Near the House

Part Two



The Farmers' Handbook



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The Farmers' Handbook is about techniques for sustainable farming and this is the third of 5 volumes. There are 13 techniques presented here. In five volumes there are 44 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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The Farmers' Handbook - this Volume's Introduction

This is the third volume of a five volume production of the Farmers' Handbook. In all there are forty four techniques and approaches shown, of which thirteen are in this third volume. In this volume we introduce you to some more of the methods used near the house (part two). The titles of these are given on the previous contents page.

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

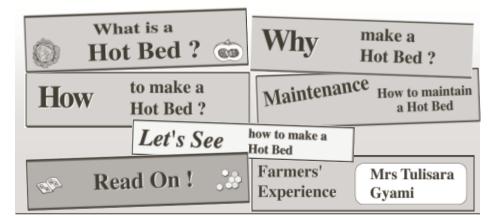
Comments and/or questions about the techniques and approaches described in this handbook will be most welcome. Suggestions for improvement will be used for future editions of this handbook and other similar publications.

Structure of the Handbook

Inside the handbook each method is descibed in a separate chapter, or chapter. All methods are descibed in the same way:-

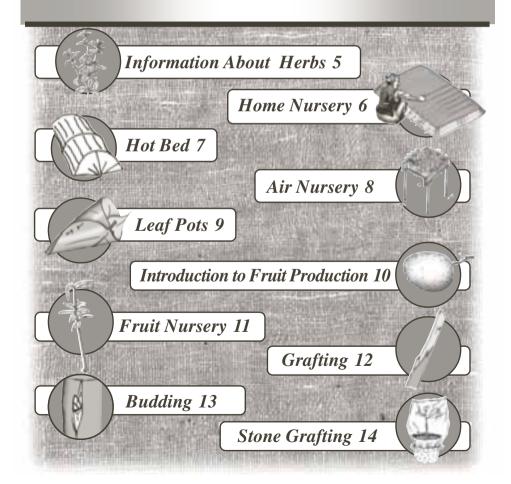
- "What is?" the method is defined and described.
- "Why?" the benefits of using this method are then described.
- The main part is then "How to?" make or do the method;
- In the "How To" section the centre pages show colour pictures about the method.
- After describing how to create the method, how to maintain, care for, manage and/or operate it is described.
- After this, there is an interview with an experienced farmer who has built and used the method.
- Finally, information is given about other chapters in the Handbook which are directly connected to this method.

There are minor changes to this structure as necessary.





Techniques



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"Near The House 2", Chapter 2 - Kitchen Garden

What is a Kitchen Garden?



A **kitchen garden** is where herbs and vegetables are grown around the house for household use. Since early times a small plot near to the house has been used for growing a variety of vegetables according to the season. Local varieties such as radish, broad leaf mustard, chilli, beans, pumpkins etc. are all grown in the kitchen garden.

In this chapter we provide information on how to establish and manage kitchen gardens with minimum input for maximum output, and show how to produce varied and nutritious crops of herbs and vegetables for use in the kitchen.



Why make a Kitchen Garden?

For people to stay healthy it's very important to have a healthy diet. A healthy diet means a balanced mix of rice, bread, pulses, vegetables, herbs, fruit etc. Vegetables are a very important part of a good diet as they contain various nutrients for many body functions. For growing, energy and protection against disease, vegetables play an essential role. Vegetables are especially important for the young, and for pregnant and nursing women.

Benefits of the Kitchen Garden

- to grow healthy, fresh vegetables yourself;
- to save the cost of buying vegetables and herbs;
- waste resources such as sweepings, kitchen scraps and dirty water can be recycled onto the garden;
- wasteland around the house can be made productive.



How to make a Kitchen Garden?

Because there's often no tradition of kitchen gardens, many people can't grow the vegetables they need for a good diet. Or they spend lots of money on vegetables, or their health suffers from lack of vegetables.

It may be that you haven't been able to make a kitchen garden. There are several reasons why it may be difficult to make a kitchen garden, or if you

have made one, it is not successful. For example:

- pests, diseases or livestock have destroyed the crop;
- no good seed or seedlings;
- lack of space;
- lack of water;
- lack of fertility;
- no spare time;
- lack of the right skills.

These vegetables have wilted because of lack of water

In this chapter easy methods are described to solve these sorts of problems, and so help the family to be able to grow good produce from their kitchen garden.

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Beneficial Connections in the Kitchen Garden

- (a) collecting waste water
- (b) sweepings pit
- **(c) home nursery** (hot bed, fruit nursery, etc.)
- **d** air nursery

(e) living fence

 $\langle \hat{\mathbf{f}} \rangle$ **fence** (not living)

(g) vegetable beds

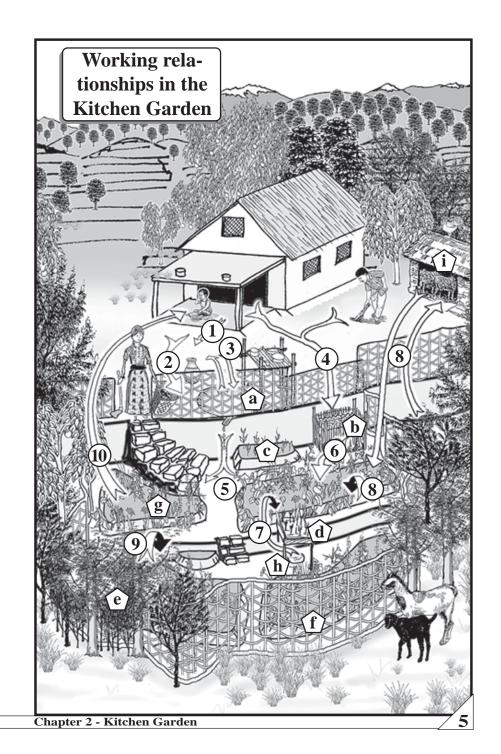
(h) liquid manure

(i) livestock stall

How to make the work easier in the Kitchen Garden

- 1 domestic waste water collection
- 3 seeds from the garden to house and from house to garden
- (5) waste water used for irrigation in the kitchen garden
- 7 liquid manure also used to control pests and disease
- 9 mulch material from the live fence and edges

- 2 ash, water, hair, etc. composting resources from the house to the land
- (4) sweepings from the house and courtyard
- (6) use of compost
- 8 fodder from the land and live fence, and compost returned to the land
- vegetables etc. from the kitchen garden to the house



Things to pay attention to

To make and manage a kitchen garden easily, and to give best production, the following things are important:-

1. Site selection

2. Protection

3. Water management

4. Fertility

5. Seed & seedlings

6. Design of the garden

Good management of the garden needs knowledge of all these. Then we can make our kitchen garden more successful.

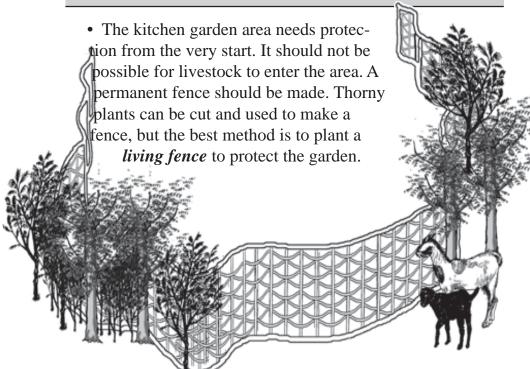
1. Site selection

If you already have a kitchen garden you may not need to choose a new site, it's enough to improve the old site. If you are making a new garden, there are many factors to consider. For example:-

- how to protect from livestock?
- how can you bring water to the site and distribute it ?
- how is the soil? How can the fertility needs be managed?
- where is the sunlight coming from?
- how can the area be accessed easily from the house?

When these issues are considered, the best site can be chosen and the work of making the garden will be easier.

2. Protection



• Then, the crops <u>within</u> the garden will also need protection from damage by many types of pest and disease. There are many ways to do this. Mixed cropping, rotations, liquid manure, etc. are all ways of protecting crops. There is more information about crop protection in the chapter *Integrated Pest Management*.





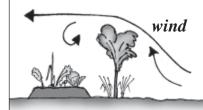
3. Water Mangement

It is important to provide enough moisture for the kitchen garden. There are many ways of conserving and increasing the moisture available. For example :-

• **Mulching**: prevents the wind and sun drying the bare soil;

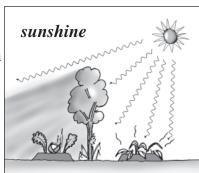
• **Green Manures**: also cover the soil, and so help in conserving water;

 Windbreak: wind will dry out the soil, so stopping the wind helps to conserve soil moisture;



• **Provide shade**: in the hot season trees can provide shade to the kitchen garden. A few small trees, such as *Lucaena*,

mulberry, *Moringa* (drumstick), Persian lilac, or even fruit trees in the fence or within the garden can be used for this. As well as giving shade, these trees can also provide other benefits, such as firewood, fodder or mulch material.



• **Mist collection**: mist collects on the leaves of trees around and within the kitchen garden, and drips onto the soil to provide extra moisture.



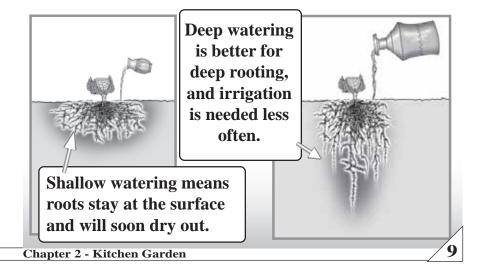
• Irrigation: if there is no irrigation for main food crops, it is likely that there is also not enough water to irrigate the kitchen garden. But if the above methods are used, then more water is conserved and so less is needed. Collecting and using waste water from the kitchen



can be enough to water the garden. Also, direct water from communal tapstands can be used on kitchen gardens.

Guidelines for Irrigation

By only putting a little water over a wide area, only the surface will be kept moist. This can cause roots to stay near the soil surface and in strong sun they can dry out very easily. So it's much better to irrigate less area with more water, so the moisture goes deeper in the soil. Then this area will not need watering again for a long time. In the hot season, irrigate in the evening or at night, and not in the daytime.

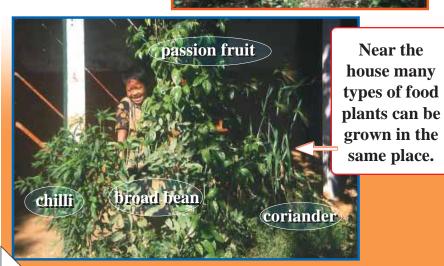


Let's See

How to make a Kitchen Garden

Kitchen garden protected inside a woven bamboo fence.

Even chickens can't get through this fence made from wormwood stalks.



Planting mixed vegetables helps to protect them from pests and diseases.

Edge plants provide useful mulch close to the garden beds where they are needed.

In mixed vegetable planting, no space is wasted and the soil is always covered.



4. Fertility

All farmers know that without fertility in the soil, crops won't grow. But fertility can be as limited as water. If there isn't enough compost for the field crops, it can't be taken and used for the kitchen garden. So our kitchen garden needs to be self reliant for fertility. Suggestions for sources of fertility are given below:

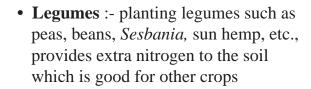
- **Sweepings pit**:- by collecting everyday sweepings from the house and yard in one place, you can make enough compost for the kitchen garden.
- **Liquid manure** :- liquid manure made in a pit or a drum gives nutrients to the plants as well as protecting them from pests and diseases.

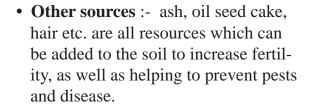


• **Mulching**:- putting a thick layer of biomass mixed with compost on the soil helps to increase fertility.



• Green manures:- sowing seeds of green manure helps to protect the soil and gives extra fertility for more production











5. Seeds and Seedlings

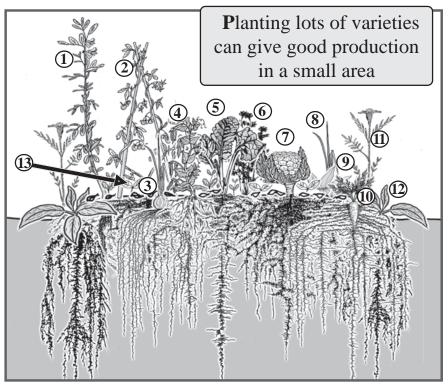
A kitchen garden can provide very good food from local, traditional vegetables, and it's important not to lose these local varieties. However, sometimes farmers are also interested to try new varieties. So it's very important to save and protect any good seed - this is the farmer's responsibility. Information about seed saving is given in the *Seed Saving* chapter. From good seed, it is important to be able to raise good, healthy seedlings for transplanting into the kitchen garden.

Nursery techniques are described in the *Home Nursery*, *Air*

nursery, Hot bed and Leaf Pots chapters.

6. Garden Design

More production in a small place



- 1) broad bean
- (2) tomato

(3) onion

4 peas

- **⑤** Swiss chard
- **6** coriander

- 7 cauliflower
- **8** garlic

9 beetroot

- (10) carrot
- 11 marigold
- (12) comfrey
- (13) new seedlings see "succession" on the next page

Species not shown, but also possible to plant

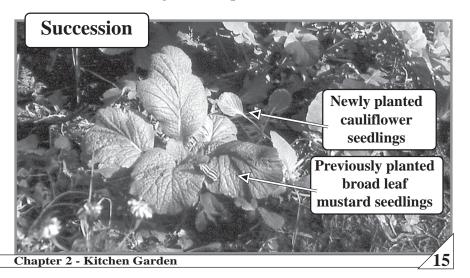
Vegetables :- cabbage, kale, radish, turnip, kohl rabi, chilli, broad leaf mustard, spinach, lettuce, aubergine, beans, etc. **Vegetable or herb companion plants :-** fennel, dill, basil, tansy, etc.

If seeds and seedlings are planted too wide apart, much of the space in between goes to waste, where weeds will grow. Weeds use precious water and compost, and cause extra work to keep clear. You also have to work harder to replace the water and compost which are lost to the weeds. This is why it's best to plant vegetables densely. But if only one type of vegetable is planted densely, it will compete with itself for space above and below ground, and so not be a good crop. So it's better to plant a mix of small and large types, to make different layers of crops on the same bed. These will also have different layers of roots in the soil.

This means many plants can be grown in a small space, but there is no competition between crops for space, water and nutrients.

Succession

As smaller vegetables are harvested for food, this makes space for the longer lasting vegetables, while in between new seedlings can be planted.



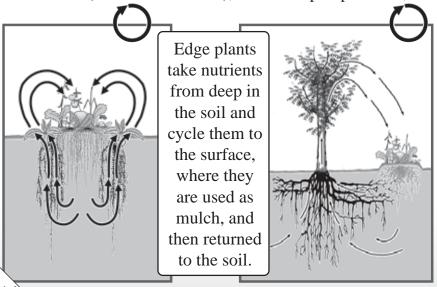
Edge Planting

It's not only the *making* of the kitchen garden, we must also be able to *maintain* it easily. It can be fun to create and plant a garden, but having to work every day to maintain it may soon become difficult, and so the garden gets neglected. Edge planting helps to make maintenance work easy in the kitchen garden.

"Edge planting" means the growing of support crops, or companion plants, in the edges around the garden and its beds. These plants help support the garden by providing mulch, protection from weeds, windbreaks, repelling pests, and producing other useful resources. Plants such as wormwood, *Adhatoda vasica*, marigold, comfrey, lemon grass, nettles, *Lucaena*, mulberry, basil, tansy, and many others are good for edge planting.

Benefits of Edge Planting

Edge planting helps with protecting the garden and also producing fodder, fuel, nectar for bees, herbs for medicines, soil conservation (terrace stabilisation), habitat for pest predators, etc.



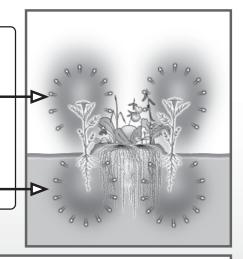
The Farmers' Handbook, "Near The House - 2"



Beneficial predator insects take nectar from the flowers.

Then they attack pest insects.

The smell of marigold flowers and leaves help to repel many types of pest insect. They also produce a substance from their roots which repels damaging soil nematodes.



Where to plant?

- in fences
- on terrace edges
- on path edges
- in agro-forestry
 on the edges of x
- on the edges of vegetable beds
- around the edge of the courtyard
- on the edge of the compost heap, waste water pit, sweepings pit, path, etc.

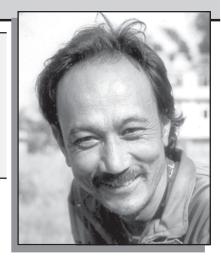
Chapter 2 - Kitchen Garden

Farmers' Experience

Mr Shyam Shrestha

Mr Shyam Shrestha owns Sunrise Farm in Sita Paila-4, Kathmandu, Nepal. He has experience making kitchen gardens, so let's hear his story.

At first I used to farm the traditional way but doing this, one type of vegetable was grown all together so there were more pest problems, and more maintenance was needed



Shyam Shrestha

as well. I've been collecting waste water from the kitchen for irrigation. For compost, I collect the rubbish around the house and cow shed into a sweepings pit. When I plant various types of vegetables mixed together, there are less pest problems. There's less weeding too, because they're planted so closely, and I mulch where I can. When I harvest, I clear whatever weeds there are and mulch them back on the beds - that's more compost. I collect seed from the best plants of everything. With this method, I plant once and then need very little work or maintenance - just harvesting, and eating. Nowadays, others are starting to learn these methods here for vegetable gardening themselves.

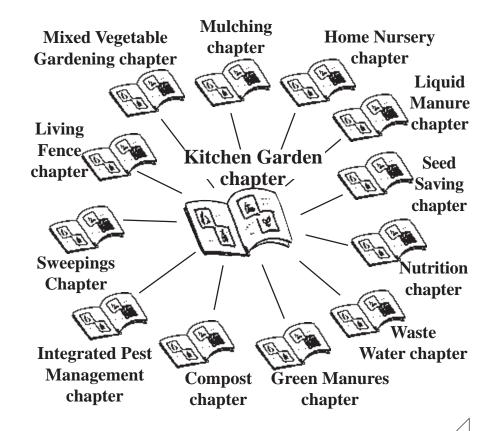


Read On!



Subjects Related to Kitchen Garden

This book provides enough information to be able to make and manage your own kitchen garden. However, this information is also linked to other methods. For extra benefits let's read, learn and practice from these related chapters.



- Mixed Vegetable Gardening: how to grow lots of vegetables easily by planting many varieties at one time
- Mulching chapter:- how to grow more crops with less work while keeping the soil covered
- Integrated Pest Management chapter: how to use local resources and knowledge in many different methods of controlling pests and diseases
- **Seed Saving chapter:** information on methods to produce and store various quality seeds at home.
- **Sweepings chapter:** how to make good compost from sweeping the house and yard.
- **Waste Water chapter:** how to get irrigation for the garden from domestic waste water.
- Green Manures chapter: sow a green manure seeds to add fertility to the soil and produce more crops
- **Compost chapter:** information on how to make good compost quickly is given in this chapter
- Liquid Manure chapter: how to use local plants to make a liquid for fertilizer and pest control
- **Nutrition chapter:** information about needs and sources of a healthy diet for all the family.
- **Living Fence chapter:** how to plant not just a fence but also produce fodder, fuelwood, mulch and other benefits
- Home Nursery chapter: make nurseries from local resources to grow many types of plants at home





What is Mixed Vegetable Gardening?

Mixed vegetable gardening means planting lots of different types of plants together. In conventional gardening,



A mixed vegetable garden, Begnas, Nepal

different varieties of vegetable are usually planted in different areas of the garden. So cabbage, onion, lettuce, radish, pea, etc. are all in their separate places. However, there are beneficial relationships between many types of vegetable and herb plants, which help them to grow. When plants grow separately, these benefits are lost to the system. This is one reason why various problems can start to affect the vegetables. To solve these problems farmers must then work harder at weeding, pest control, irrigation, etc. Without this extra work, production can be lost.

Mixing different species together helps the different crops. So in this chapter information is provided on how to plant and maintain a mixed vegetable garden.

Why plant a Mixed Vegetable Garden?

Many problems can affect the success of vegetable gardening. For example:-

- lack of seed & seedlings lack of water lack of time
- lack of knowledge
 lack of fertility
 lack of space
- pests & disease or being eaten by livestock

These problems can make vegetable production seem very difficult. They can cause the garden to fail, or productivity to be less, even with high inputs.

Benefits of Mixed Vegetable Gardening

- less pest and disease
- less weeding
- less need to irrigate
- many types of vegetable in the same place
- no space is wasted
- vegetables can be harvested over a longer time
- high production in a small area



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www.designedvisions.com

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leek



to plant a Mixed Vegetable Garden?

If you have your own good method of growing vegetables, don't stop all at once to try mixed vegetable gardening. Try it out on a small area of your vegetable garden and see. If it works well, you can increase it next year.

Materials needed



- **seed :-** mustard, buckwheat, fenugreek, broad leaf mustard, lettuce, chard, beetroot, coriander, fennel, radish, turnip, kohl rabi, spinach, pea, broad bean, carrot, kale, chinese cabbage, pak choy, basil, garlic, parsnip, onion (seedlings or starts), etc.
- **seedlings**:- cauliflower, cabbage, brocolli, onion, leek, marigold, etc.
- compost
- light (fine) mulch
- ash, oil seed cake

fertile soil



Time to plant

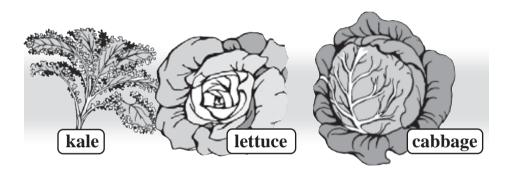
- low-lying tropical or sub tropical after the monsoon (Autumn)
- high altitude or temperate areas in the early spring

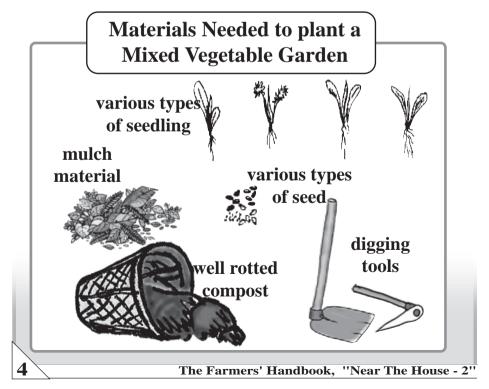


Chapter 3 - Mixed Vegetable Gardening

Preparing the garden

The more fertile the soil is, the less preparation is needed. Dig the area, mix in compost and make the soil fine. Make garden beds according to your needs and the shape and slope of the land. If the width of the beds is 4 feet then the centre of the bed can be reached without treading on the soil.





Planting Seedlings

The soil should be fertile and fine to plant seedlings. Plant cabbages, cauliflower, etc. at their normal distance of 12-18 inches. In between and on the edges of the beds plant onion seedlings or starts, and garlic bulbs at 4 - 6 inch intervals.

