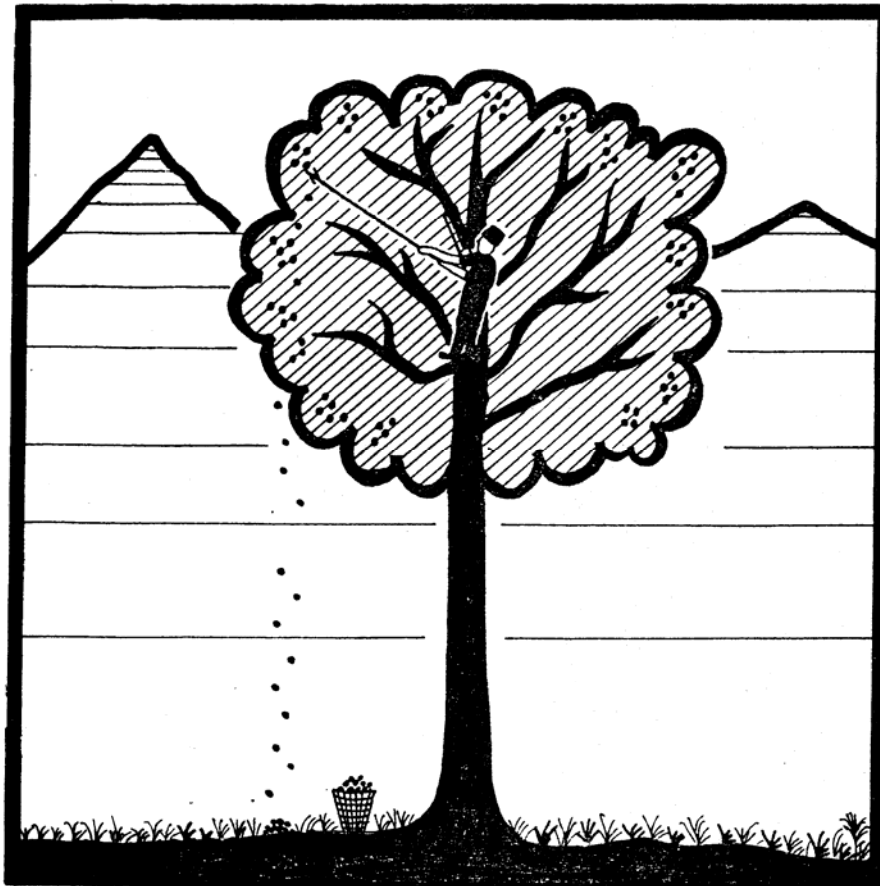




NR Study-Note F120b GUIDELINES FOR TREE SEED COLLECTION



Based on text and graphics in:
TREE SEED HANDLING:
A manual for field staff in Nepal.
Field Document No. 11
HMG/EEC/ODA National Tree Seed Project
HMG/UNDP/FAO Community Forestry Development Project
by A.M.J.Robbins and N.B.Shrestha (1986)

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Revised July 2004

PREFACE to the original document

Obtaining adequate supplies of high quality, healthy seeds for the Community Forestry Project is a recurring problem. This is made more difficult as we use as many as 80 different species to suit the ecological requirements of the various sites, as well as to meet the preferences of the farmers who need tree species for fodder, fuel or multipurposes.

The original nursery manual published as a Field Document (No. 2b) devoted only one chapter to seed collection and the subject was treated only in a very general manner. The present document has treated the subject of "Seeds" much more thoroughly with detailed guidelines for seed collection, seed processing and treatment, rules for seed storage and finally testing the seed that has been collected. It is primarily meant for those involved in reforestation and afforestation. The document is well illustrated with sketches and written in both Nepali and English making it easier to comprehend. It is highly commendable that complex scientific information about various aspects of seeds have been discussed in such plain and simple manner.

Seeds are the most essential basic resource material for raising successful plantations. Better seeds grow into better seedlings which ultimately, will grow into healthy trees. Therefore, this document will go a long way in solving practical difficulties in seed collection i.e. from tree climbing and harvesting to seed storage and distribution and will encourage field staff to collect quality seeds to ensure good quality plantations.

We are appreciative and also indebted to Mr. Marcus Robbins, Silviculturist, ODA and Mr. Narendra Bahadur Shrestha, Chief, Afforestation Unit, CFAD for preparing such valuable guidelines. We are sure that all concerned will find it purposeful and of practical utility.

