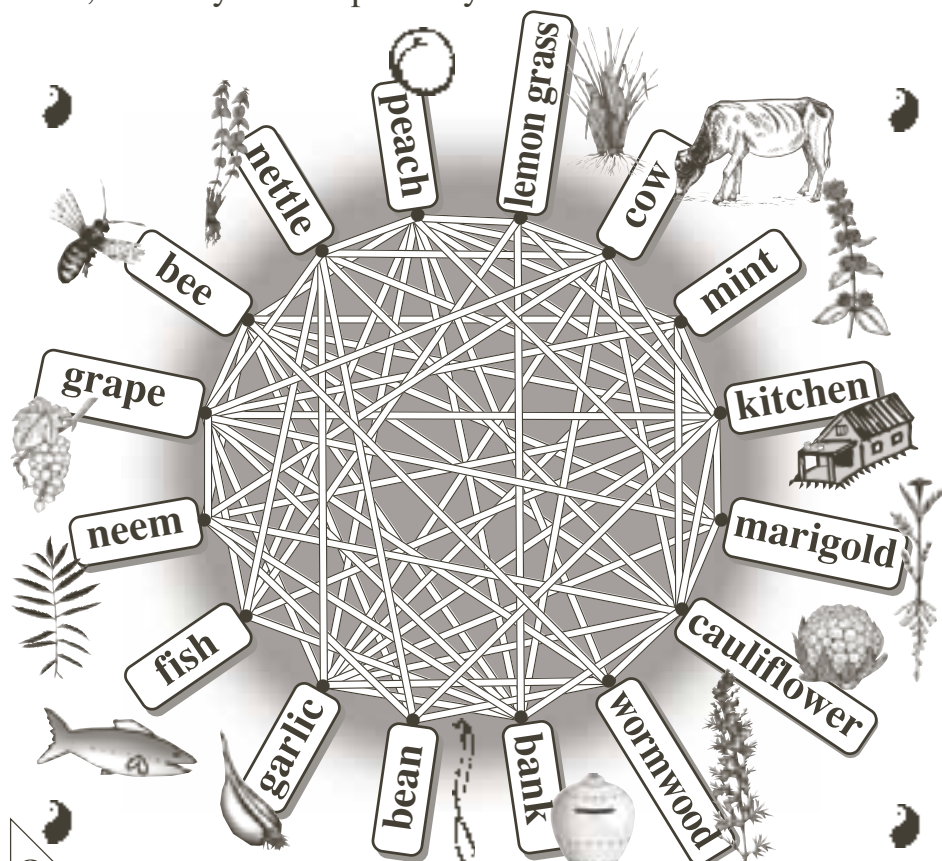
Bare, degraded land will improve itself naturally. This process of regeneration is called **succession**. For example, when any bare land is protected, special ground cover plants called *pioneers* will grow first. They will start the soil improvement process. Then, larger shrubs and trees will grow. Eventually, a mature forest will develop, and the soil will have a new life. This principle is used to regenerate unproductive land into productive systems quickly, successfully, and at low cost. We can also use species that follow this principle, but are more useful for human needs.



* Beneficial, functional relationships

In nature, living and non-living elements are connected to each other. This is a relationship of cooperation, not competition. For example, birds eat seed and disperse it elsewhere in their manure. Also, bees take nectar from flowers, so helping pollination.

In farming systems also, different elements can be related to each other. Anything that any one element needs can be provided by another element, and the outputs of that are used by something else. In the diagram below are examples of sixteen elements in a homestead. There are various connections linking the needs of one element to the outputs of another, in a way that helps the system to be sustainable.



For example, the bee takes nectar from the peach flower, and the peach can produce better fruit from the pollination. Wormwood and nettle can help the bean, garlic, cauliflower in the kitchen garden by being used for mulch. Newly sprouting shoots of the peach can be rubbed on the cow to prevent skin parasites, while the cow provides manure to many elements in the system. Garlic, wormwood, nettle, marigold, etc. are all useful in the vegetable garden and orchard for companion planting, liquid manure and pest control.

Design looks to put the right elements together in the right place, so that needs and outputs are met within the system. This reduces work and waste, and the need for external inputs, while increasing production. The right elements in the right place will create their own beneficial connections.

* Diversity

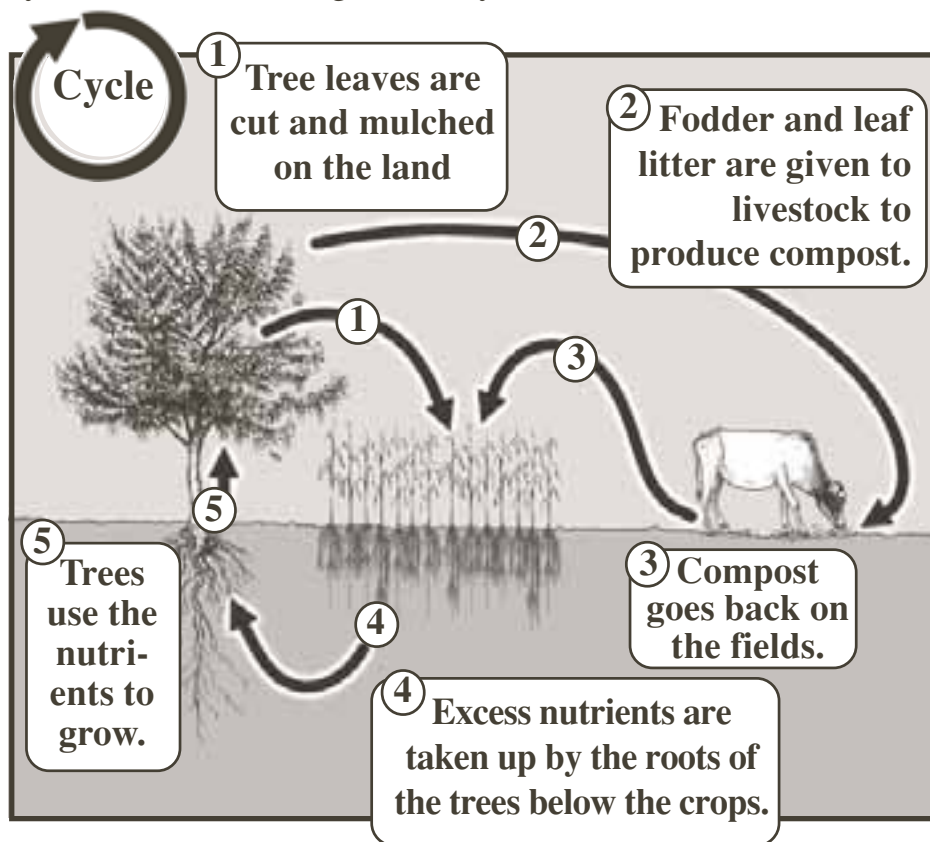
Nature is diverse, with many types of plants, animals and habitats. For example, though Nepal is a small country it has a huge diversity of climates and wildlife. The more diversity there is, the more beneficial relationships there are between the various elements in the system. This helps the system to be sustainable.