Sowing Seeds

First sow the large seeds :- pea, radish, broad (fava) bean, climbing or dwarf beans, etc. are planted at intervals of 6 inches. Make a smale hole with your finger, plant the seed, and cover. Then, thinly sow all other vegetable or herb seed except the mustard, buckwheat or fenugreek. Lastly, after planting the seedlings and sowing the seed, thickly sow the mustard, buckwheat and/or fenugreek. If you don't have all of these 3, any one or two of them will do. On the edge of the beds it's good to plant or sow **companion plants**, such as

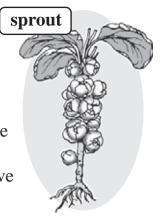
lemon grass, marigold, basil, wormwood, comfrey, etc

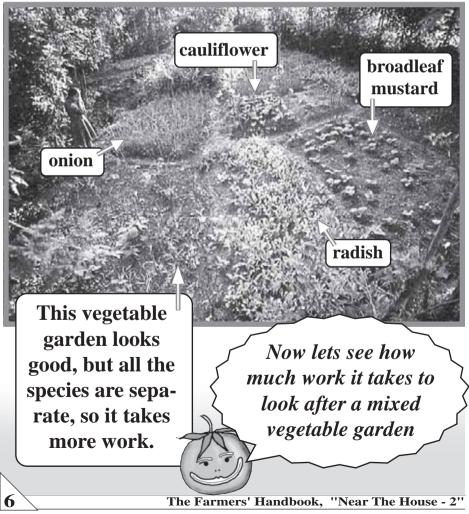
Different types
of vegetables
are good for
our health

Chapter 3 - Mixed Vegetable Gardening

Covering the soil

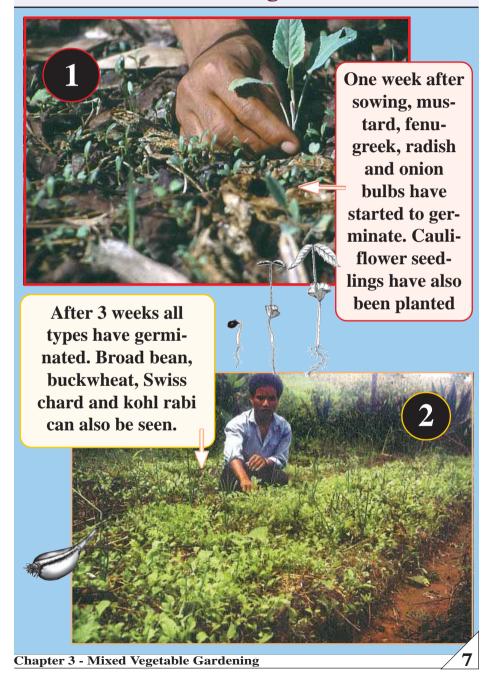
After planting everything, sprinkle ash on top. Then cover with fine, fertile soil - enough to cover all the seed and ash. Finally, taking care not to cover the seedlings, add a thin mulch to cover all the soil, and water well. Now your mixed vegetable bed is complete, and all you have to do is harvest!

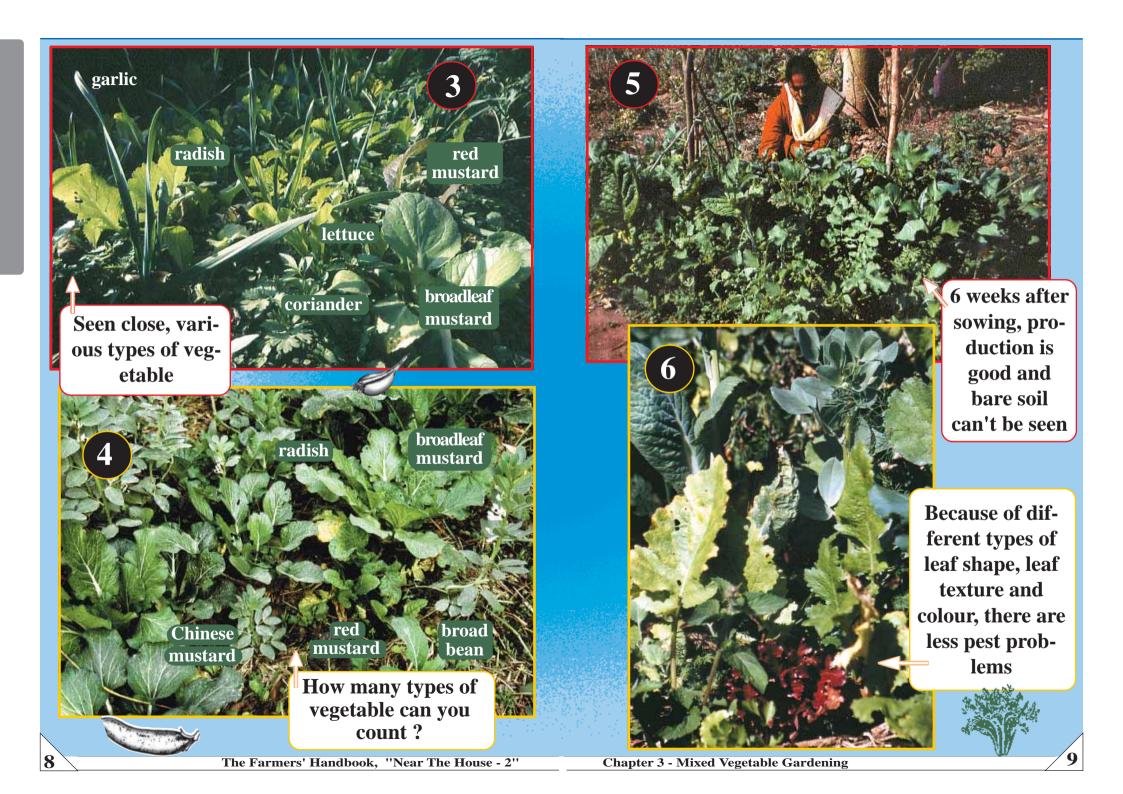




Let's See

How to make a Mixed Vegetable Garden





After eating from the garden for 4 months there are still lots of This farmer has vegetables, and still no sown 9 types of vegbare soil. etable together on his large field.

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Maintenance

How to maintain a Mixed Vegetable Garden

By making the bed in this way, less maintenance is needed later on. Weeding and watering may still be needed according to site, but the mulch, and the density of plants help to conserve moisture and keep weeds down.

In a bed planted like this, first the mustard will germinate. It will be followed by broad leaf mustard, radish, fenugreek, buckwheat, and so on. The mustard, fenugreek and buckwheat will grow very densely, and help prevent weeds from growing to leave minimum weeding. From 2-3 weeks, production starts with mustard leaves being picked as a greenleaf vegetable.

Shortly after, buckwheat and fenugreek can be picked for the same use. Picking of these can continue over the next 2-3 weeks, until they are all gone (except for

By this time, other vegeables will start to be ready. Broadleaf mustard, radish leaves, small radishes, lettuce, etc. can be harvested from 1 month after sowing. Fast growing leaf vegetables are picked to make space for slower, longer living species.

So maintenance of the mixed vegetable bed is really just harvesting. If this doesn't happen, the vegetables will grow too thick and the system will lose productivity. The space left by a harvested plant is quickly taken up by another. In this way, the bed never has any empty spaces or bare soil.

seed plants).

When can you harvest the fruits of your labour?

Before 3 weeks mustard greens

1 month mustard greens (continued); fenugreek,

buckwheat greens; radish greens.

2 months radish, broadleaf mustard, lettuce, Chinese

mustard.

3 months radish, broadleaf mustard, lettuce, chard,

coriander leaves, kohl rabi, turnip, beet-

root, etc.

4 months broadleaf mustard, chard, turnip, radish,

carrot, coriander, peas, chinese cabbage,

kohl rabi, beetroot, kale, etc.

5 months chard, carrot, peas, broad bean, kale, cab-

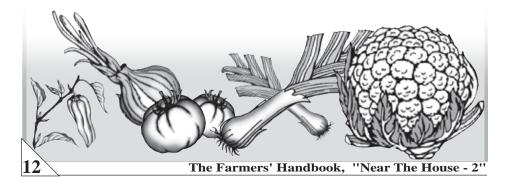
bage, etc.

6 months chard, cauliflower, carrot, peas, broad

beans, cabbage, onions, garlic, etc.

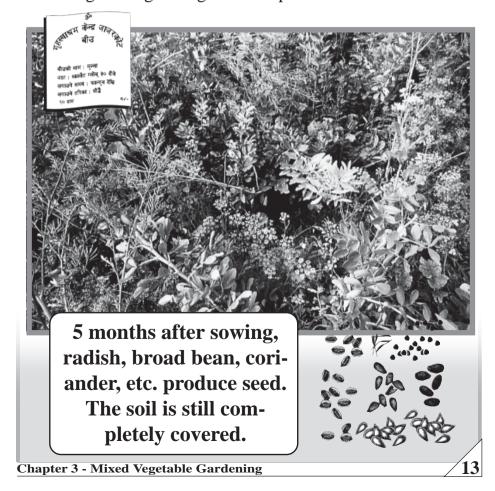
7 months cabbage, sprout, onion, garlic, coriander

seed, fennel seed, leek, brocolli, etc.



After all plants are harvested

Using this method, vegetables can be easily harvested and eaten for up to 7 months. Finally, after everything has been eaten, add compost and dig the bed ready for the next season. If the monsoon or summer is next, maize, beans, squash, chillies, etc. can be sown. Or a crop of green manures can be grown, or the garden mulched thickly and left fallow. It's up to you, your seasons, your crops and your needs. When the right season starts again, the cycle is complete and the process of mixed vegetable growing can be repeated.



Farmers' Experience

Mrs Ekmaya Shris

From Nepal, Surkhet district, Gumi - 5, Ratadada village, and a member of "Haryali" women's group, Mrs Ekmaya Shris has planted her own mixed vegetable garden. Now let's hear about her experience.

I learnt about mixed vegetable gardening from the homestead programme (JPP) so I could grow vegetables better. I planted greens,



Mrs Ekmaya Shris

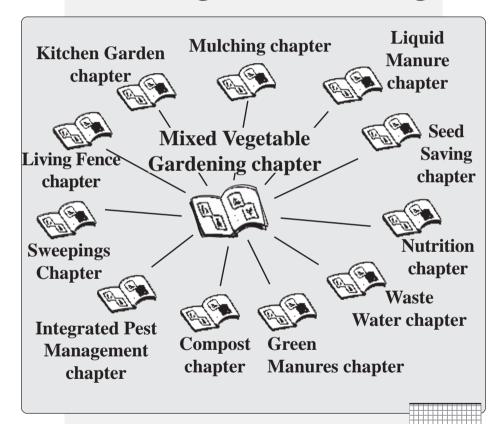
radish, garlic, broad beans, cabbage, coriander and others all at the same time. The beans were good young, and used for lentils when they were older. It's a good method to protect against pests as well, and by planting lots of types, if one doesn't do well the others will still produce food. After planting, there was always food to harvest, but no work for a whole 5 months. We start in September after the monsoon, and there's enough to eat continuously until April. Weeding isn't needed either even though we only put a light mulch around the plants. This is a great method. Now I can teach what I've learned to others, and I'm still learning more about what I don't know. ??



Read On!



Subjects Related to Mixed Vegetable Gardening



Integrated Pest Management chapter:-

how to use local resources and knowledge in many different methods of controlling pests and diseases



Kitchen Garden chapter: design your garden to produce healthy vegetables at low cost

Mulching chapter:- how to grow more crops with less work while keeping the soil covered

Seed Saving chapter: information on methods to produce and store various quality seeds at home

Sweepings chapter: how to make good compost from sweeping the house and yard

Waste Water chapter: how to get irrigation for the garden from domestic waste water

Green Manures chapter: use green manures to add fertility to the soil and produce more crops

Compost chapter: information on how to make good compost quickly is given in this chapter

Liquid Manure chapter: use local plants to make a liquid for fertilizer and pest control

Nutrition chapter: information about needs and sources of a healthy diet for all the family

Living Fence chapter: how to plant not just a fence but also produce fodder, fuelwood, mulch and other benefits











, Booklet 4 - Growing Off-Season Onions

What are Off-Season Onions?





In Nepal, farmers usually start planting onions from seed in October, and transplant in November. This means that when April comes the crop is ready, and for a short period the bazaar is full of onions. And that means at this time, the price of onions is low. As a result, it's more difficult for farmers to gain a good income from selling onions. However, before and after this time, the price of onions is 2 or 3 times higher. Then, onions need to be imported from outside the country. How fine it would be for farmers to get such good prices for their crops. One way of making more from onion growing is by *off-season* onion production.

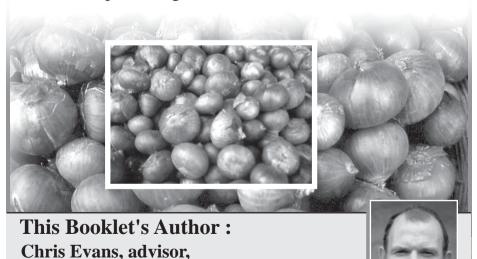
This booklet gives information on how to grow onions to sell over an extended period. Note that months are described for the northern hemisphere, and need to be adapted for the southern hemisphere.

Why

grow offseason Onions?

Benefits of growing off-season onions

- when onions are less available, they can be sold at higher prices;
- by growing onions out of season, you save having to buy them at higher prices;
- onions are a nutritious vegetable, and it's good to eat them from time to time. By growing them out of season, you can eat onions more regularly;
- in the off-season method, onion bulbs are planted at the end of the monsoon when there is still moisture in the soil. This means that poorer farmers without irrigation can benefit more from producing off-season onions,



Himalayan Permaculture Group, Nepal

www.designedvisions.com

How

to grow offseason Onions?

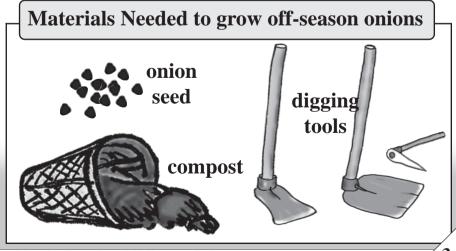
New types of seed aren't needed to grow off-season onions. You can use whatever types you are used to planting, or are locally available.

1. When ?

Onion seed is planted between October and December. Use the same method to plant seed as in normal onion growing. You can also start a little earlier, in September.

2. Where?

Firstly you need a nursery to sow the onion seed in. Choose a place where the seedlings can be protected and cared for easily. The onion seedlings can be transplanted into the kitchen garden. If grown on a large scale, a transplant bed is also needed, according to the needs of the farmer.



Booklet 4 - Growing Off-Season Onions

3. Sowing the seed

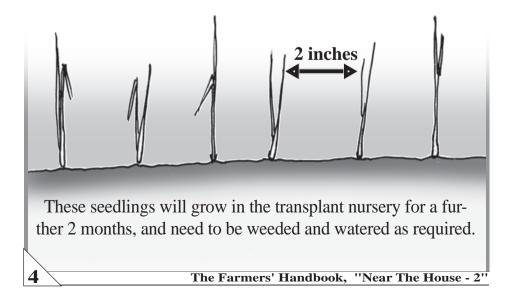
Before sowing onion seed, soaking it in water helps to speed up germination. Change the water twice daily and after 2-3 days a tiny white root will appear. As soon as this happens, sow the seed in the nusery.



After sowing, cover the seed with fine, fertile soil. Mixing ash and ground oil seed cake with the soil provides fertility, and also helps to protect against pests in the soil. Then, cover the soil with a fine mulch. As the onion seedlings grow, irrigate and weed as needed.

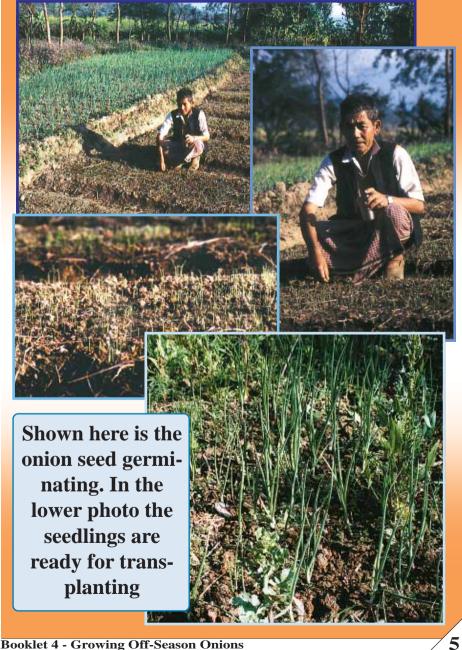
4. Transplanting the seedlings

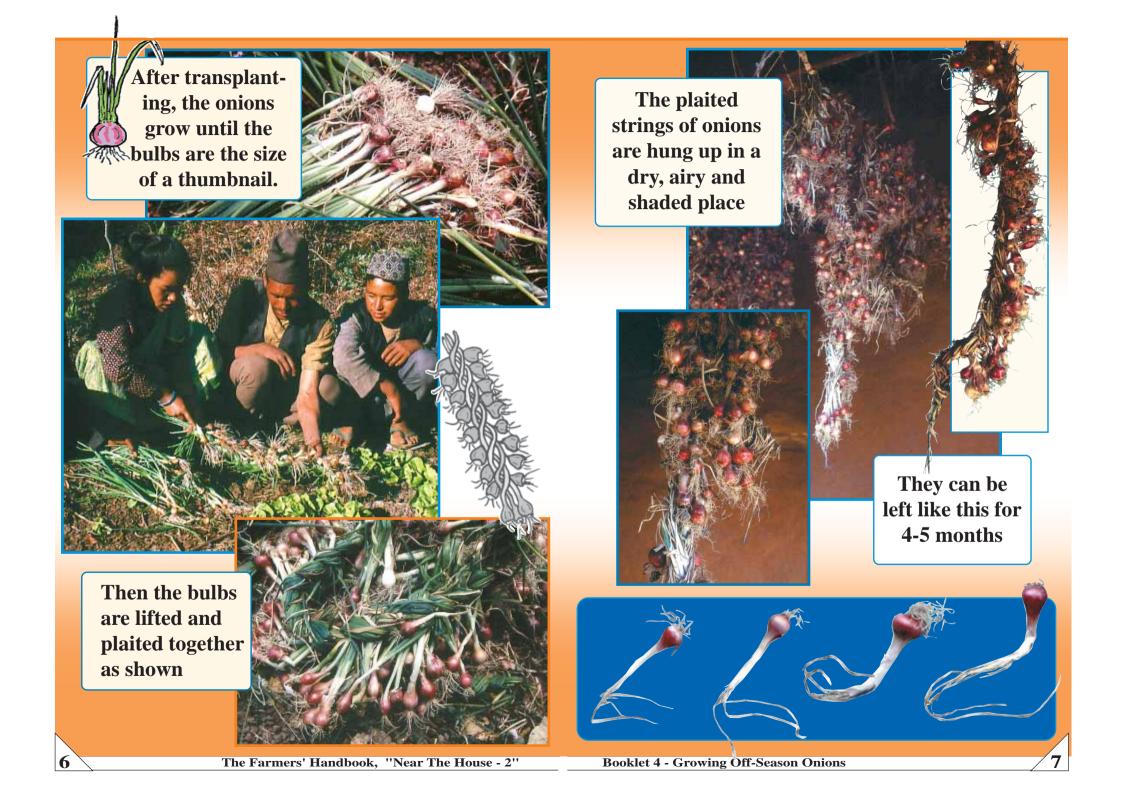
After about a month in the nursery, the seedlings are transplanted so they are a distance of about 2 inches apart. The seedlings will be about 3-6 inches tall. The nursery bed can also be used by leaving seedlings at the required distance after transplanting the others.

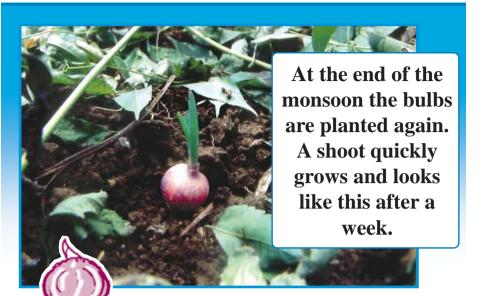


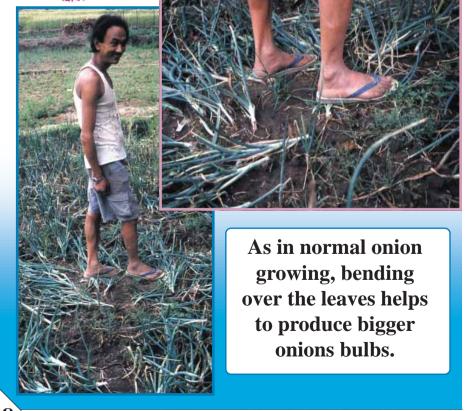
Let's See

How to grow offseason onions









5. When the onion bulbs are the size of a thumbnail, they are ready to lift (uproot). The bulb should be firm. After lifting, plait the leaves together to make a long string of bulbs 18-24 inches long. There may be 50-60 bulbs in a string.

The string is hung in a shaded, dry and well-aired place.

6. The string can be left hanging for the whole of the monsoon. At the end of the monsoon unplait the string and plant the bulbs separately in the vegetable garden.



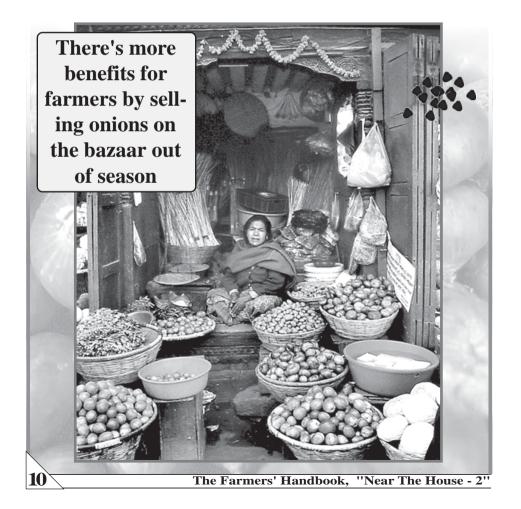
The off-season onions can be mixed with other vegetable varieties in the garden. More information about this is given in the booklets *Mixed Vegetable Gardening* and *Kitchen Garden*. Planting the bulbs in September means the onions will be fully grown in November. This is the time when onions are not easily available so the market price is higher



Booklet 4 - Growing Off-Season Onions

Occasional irrigation is needed to grow onion seedlings. But by planting at the end of the monsoon there is still plenty of moisture left in the soil. If there is a lack of irrigation, groups of farmers can get together to grow seedlings in one place where water is available, such as below a community tap stand. Then, the bulbs are distributed among the farmers for storage individually. After the monsoon, everyone can then plant onion bulbs and produce a good crop without the need for irrigation.

It's also easy to produce seed from onions grown in this way. Simply select the best plants, and let them grow to seed.



Farmers' Experience

Mr Bal Bahadur Regmi

From Nepal, Surkhet district, Gumi - 2, Shera village, Mr Bal Bahadur Regmi has produced his own off-season onions. Now let's hear about his experience.