M. S. Ranatunga, Chief Technical Advisor, Community Forestry Development Project

B. P. Kayastha, Chief, Community Forestry and Afforestation Division

INTRODUCTION to the original document

Afforestation in Nepal is currently around 15 thousand hectares per year, equivalent to 30 million saplings. This production requires at least 150 million viable seeds, equivalent to 15 tonnes of seed per year or 150 tonnes of fruit. These amounts will double within 5 years.

In view of this demand for seed, HMG/N has agreed to start a National Tree Seed Project (NTSP), with assistance from the European Economic Community (EEC) and the UK Overseas Development Administration (ODA), with the object of ensuring adequate supplies of high quality seed for all programmes of reforestation within the Kingdom of Nepal. The NTSP is based at the national Tree Seed Unit facilities of the Community Forestry and Afforestation Division (CFAD), which were established in 1981 under the Nepal Australia Forestry Project.

The geography of Nepal means that it is neither practical nor advisable to collect and distribute such quantities of seed as a centralised operation, and therefore each forest district or project must endeavour to become self-sufficient in seed supplies as far as is possible. The strategy of the NTSP is, therefore, to provide support to the districts in achieving this self-sufficiency, and to take responsibility for aspects of seed supply that the district cannot handle.

As a first step in providing such support, this manual has been written for District Forest Controllers and their staff, with the aim of ensuring that proper seed handling practices are used in each forest district. The manual was originally written as 4 separate technical leaflets which have been put together under one cover. The manual covers general techniques only, and detailed handling of individual species will be published by the NTSP as separate leaflets.

The authors are very grateful for the help of many people in the preparation of this guide, in particular to: Mr. B. P. Kayastha and Mr. M. S. Ranatunga for their suggestion and support in producing the manual as a field document of the Community Forestry Development Project; the staff of the Forestry Research Project for their invaluable help in commenting on the text; Mr. Debendra Amatya (Forestry Services) for his willing assistance in translation into Nepali; and to Secretarial Support Services for arranging publication.

Readers who require further information, or have any comments or queries about the manual, are asked to write to the authors at the CFAD, Hattisar, Kathmandu.

A. M. J. Bobbins, (Technical Advisor, ODA)

N. B. Shrestha, (Chief, Afforestation Unit CFAD)

NOTE on the current publication

The first leaflet of the original manual has been reformatted here, in electronic form, with some modifications, as a follow-up to a study commissioned by FAO, to make tree seed extension literature more widely available. I am very grateful to Pierre Sigaud at FAO for his original initiative and support in doing this. The current version is one in a series of NR Study-notes produced by the author, for use in training courses.

The document may be freely edited, provided acknowledgement of the source is made. The graphics are available in TIFF format for editing, if required.

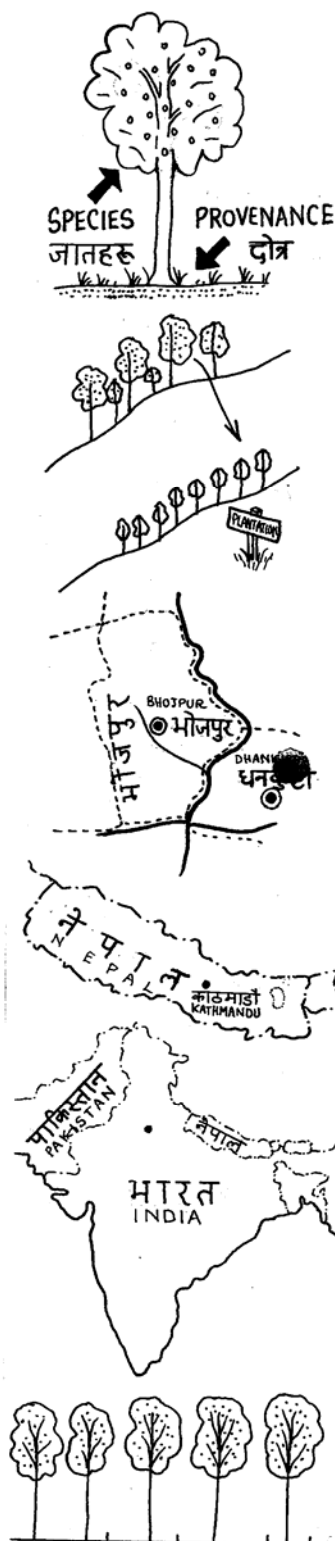
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A.M.J.Robbins

Oxford

July 2004

VERSION July 2004



1 WHERE TO COLLECT

1.1 Where you collect is important

The place where seed is actually collected from is known as the seed **PROVENANCE**. Remember that whether you collect your own seed or receive it from a supplier, planting the right provenance is as important as planting the right species.