An example of using diversity in farming is with mixed vegetable gardening, the integrated orchard, and agroforestry.



* Cycles and Re-cycling

In nature, living things die and rot down. The nutrients they are made of are released back into the system for use by the plants. This cycle always runs, so elements which the forest needs, such as water and soil nutrients, are always made available, and never run out. In farming systems, the cycle of nutrients in agroforestry is shown below.



Another example can be seen in the kitchen garden. Waste water from washing can be used for irrigating the vegetables, and sweepings from the house and yard can be recycled as compost for the kitchen garden. Without cycles like this, it is very difficult to be sustainable.

* Use of local resources

The forest doesn't need to travel anywhere to find its basic resources. There are no transport costs to bring in its needs. The more a farming system relies on external inputs, the more are its costs of production, and the less sustainable the system is. This is a very important principle in achieving sustainability.

* Each element performs multiple functions

In nature, each element performs several functions. A single tree will provide leaf litter, habitats for birds and insects to live in, a support for climbing plants, protects the soil, and so on. Trees planted on the farm can also provide many benefits according to their characteristics, such as fodder, mulch, medicine, etc. Extra benefits come by planting them in the right place and in relation to other elements, such as giving shade. In design, each element should produce at least 3 different benefits or functions within the system.



Trees can meet all our needs

❁ Each function is supported by multiple elements

In nature, many elements combine to support any one function. For example, the function of maintaining soil fertility in the forest is provided by the leaves of trees, by soil bacteria, earthworms, bird droppings, dead animals, fungus, the wind blowing dust, etc. This principle is also related to diversity.

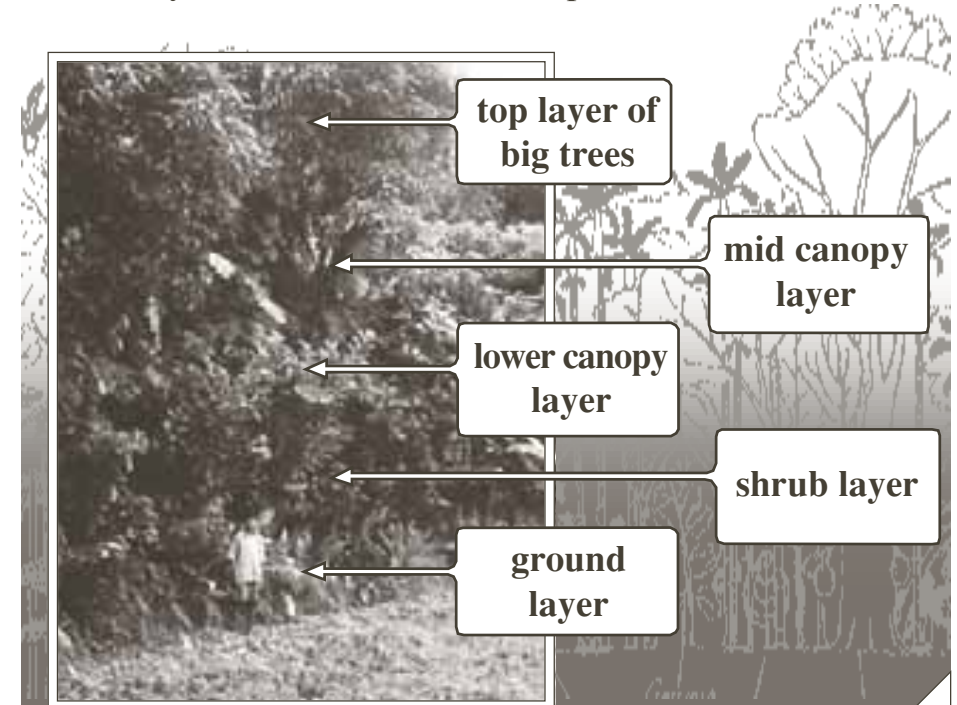


In farming, this principle can be seen in the **living fence**, or hedge. The single function is for protection, and this is made up of many species of trees and shrubs (elements). So if one species of the fence is unsuccessful for any reason, other species will continue the function, so the protection is not lost. In mixed vegetable gardening, there are many varieties of vegetable growing together which all provide food. If insects attack one type, there will always be others to provide food, so production is not lost. This principle is used to reduce risk in the system.

❁ Stacking for efficient use of space

In nature one reason why there is such great production with such small input is that space is used very efficiently, and there are many elements in a small space. By stacking one species on top of another, more species can grow. In one forest, up to 7 layers can be seen :- a ground or weed layer, shrub layer, lower, mid and upper canopy layers, a climbing plant layer, and a root layer. Different species are stacked into this system, giving production from 10-20 metres below the ground to 30-40 metres above the ground. No space is wasted.

Planting layers of trees and shrubs in farming systems is very productive. In the living fence, agroforestry and the integrated orchard, species are planted according to their size and shape, and whether they need shade or sun, to make many levels and produce many more benefits than a field of grain, which only uses a metre of vertical space.



To recognise the state of the land, many things must be understood. What are the problems ? Where are important resources such as soil, water, fertility, money or time being lost from the homestead, or damaged ? If so, before trying out any new methods to increase production, a first priority is to protect and conserve those resources being lost.

here is soil erosion

livestock can get in here

soil erosion here

low fertility for crops

no toilet

damage from wind

washing
water
wasted

raw compost

soil is bare

no vegetables

fertile soil
collects at the
bottom

no fruit

What are the resources on the land ? What techniques can be added to the farm ?
Which resources need to be increased to get better production for less cost ?
How can natural principles be used to do this ? There are many such questions.
As design experience increases, it becomes easier to answer the questions, and
farmers' capacity to make systems more sustainable will increase.

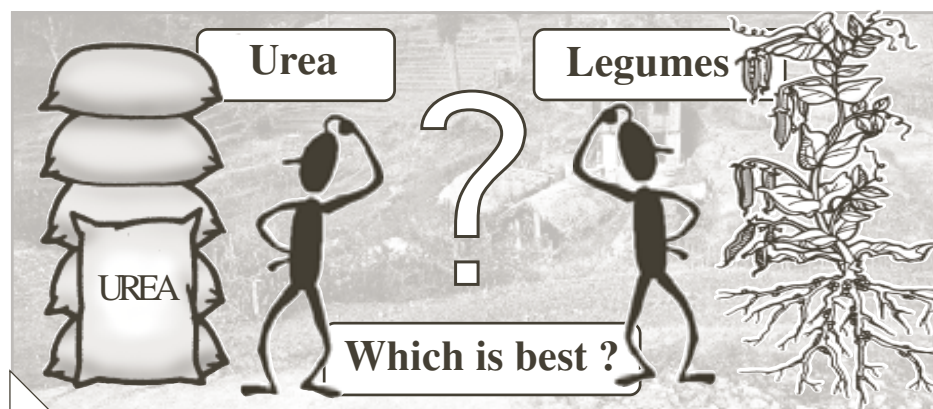
Examples of fruit and multi-purpose species for lowland and highland, suitable for different stacked layers

Big trees :- mango, jackfruit, avocado, walnut, neem, chestnut, soapnut, oak, etc. **Mid-canopy trees :-** apple, pear, peach, plum, apricot, persimmon, etc. **Low-canopy trees :-** orange, lime, banana, custard apple, guava, coffee, sea buckthorn, papaya, *Gliricidia*, mulberry, hazel, *Lucaena*, elder, etc. **Bush layer :-** cardamon, pineapple, napier grass, lemon grass, tumeric, broom grass, *Crotalaria*, *Sesbania*, etc. **Ground layer :-** sweet potato, taro, bean, groundnut, clover, comfrey, wormwood, chamomile, etc.