I've grown off-season onions since 1997 and I like the method very much. After sowing the seed in December, I leave the seedlings to grow into firm bulbs the size of my thumbnail, then lift them and



Bal Bahadur Regmi

hang them plaited together in a shaded and airy place. Then in September I make beds and plant the bulbs again. At that time, the soil is moist from the monsoon, so I don't need to irrigate. The onions are then ready to eat and sell in November. This method is really easy and I can eat onions when there's normally none available. And because there are no other onions available, they're more expensive. You can also save seed using this method. Nowadays others in the village have started to use this method. We produce seedlings on our farm, and distribute the bulbs to other farmers to continue the method of planting the bulbs on their own land.



Read On!



Subjects Related to Growing Off-Season Onions

Good benefits can be had from the information in this book about growing off-season onions. However, this information is also linked to other methods. For extra benefits let's read, learn and practice from other related booklets.



Kitchen Garden and

Mixed Vegetable Growing booklets

How to make and manage a home vegetable garden for permanence, ease and simplicity? These booklets give information on how to do less work for more production, while also being able to produce a wide range of fresh vegetables.





Home Nursery booklet

Different plant species have different ways of propagation. This booklet tells how to easily grow many types of plant for home use.



Seed Saving booklet

This booklet gives information on methods to produce and store various quality seeds at home.



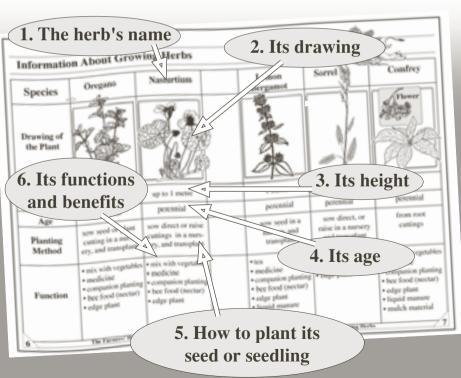


Growing Booklet 5 "Near The House Handbook The Farmers'

Information About Growing Herbs

In our diets, we eat not only grains, bread, vegetables and pulses but also different types of herbs. Herbs make food more tasty and can also help digestion, and act as medicines. So it's a good idea to learn how to grow appropriate new types of herb. In this booklet we learn about some new types of herb, and how to grow and use them for more benefits in our diet and garden.

How to read the information on new herb varieties?



Information About Growing Herbs



Species	Balm	Basil		Borage	Chamomile	Lavender
Drawing of the Plant						
Height	1 metre	50 cm		50 cm	50 cm	50 cm
Age	perennial	annual		annual	perennial	perennial
Planting Method	sow direct, or raise in a nursery and transplant	sow direct, or raise in a nursery and transplant		sow direct, or raise in a nursery and transplant	sow direct, or raise in a nursery and transplant	raise in a nursery and transplant
Function	 medicine companion planting bee food (nectar) edge plant mulch material 	 mix with vegetables medicine companion planting bee food (nectar) edge plant liquid manure 		 mix with vegetables medicine companion planting bee food (nectar) edge plant liquid manure mulch material 	medicinecompanion plantingbee food (nectar)edge plantmulch material	medicinecompanion plantingbee food (nectar)edge plant
The Farmers' Handbook, "Near The House - 2" Booklet 5 - Information About Growing Herbs 3						

Information About Growing Herbs



raise

and

and

Species	Marjoram	Rosemary		Sage	Tansy	Thyme
Drawing of the Plant						
Height	50 cm	50 cm		up to 1 metre	1 metre	50 cm
Age	annual	perennial		perennial	annual	perennial
Planting Method	sow seed or plant cutting in a nurs- ery, and transplant	sow seed or plant cutting in a nurs- ery, and transplant		sow seed or plant cutting in a nurs- ery, and transplant	sow seed or plant cutting in a nurs- ery, and transplant	sow seed or plant cutting in a nurs- ery, and transplant
Function	 mix with vegetables medicine companion planting bee food (nectar) edge plant 	 mix with vegetables medicine companion planting bee food (nectar) edge plant 		 medicine companion planting bee food (nectar) edge plant liquid manure 	 medicine companion planting bee food (nectar) edge plant liquid manure mulch material 	 mix with vegetables medicine companion planting bee food (nectar) edge plant
4	The Farmers' Handbook, "Near The House - 2" Booklet 5 - Information About Growing Herbs 5					

Information About Growing Herbs

Species	Oregano	Nasturtium	Lemon Bergamot	Sorrel	Comfrey
Drawing of & the Plant					Flower
Height	50 cm	up to 1 metre	1 metre	25 cm	50 cm
Age	perennial	perennial	perennial	perennial	perennial
Planting Method	sow seed or plant cutting in a nurs- ery, and transplant	sow direct or raise cuttings in a nurs- ery, and transplant	sow seed in a nursery and transplant	sow direct, or raise in a nursery and transplant	from root cuttings
Function	 mix with vegetables medicine companion planting bee food (nectar) edge plant 	 mix with vegetables medicine companion planting bee food (nectar) edge plant 	 tea medicine companion planting bee food (nectar) edge plant liquid manure 	mix with vegetablesmedicineedge plant	 mix with vegetables medicine companion planting bee food (nectar) edge plant liquid manure mulch material
6	The Farmers' Handboo	ok, "Near The House - 2"	Booklet 5 - Information	n About Growing Herbs	7

Information About Growing Herbs

Species	Summer Savory	Feverfew	Parsley
Drawing of the Plant			
Height	50 cm	50 cm	30 cm
Age	annual	perennial	perennial
Planting Age	sow seed in a nursery and transplant	sow seed in a nursery and transplant	sow seed in a nursery and transplant
Function	 mix with vegetables medicine companion planting bee food (nectar) edge plant 	 medicine companion planting bee food (nectar) edge plant liquid manure 	 mix with vegetables medicine companion planting bee food (nectar) edge plant



What is a Home Nursery?

A Home Nursery

is a nursery made in your own garden to grow plants that you need yourself. There is no single way to make a Home Nursery, nor is it made for just one type of plant. Vegetable, fodder, fruit, medicinal herbs, and other types of seedling can all be grown in the home nursery. Then, you can plant these seedlings on your own land, or distribute to your friends, or even sell them. For different species of seedling,



Belmaya Rana and her Home Nursery, Surkhet, Nepal

there are different types of home nursery.

In this chapter simple methods are described for growing different types of plants for home use.



Why make a Home Nursery?

- to obtain suitable seedlings when needed;
- to produce seedlings close to where they are needed;
- so seedlings can be cared for and protected at home;
- to grow the right species which are right for the local climate;
- to make use of domestic waste resources for water and compost;

• to improve productivity on your own land using trees and shrubs;

 seedlings can be exchanged or sold;

 by producing seedlings yourself you don't need to import them;

• you increase your skills 🛝

It may be that you don't have the resources in your village to build and manage a large nursery. In a big nursery more water, compost, and more maintenance would be needed. This means there is less time to spend working at home, and an extra person would need to be employed. In many villages it's difficult to make such arrangements. So, you can use local waste resources and simple methods to successfully raise seedlings, even if only a few, at home.

How

to make a Home Nursery?

There are many methods of growing plants, and many different types of nursery to do this. The fruit nursery, leaf pot nursery, hot bed, air nursery, etc. all have their own methods. They are described in more detail in other chapters.

In this chapter, at first information is given about things concerned with any type of nursery. After that, we give some examples of useful types of nursery.

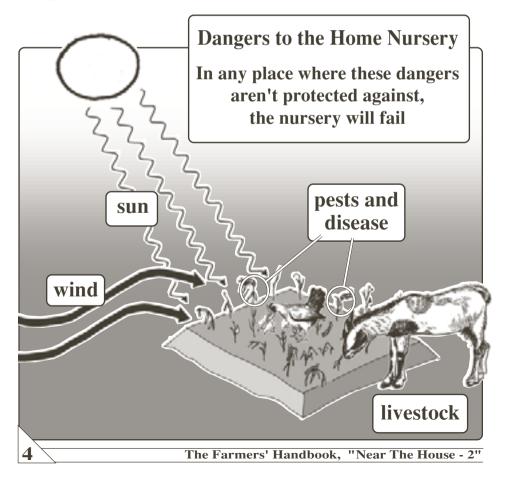


1. Things to consider when building a Home Nursery

(a) Site Selection

It's important to choose the right place for a nursery. A site is needed where watering, checking, protecting, mulching, composting and such daily maintenance becomes easier. Once the right site is chosen, we can start to build the nursery.

You can put different types of nursery in different places around the farm. But wherever they are, you need protection, compost, water and good seed or seedlings.



(b) Protection

To make a successful home nursery it's essential to have a protected area. If your home nursery isn't protected, chickens, goats, etc. will damage it and eat the plants there, and all your work will go to waste. Also, seedlings won't be available when needed.

What to protect against?

Danger	Management	Resources needed
Livestock	fence, live fence, watcher, commu- nity agreement	wormwood, thorny plants, Crotalaria, Sesbania, citrus, bamboo, etc
Sun	thatch shades, water	straw, mulch, shade trees, green manures, etc.
Pests & diseases	integrated pest management methods	healthy soil & plants, liquid manure, mixed crops, rotations, companion planting, ash, oil seed cake, cow's urine, neem oil, etc.
Wind	mulch, thatch shades, wind- break	straw, mulch, trees (agro- forestry), green manures, etc.
Hail Chapter 6 - Ho	thatch shades, tree cover	straw, mulch, agro-forestry, green manures, etc.

(c) Soil and Fertility Management

To raise healthy seedlings in the shortest possible time, fertile soil is essential. If the forest is near, you can bring in good, fertile soil for making beds and filling pots. Otherwise, livestock manure is used for making compost to mix with the local soil. It is important that compost is well rotted, and raw or even half decomposed compost shouldn't be used in the top soil of the nursery. Compost produced from the sweepings pit is good to use. Information about this is

If the soil is clay type, mix one part sand with 2 parts soil and one part compost.

Soil from the Mother Tree

given in the Sweepings chapter.

For many species of tree, if soil is taken from around the roots of the same species in the forest and mixed in beds or pots, growth in the nursery can be greatly improved. This is because the soil under the "Mother Tree" contains essential micro-organisms which help the young plants to grow, just like mother's milk helps a baby.

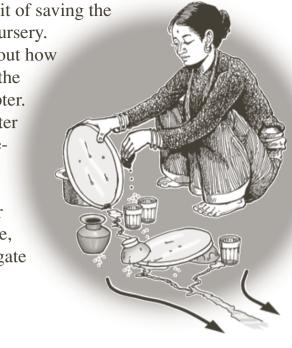
(d) Water Management

By using waste water from the household, enough water to irrigate the home nursery can be provided. So morning and evening, washing hands and face, or washing pots and

pans, get into the habit of saving the waste water for the nursery.

More information about how to do this is given in the Waste Water Pit chapter.

In the hot season, water the nursery in the evenings or at night, not during the day. By mulching the beds, or making a thatch shade, the water used to irrigate will last longer.



(e) Seed

Talk with other farmers to decide which species are wanted to be grown, and where the seed can be obtained. Many types of seed can be collected from the nearby forest or farmland. This seed should be collected at the right time, and stored well until ready for sowing. More information about this is given in the *Seed Saving* chapter.

Timely Seed Sowing

Most seeds can be sown in the nursery in the Spring. In lower, hotter climates this can start in the winter. At higher elevations it may be some months later. Here, using a **hot bed** can mean starting in the winter even at high elevations. Information about this is given in the *Hot Bed* chapter. Seedlings must always be big enough (at least 8-12 inches) to plant out in the planting season, whenever that is.

Species Selection

The method used in the nursery will depend on which plants you want to grow.

Type of nursery	Species grown
Seed sown direct into nursery beds	Vegetables:- cauliflower, cabbage, to-mato, aubergine, chard, brocolli, etc. Trees:- Persian lilac, neem, sea buck-thorn, ash, coffee, oak, etc. (these can then be transplanted into pots)
Seed sown into polypots	walnut, mango, soapnut, butter tree, etc.
Cuttings	mullberry, napier grass, willow, hazel, some <i>Ficus</i> , etc.
Root slips =	comfrey, lemon grass, broom grass, etc.
Air nursery	Lucaena, Acacia, Sisso, Bauhinia, Sesbania, (most legumes), papaya, tree cotton, etc.
Fruit nursery	wild peach, pear, citrus, walnut, etc.
Hot bed	pumpkin, tomato, gourds, chilli, aubergine, etc. for off-season growing
Leaf pots -	pumpkin, gourds, cucumber, beans, peas, etc.

The air nursery, fruit nursery, hot bed and leaf pots are described in more detail in their own chapters.

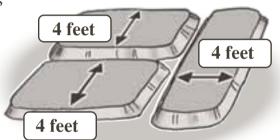
2. Making nursery beds

After choosing a site with suitable water and fertility resources, you can start work on making the beds.

• Size of the beds

The beds should be 4 feet wide. This allows reaching to the centre of the bed from either side without stepping on the

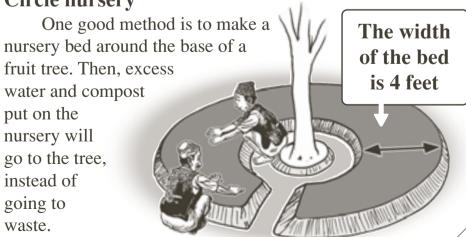
soil. The beds can be as long as you need. The shape and length of the beds depends on the number of plants you want to grow.



Shape of the beds

If the nursery is on a slope, the beds should follow the contour, i.e. they should be as level as possible. Watering and access should then decide how to design the beds.

Circle nursery



Preparing the nursery soil

Dig the nursery bed to a depth of 50 cm (18 inches) and add compost, forest soil, sand, etc. as needed. After making the soil fine and loose, the beds are ready for sowing seed. Tree, shrub and vegetable seed can be sown. Beds for planting cuttings and root slips are made in the same way.

3. Sowing and Planting in the home nursery

Now, information is given about planting in different types of nursery. First, how to sow seed, then plant cuttings, and after that examples are given of how to plant napier grass, lemon grass and comfrey.



(a) Sowing seed in the beds

This method is dependent on the shape and size of the seed.

• Small seed :-

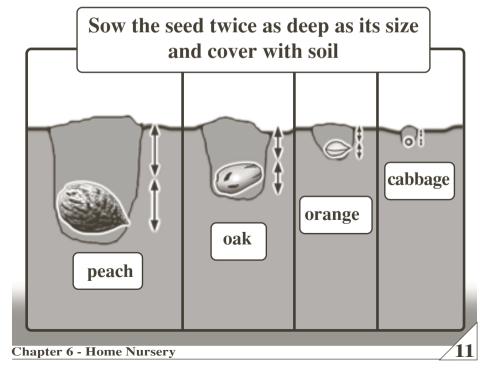
alder, eucalyptus, etc. This seed is very small and needs mixing with sand or soil to help sow evenly. Mix one part seed with 2 parts sand or soil. Make small lines across the bed with your finger, and sow the seed mix into this small trench. Then cover with a thin layer of fine soil.

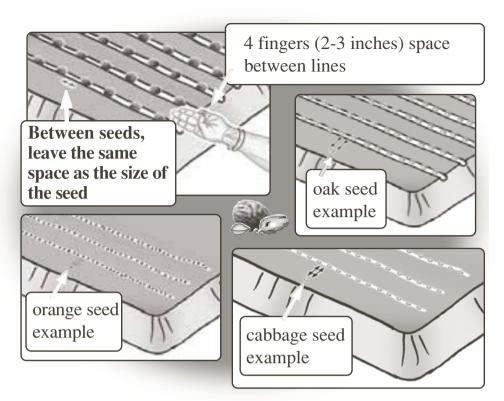
• Large seed :-

make a deeper trench across the bed. Seed is planted at twice the depth of the seed's thickness.

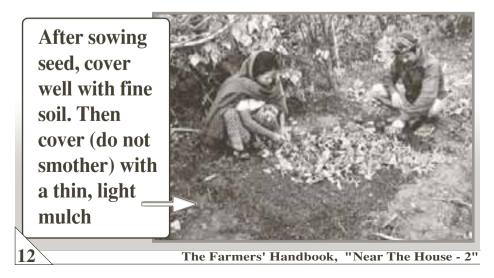
• Seed planting distance :-

leave a distance between seeds which is the same as the size of the seed.





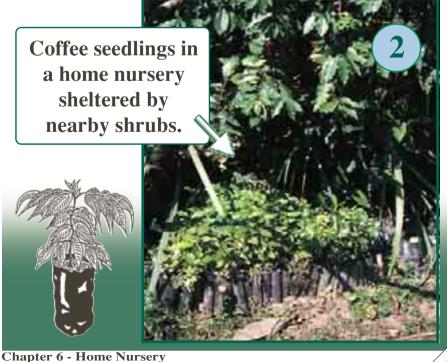
• Benefits of planting in a line: after seeds planted in a line have germinated, they can be recognised from weeds that germinate around them. This means that the bed can be weeded without damaging the new seedlings.

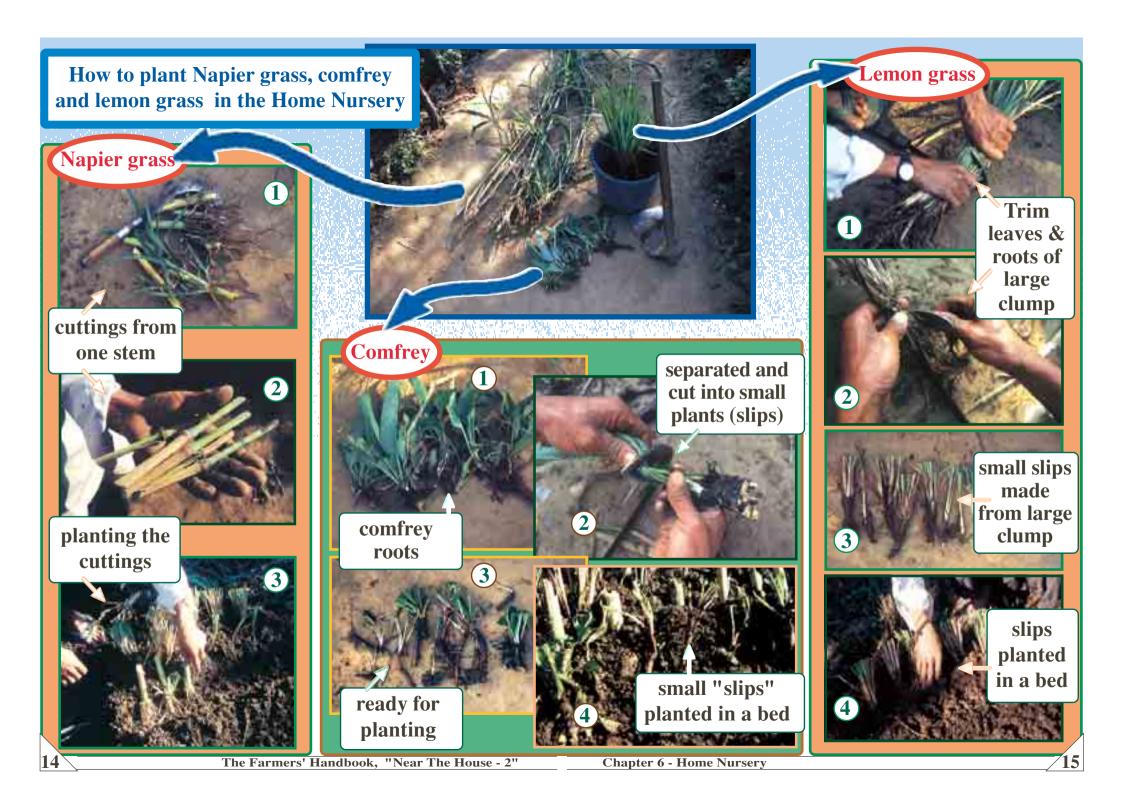


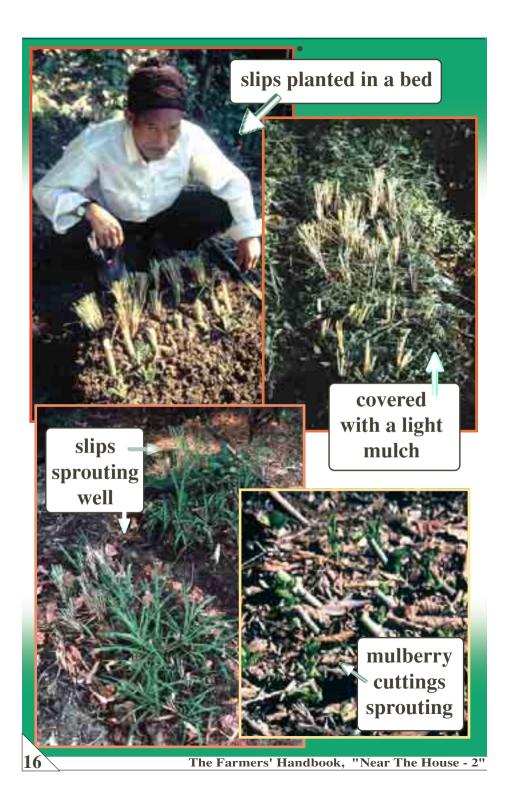
Let's See

how to make a **Home Nursery**









Lucaena planted on the edge of the beds provide shade and a support for a frame to hold thatch, as well as producing fodder, firewood, etc.



(b) Planting cuttings

Some species are more successful and grow faster from cuttings than from seed.

Species growing from cuttings :- mulberry, willow, many *Ficus*, drumstick, grape, honey locust, etc.

Timing of cuttings

Cuttings are usually made in the cold, dormant season. Deciduous plants lose their leaves in winter, and 2-3 weeks before sprouting new leaves in the Spring is usually the best time to plant these cuttings. So if plants sprout in late February, plant the cuttings in early February. If they sprout in mid March, plant the cuttings in late February, etc.

Selecting cuttings

When selecting branches for making cuttings, always choose healthy, undamaged and disease-free branches from last year's wood. Cut the branch cleanly into short lengths, and plant quickly in the nursery.

Things to consider when preparing cuttings

Cuttings are prepared after bringing to the nursery, and when preparing should be cut straight at the base and slanting at the top. Cuttings are usually

cut near

to the

bud.

doesn't

dry ou

between 6 and 12 inches long. There should be at least 5 buds on the cutting. The top of the cutting should be

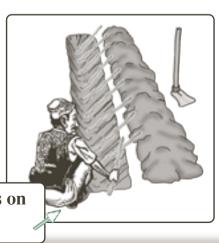
pruned just above the top bud with a slanting cut. If cut too

far above this bud, the wood will dry out and can cause disease to enter.

Preparing a bed for planting cuttings

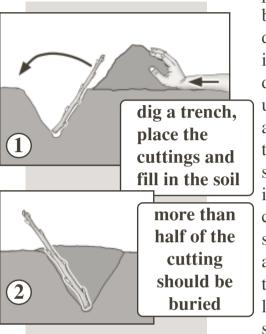
The bed is dug and made fertile as for a normal nursery (see p.6 and 10). It's most important that the soil is light and loose, not compacted like clay.