1.2 Sites should be matched

Trees generally grow best when planted on sites that are similar to the sites where their parent trees were growing. This is because the trees are accustomed or adapted to that type of site. The site type is determined by many factors such as altitude, longitude, altitude, aspect, rainfall and soil.

1.3 Local seed is safest

Usually, the safest way of ensuring that the sites are as similar as possible is to collect at a similar altitude from near to the planting site i.e. within your district. If no nearby seed sources are available, and seed has to be collected from neighbouring districts, arrange collection from areas with a similar altitude and rainfall (see note 1).

1.3 Exotic seed requires care

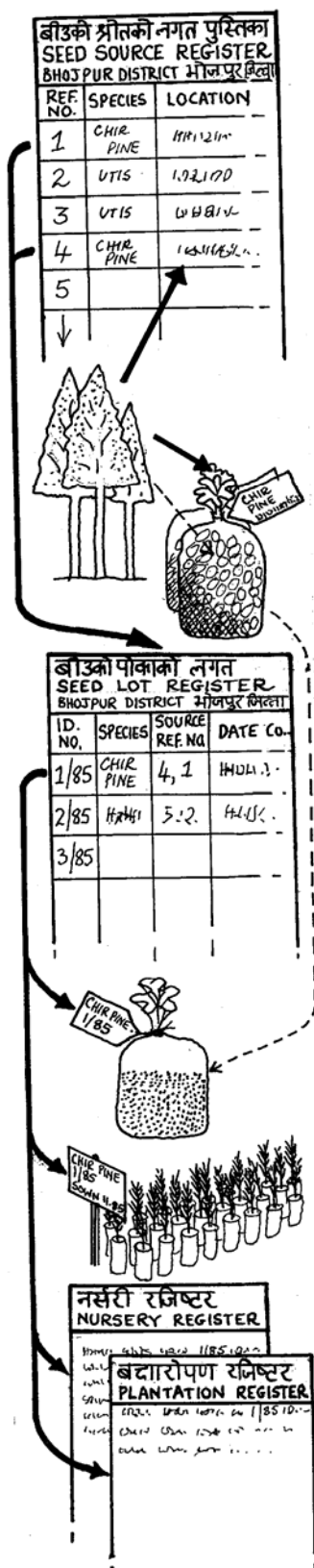
Sometimes, seed from very distant or different sources will grow better than local sources of the same species. Occasionally, a species which does not have a local or even national source (i.e. **EXOTIC** species) may grow better than local **(INDIGENOUS)** species e.g. *Eucalyptus camaldulensis* or *Pinus patula*. However, they should only be used if they have been properly tested.

1.4 Plantations can be used.

If there are no plantations of exotic species, then seed must be ordered from abroad. However, if there are already plantations, they may be suitable for seed collection. Check with the national seed centre first before carrying out collections and using the seed.

1.5 Sources can be improved:

Natural stands or plantations can be managed to improve seed production. If there are no suitable sources, special seed stands can be planted, either of local or exotic species.



1.6 Register your seed sources:

It is very important to keep a register of actual or potential seed collection areas within your district or project area. The register should give details of the species, location, extent and site. Each source should have a reference number (see note 2). If possible, the location should be marked on a map.

1.7 What use is a register?

The register will help you in the following ways: (1) If you know exactly where and how large the seed sources are, future collections can be planned more easily. (2) If there is a danger of seed sources being cut down, steps can be taken to preserve them. (3) If, in the future a particular seed source grows well, then you will know where to collect more of the same seed (4) If you decide to improve some sources, the register will help plan where to do it.

1.8 Keep seed lots separate:

Seed collected from different species must always be kept separate as distinct seed lots. If a particular species is collected from several separate sources, only mix these to form one seed lot IF the site types are similar. If some sources are very different, keep them as a separate seed lot. Never mix seed lots from different year's collections.