* Use of biological (living) resources

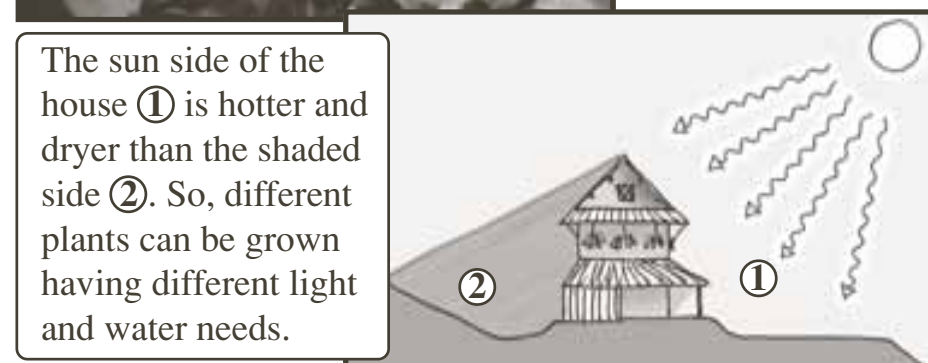
In nature, it is the living, organic resources which are responsible for running the system. Important functions such as making the soil fertile, distributing seed, conserving moisture, etc. are all served by living things. Trees, birds, worms and bacteria all work for the development of the system.

For fertility and crop protection in sustainable agriculture, benefits from green manures, liquid manure, legumes, predator insects and companion planting are greater than chemical fertilisers and pesticides.



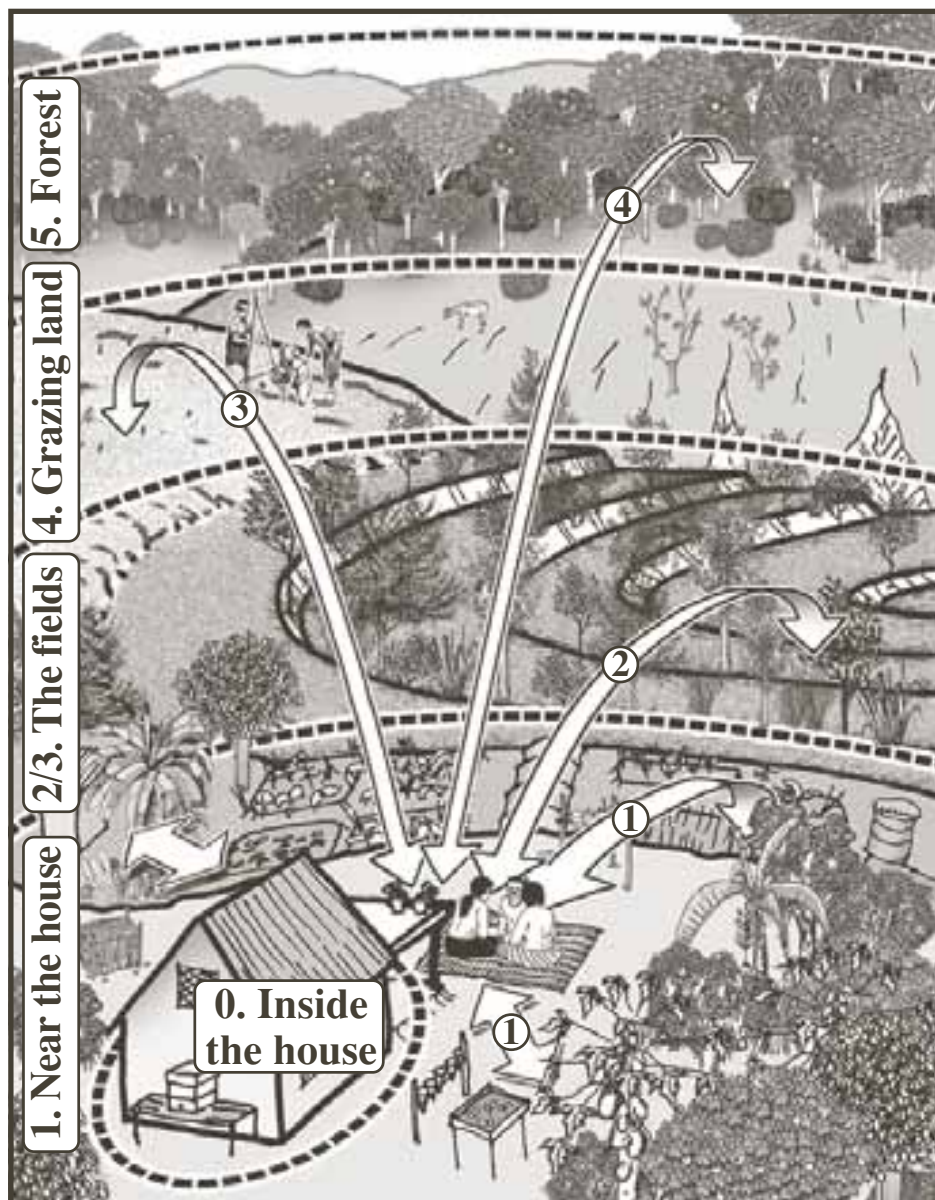
* Use of microclimate

The climate inside and around the forest is different to the surrounding climate. There are areas of different moisture, temperature, and light levels. These small areas of diverse temperature, light and moisture are called **microclimates**. In farming, use can be made of microclimates by growing the type of plant that grows best in that particular place. Microclimates can also be created, for example by planting wind-breaks or making ponds. Species are then selected according to their site needs. This also brings **diversity** onto the farm.







There's nothing new about using microclimates. The terraces in front of houses are traditionally kept on the sunny side. That makes them ideal for drying seed and vegetables, making pickles, etc. The sun gives free energy in this place. The shade side is good for shade-loving crops, or a nursery can be made.

* Energy-efficient planning



In this diagram, the relationship of the house to other parts of a well designed farm is shown by the different thickness of the arrows. A thick arrow shows a frequent connection, and thinner arrow shows where less visits are needed.

Areas of the farm are divided by zone. Inside the house is zone 0 and close to the house is zone 1. Zone 1 has techniques and systems that need more maintenance, such as the kitchen garden, which is visited 2-3 times a day for maintenance and harvesting. Various nurseries also belong in zone 1, because they need extra care, such as daily watering. By placing them near the house, less time and energy are used for harvesting or maintaining these systems. Below are more examples :-

zone	number of visits	suitable technologies and systems
1 - near the house	 ① many	kitchen garden, nurseries, waste water, sweepings pit, toilet, bees, etc.
2 & 3 - the fields	 ② fewer	agroforestry (fodder, firewood, timber production, fruit trees, mixed with field crops, orchard, green manures, etc.
4 - grazing area	 less still ③	soil erosion control, soil improvement, plantation, integrated orchard, etc.
5- forest	 very rarely ④	forest management, wild and cultivated herbs, education, etc.