Dig a trench, place cuttings on one side, and fill in



Planting the cuttings

After cutting the branch from the tree to be propagated and trimming it into short lengths, the cuttings should be



planted quickly into the bed to prevent them from drying out. Make a trench in the bed about 4-6 inches deep. Place the cuttings upright about 3 inches apart against the side of the trench. Then refill the soil into the trench, covering more than half of the cuttings. The cuttings should be left at an angle, as in the drawing. Plant the rest of the bed in lines like this. The cuttings should be left with the

slanting top cut at a vertical angle, and facing away from the sun. By doing this water cannot settle on the top, and the sun will not dry out the cut surface. Place a light mulch between the cuttings and make thatch shades over the top. This will conserve moisture and protect from frost, hail, etc. The nurs-

ery should be well protected, as the cuttings should not be touched or moved.

plant the cuttings at an angle pointing away from the sun



if cut away

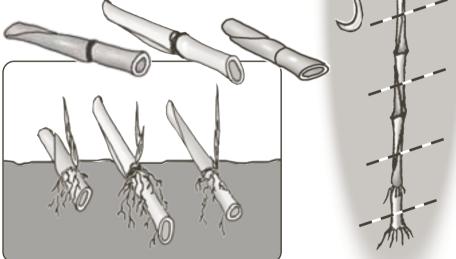
from the

bud, top will

dry out

(c) Planting Napier grass cuttings

The nursery for Napier grass is prepared in the same way as for other types. The Napier stem should be mature and slightly woody. If there are small aerial roots and leaves sprouting from the internodes, these can be planted in a nursery, or directly onto their permanent positions in the fields. To make the cutting, make a slanting cut mid point between 2 nodes. When planting in the nursery make sure the node on the cutting is buried in the soil. If successful, roots will sprout from this node and the cutting will grow.



Many types of cutting can be planted in the rainy season as well. At this time, cuttings can be made and planted direct into farmers' fields.

Broom grass can be planted in a nursery in the same way, but this is done in the Summer.

(d) Planting Lemon grass slips

Chapter 6 - Home Nursery

To propagate lemon grass, carefully dig out a large clump and divide into small plants, or *slips*. These can then be planted in the nursery. In the rainy season the small slips can also be planted out directly into the fields. Before planting, the leaves should be trimmed to about 4-6 inches and the roots trimmed to about 2-3

inches long. Plant as described Make small slips above, cover with mulch and from a large clump water well. Trim the leaves and roots 4-6 inches 2-3 inches Dig a trench, place the slips and fill in the soil

(e) Planting root slips

Some plants will grow from planting sections of root, or root and shoots. By planting these in a nursery, many useful plants can be produced in a small space. Plants which will grow from root slips include comfrey, lemon grass, broom grass and cardamon. Preparation of beds to plant root slips is the same as other

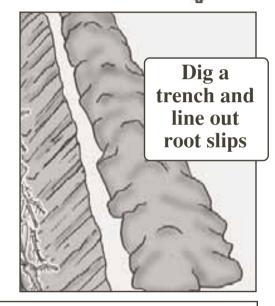
methods described above.

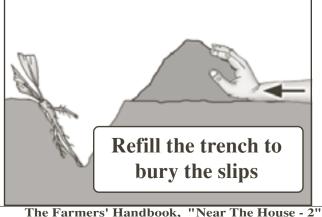
Planting method

The method for planting root slips is the same for planting cuttings. Dig a trench and line the root slips along one side, then fill in the soil again. Leave a small shoot sticking up from the soil surface.

Then cover with mulch

and irrigate. At first the bed should be well watered, and then give water as needed. Add a thatch shade as required.



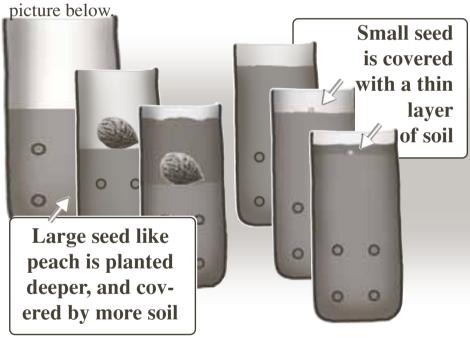


(f) Using Polypots

Many seeds can be planted directly into polypots. Others planted into beds can then be transplanted into polypots after they have germinated.

Planting seeds in polypots

When planting seed in polypots, the seed is buried by the same depth of soil as is the thickness of the seed. When filling the pots with loose, fertile soil, leave enough space to place the seed, then cover it with the remaining soil, as in the



Placing the polypots in the nursery

After seed is sown in the pots they are put into the nursery beds. A bed width of 1 metre is enough, the length is according to the number of pots needed. It's not necessary to prepare the soil of the beds as the good soil is already filled into the pots. It is better if the floor underneath the pots is made of stone or gravel.

To keep the pots upright in the bed, place stones, bricks or bamboo around the edge. In a 1 metre wide bed, you can fit 18-20 regular small sized polypots (2 inch diameter) filled with soil. If large size, (4 inch) 8-10 pots will fit in one line.

To allow more space in the bed, place a cross bar made of bamboo every 6 lines of pots, and continue to place more pots the other side of it. When all are placed, water and place a thatch shade on top of the bed.

Cross bar placed every 6 lines of pots

Bed with stone, bricks or bamboo on the edge

Root pruning in the pots

As the seed germinates and the plant grows, its roots will grow down into the soil in the pot. If the roots are allowed to grow too long and thick out of the holes in the pots, lifting the pots will be difficult and if the roots break the plant may die. So after the first month of growing, the pots should be lifted to check for roots growing out of the holes. If found, they should be cleanly cut and the pot returned to the bed. After the first pruning, pots should be checked every 2 weeks. Pruning the roots like this is good for the plant and means it can be planted easily. Not pruning can cause the plant to die.

If plants are to be transplanted from bed to pot, the seedling is ready at the 4 leaf stage. First, water the bed well and then carefully lift the seedlings with the help of a small stick.

Using the stick, make a hole in the soil of the pot for the roots.

Making sure the roots of the seedling are pointing downwards, place the seedling into the hole. The roots must all be in the hole.

Finally, use the stick or fingers to press the hole closed around the roots, and give water.

For some days afterwards keep a shade over the bed, as the seedlings need to be protected from the sun.

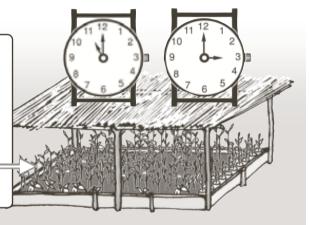
(g) Irrigating in the nursery

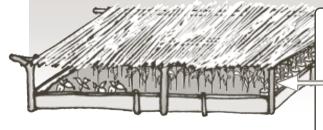
Seedlings need the right amount of water to grow well. With too little water seed will not germinate, and growing seedlings will dry out. Too much water and they will rot, and the water is wasted. Mulch and shading reduce the amount of water needed by conserving the moisture. In the cold season it is best to water in the morning, and in the hot season water in the evening or at night.

(g) Thatching over the nursery

Small seedlings need protection against heavy rain, strong sun, frost and hail, etc. On hot, sunny days shades should be placed over the beds from around 11am to 3pm. The shade should be about 50cm high. In the winter, or whenever frost is likely, shades are needed at night, and should be about 25cm high.

To protect from the sun in summer, high shades are needed in the daytime.





To protect from frost in the winter, low shades are needed at night

(h) Weeding in the nursery

Various weeds will grow in the nursery. These need continuous removal. Sometimes it's difficult to distinguish weeds from sown plants. By sowing in straight lines, seedlings can be recognised after they germinate. Everything else will be weeds and can be carefully pulled, dried, and mulched back on the beds.

Farmers' Experience

Mrs Devi Gurung

From Nepal, Surkhet district, Gumi - 3, Shera village, and a member of "Chintan" Women's Group, Mrs Devi Gurung has made her own home nursery. Now let's read about her experience.

44 I learned about making a home nursery from the Homestead Programme (JPP) and my local Women's Group. Now, in my nursery I have seedlings for produc-



Mrs Devi Gurung

ing fruit, firewood, fodder and the like. I have tree cotton, coffee, *Bauhinia*, bamboo, *Acacia*, papaya, *Lucaena* and so on. Some seedlings are in beds, some are in polypots, according to the species of plant. So now it's easy to plant them on my land. For fertility in the nursery and the vegetable garden I used the compost in the sweepings pit. And the waste water pit provides enough water for irrigation. All together there are 5 to 600 seedlings. Mainly I'll be planting them at home, but I will also swap some with friends in the group, and give some away as well. ??

Chapter 6 - Home Nursery



Read On!



Subjects Related to Home Nursery

Liquid Manure chapter: Use local plants to make a liquid for fertilizer and pest control from information in this chapter.



There are many types of pest and disease which affect farm crops. In this chapter information is given about preventing these problems using local resources.

Waste Water chapter:- If you need extra water for the home nursery, find information in this chapter about how to make use of household and tapstand waste water for irrigation.

Kitchen Garden and Mixed Vegetable Growing chapters How to make and manage a home vegetable garden for permanence, ease and simplicity? Information on doing less work for more production while also being able to produce a wide range of fresh vegetables is given in these chapters.

Four chapters on how to make various other nurseries: Different types of plants need different types of management to grow them successfully. Information on how to build and manage the fruit nursery, air nursery, hot bed and leaf pots is given in these chapters.

Agroforestry chapter: information about how to integrate trees and crops by planting and managing trees on farmland without decreasing farm yield and producing a range of other useful products is given in this chapter.

Grihasthi Communications

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What is a Hot Bed?





Bhim Regmi and his Hot Bed

Good, nutritious food is not only a need for everybody, it's a right. Many farmers grow vegetables, which helps to provide us with many essential nutrients. But there are several months when seeds won't grow because of the cold, and the kitchen garden stays empty. One method of raising vegetable seedlings even in cold weather is called the *Hot Bed*.

The hot bed is a way or providing extra heat to the soil and growing seedlings in the cold season, so seedlings can be grown ahead of time. This means that vegetables can be grown off season, even in cold climates. Read on, to find out how to do this.

Why make a Hot Bed?

In cold climates and at high altitudes, for several months over Winter and early Spring there is snow and frost, which prevents seeds germinating and can kill young plants. For this reason seedlings can't be grown until the time for frost has past and the weather warms up. By making a hot bed, seedlings can be grown even in the winter. This means that vegetables can be produced 1 or 2 months earlier than usual.



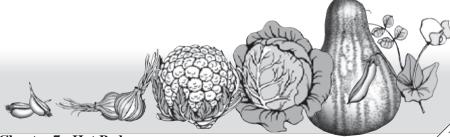
There are also economic benefits from this. If vegetables can be raised off season, i.e. ahead of time, they can be sent earlier to the market when prices will be higher. For example, if in a normal season vegetables are 10 rupees a kilo, at off-season times the vegetables may be sold at 15-20 rupees.

How

to make a Hot Bed?

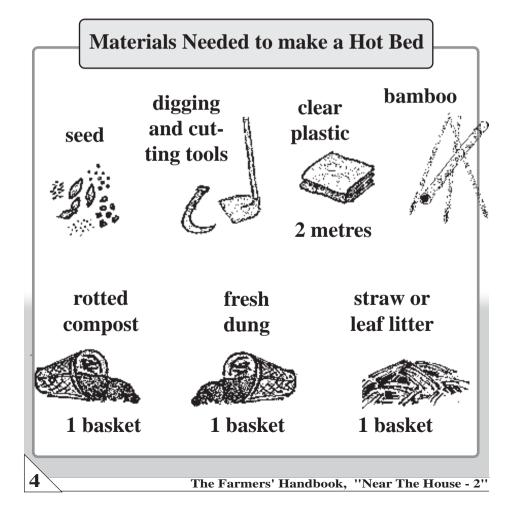
Making the Hot Bed

- Choose a good site for the nursery. This must be easy to protect and maintain, with plenty of sun.
- Dig a trench. The trench should be 1 metre wide, 50cm deep, and as long as you need for the amount of plants to be grown (a 1x1m hot bed is usually enough for several families to share seedlings grown for planting in their own kitchen gardens).
- Place a 3 inch thick layer of straw or leaf litter in the bottom of the trench.
- On top of this place a 3 inch layer of raw, fresh cow or horse dung, and wet well.
- On top of the dung place another 3 inch layer of straw or leaf litter.
- Then return a 3 inch layer of the soil dug from the trench.
- Finally put a 3 inch layer of fine, fertile soil (which can be made by mixing compost with the dug out soil, if it is suitable).

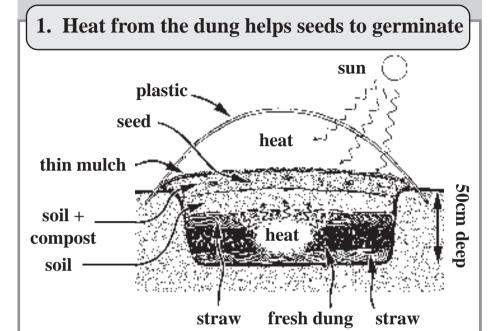


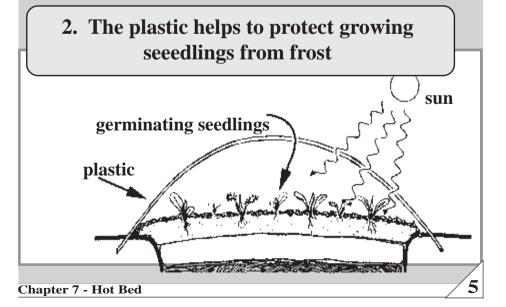
The seed will be sown into this layer of fine, fertile soil. In the Hot Bed we can sow seeds direct into the soil, or into leaf pots filled with the same soil. After sowing the seed, cover the bed with a thin layer of finely chopped mulch.

Finally, the bed is covered with a sheet of plastic. First of all make a bamboo frame on which to hang the plastic. Bury the edges of the plastic in the soil around the bed, so air cannot get in.



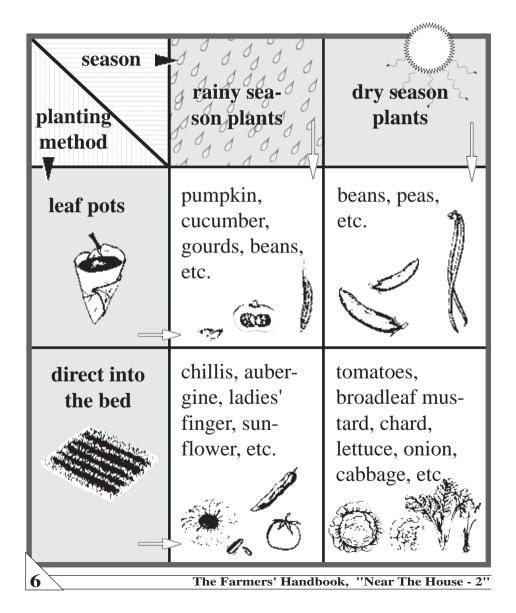
Hot Bed Inside shown through cross section





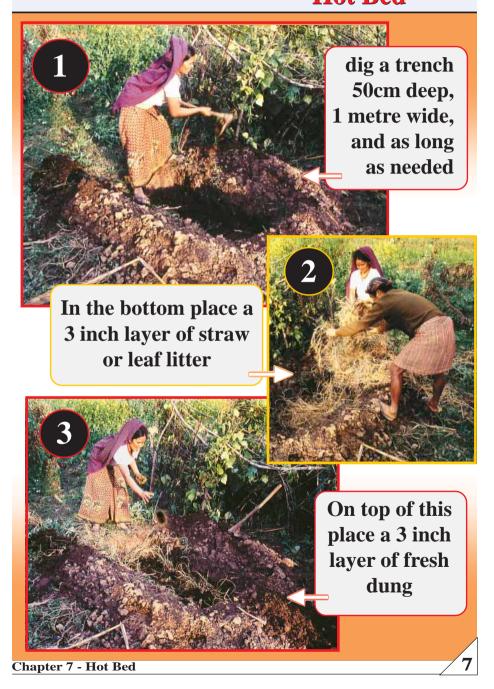
Species to grow in the hot bed

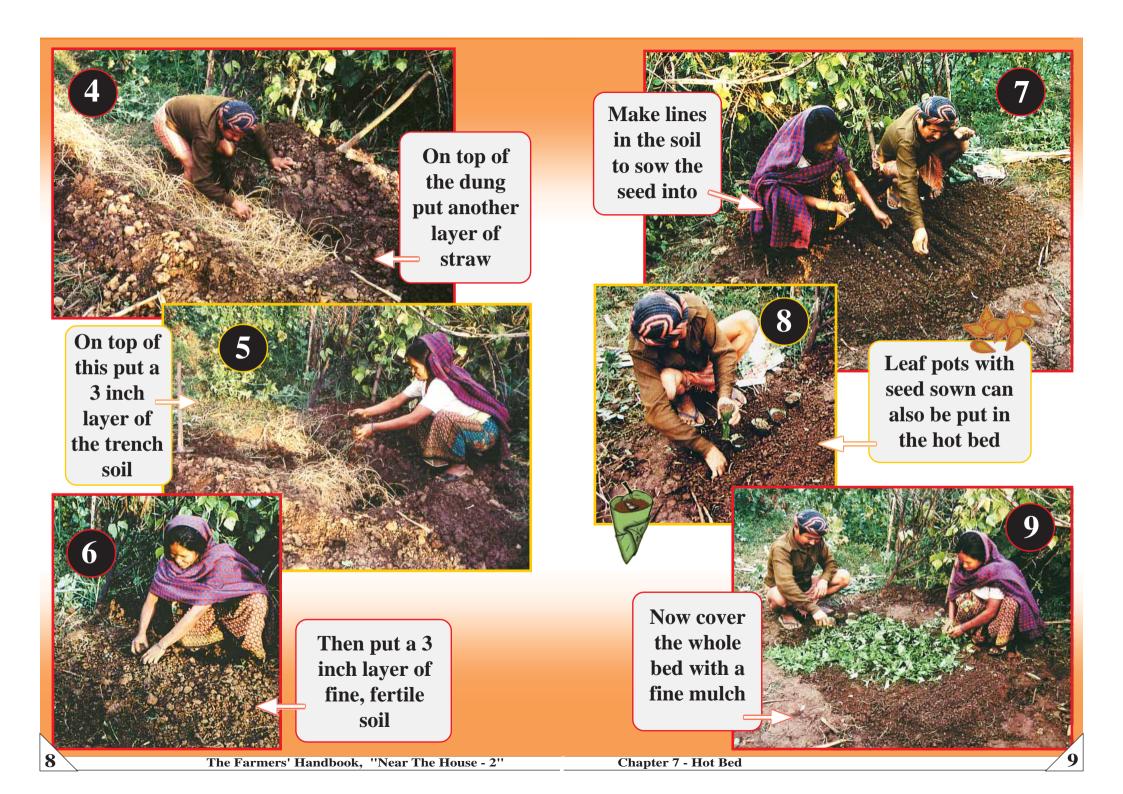
Most types of vegetable can be grown in the hot bed. Usually, summer crops are most suitable as these are the ones that can be started for early planting after the winter.

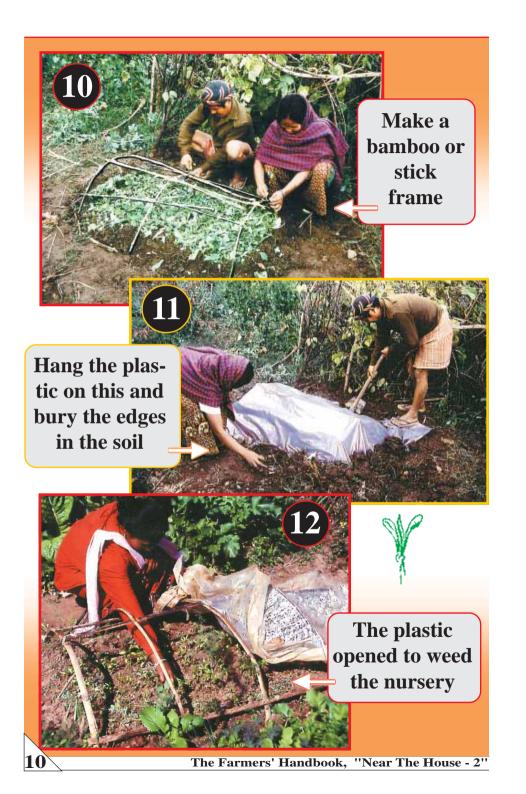


Let's See

how to make a Hot Bed







Maintenance

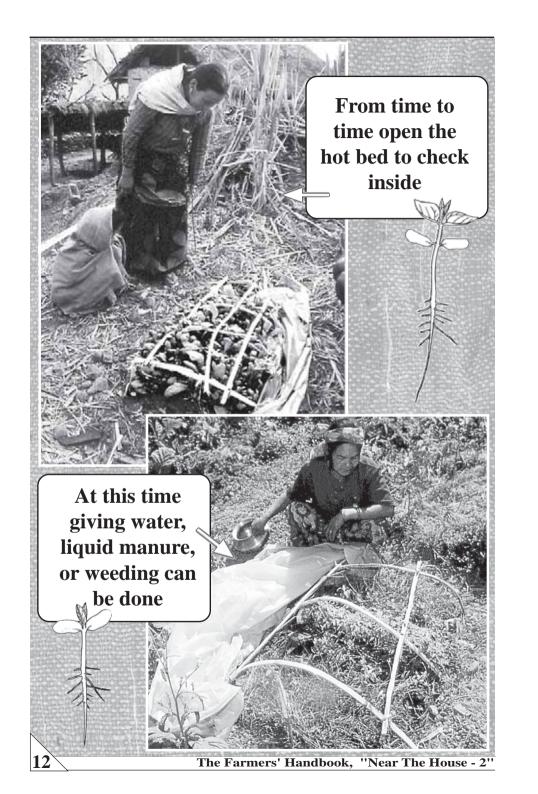
How to maintain a Hot Bed

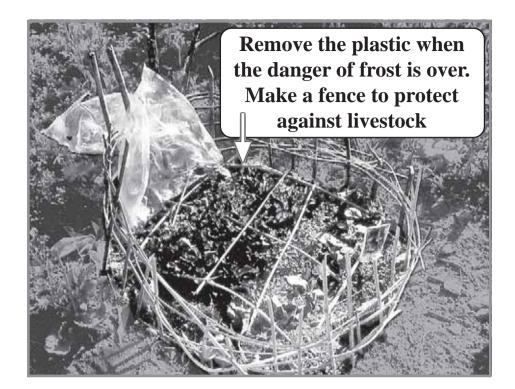
From time to time the nursery needs maintaining:-

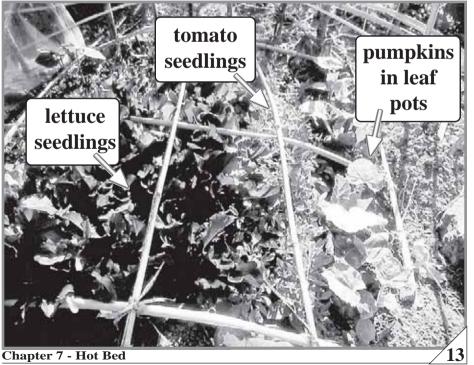
- when the sun is out the plastic can be folded back to irrigate and weed the nursery as required;
- replace the plastic in the evening, when the sun goes down;
- heat from the dung warms the soil, and the plastic prevents it quickly escaping;
- when the danger of frost has passed the seedlings in the hot bed can be transplanted into the kitchen garden

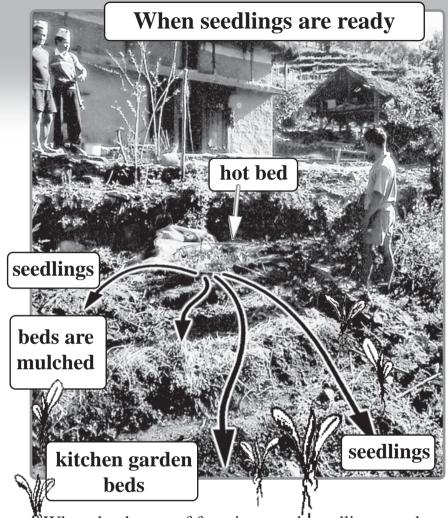


Chapter 7 - Hot Bed









When the danger of frost is passed, seedlings can be transplanted from the hot bed into the kitchen garden. First, water the plants well before transplanting. Water them again once they have been transplanted.