1.9 Register your seed lots:

Every seed lot collected in your district should be registered with details of species, seed sources, date of collection and name of collector (see note 3). Each seed lot should be given an identity no., so that it can be easily distinguished from other seed lots. The number, with the species name, can be used for identifying seed in store; plants in nursery; and in plantation registers. Note that all seed sent from the TSU or regional stores will have its own identity no., which should be used instead. (see note 4)

1.10 Good labelling is essential:

Information on seed sources and seed lots will only be of use if fruits, seeds and plants are properly labelled to maintain identity; Until an identity no. has been assigned, fruits and seeds should be labelled with species name, sources, date and collector. A duplicate label should be put inside all containers, in case the outer one is lost.

2 WHICH TREES TO HARVEST

2.1 Collect from good seed trees:

Seedlings generally grow to be like their parent seed trees. The quality of a plantation will only be as good as the quality of the parent seed trees. Therefore, seed should only be collected from trees that you would like to see in your plantations or farm.

2.2 What is a good seed tree?

This depends on the species to be collected and its use. Trees used mainly for **TIMBER** should be tall, straight, with light branching and no forking. **FODDER** trees should be shorter, bushy, with a large crown and dense foliage. Trees for **FUELWOOD** can benefit from abundant branching. Trees used for reclaiming sites have no particular characteristics. All seed trees should be growing vigorously. Obviously, they should have a reasonable amount of fruit, especially if the tree is grown for its edible fruit as well.

2.3 Avoid unhealthy trees:

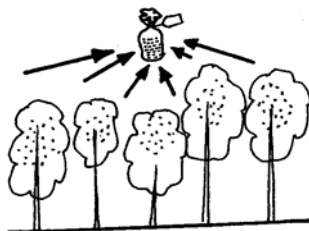
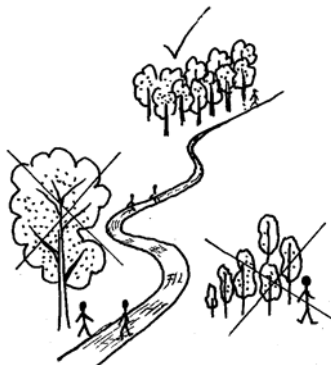
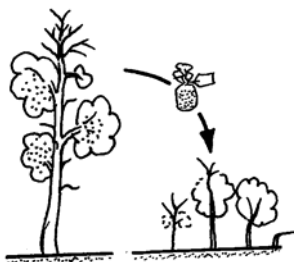
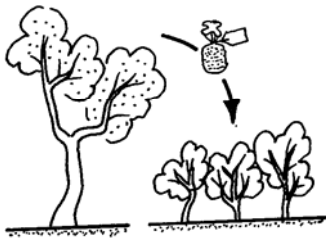
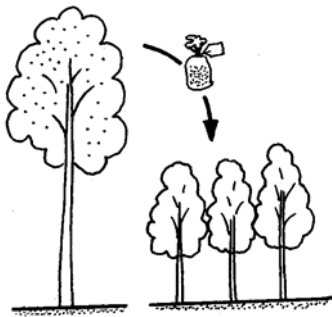
Do not collect seed from trees that look suppressed, diseased or generally unhealthy. Sometimes it is tempting to do so, because such trees tend to produce an abundant fruit crop, and they can be shorter and easier to climb. However, the seedlings produced from such seed will very likely be susceptible to disease.

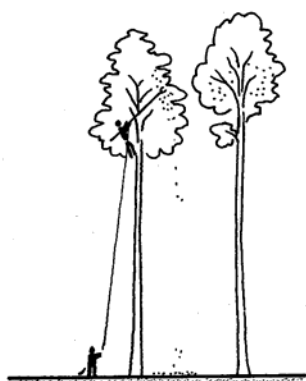
2.4 Avoid young or isolated trees:

If you are collecting seed from a species that normally grows in groups or stands (eg. Utis, Chir pine, Sissoo) avoid collecting from very isolated trees. Such trees may have many fruits, but many of the seed within may be empty due to poor pollination. For the same reason, do not collect from very young trees.

2.5 Collect from several parents:

A seed lot is generally best if it is made up of seed from several seed trees, and not just from one or two that happened to have many fruits. If the seed lot comes from many parents, there will be more variety in the seedlings, and they will have a better chance of forming a healthy plantation.





| | |
|--------|-------|
| SACK | बोरा |
| ROPE | डोरी |
| CUTTER | काटने |
| STRING | घागी |
| LABELS | लेवत |



3 HOW TO CLIMB THE TREE

3.1 Climbing requires care:

Some trees can be harvested without climbing them, but it is generally necessary to do some climbing. Tall, well formed trees with few branches, typical of good timber seed trees, are not so easy to climb, and care must be taken to avoid accidents.