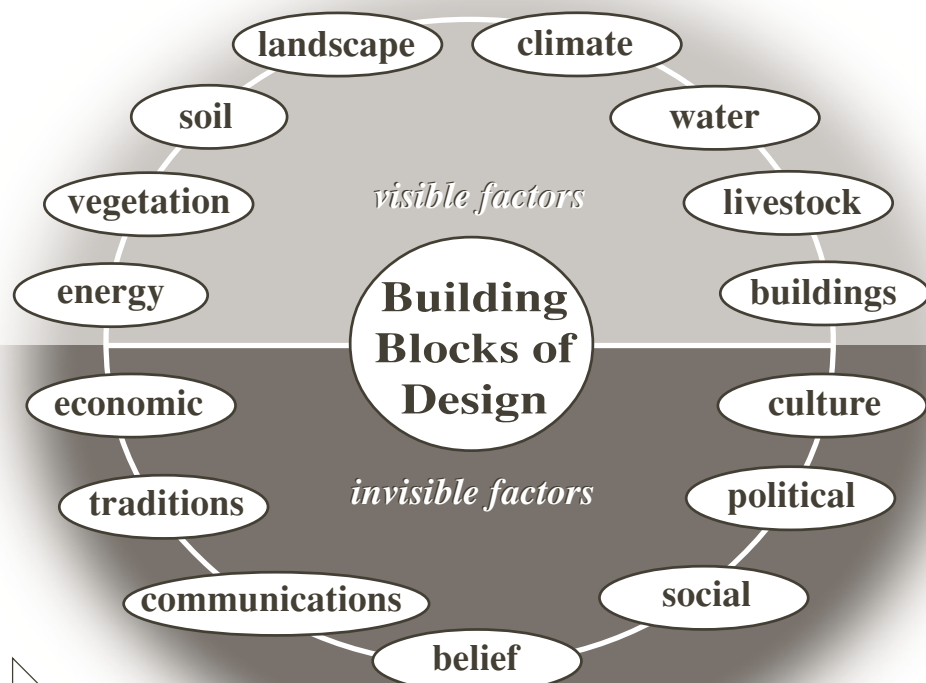
Having the right Attitude

The principles described above are necessary to design a sustainable system, but most important is the attitude of the designer and user. As long as people don't have a deep desire to achieve the goals of sustainability within ethical guidelines, then no type of design can help to reach these goals. Some people feel that they can't make a difference by themselves, or are scared of making a change, or of losing resources.

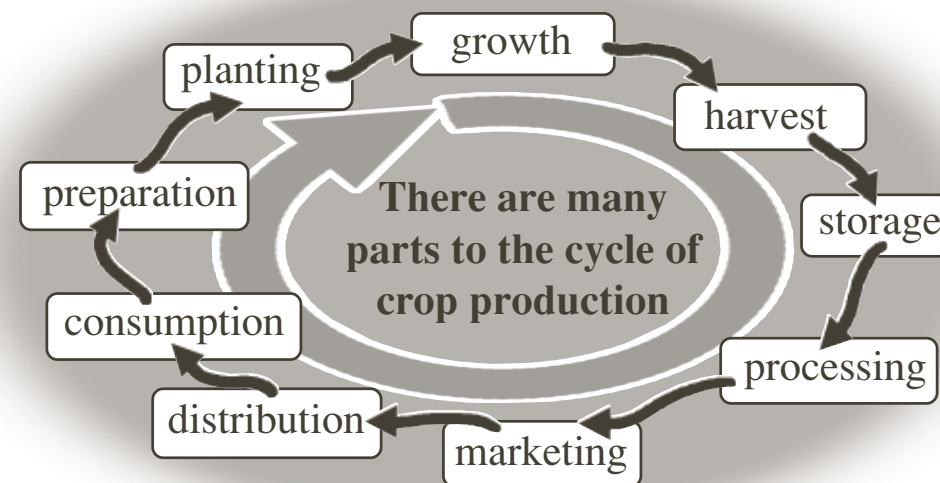
But good design can solve many problems. With the right attitude, problems can become solutions, and a progressive design will develop. We can also design to learn. People need to work together to find the right techniques and resources to solve their own problems and meet their own needs, as well as those of nature.

Building Blocks of Design

When designing land to be more productive and sustainable, it is very important to understand the factors which can both limit, or aid, the progress of the design. Then the design can be adapted and changed in the early stages, so that no mistakes will prevent the objectives of sustainability being reached. Factors which can affect the design are divided into 2 groups - those which are visible, and those which are invisible. This is shown below :-



The effects of some of these factors are illustrated below in the farming system's cycle of rice production.



Many of the visible and invisible factors shown on the previous page will affect the crop production, and so they will determine the strategy which needs to be used in design. In the monsoon, there is more heat and water, and so sickness is more common. Yet this is the time when most human labour is required, and also when there are more pest problems. If communal oxen are not available, ploughing, planting and weeding work is delayed. When all these issues are sorted out, there may be a good crop, but then rats can destroy the crop in storage, or the price in the bazaar may be low, and all the work can again be wasted.

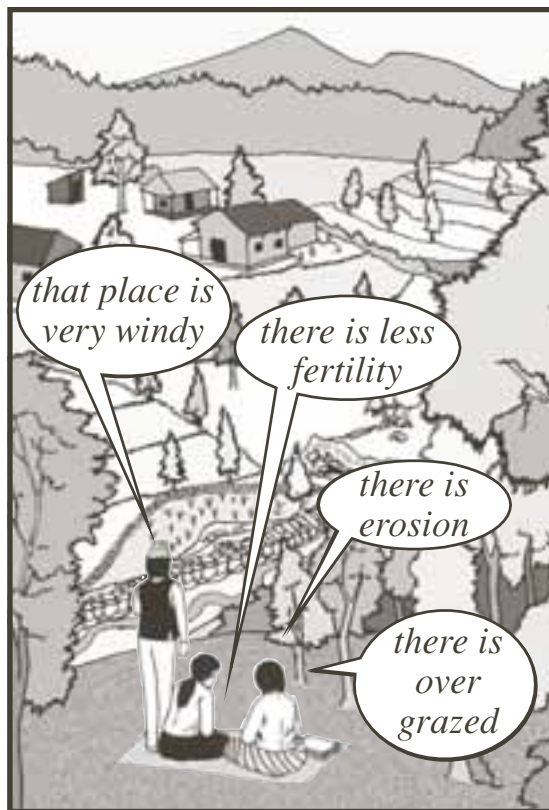
So when making a design, all these factors must be considered. Which factors, at what stage, and where they may cause problems for production should be considered at the very start of the design process. Whether the solution to that problem can be solved with local resources or not, should also be considered early on.