This Booklet's Author:

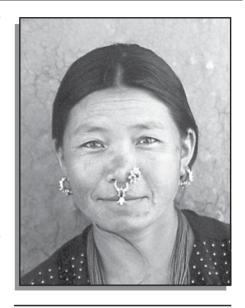
Chris Evans, advisor, Himalayan Permaculture Group, Nepal www.designedvisions.com

Farmers' Experience

Mrs Tulisara Gyami

From Nepal, Surkhet district, Lekh Pharsa-2,
Purano Gaun village, and
a member of "Creative"
Women's Group, Mrs
Tulisara Gyami has made
her own hot bed nursery.
Now let's read about her
experience.

In our village, it's difficult to grow vegetables in the winter because of the cold at that time. The frost kills the plants. That's why I made a



Mrs Tulisara Gyami

hot bed, to grow off season vegetables. After I made the hot bed it was easy to grow vegetables earlier in the season. As soon as I saw the first hot bed, I knew it would work because the morning after the day we made it, the heat had warmed up the inside and it was full of steam. Outside we were shaking with cold, but inside the plastic seedlings started to germinate very quickly. I used the bed for 3 or 4 successive plantings into the garden. This made it easy to grow lots of beneficial vegetables 2 months sooner than normal.



Read On!

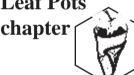


Subjects Related to the Hot Bed

Hot Bed chapter (1)



Leaf Pots chapter



Many types of vegetable for off-season production can be grown in the hot bed. Cucumber, pumpkin, beans, etc. can also be grown off season. You can learn how to make leaf pots from this chapter.

Kitchen Garden chapter **Mixed Vegetable**

Gardening chapter

Plants grown in the nursery can be mixed with all sorts of others for planting. Information on a method producing more with less work is given in this chapter.

Where, when, and how to plant seedlings raised in the nursery with less work and more production? Information on how to make a successful kitchen garden is given in this chapter.

Grihasthi Communications

What is an Air Nursery?

It's everyone's responsibility to plant trees and make the Earth green. But because of lack of skills to raise plants, many farmers don't do this important work. They may try to do it, but often the planting isn't successful. In this chapter we discuss the question of how



Ram and Lilawati Gharti's Air Nursery

to raise seedlings using local resources and less work. There are many types of nursery to raise different types of seedlings. Here, we learn about a new and quite different type of nursery, called an *Air Nursery*.

An Air Nursery is a bed which is lifted above the ground, so there is empty air space between the bottom of the bed and the ground below.



Why

make an Air Nursery?

The main purpose of the air nursery is to produce a good shape for seedlings' roots. It is mainly useful for those plants which develop a fast-growing tap root.

Seedlings are usually raised from seed sown in a nursery bed, or sown direct into polypots, or transplanted from one to the other. But it's very easy to damage the roots as young seedlings are transplanted from one place to another. Many plants can dry out. In polypots, roots need pruning regularly, and if this is forgotten or not possible at the right time, the roots grow into the soil and when lifted can break and damage the plant. The air nursery is especially for species that grow these fast, long roots in the nursery.



A small air nursery can be made in the corner of a kitchen garden

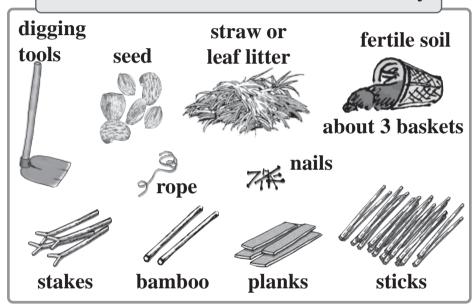
This chapter's Author:-Mrs Belmaya Rana Local Coordinator, Gumi, Surkhet, Nepal



How

to make an Air Nursery?

Materials needed to make an Air Nursery

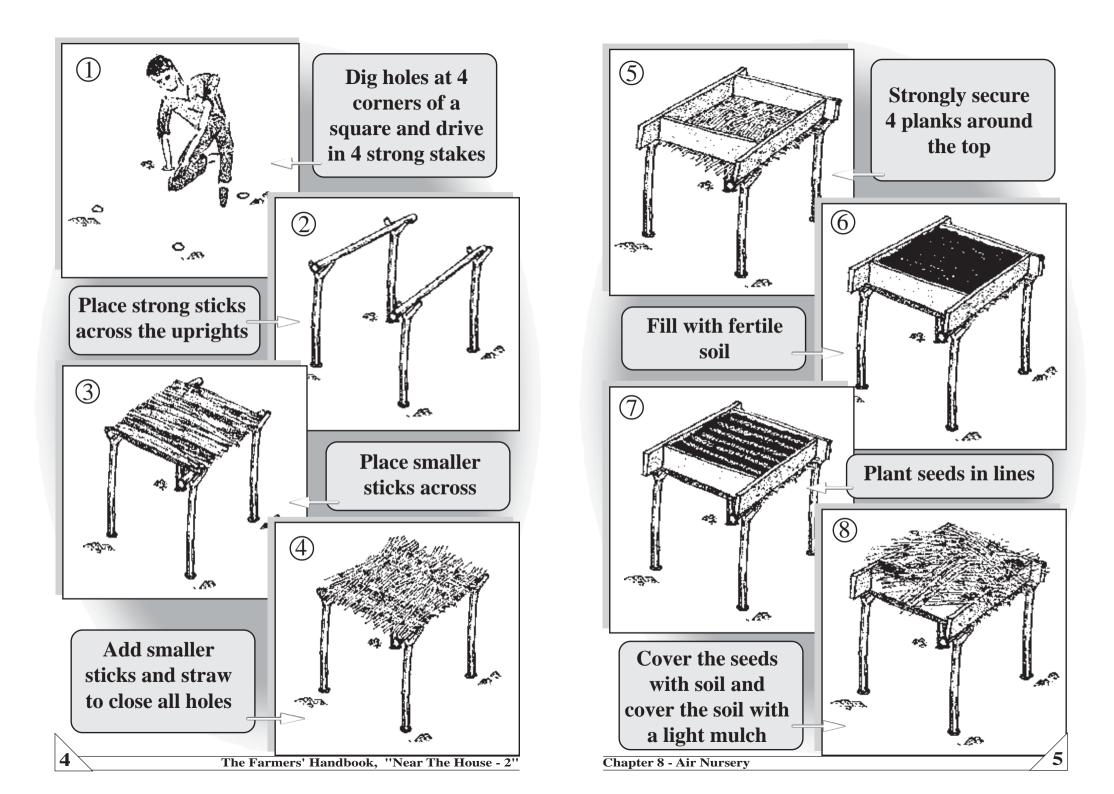


When to build an air nursery

The air nursery is built whenever normal nurseries are started. This is normally late winter for lower, warmer areas, and later in the spring for higher, cooler areas.

Building the Air Nursery

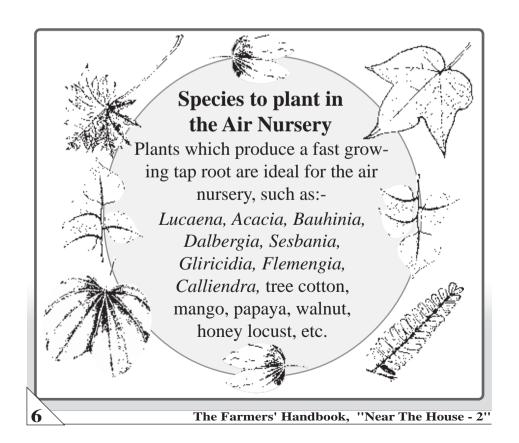
On the following pages the building method for the air nursery is described, with pictures and text.



How to make

Dig in 4 stakes at the corners of a square, and between 50cm and 1 metre high, so they are strong and steady.

Surround the top frame with planks or bamboo, and fill with up to 6 inches of fine, fertile soil to make the nursery bed. Dig a round pit 50 cm deep and 50 cm in diameter underneath the nursery. The soil from this can be used this to fill the nursery above. This pit then has a second use when lined with plastic to make liquid manure in, and is shaded by the nursery above. Now the air nursery is ready to sow seeds in. After sowing, cover the seeds with a thin layer of soil and then a fine mulch, and water the bed well. Seeds will germinate quicker if first soaked in warm water for 1-2 days.



Let's See

how to make an Air Nursery



Use straw or leaf litter to stop soil from falling through

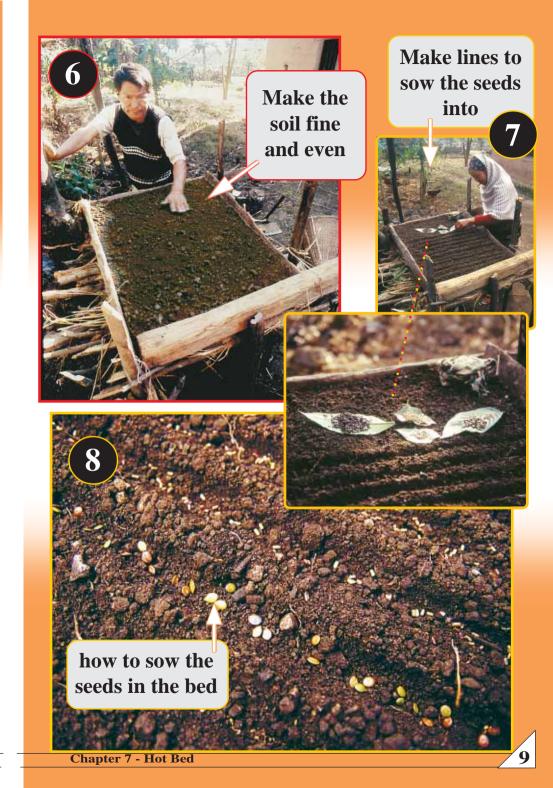


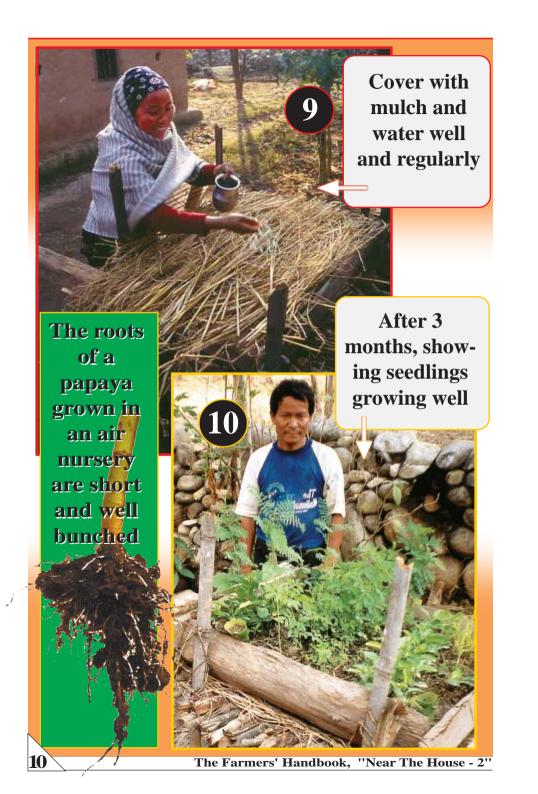


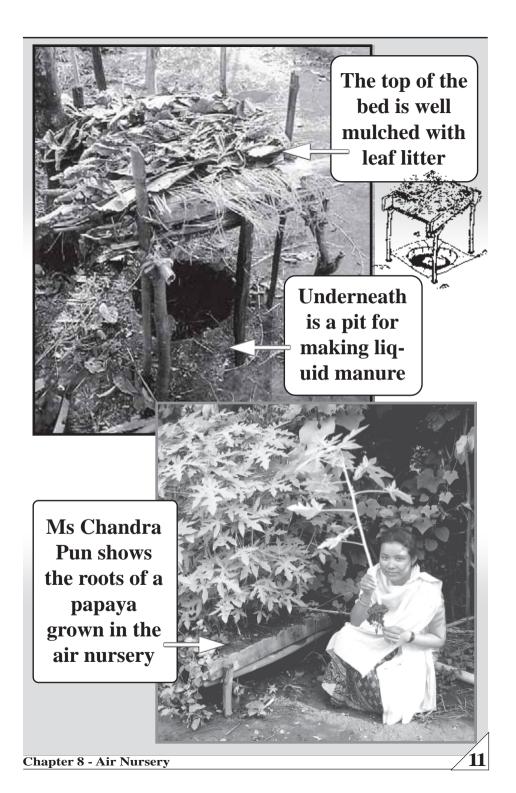
Inside this, put up to 6 inches of fertile soil



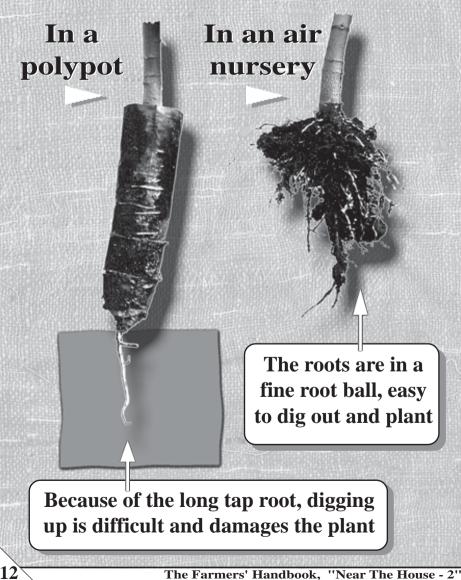
The Farmers' Handbook, "Near The House - 2"







Both roots shown below belong to the papaya plant. One is grown in a polypot and the other in an air nursery. What difference can you see?



Maintenance

How to maintain an Air Nursery

This is how the plants in an air nursery grow well. From time to time regular maintenance of watering and weeding is needed, and liquid manure can be used.

Things to note:-

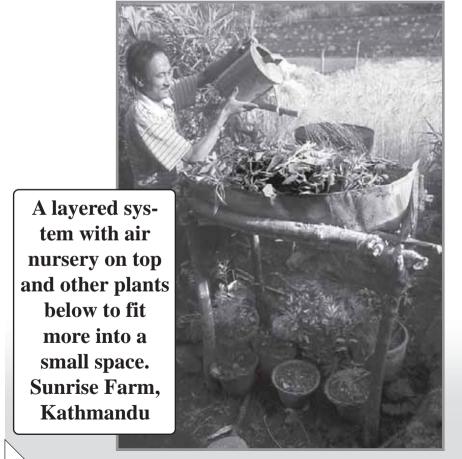
Water will dry out faster than normal in the air nursery, so watering is needed more often. In the hot season water once or twice a day, and in the cold season once every 2 days is enough.

Here's a big, community air nursery to grow many seedlings

Chapter 8 - Air Nursery

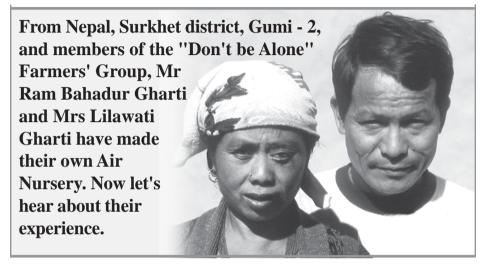
So the roots will grow down as the leaves and stems grow up. As the fast-growing tap roots grow down, they meet the base of the bed and grow into the air space. Here, they will dry up and die, which stops the deep root growing - this is automatic root pruning. Instead, many fine roots will grow higher up.

When this is done, it becomes much easier to dig up seedlings for planting out, and roots are not damaged. No harm is done to the seedling. Just trim off the dead roots when it is time to plant out.



Farmers' Experience

Mr Ram Bahadur Gharti and **Mrs Lilawati Gharti**



But then the Homestead Programme (JPP) taught us and we built our own. We didn't think we had the materials to build one but managed to find bits and pieces and eventually in only half an hour we'd built an air nursery. If we'd known how to build it before it would've been much easier because it's a much better way of growing seedlings, to dig up without damaging the roots. We made the nursery taller to protect the seedlings from being eaten by the chickens and pigs. It's just right for growing seedlings for planting on our own land, and we give to friends as well. But I've said I'm not giving any next year so they'll have to make their own nursery. They've agreed to that, at least.



Read On!



Subjects Related to the Air Nursery

Good benefits can be had from the information in this book about making and using an air nursery. However, this information is also linked to other methods. For extra benefits let's read, learn and practice from other related chapters.

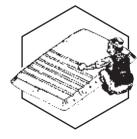
Agroforestry, Living Fence, Fruit Orchard and Soil Conservation chapters

The air nursery is for growing strong, healthy plants. Information on how and where to plant fruit and multi-purpose seedlings for better production and less work is given in these chapters.



> Home Nursery chapter

Around the homestead you need to plant many different plants for different functions. Information on different nurseries to grow various types of plants is given in this chapter.





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What are Leaf Pots?



There are various methods to raise many different species of plant. Often, certain species cannot be transplanted as small seedlings, and they need to be sown direct in the garden or fields. When these species are sown, such as beans, pumpkins, gourds and cucumbers, lack of care for the small plants mean that many die due to pests, weeds, lack of



Watering leaf pots in a nursery

water, etc., and are wasted. But by sowing in a *Leaf Pot* nursery, the plants can get the necessary care and attention when young, and be planted out when they are strong and healthy. This saves many seeds and plants from going to waste.

This method of using large leaves to make into pots, filling them with fertile soil and growing seedlings is called a *Leaf Pot* Nursery.

Why

make Leaf Pots?

- For growing seedlings which can't be transplanted from beds, such as some vegetables, fast growing trees or green manure seed plants, leaf pots can be used.
- Vegetables such as beans, pumpkin, cucumber, gourds, etc. cannot be transplanted bare-root, so these can be sown in leaf pots.
- Trees and green manure species, such as velvet bean, *Sesbania, Crotalaria* (such as sunhemp), lab lab bean, etc., which are to be used for seed production and so need more care and attention, can be started in leaf pots.
- When seedlings are growing in a leaf pot nursery, they can be given better care. This helps them to grow well, and also stops seed and seedlings being wasted.

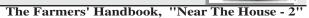


This Booklet's Author:

Chris Evans, advisor,

Himalayan Permaculture Group, Nepal

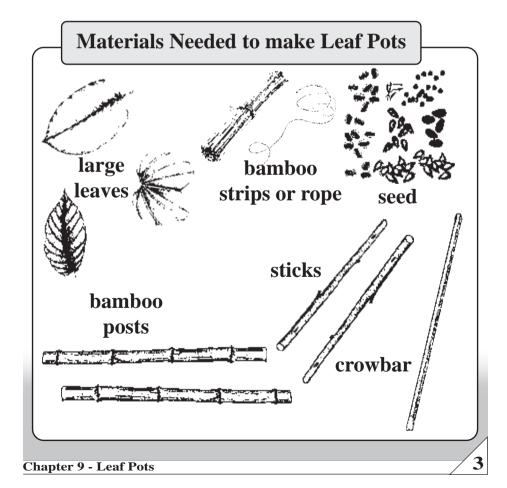
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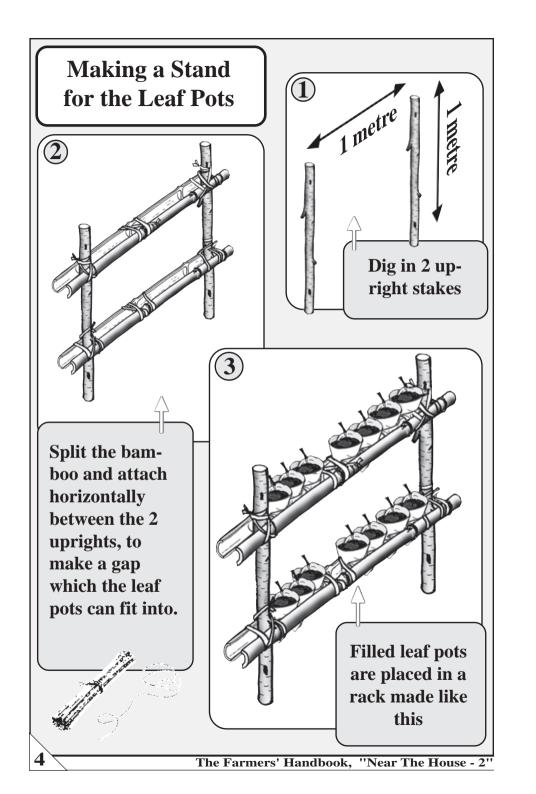


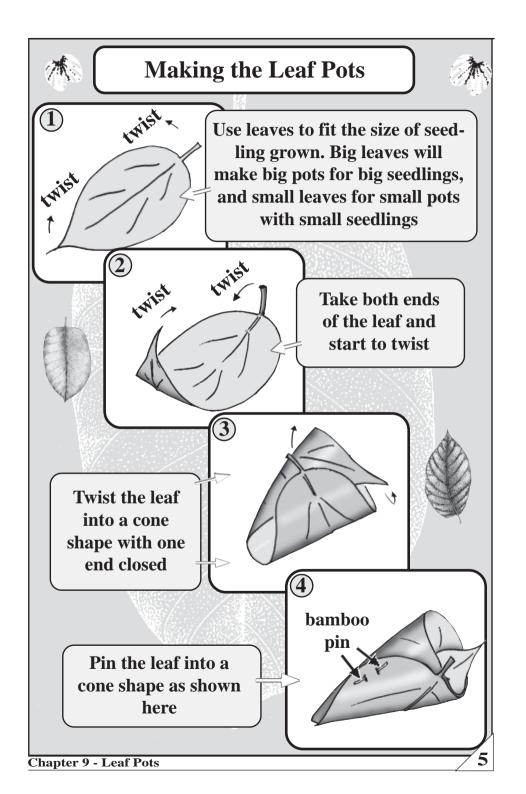
How

to make Leaf Pots?

Choose big, whole, unbroken leaves of the appropriate species. These leaves are rolled into a cone and stitched with bamboo pins. This will hold the soil well. After filling with fertile soil, the cones are sown with seed and covered with soil the same as if using polypots.