The Design Process

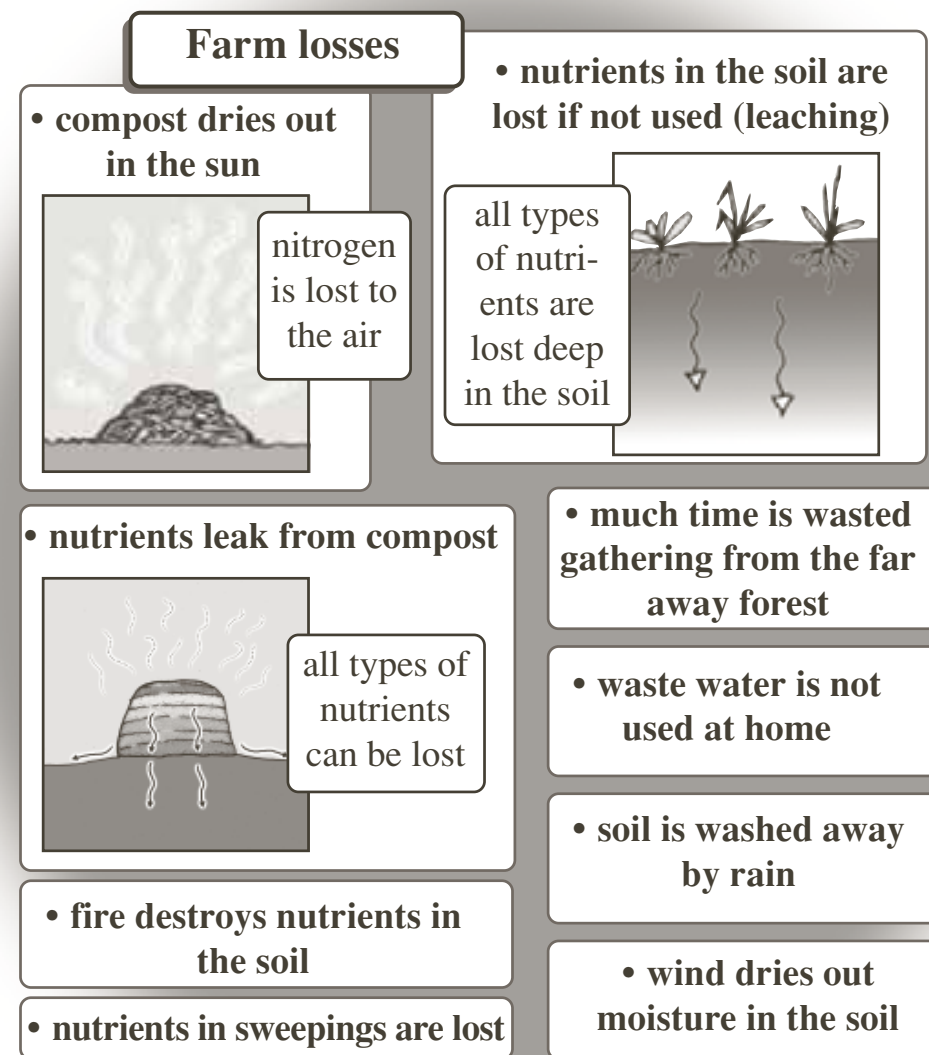
The process of creating the design, and then implementing it, is a step by step approach which enables the design to reach its goals more easily. Following the design process helps with many decisions :- what to do first, which areas are most important, how to use the available technologies and any other resources, how the design grows in a natural way, and so on. A summary of the main steps in the design process is given below :-

1. Gathering information about the people and the land involved in the design.

- Collect information about the people's vision and goals, their resources, needs, constraints, capacity, costs, problems, skills, income, etc.
- In the same way, collect information about the site - the soil, water, climate, aspect, slope, vegetation, microclimate, live-stock, pests and diseases, erosion, exposure to wind, and any other relevant information about problems and resources.



When creating and implementing a design, it is a priority to repair damaged systems, and stop loss of resources from the existing system - this will give immediate results. Below are examples of how we can lose resources from farming :-



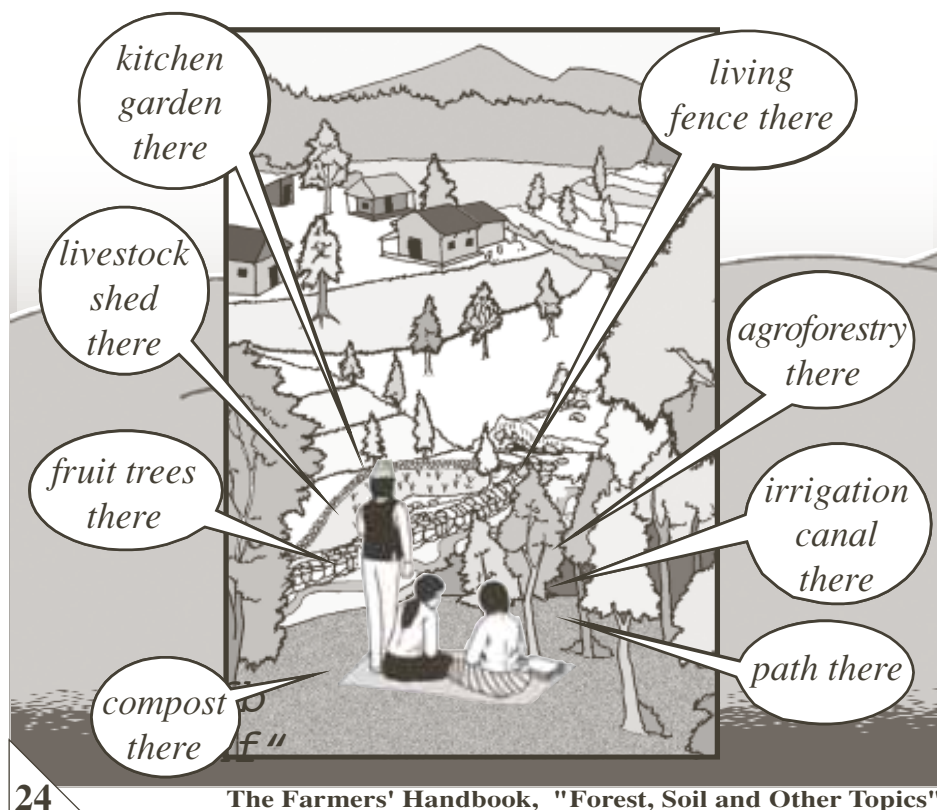
So we should discover leaks to the system early in the design process. Then, it can be decided what techniques are needed, when and where, to find the solutions and prevent valuable resources being lost.

2. Deciding which functions are needed

According to what we have found out about the people and the site, what are the needs of the design ? For example, increasing fodder and firewood production, growing more nutritious food, protecting from livestock, preventing soil erosion, protecting from wind, increasing fertility, earning more cash, etc. are all examples of the types of functions needed.

3. Selecting techniques

To carry out the functions identified in 2, what methods are needed ? For example, agroforestry, living fence, bee-keeping, fruit production, kitchen garden, compost making, mulching, home nursery, improvement in livestock management, seed production, green manures, etc. are all methods of providing for the identified needs of the farmer and the site.



4. Placement

Where should the systems be placed for them to give maximum benefit ? They should be placed in beneficial relationship to each other, so that the needs of one are met by the outputs of another, instead of competing. The principles of nature can be used to help with this. For example, the nursery should be placed where there is shelter, water is near, and it is easy to care for the site. In the same way, the best places are selected for the compost, fruit orchard, fodder trees, etc.

5. Species' selection

Finally, the best species to fulfil the needs of the site and the functions required are selected and placed, understanding their characteristics, yields and needs. For example, when selecting trees for the orchard, ask the following questions :-

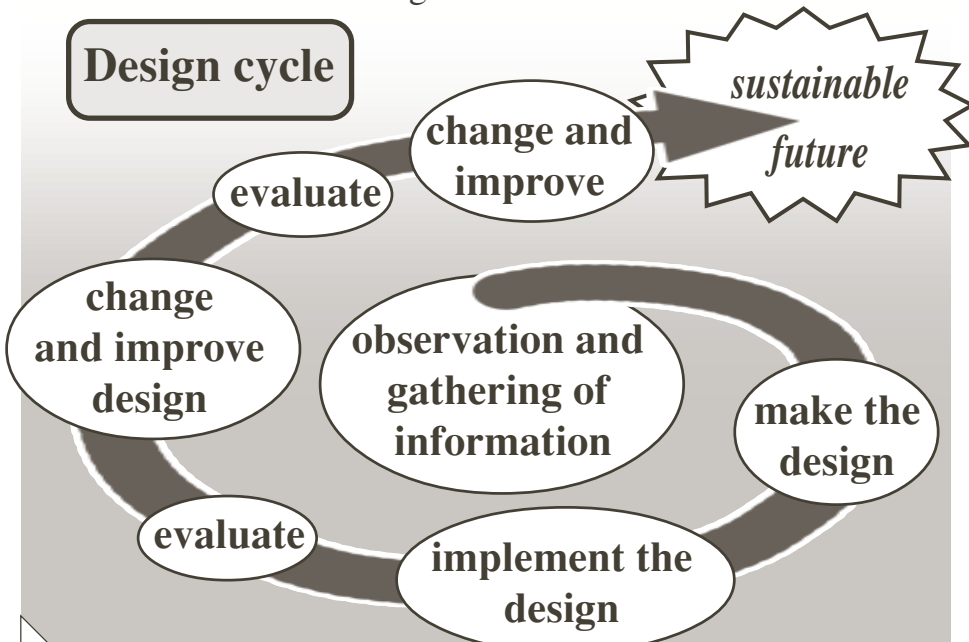


6. Timetable

This work of implementing the design can't all be done at the same time. So it's good to arrange the work according to **priority**. Some systems can wait until later to establish. This will make the design much easier to implement. The most important systems to design and implement first are usually for site protection, access, water and soil improvement, as they all allow other parts of the design to develop.

Evaluation

As the design is being created and implemented, time should be spent evaluating progress against the aims and needs of the people and site. The design can be changed and adapted as necessary. Are the principles being applied? What has changed? What problems have been solved? Will more problems be created? Will the design help the people to reach their goals? Questions like this should constantly be evaluated, and all stakeholders in the design should be consulted.



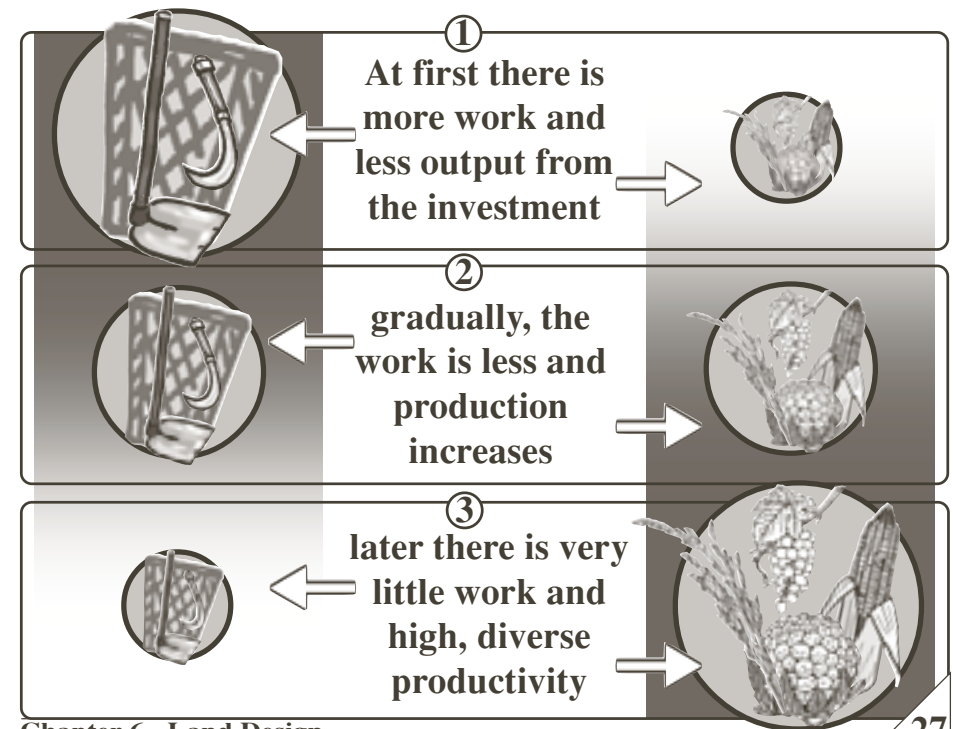
There are 2 types of place to implement a design :-

1. **Where there is no production** - like a degraded, bare site.
2. **Where there is on-going production** - e.g. a working farm.

1. Where there has been no production (such as degraded land), the design will definitely create productivity on that site. The design will help to create the best regeneration and production, in the shortest time. There are more details about this in the *Soil Conservation and Improvement* chapter.

2. Where there is on-going production (such as a working farm), that existing production should not decrease as the design is implemented and other types of production begin. Otherwise, the farmer or the community may have problems meeting basic needs in the short term. The design will help to improve and increase resources, reduce costs, and diversify production.

How to tell if the design is working ?



Farmers' Experience

Mr Govinda Sharma

From Nepal, Kavrepalanchowk district, Patlekheta VDC, Mr Govinda Sharma has used permaculture design on his own farm. Now let's read about his experiences.



Govinda Sharma

“ I took a Permaculture design course in 1991. After that I started to learn from friends, then started to put all that experience into practice. Now, I also help other organisations to make and implement designs. A farming system which is planned using this method is very productive, and easy to use. Instead of having just one crop, many diverse crops can be grown. Instead of just growing corn, I find it's better to mix beans, pumpkins, and plant fodder around the edges to give a higher total yield. At first, the other local farmers didn't accept what I was doing, but when they saw the crops I was growing, with only small extra inputs and mainly local resources after the start, they became interested, and have started copying some of the methods. They are understanding that you can reap the fruits of your investment, and that investment isn't just strength and sweat, it's also design. ”



Glossary

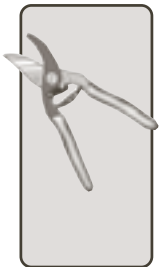


This Farmers' Handbook can also be used by people who have just started to learn how to read and write, to help them increase these skills. That's why there may be some words used in the Handbook which are more difficult to understand. We have evaluated the books with many groups, and below is a list of some of the words they found difficult. Discuss the words and try to write down what they mean. You can add any other words that you and your group don't understand in the space available.