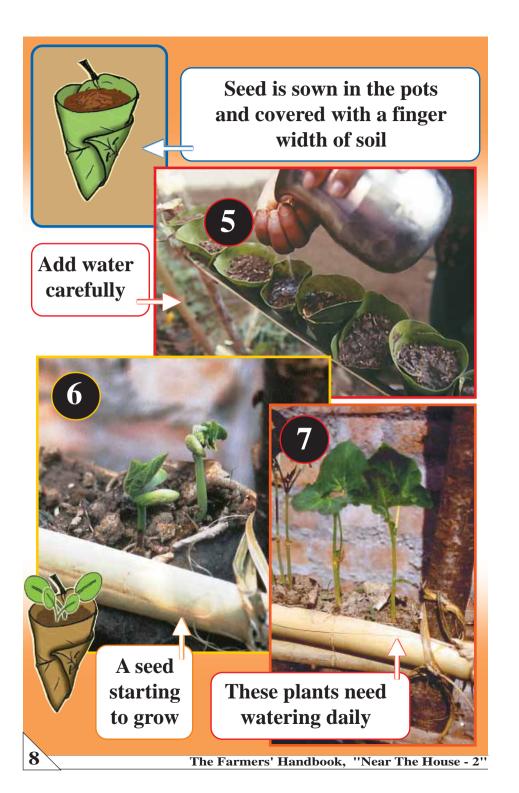












Maintenance

How to maintain Leaf Pots

Keeping the pots while seedlings grow

After sowing seed in the leaf pots, they need to be put in a safe place. The pots can be half buried in a nursery bed, or in a hot bed, as necessary. Another method for keeping leaf pots can be called a **vertical nursery**. This can only be used for cone-shaped leaf pots. A vertical nursery doesn't use up

any land and can be made next to the house or on the edge of the courtyard. Seedlings will also be safe from chickens. See p. 4 for how to build the vertical nursery.

High output from a small area. Leaf pots under an air nursery, with a pit for liquid manure at ground level.



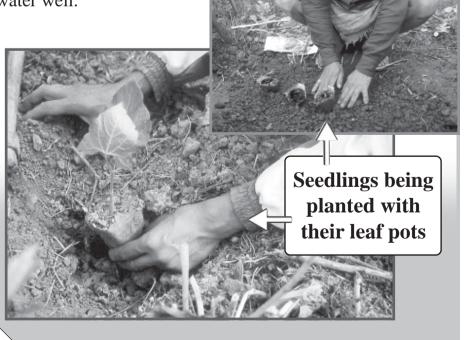
Chapter 9 - Leaf Pots

Because they are in the air, leaf pots in a vertical nursery can dry out quickly so need small amounts of water once or twice a day. If placed in the shade, they will need less water.

Planting the Leaf Pot

When the seedling has grown to the 4 leaf stage it can be planted out. At the place where it is to be planted, dig a small hole and fill with compost. Without taking the seedling out of

the pot, plant both together in the hole. By doing this the roots of the seedling aren't disturbed. The leaf pot should be completely buried. After planting, add mulch and water well.



The Farmers' Handbook, "Near The House - 2"

Farmers' **Experience**

Mrs Vishnumaya **Shris**

From Nepal, Surkhet district, Gumi - 3, Ratadada village, and a member of "Hariyali" women's group, Mrs Vishnumaya Shris has made her own leaf pots. Now let's hear what she says.

44 If we plant various types of seed direct onto the land many can die, or not grow well. So we make leaf pots, filling them with soil and sowing them with seeds such



Mrs Vishnumaya Shris

as pumpkin, cucumber, beans, cow pea, bitter gourd, bottle gourd, etc., especially the climbing vegetables. We keep the pots in a vertical rack made from bamboo. We tie split bamboo in between 2 upright posts which leaves a gap perfect for holding the leaf pots. The pots need watering every day. Seedlings grow faster than if sown direct in the field, and are ready to plant out 2-3 weeks after sowing. We found that these plants suffer less from insect pests than others, perhaps because they're stronger. We share these skills in the group. I teach to some, and learn from others. ""



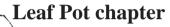


Read On!



Subjects Related to Leaf Pots

This book provides enough information to be able to make and grow plants in your own leaf pots. However, this information is also linked to other methods. For extra benefits let's read, learn and practice from other related chapters.





Kitchen Garden chapter



Hot Bed chapter

Leaf pots are very useful in successful vegetable gardening. Information about this and other easy methods for home-producing healthy vegetable sat low cost is given in this chapter

This chapter descibes how to use leaf pot seedlings along with other varieties in a hot bed to grow off season vegetables

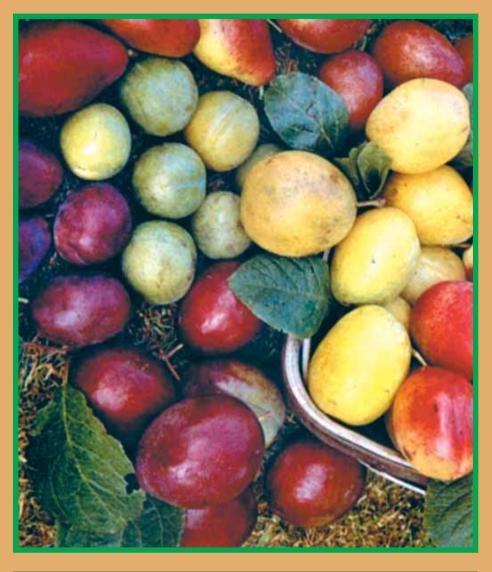
Mixed Vegetable Gardening chapter

With less weeding, watering and other work, and harvesting various types of vegetables from 3 weeks after planting, lasting up to 6 months. Information on this easy technique is given in this chapter

Grihasthi Communications

Producing Fruit at Home

an Introduction



'Fruit is the elixir of life'

Did you know ...?

- The reason why people often like sweet food is because of the need for vitamin "C".

 Fruit has lots of vitamin C, and ripe fruit is usually sweet, so we are programmed to like sweet things. That's why people like sugar products. But of course, there's no vitamin C in sugar!
- Eating a piece of fruit after a meal helps the intestine to digest the meal.
- Fruit is tasty, juicy and nutritous, and contains many essential vitamins and minerals for our bodies.
- It is one of our responsibilities to plant fruit trees. That's why even if we only have a small piece of land, many of us are keen to plant fruit trees.

In this Farmers' Handbook there is information about various methods of producing fruit. In this volume, *Near the House (2)*, are chapters about the Fruit Nursery, Grafting, Budding and Stone Grafting. In the next volume, *The Fields*, are chapters about Air Layering, Top Grafting, Planting Fruit Trees and Integrated Fruit Orchards.

This chapter gives additional information to help the other technical chapters be more effective. They are all connected together to give simple methods to successfully produce more fruit at home.

Information about Improved Fruit Varieties

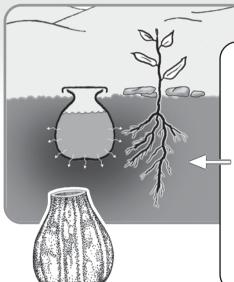
To grow improved fruit varieties, it's possible to join local, wild varieties with their improved relatives. Information about which species to join, when to join them and which method is used to join them is given in the chart on the next 2 pages.



After this, on page 7, is information about the other chapters related to fruit production.

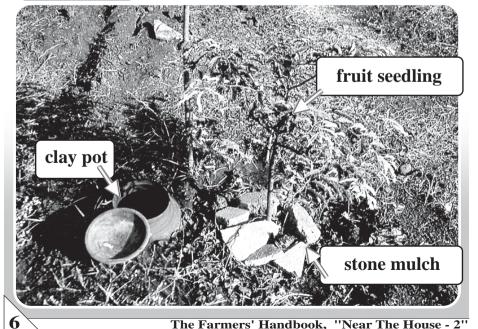
The fruits you want to produce are in these columns		The local species (root-	Here is information about which techniques to use, and when to use them (Northern Hemisphere)						
Species of scion (branch)	Drawing	stock) to join them to	Grafting		Top Grafting	Budding	Air Layering	Cuttings	Stone Grafting
Peach		wild peach	Feb-March Aug-Sept		Feb-March	June-July	_	Feb-March	_
Plum	00	wild peach or plum	Feb-March		Feb-March	June-July	Feb-April	_	-
Almond		wild peach	Feb-March		Feb-March	June-July	_	_	_
Apricot	Ob 1	wild peach or apricot	Feb-March		Feb-March	June-July	-	-	_
Walnut		wild walnut	March-April		-	-	_	_	_
Apple		wild apple	Feb-March Aug-Sept		Feb-March	June-July	Feb-April	-	_
Pear		wild pear	Feb-March Aug-Sept		Feb-March	June-July	_	Feb-March	_
Citrus spp.		Trifolate	Oct-Nov		_	June-July	Feb-April	_	_
Persimon		local persimon	Feb-March		Feb-March	June-July	_	_	_
Mango		wild mango	June-July (stone grafting)		ı	-	_	_	May-June
Guava		guava	_		1	-	Feb-April	_	_
Grape		grape	Feb-March		Feb-March	-	_	Feb-March	_
Cherry	90	wild cherry	Feb-March			June-July	_	_	
The Farmers' Handbook, "Near The House - 2" Chapter 10 - Producing Fruit at Home									

An easy way to irrigate fruit trees



Bury a porous clay pot about 50cm away from a newly planted fruit seedling. When this is filled with water, it soaks out of the pot directly to the root zone of the seedling. Instead of a pot, the hardened shell of a bottle gourd can be used, with a small hole made in the base.

bottle gourd



Subjects Related to Fruit Production

These chapters give different techniques to grow fruit trees successfully in the villages.

Fruit Nursery chapter

How to grow root stock from local wild fruit seed for grafting and budding on your own land.



Grafting & Budding chapters

Produce high quality and quick fruiting seedlings at home with these 2 methods.





Stone Grafting chapter

Graft improved mango onto local wild trees quickly and easily at home.





Air Layering chapter

Produce good quality citrus, guava, lichi, pomegranate, etc. with this easy method.





Top Grafting chapter

Easy methods to graft wild trees growing in the fields and forests to make productive fruit trees.





Fruit Tree Planting chapter

How to plant out high value fruit trees for best production using local resources.





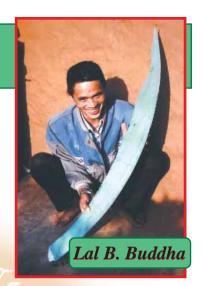
Integrated Fruit Orchard chapter

Fruit and other multi-purpose trees in an orchard designed to give maximum yields quickly.



Farmers' Innovation - Plastic or Organic?

To bind grafted fruit trees plastic tape is usually used. But Mr Lal Bahadur Buddha, a Farmers' Leader from Jajarkot district, Danagaun-2, Kalpat village in Nepal, has found a method which doen't need plastic for grafting, budding and top grafting work. He very carefully strips a thin layer



from the surface of the **Sisal** plant (*Agave spp.*) and uses this instead to bind scion to rootstock (see picture). Using plastic you need to be careful to cut it off after 3-4 months or it will strangle the seedling. Not so with sisal - because it is organic it degrades and falls off by itself.



Lal Bahadur has for many years played a leading role in fruit improvement in his district. He has even invented a new method to graft walnut (see the *Grafting* chapter). When experts from the Horticulture Station in Kathmandu said that it is only possible to get a 25% success rate with walnut, Lal was getting 80% with his own method. He spends his time teaching other farmers his methods.



Fruit Nursery
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What is a Fruit Nursery?





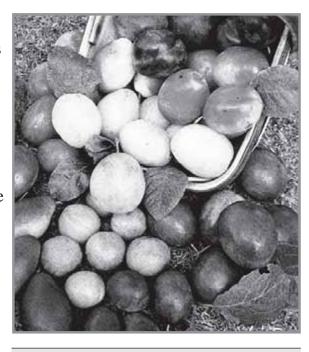
Local fruit nursery, Panchkatya, Jajarkot

The **fruit nursery** is a place where local wild fruit seed is sown to grow seedlings. This means selecting from healthy, disease free species that grow wild or on farms, such as wild pear, peach, walnut, apple, etc. Branches (scion) or buds from good fruiting trees, which must also be healthy and disease resistant, can then be joined onto these seedlings while still in the fruit nursery. This will produce high quality fruit trees with strong, local roots. The work of joining 2 compatible plants together in the fruit nursery is called grafting or budding. Information about these methods is given in their own chapters.

Chapter 11 - Fruit Nucsery

Why make a Fruit Nursery?

- To grow improved fruit trees in your own village.
- To make use of the local wild fruit trees.
- To grow fruit trees suited to the local climate and soil.
- To be able to obtain fruit trees whenever you need.
- To save the cost of buying fruit trees.



Seven types of local plum

- To grow fruit trees which produce quickly.
- To be able to generate income from local resources.

This Chapter's Author: Chris Evans, advisor, Himalayan Permaculture Group, Nepal www.designedvisions.com



The Farmers' Handbook, "Near The House - 2"

How to make a Fruit Nursery?

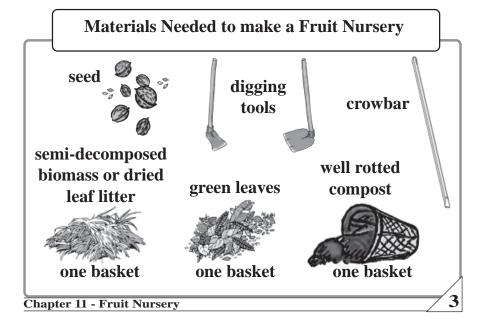
1. Time to build the nursery

The best time to build the fruit nursery is in the Autumn (October in the Northern hemisphere)

2. Materials needed

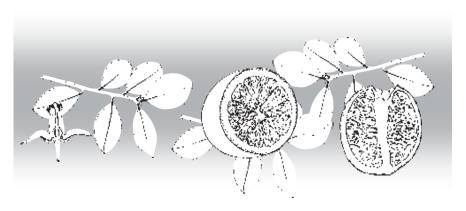
These are the materials needed to build a fruit nursery:

- **seed**: collect good viable seed of local, wild fruit trees, such as peach, plum, apricot, cherry, walnut, pear, etc.
- digging tools;
- **biomass**: a basket each of well rotted compost, semi decomposed biomass, and fresh green leaves.



Site Selection

It's important to choose the right place for a nursery. A site is needed where watering, checking, protecting, mulching and composting and such daily maintenance will be easy.

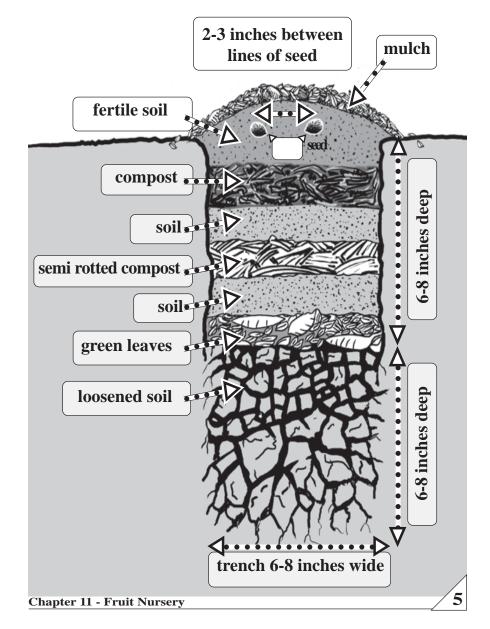


Digging the bed

The bed for planting the seed can be as long as you need, depending on the number of seeds you have to sow. First, dig a trench about 6 inches wide and 6-8 inches deep, keeping the removed soil close by. Then with a crow bar or pick axe, loosen up another 6-8 inches of soil in the bottom of the trench, without removing it from the trench.

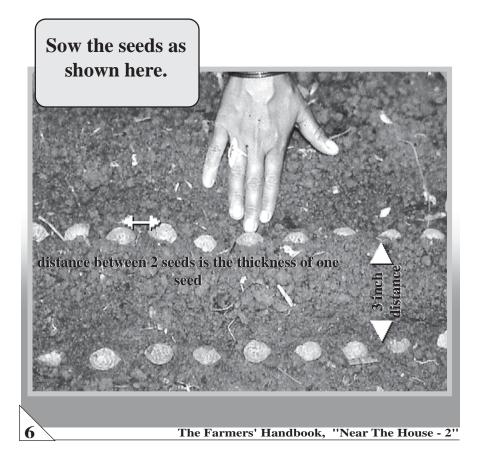
Now place a 2 inch layer of green leaves in the bottom of the trench. On top of this put a 2 inch layer of the soil dug out of the trench. Next, put a 2 inch layer of half decomposed or dried leaf litter. Cover this layer with another 2 inch layer of soil. Then put a 2 inch layer of the well rotted compost. Now put all the remaining soil that was dug out of the trench to make a mound above the trench. The trench has now been refilled with the soil, green leaves, leaf litter and compost.

Cross section to show the fruit nursery trench



Sowing seed in the nursery

Now the local, wild fruit seed, such as wild pear, apple, peach, plum, apricot, walnut, etc. can be sown in the nursery. Along the heaped up bed make 2 shallow grooves 3-4 inches apart, and place the seed into these grooves. The distance between each seed in the line should be the same as the size of the seed itself. Cover the seed with soil to a depth which is the same thickness of the seed, and then cover with a 2-3 inch thick layer of mulch. For the mulch, use leaf litter, straw, pulled weeds, etc.



how to make a Let's See **Fruit Nursery** green leaves spade leaf litter pick **Materials** needed to make a fruit nursery compost Size of the trench 6-8 inches deep Dig out the trench and leave the soil at

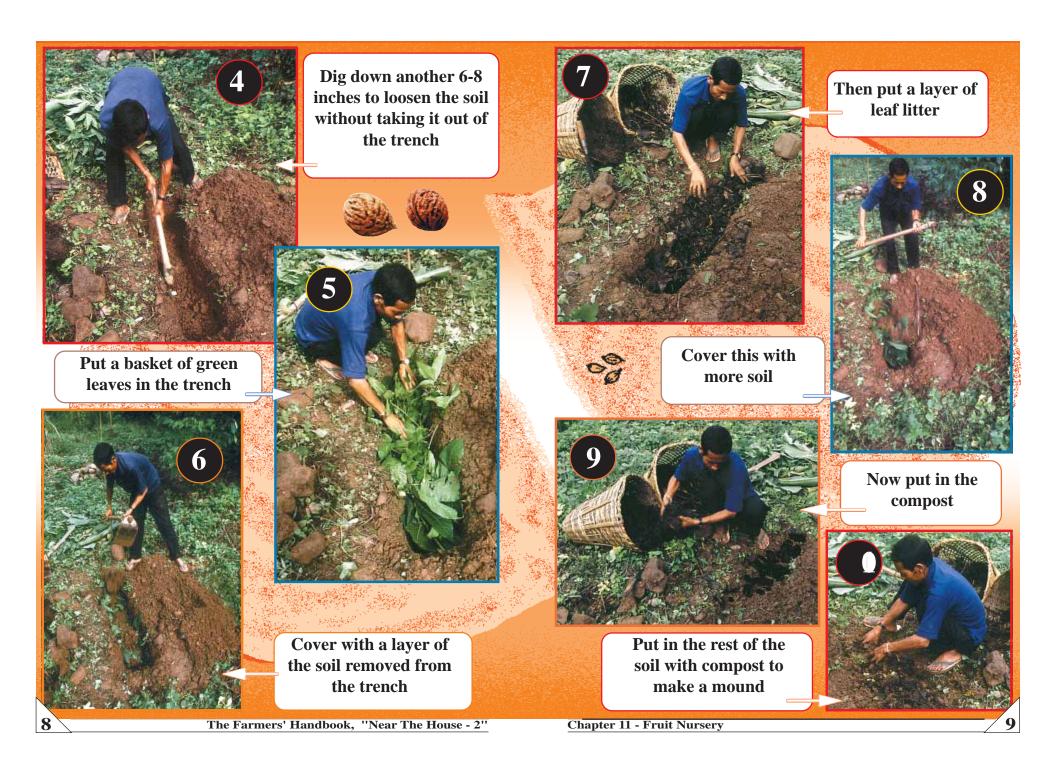
6-8 inches wide

Chapter 11 - Fruit Nursery

the edge

soil removed

from trench



Peach seed For sowing distance see earlier p.6 Put on mulch The Farmers' Handbook, "Near The House - 2"

Maintenance

How to maintain a Fruit Nursery

After sowing the seed the nursery needs good maintenance. Seed sown in the Autumn will germinate the next Spring. In the months in between, the nursery should be watered deeply every 2-3 weeks if it doesn't rain. This will help the seed to germinate well. After the seeds have germinated, the mulch helps to conserve moisture in the soil, and keeps down weeds. Even so, irrigate and weed the nursery as needed. Add more mulch if needed. All this helps the seedlings to grow well.

Seedlings which germinate in the Spring may be big enough to graft or bud the next Winter. If the seeds germinate slowly, or if weeding and irrigation is not done, the seedlings will be a year slower to reach the size needed for grafting and budding.

Grafted seedlings completed in the nursery (arrows point to where the graft is)



Chapter 11 - Fruit Nursery

11

Work needed while seedlings are growing in the nursery

irrigation: the seedlings need water regularly.weeding: pull up any weeds that grow and use

them as mulch.

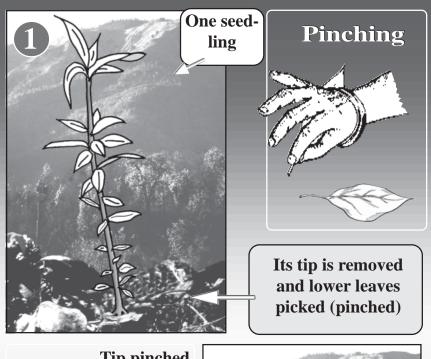
mulch: keep a thick mulch on the bed

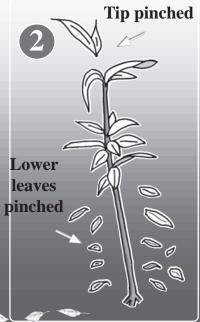
Pinching (removing the leaves)

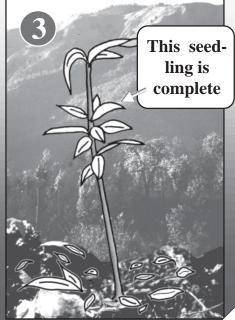
In the late summer any lower leaves or small branches should be removed with secateurs or a sharp hook, and the growing tip also cut off. This makes a good shape of the seedling ready for grafting or budding. By taking out the tip the seedling will grow fatter rather than taller, and taking out the side leaves and branches lower down leaves a clean stem which is easier to graft or bud. This work of picking leaves and tips is called *pinching*.



The Farmers' Handbook, "Near The House - 2"







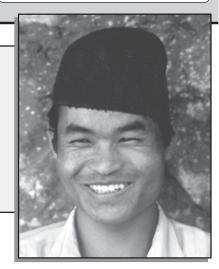
Chapter 11 - Fruit Nursery

Farmers' Experience

Mr Dhan Bahadur Midun

From Nepal, Surkhet district, Lekh Pharsa-2, Purano Gaun village, local teacher Mr Dhan Bahadur Midun has made his own fruit nursery. Now let's read about his experience.