Word

Meaning

Fallow
Monoculture
Habitat
Legume
Tap root
Cambium
Element
Nutrient
Shrub
Terrace
Secateurs
Micro-organism
Bacteria
etc.



Word

Meaning

Pollination
Biomass
Mulch
Pruning
System
Integrated
Nature
Micro-climate
etc.



Word

Meaning

Economic
Diversity
Bio-diversity
Evaluation
Scion
Bud
Rootstock
etc.



Some new plants



Velvet bean



Comfrey



Clover



Horse-tail



Sea Buckthorn



Adhatoda vasica

Your own word list

Here you can add any of your own words which are difficult to understand, and keep a list to ask someone who may know what they mean.

Practical Literacy

1. Why Literacy ?

To learn to read, write and calculate is a priority to many. There are good reasons for this. If you are literate you can correspond with friends and relatives who live far away, you can read labels, books, signs, contracts, and you can make bigger calculations if you know how to write them down on paper. Furthermore, for many people being literate makes them more respected by others who believe that being illiterate means being ignorant. You never need to ask others to read for you, and you can't be cheated by being made to sign something you don't understand. It will also increase your self confidence.



2. Production

However, for many small farmers, learning to read and write may not be their highest priority. Their main concern is to make ends meet - to produce enough to meet the needs of their family. This means that poorer farmers often drop out of adult literacy classes (and many children drop out of school), because most people believe that literacy isn't the solution to their daily problems.

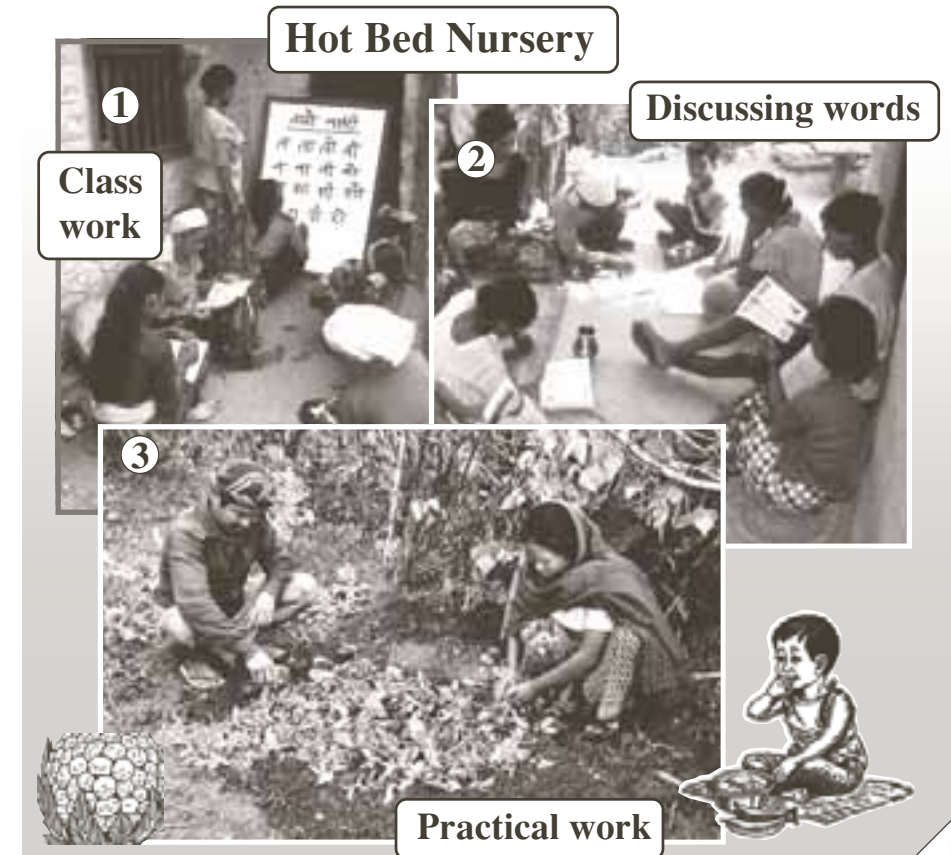


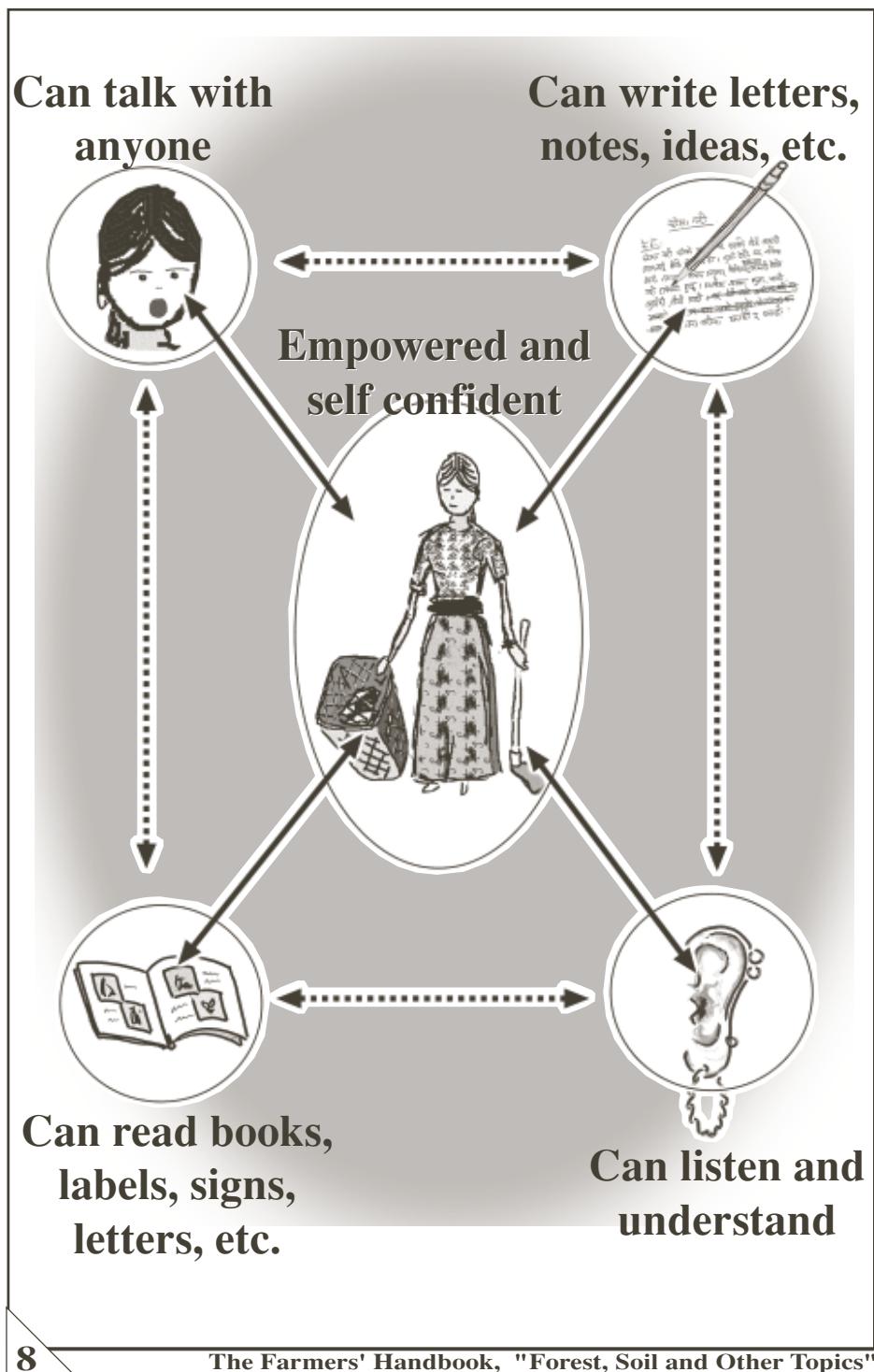
3. Why Practical Literacy ?