After the Homestead Programme started work in our village I learned about fruit nurseries, and made one on my own land. I started by growing



Dhan Bahadur Midun

100-200 seedlings, and have gradually increased that number with experience. It was difficult at first without the knowledge but now I find it easy. Though we don't have any irrigation here, by using lots of compost and mulch the need for water was much reduced, and what we saved in the waste water pit has been enough. I've sold, exchanged and given away seedlings I raised here to friends in our village. I've also provided other villages up to 2 days' walk away with seedlings. Doing this I'm starting to understand that by applying work and investing in the right place at the right time, many benefits can be gained. 19

The Farmers' Handbook, "Near The House - 2



Read On!



Subjects Related to the Fruit Nursery

This book gives enough information to be able to make and manage your own Fruit Nursery. However, this information is also linked to other methods. For extra benefits let's read, learn and practice from other related chapters.

Integrated Fruit Orchard chapter



Fruit Nursery chapter Fruit Tree Planting chapter



Grafting & Budding chapters .



Seed Saving Chapter





Seed Saving Chapter

To grow good fruit root stock you need to select good, healthy trees to produce seed. More information on seed saving is given in this chapter.



Chapter 11 - Fruit Nursery



Fruit Tree Planting chapter

After raising good seedlings in the fruit nursery, if they're not planted well all the work can go to waste. Information on more productive planting is given in this chapter.





Integrated Fruit Orchard chapter

Plant fruit trees with various other multipurpose trees to give more and quicker benefits for less work. This is the Integrated Orchard, and you can read about it in this chapter





Grafting & Budding chapters

Local peach, pear, walnut, etc. sown in a fruit nursery can be grafted with cuttings or buds of compatible improved trees after 1 to 2 years. In these chapters, learn how to do this method at home.





Near The House 2", Chapter 12 - Grafting

What is Grafting?



Grafted peach trees ready for planting, Surkhet, Nepal

It can be difficult for farmers to earn their livelihoods from growing only grain crops. That's why it's good to learn new methods which increase production to farm our own land. One method is by making a nursery to grow improved fruit tree seedlings. This means you can grow tasty and nutritious fruit on your own land, and at the same time sell or trade extra production to earn cash. There are many methods of joining local wild fruit tree rootstock to high producing improved varieties. One of those methods, which is detailed in this chapter, is called *grafting*.

Grafting is a method of joining the cutting (scion) of an improved variety of fruit tree onto the root (rootstock) of a local compatible variety.

do Grafting?

Benefits of Grafting

• Grafted trees produce fruit quicker. A tree grown from seed

may take 8-10 years to fruit, but a grafted tree will only take 2-4 years.

- A tree grown from seed may produce poor tasting fruit. Grafting is done to improve the taste and size of the fruit.
- A tree grown from seed may not produce fruit the same as the tree the seed came from (mother tree). But a grafted tree will be just as good as the tree the cutting (scion) came from.
- A grafted tree will continue to give the same quality fruit for many years.
- Grafted fruit trees can be sold to give an income to the household.
- By producing your own seedlings and fruit, you save money.
- Seedlings can be produced locally, saving time in searching for the right fruit trees to plant.





This Chapter's Author: Mr Bhuvan Khadka Himalayan Permaculture Group, Surkhet, Nepal



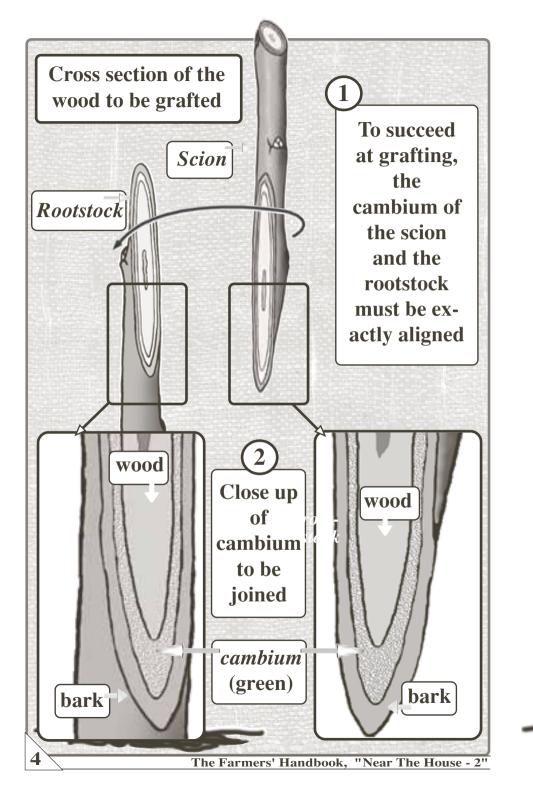
How

to do **Grafting?**



How does grafting work?

All plants have tiny channels which take water and nutrients up to the leaves and down again. These channels are inside the bark but outside the woody part of the stem. They form a greenish band around the stem called the *cambium*.



In a successful graft, the channels in the cambium carrying nutrients and water from the rootstock to the scion and back are continuous, not broken.

Grafting Method

- Preparing the rootstock for grafting
- A local, wild fruit tree seedling grown in the nursery or naturally in the forest is called the *rootstock*.
- For grafting, the rootstock is ideally the thickness of a pencil, but it can be a little thinner or thicker than this (5-10mm).
- Leaves and branches should be prevented from growing from the rootstock on the first 4-6 inches from the ground.
 These can be carefully pinched off from time to time.

Selecting the scion for grafting

- To graft onto a local, wild rootstock, the branch cutting from a good fruiting tree is needed.
- This branch cutting is called a *scion*.
- The scion sould be from a healthy, disease-free tree that gives good fruit.
- A one year old branch should be used as scion wood.
- If the scion is to be brought from far away, a whole branch should be cut. The cut end should be covered with moss and packed in sacking. Any buds should be unbroken, and the cutting should not be exposed to the sun.

Cutting the scion

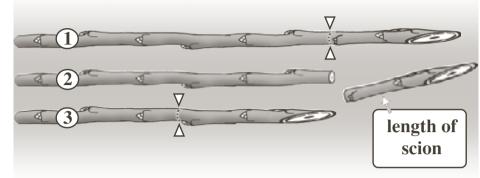
- The scion should be the same diameter as the rootstock if possible. It can be thinner than the rootstock, but not thicker.
- There should be 3-5 live buds on the scion, which should be cut at a slant, just above the top bud.

Prepared rootstock

Cutting the rootstock and grafting the scion

- The way to prepare rootstock is described in the *Fruit Nursery* chapter.
- On the day before grafting, water the rootstock well and mulch thickly.
- Using a sharp knife or similar tool, make a 1 inch long slanting cut through the rootstock 1-3 inches from the ground. The face of the cut should be completely flat.

• Trim the scion so it has 3-5 buds. The scion should not be thicker than the rootstock.



• Make a 1 inch long slanting cut at the base of the scion, the same length as the cut on the rootstock. The face of the cut should be completely flat.

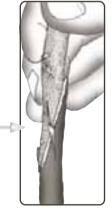
• Half way up the slanting cuts of both rootsock and scion cut a small nick into

the face of the cut edge (see also p.10, photo 5 to 8).

- Join rootstock and scion together by inserting the nicks on opposing faces of the rootstock and scion into each other.
- Push rootstock and scion together so that the cambium layers are in close contact *at least* on one side of the join (if rootstock is larger than scion), if not both sides (if rootstock and scion are the same size).
- The scion and rootstock should be held together by the opposing nicks being interlinked with each other.



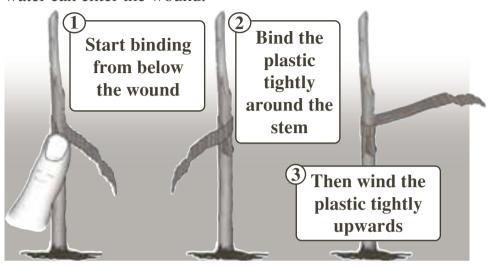
The scion should be cut just above the top bud to prevent too much wood drying out



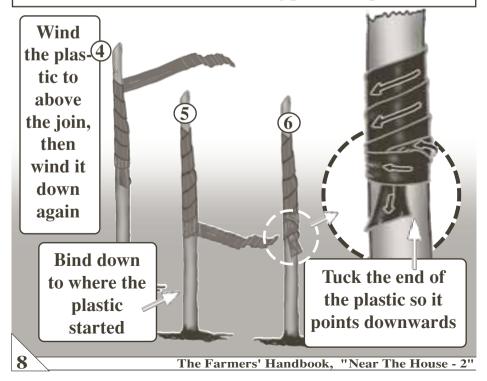


Binding the Graft

Bind the joined rootstock and scion together so no air or water can enter the wound.

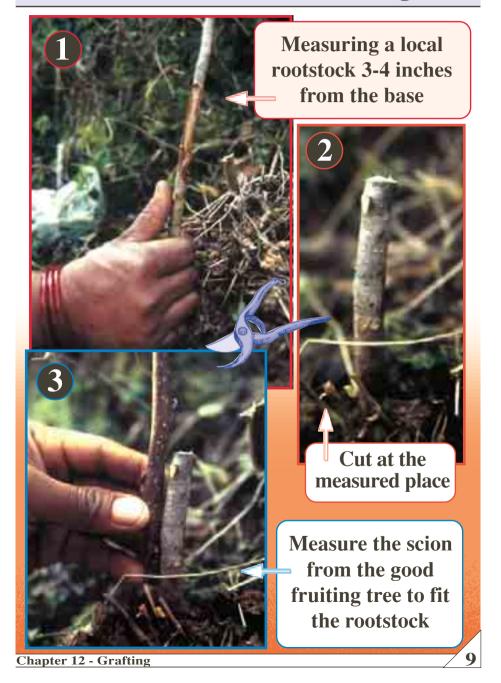


See an alternative to using plastic on p.18

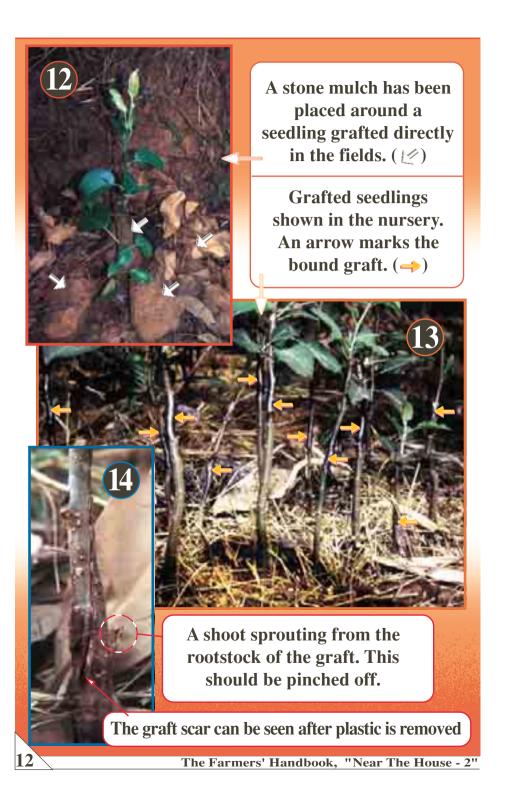


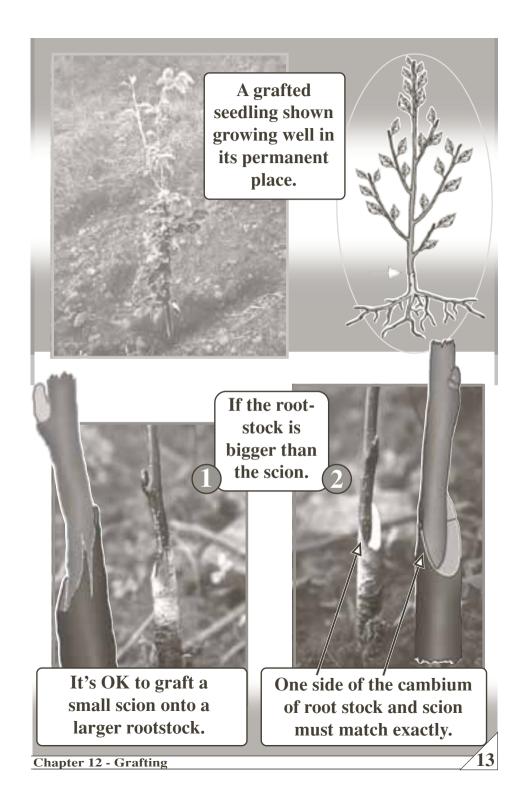
Let's See

how to do Grafting









Maintenance

How to maintain a grafted seedling

Without

protection.

Care needed after grafting

- The grafted seedlings need fencing against livestock, and should not be touched.
- They should be protected from strong sun, wind, hail, and heavy rain. Make a 50cm high thatch to place over them, and the nursery should be in a sheltered site.
- The seedlings need regular watering to keep the soil moist.
- After 4 months, when the scion has sprouted well, the plastic can be carefully removed.

work is wasted

Pinching

Any leaves or branches sprouting below the graft (from the rootstock) should be pinched off with the fingers, otherwise they take valuable water and nutrients meant for above the graft. This is called pinching.

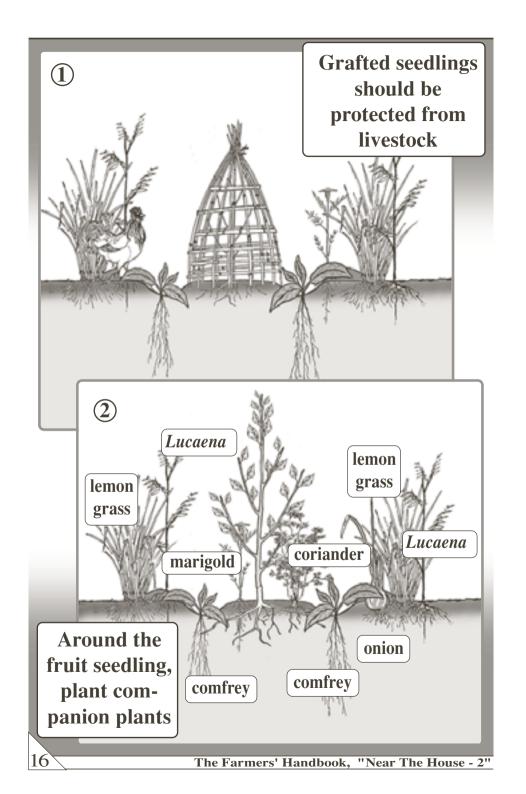
If the graft is unsuccessful, a single sprout from the rootstock can be allowed to grow. This can be used to graft another scion again next year.

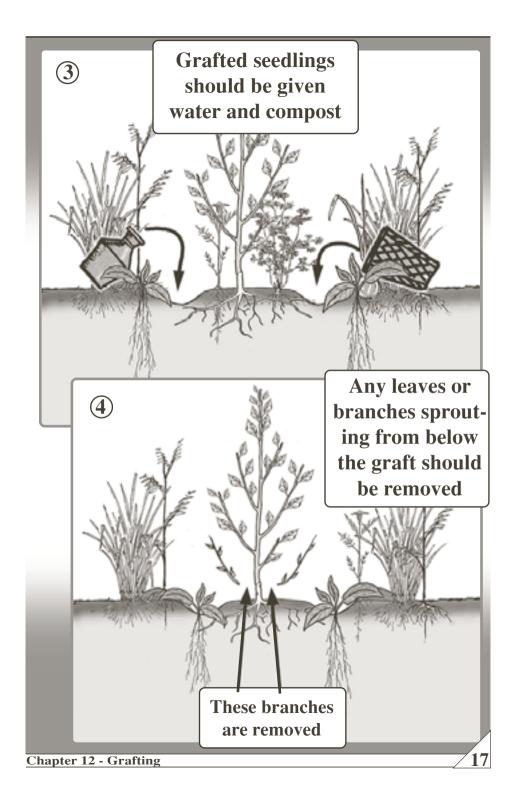
Citrus rootstock is grafted in the Autumn and kept under plastic until Spring.



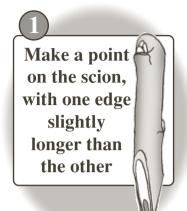
Compatible species and timing of grafting

Type of scion	Type of rootstock	Month (Northern Hemisphere)				
1. Improved peach, plum, apricot, almond	all can be grafted onto wild peach, plum or apricot	Jan./Feb., Sept.				
2. Soft shelled walnut	local walnut	March, April				
3. Pear	wild pear	Jan./Feb., Sept.				
4. Orange	trifoliate	Oct./Nov.				
5. Persimon	local persimon	Jan./Feb.				
6. Apple	wild apple, crabapple	Jan./Feb., Sept.				
7. Cherry	wild cherry	Jan./Feb.				
Chapter 12 - Grafting 15						

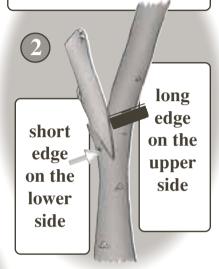




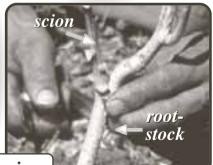
The method for grafting walnut is slightly different to that given above. Let's see:



How the scion is joined onto the rootstock



When the rootstock and scion fit perfectly, cut off the rootstock above the graft. Then bind it as in the normal method.



This is done in the spring

The skin of the sisal (Agave) can be used to bind the graft. The skin is removed as shown here. More details about this are given in chapter 10 - Fruit Introduction

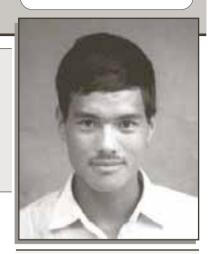


Farmers' Experience

Mr Shanta Bahadur Pun

From Jajarkot district, Dhime - 7, Dharnasi village in Nepal, Mr Shanta Bahadur Pun has done plenty of grafting. Now let's read about his experiences.

44 After I learned grafting I practiced at home with a small local, wild peach nursery. Onto them I grafted improved peach,



Shanta Bahadur Pun

plum, apricot and almond. On such a small piece of land this gave such a high production, and you can literally eat the fruits of this success within 3 years! In the spring, shades over the beds are very important - this stops the hot sun from drying out the newly grafted seedlings. Water needs to be given carefully, at ground level. If you water from above, water can get inside and ruin the graft, and it can also shake the seedlings and so break the graft. The cutting tools need to be sharp and clean - like in any operation. I've succeeded using just the local *ashi* (hook), I don't need a posh grafting knife. At first the other farmers didn't believe that it would work. I grafted plants on my own farm, and sold them. Then they believed me. Nowadays all the farmers have small or large nurseries on their land.



Read On!



Subjects Related to Grafting

This book provides enough information for you to be able to do your own grafting on fruit trees. However, this information is also linked to other methods. For extra benefits let's read, learn and practice from other related chapters.



Fruit Nursery chapter

How to grow root stock from local wild fruit seed for grafting and budding on your own land



Stone Grafting, Budding, Top Grafting and Air Layering chapters

Information about various simple methods of growing improved fruit varieties at home for planting on the farm are given in these chapters.



Fruit Tree Planting chapter

After raising good seedlings in the fruit nursery, if they're not planted well all the work can go to waste. Information is given in this chapter.



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.







What is **Budding?**

Fruit trees which have grown from seed may not give good fruit. There are various other ways to make sure that trees fruit well. Depending on the variety and season there are different methods to improve fruit trees. One way is by taking a local, wild fruit tree and transferring a bud from a tasty, good and heavy-fruiting tree onto it. This is called **Budding**. Budding is just one of the techniques used to im-



A one year old budded peach seedling

prove fruit trees so that they give more production.

This chapter gives information about where, when and how to do budding, so you can do it at home to produce your own good quality fruit seedlings.

Why do Budding?

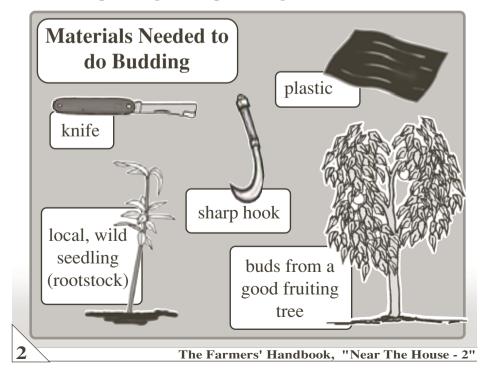
?

Benefits of Budding

- the tree produces good fruit
- the tree fruits sooner
- you don't need to wait for other seasons and methods
- to be able to produce good trees in your own time
- to use time efficiently
- to save having to buy fruit seedlings
- to increase farm production;
- to develop new skills
- to increase production from less land

When to do Budding?

Budding should be done in the early Summer when new shoots are sprouting and sap is rising the most.



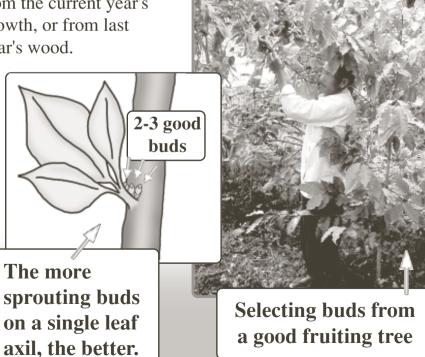
How

to do Budding?

1. Selecting bud wood for budding

The first thing to do in budding is to select good buds from the tree you want to propagate. If this is far away then the whole branch containing the bud should be cut and

brought. Don't bring a branch which doesn't have good buds on it. Good buds can come from the current year's growth, or from last year's wood.



Chapter 13 - Budding

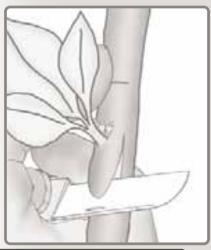
3

2. Cutting the selected bud

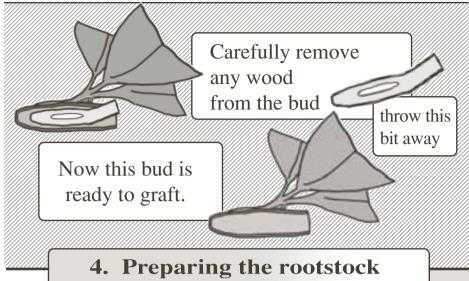
Make a cut through the bark to the wood about half an inch above the selected bud. Taking care not to damage the bud, cut from half an inch below the bud. upwards to the first cut as shown in the picture.

Carefully separate any wood that has been cut from the bark and bud (see the picture at the top of the next page). Now the bud is ready. Put the bud in a bowl of water. so it can be carried without drying out.

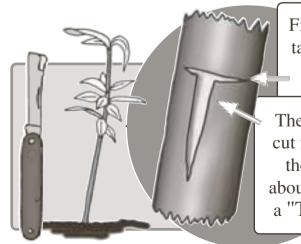




3. Preparing the bud If there are leaves on the budwood, these can be trimmed as shown here. The Farmers' Handbook, "Near The House - 2"



A compatible local, wild variety of seedling is called a rootstock. The rootstock shouldn't have any disease or wounds. The rootstock should be prepared before the bud is cut, to save time. How to prepare rootstock is described in the Fruit Nursery chapter. The rootstock seedling should be well watered and mulched the day before it is to be budded.