In Practical Literacy we combine meeting the basic needs of the family with the benefits of learning to read and write. During a Practical Literacy Programme (PLP) the participants will learn both reading, writing and calculation skills, and learn about farming and household techniques. This means that they can improve their farm production, and their general well-being.

4. How ?

The PLP course starts by participants describing their own situations, past and present, using maps, trend lines, ranking etc. From these descriptions words are chosen by the participants, and their spelling is learnt. Very basic reading and writing skills are learnt at this stage. On one day participants will learn and practice how to establish and manage various techniques such as waste water management, grafting, terrace improvement, etc. That evening, or on the next day, they can read about the method from the Handbook, and write their own words about what they have done. These can gradually be formed into sentences as comments and evaluations of the method, or to make stories, proposals and reports.





Illustrations

The producers of the Farmers' Handbook gratefully acknowledge the work of the following individuals and institutions whose illustrations have been used in the publication.

Though most illustrations for the handbook are made by Grihasthi Communications, some illustrations have also been taken from :

- * Clip Art Book, CERID
- * A Farmer's Primer on Growing Soybean on Riceland, IRRI
- * Management of Forest Nurseries, HMG/UNDP/FAO
- * Religious and Useful Plants of Nepal and India, Majupuria & Joshi
- * A Handbook of Gravity-Flow Water Systems, IT Publications
- * Common Tree Species, HMG/UNDP/FAO
- * Tropical Leaf vegetable in Human Nutrition, Kononklijk Instituut voor Tropen
- * Focus, GAD, Denmark
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- * The Grafters' Handbook, CASSEL
- * Plant Propagation, Royal Horticultural Society, UK
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- * The Fruit Expert, ExpertBooks
- * Monocotyledons, Longman
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- * Farm Implements for arid and tropical regions, FAO
- * Permaculture, A Designers Manual, Tagari Publications
- * Queen Rearing Simplified, Cook
- * Beekeeping for Honey Production in Sri Lanka, R W K Punchihewa
- * Zambian beekeeping Handbook, GVS
- * Beekeeping Trainer's Resource Book, ICIMOD, Nepal
- * Pollination Management of Mountain Crops through Beekeeping, ICIMOD
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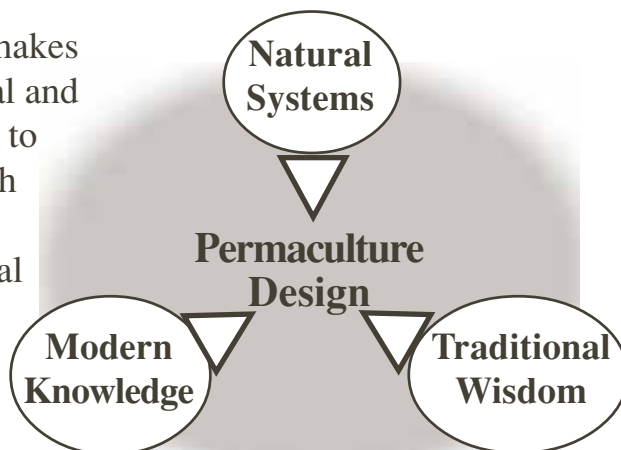


What is Permaculture ?

The word **Permaculture** was first used in 1973 by Bill Mollison and David Holmgren, from Australia. Permaculture is an English word, made up from the words **Permanent** and **Agriculture**. Because agriculture is our primary producer of food, clothing and shelter made from natural resources, and these are the material and economic base for society as a whole, it can also be taken to mean a permanence in **culture** itself. Permaculture is a system of design. It takes its methods from observation of the stability, diversity, resilience and productivity of natural systems, to benefit people and all living and non-living things in a sustainable way.

Permaculture makes excellent use of local and biological resources to create systems which foster self reliance, through an ecological agriculture, balanced with the local economy and society.

In fact, there is not much new in permaculture. It's a synthesis of the understanding of natural systems, traditional wisdom, and modern scientific and applied knowledge. It takes the best of all of these to assist in creating/living a life with more quality and choice.



Nepal Permaculture Group Regional Contact Addresses

Nepal Permaculture Group :- registered in 1995 to promote sustainable development, NPG is a national network of over 250 individual and 8 organisational members. It works in education, research, capacity building and networking of permaculture related activities.

If readers of this Handbook are interested to learn more about any of these, or other, technology information, they can contact NPG through any of the following regional member-contacts.

*Own country's
networks*

①. Eastern Region

Durga Niroula,
Women's Development
Organisation, Biratnagar
nbs@brt.wlink.com.np

②. Mid Region

Basanta Ranabhat,
Ecological Service Centre,
Chitwan
Tel: 053-23663, 24574
Fax: 20135, 20482
ecoce@mos.com.np

③. Western Region

Padya Kiran Rana, TOLI,
Pokhara. Tel: 061-23370
toli@mos.com.np

④. Mid and Far Western Region

Himalayan Permaculture
Group, P.O. Box 19121,
Kathmandu, Nepal
c/o ATA (01) 5549774
nepal@atasia.org.uk





Grihasthi Communications

The following useful educational materials for farmers are also published in Nepal and available **from Grihasthi Communications**.

Posters on Health

- Herbs for Health
- Herbs for Women's Health
- Let's Stop Using Poisonous Chemicals

Books on Health

- Common Local Herbal Medicines for Health
- Herbal Medicines for Women's Health

Video

"Our Seeds, Our Life"

Farmers' Workshop on Loss of Genetic Biodiversity and Seed Saving

Video

"Ancient Futures"

The effects of modern development on traditional systems in Ladakh

Contact

Distributors :-

**Nepal Permaculture Group,
P.O. Box 8132, Kathmandu,
Nepal.**

Tel: + 977 1 252597

npg@earthcare.wlink.com.np