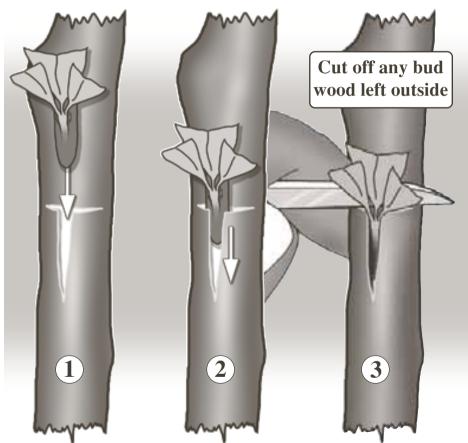
First make a horizontal cut in the bark, as deep as the wood

Then make a vertical cut from the centre of the first cut, down about an inch, to make a "T" shaped wound.

Chapter 13 - Budding

5. Joining the bud to the rootstock

To graft the bud from the improved tree, use your knife to prise open the T-shaped wound, and slowly insert the budwood downwards into the opening. The budwood should fit exactly into the inside of the T. If there is a small piece of the budwood left sticking out above the horizontal cut in the rootstock, this should be cut off.



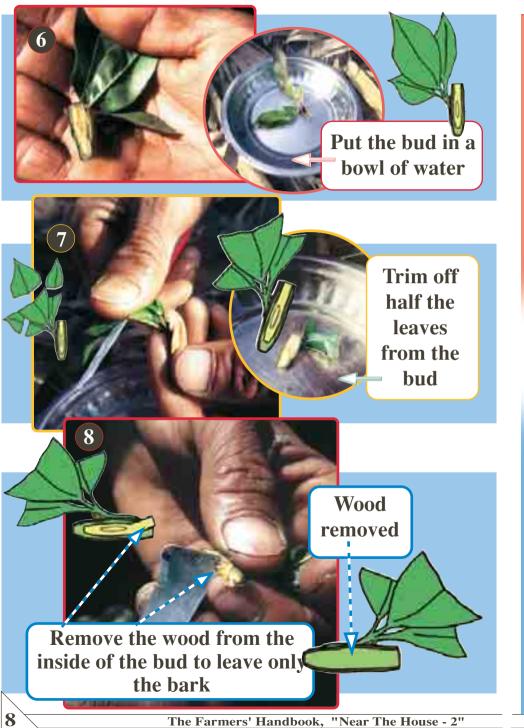
Part 6, binding the bud with plastic, is continued after the colour pictures

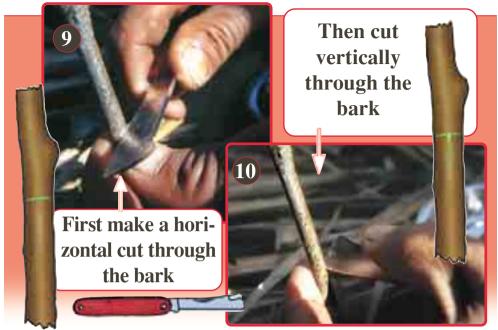
The Farmers' Handbook, "Near The House - 2"

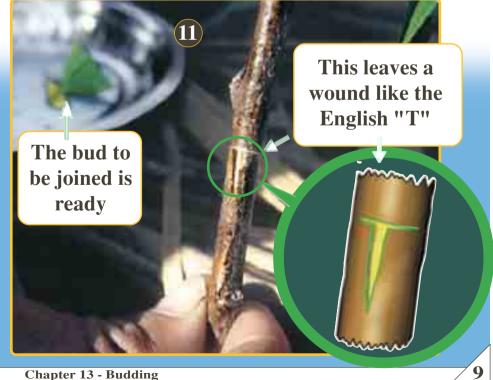
Let's See

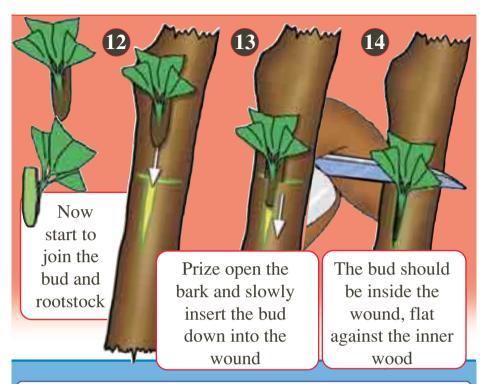
how to do Budding





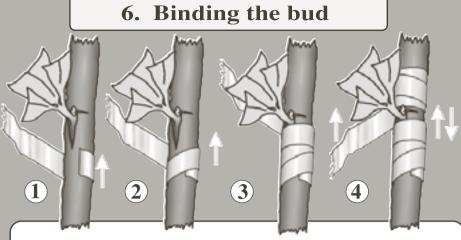




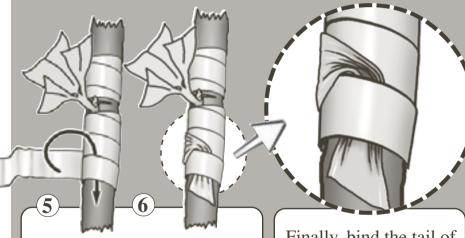


See page 14 for an organic alternative to plastic





After inserting the bud use an inch-wide strip of thin plastic to bind it fairly tightly onto the rootstock. Cover the wound, binding from the bottom to the top and back down again.



Don't cover the bud and leaves with the plastic, leave them outside.

Finally, bind the tail of the plastic so it points down to allow any rain to run off

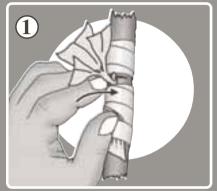
See page 14 for an organic alternative to plastic

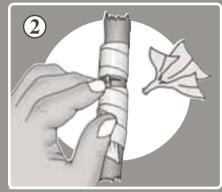
Chapter 13 - Budding

Maintenance

How to maintain a budded seedling

How to tell if the budding is successful

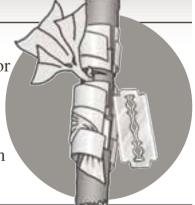




Two weeks after the budding is done, gently pull at the leaf stems on the bud. If the leaf comes away easily from the base, even by just touching it, the budding has been successful. If the leaf does not come away even with a stronger tug, and slowly dries up, then the budding has probably failed Then you can try again by grafting in the winter.

Removing the plastic

Whether the budding is successful or not, the plastic needs to be gently cut and removed after 3-4 weeks otherwise it will "strangle" the growing seedling. This can kill even a successful bud.



Things to do after budding is complete

Give plenty of water to the seedling immediately after budding. Keep the budded plants well mulched. Make a thatch to shade the seedlings from the hot sun. Water and



weed the seedlings as necessary. Carefully remove any buds that sprout

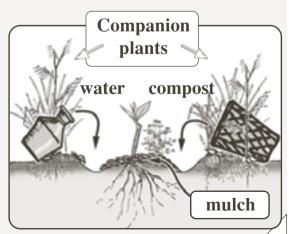
below the new bud. In the autumn after the budding was done, carefully cut off the top of the seedling just above the new bud.



Planting the Seedling

If the seedling is deciduous (that is it drops its leaves in winter) the budded seedling can be planted out in late winter. If the plant is evergreen it is usually planted in the summer. A good place to plant such a valuable seedling is in an

old pit latrine. Otherwise, dig a pit one metre deep and one metre wide, fill it with compost and soil, and plant the seedling there. Full information about this is given in the chapter *Fruit Tree Planting*.



Chapter 13 - Budding

An easy way to irrigate fruit trees

Bury a porous clay pot about 50cm away from a newly planted fruit seedling. When this is filled with water, it soaks out of the pot directly to the root zone of the seedling. Instead of a pot, the hardened shell of a bottle gourd can be used, with a small hole made in the base.





You can also use the skin of the sisal leaf (Agave) to bind the bud. As shown here, carefully peel the skin from the leaf. See chapter no: 10, Introducing Home Fruit Production for more details

The Farmers' Handbook, "Near The House - 2"

Farmers' Experience

Mr Lal Bahadur Budhathoki

From Nepal, Jajarkot district, Khalanga - 5, Pokhara village, Mr Lal Bahadur Budhathoki has done plenty of budding. Now let's hear about his experience.

I first learned about budding from the Homestead Programme (JPP) and came home and started budding improved peach onto our local, wild peaches. Budding is done in late June, and when other local



Lal B. Budhathoki

farmers saw, they were amazed that you could transfer just a bud from one tree to another. I budded peach onto wild peach, and pear onto our local wild pear, but this wasn't as good as the peach. Now the local Farmers' Group has started to do it. Everyone thinks it's great, and it's cheap too. The budding is done in late June, and then the top is cut off in the Autumn to allow the bud to grow on up. If it fails, it doesn't affect the tree and you can graft again in the Winter. Also, if grafting is unsuccessful in the Winter you can do budding on the same plant in the Summer. Either way the seedling isn't wasted. We don't use fancy grafting knives - just a razor blade and *ashi* (local cutting hook) are enough. The plastic is to keep out air and water, but needs removing quickly, within the month. ??



Read On!





Fruit Nursery chapter

How to grow root stock from local wild fruit seed at home for grafting and budding on your own land.





Fruit Tree Planting chapter

After raising good seedlings in the fruit nursery, if they're not planted well all the work can go to waste. Information is given in this chapter.





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





Agroforestry chapter

Planting trees on farmland can bring farmers many benefits. But you can't plant any type of tree, nor anywhere. This chapter gives information on how to plant trees without affecting farm yield



Grafting, Top Grafting, Stone Grafting & Air Layering chapters

Here is more information about various simple methods of growing improved fruit varieties at home for planting on the farm.





What is Stone Grafting?

In the tropics and sub-tropics, many farmers like to plant mango trees. Demand for good fruit is increasing, and farmers are understanding the benefits of this. Farmers want to plant mangos, but often the seedlings aren't available, or if they are, they're expensive. But there is an easy way of producing good quality mango seedlings. This is called Stone Grafting. Using this method, mango seedlings can be grown quickly and cheaply at home, produc-



Grafted mango in fruit, Nepal

ing good quality fruit. Grafted trees also are fast to produce fruit. This means that poorer farmers can easily plant mangos without going into debt, and get faster benefits.

In this booklet you can learn how to do stone grafting for quick and easy mango production at home.

Why do Stone Grafting?

Nowadays most mango grafting is done using the "Inarching" method. But this takes 2-3 years to produce a seedling, which is why mango seedlings are so expensive. Also, in Nepal, the skilled grafters live in the south, so it is difficult to obtain mango seedlings in the poorer northern hill districts. Transport is expensive, and many seedlings can die during the journey in the hot summer, when they are distributed. Seedlings costings 2 or 3 times as much after they have been transported from the nursery into more remote hill districts.

So there are many benefits from using **stone grafting** to produce mango seedlings:-

- quick production while it takes 2-3 years to produce a seedling for distribution with inarching, it takes 2 months with stone grafting;
- stone grafted seedlings are cheap to produce
- stone grafting is an easy method
- many seedlings can be produced in a small place, unlike inarching
- seedlings can be produced near to where they are to be planted

This Booklet's Author: Chris Evans Appropriate Technology Asia, Nepal



The Farmers' Handbook, "Near The House - 2"

How to do Stone Grafting?

When to do Stone Grafting?

Stone grafting is done in the early summer, at the time when wild mangos are ripe and the tips of the branches have new red shoots.

Where to do Stone Grafting?

A stone grafting nursery can be made at home on a small plot to grow just a few plants, or on a big plot with 2-300 plants. One square metre of nursery bed can contain about 100 plants. For this, a well shaded spot is needed, protected from livestock, and easy to visit for care and maintenance. If possible, there should be good fruiting mango trees nearby from which to take scion for grafting.



How to do Stone Grafting

plastic

1. Planting the Seed

• Fill the polypots with fertile soil.

• Dig a trench for the nursery bed, about 4-6 inches deep. The width and length of the trench depends on how many seedlings are to be produced.

• Lay out the thick plastic in the base of the trench.

• Place the filled polypots in the trench.

• Collect ripe seed from healthy, diseasefree wild local mango trees. They ripen at just the right time for stone grafting.

• Sow the seed in the polypot and cover with the soil.

• Watch for when the seed starts to germinate. Within a week, the first seeds will start to grow, but they won't all start at the same time. Keep the sprouted pots in one place.

With stone grafting it is important to keep note of the time when the rootstock germinates. On the next page is a type of calendar showing which work needs to be done, at what time.

on mother scion from 7 days after the seed has sprouted trim the leaves on the scion until a week around tip of branch don't do 6 after 3,4 but don't branch a good cut it) sprouts root-Types of work done in Stone Grafting Scion on the mother tree is prepared preparing the scion on the mother tree; a daily calendar of when to do (a) seed germinates in the polypot. The counted as sprouts is day One description of work is in 3 parts preparing the rootstock; given. ootstock plant and (b) is C when to do prepare scion preparing (a) and (b)on mother tree rootstock **Booklet 14 - Stone Grafting**

The Farmers' Handbook, "Near The House - 2"

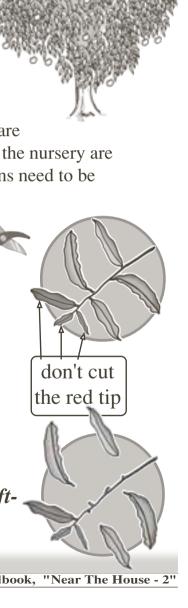
2. Preparing the Scion

A scion needs to be cut and brought from a healthy, good fruiting mango tree. This is called the mother tree. Before the scion is cut it needs to be prepared while still on the mother tree, and the time to do this depends on when the rootstock seed had sprouted in the nursery. Five to seven days after the seed has sprouted in the nursery, you need to go to the mother tree and prepare the scion. However many seedlings in the nursery are 5-7 days old, the same number of scions need to be prepared on the mother tree.

Preparing the Scion

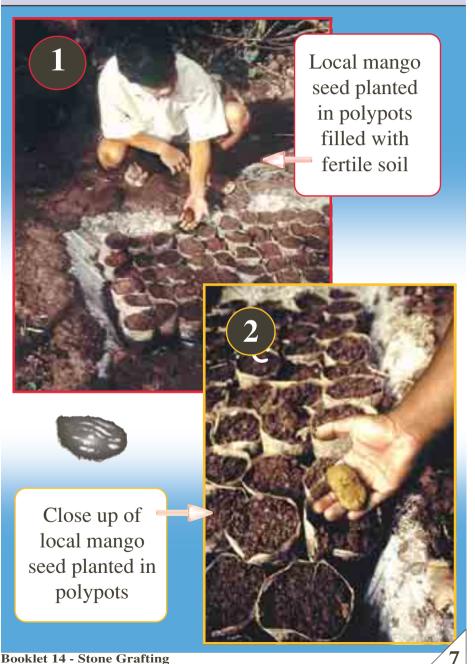
Go to the mother tree and select branches for scions. If the branch has red sprouting tips, then it is suitable to use as a scion. The branch and tip should be healthy and disease free. Now trim off the leaves around the tip for a length of about 6 inches, but don't trim the tip itself.

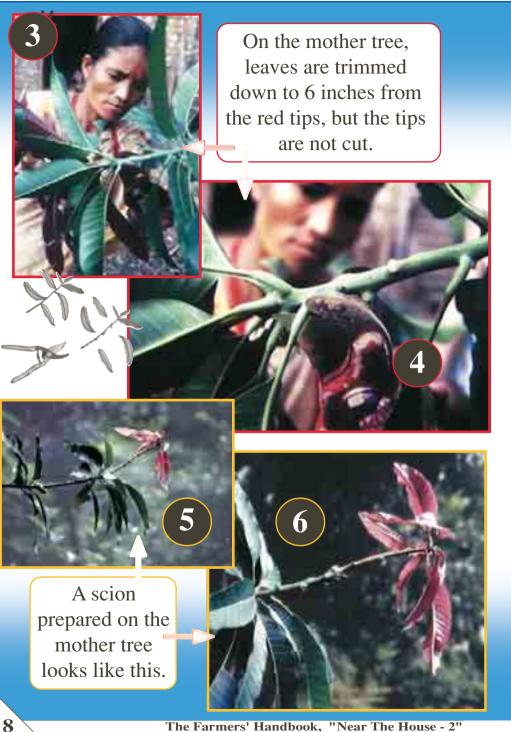
> The third part of Stone Grafting is continued on p.11.



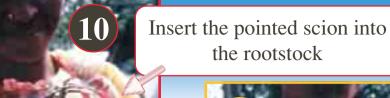
Let's See

how to do **Stone Grafting**













The grafted seedling is then put inside plastic. There are 2 methods: for a single seedling cover and tie with a plastic bag (left), or for a whole nursery, cover with a plastic sheet (right).

3. Cutting the Scion

The trimmed branch will be cut for use as a scion to join to the rootstock, but not yet. It will be another week before this is done, and until that time the trimmed, red branch tip will remain on the mother tree.

• After 7 days return to the mother tree to collect the scion.

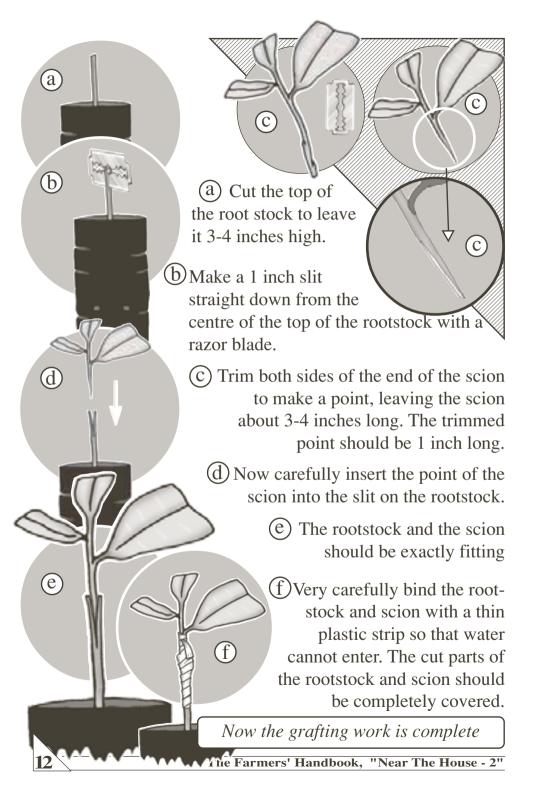
• Using secateurs or a sharp tool, cut the branch 6 inches from the red tip. As soon as it has been cut, put the scion in a glass of water. This is because it is very soft and will otherwise dry out quickly.

• When the scion is in the glass, trim each leaf as shown. This also reduces water loss.

• Now take the scion to the nursery, where it should be grafted immediately onto the rootstock.

4. Grafting the scion to the rootstock

• By this time, the seedlings growing from the local, wild mango seed should be 12-14 days old. Their leaves and stem should be soft and red, like the scion on the mother tree.

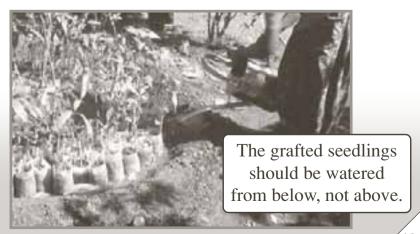


Maintenance How to maintain a grafted seedling

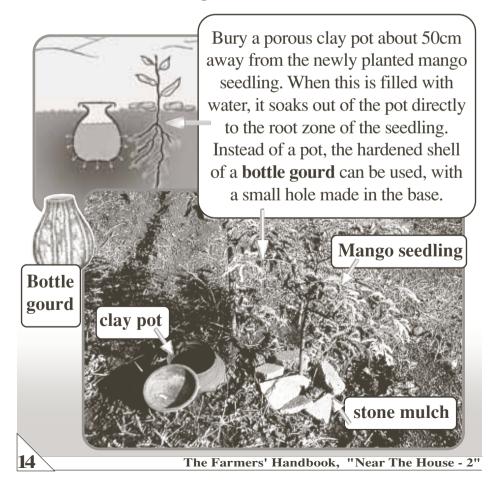
Care for the seedling after stone grafting

At first the grafted seedling is very weak. Even though it may be well grafted, if it is not cared for properly the graft can fail and all the work will be wasted. Care should be given as described below.

- The seedling should not be touched or moved.
- The seedling needs lots of water. However, water cannot be given from above because the falling water will shake the seedling and the graft can break. Therefore, water should be given from the bottom by pouring it into the trench where the polypots are placed. This will seep into the polypots through the holes, and go directly to the roots. This is better for the seedling.
- The seedlings need to be kept in a moist environment. So cover the nursery with plastic and bury the edges, like in the hot bed nursery, so no air can get in. Only open when watering.



- The seedlings should be well shaded.
- Within 1-2 weeks you will know if the graft has been successful or not. If not, the top will dry out and die.
- If the graft is successful, the seedling can be planted out into its permanent position after 2 months in the nursery. For this, a pit needs to be dug and composted beforehand.
- The mango may flower after a year, but it is not good to allow it to fruit for at least 3 years. During this time, the flowers should be removed to stop fruiting.
- How to plant fruit trees such as the mango is descibed in the *Fruit Tree Planting* booklet.

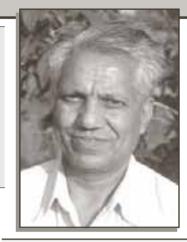


Farmers' Experience

Mr Ishwari Prasad Panti

From Nepal, Rupandehi district, Butwal town, Mr Ishwari Prasad Panti is a horticulture expert who has done lots of stone grafting. Now let's hear about his experience.

The first thing to pay attention to in stone grafting is the nursery. The rootstock as well as the mother tree need good care.



Mr Ishwari Prasad Panti

When grafted, the seedlings should be under plastic, and in the shade. In the full sun, all the work will be wasted. Too much wind can also dry out the seedlings. For the rootstock, plant ripe seed from wild, local mangos (which grow everywhere) in the nursery. After the rootstock has germinated, it is grafted when it is red. The scion from the mother tree should also be red. One week before grafting the scion should be trimmed while still on the tree. The rootstock should be cut to 3 inches tall, and slit down the middle. The scion should be the same size, and cut to a 1 inch point. Making sure the edges are matching, the scion is inserted into the rootstock. This method is very quick, and I can get a 65% success rate. It's also possible to stone graft even when the rootstock seed has just split and the stem is just pushing out.

Booklet 14 - Stone Grafting



Read On!



Subjects Related to Stone Grafting



Fruit Tree Planting booklet

After raising good seedlings in the fruit nursery, if they're not planted well all the work can go to waste. Information is given in this booklet.





Integrated Fruit Orchard booklet

Information is given in this booklet on how to plant fruit trees with various other multi-purpose trees, giving extra and quicker benefits for less work.





Agroforestry booklet

Planting trees on farmland can bring farmers many benefits. Different types of trees grow better in different places. This booklet gives information on how to plant trees to increase farm diversity and productivity, without affecting crop yield.





Pit Latrine booklet

A fruit tree grows best if planted in a big pit. If you have an old pit latrine to plant in, you can double the benefits. In this booklet learn how to make a hygienic, cheap and productive pit latrine.