3.2 Local methods can be safe:

The Seed Centre and its regional stations will be providing equipment and training for climbing difficult trees, but this will be limited to special collection teams of the Seed Centre, and to a few climbers per district. Many of the climbers you employ will therefore continue to use local methods which can be quite adequate and safe if a few rules are observed, listed as follows

3.3 Employ good climbers:

Try to ensure that only people who are strong, agile and like climbing actually work as climbers. A competent climber with no equipment is probably safer than an inexperienced climber with equipment that he doesn't know how to use.

3.4 Insist on a safety rope:

A climber should always take a length of rope with him and keep himself tied to the tree whenever possible while harvesting fruits. Besides protecting himself lest he slip, the rope can help him reach the fruits better. Always put the rope AROUND the stem, and then over a branch. (see note 5)

3.5 Check branches:

This will be common sense to locals who climb a lot. However, it should be emphasised that branches should be checked before being used to support the climber's weight. The strongest part is at the base of the branch.

3.6 Provide the right tools:

Make sure that the right harvesting tools and handles are available and used. Incorrect tools make harvesting difficult, cause damage to the tree, and can be dangerous to use.

3.7 Have an assistant:

It is always a good idea if the climber has an assistant on the ground, as he can gather fruits as they are cut, and also help if the climber has any problems.

| COLLECTION TIMES | | | | | | | | | | | | | |
|------------------|--------|---|---|---|---|---|---|---|---|---|---|---|-------|
| BHOJPUR DISTRICT | | | | | | | | | | | | | |
| SPECIES | MONTHS | | | | | | | | | | | | NOTES |
| | J | F | M | A | M | J | J | A | S | O | N | D | |
| CHIR PINE | x | x | x | x | | | | | | | | | |
| UTIS | x | x | x | | | | | | | | | x | |
| ↓ | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

4 WHEN AND WHAT FRUITS TO HARVEST

4.1 Know your collection times:

A list of species and dates for collection is a great help for planning seed collections. You can find details in several publications already available. However, the dates given are general, and your district may be very different from the average. Therefore it is necessary to check and correct these lists, or make your own. Remember that the dates can vary from year to year, too. (see note 6)

4.2 Check well ahead:

Since collection times vary by several weeks from place to place and year to year within a district, ask field staff to keep you informed of how fruits are ripening, well in advance of the normal collection dates.

4.3 Collect mature seed:

When collection is started, it is very important to collect fruits only when the seeds within are properly developed and mature. Mature seeds have the best chance of storing well and producing the highest number of healthy, vigorous seedlings in the nursery. Therefore, make sure that the fruits picked are properly ripened, and neither too young nor too old and overripe.

4.4 When are fruits mature?

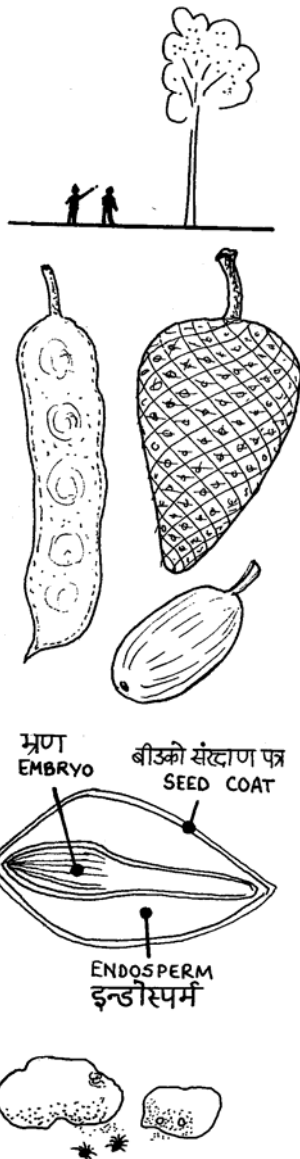
In general, fruits that naturally dry out on the tree are ready to pick when they are almost dry, brown in colour, and about to open (if they are the type that open) e.g. Chir pine, Siris. Fruits that are fleshy and do not dry out on the tree are ready when they have changed from green to their normal ripe colour e.g. Chiuri, Champ.

4.5 A cutting test can help:

A simple way of checking ripeness is to extract some seeds from a sample of fruits, and cut them in half using a razor blade. The contents should be white, firm, and should fill the seed coat with a few empty spaces. This test can also help you estimate the yield of seed from fruits.

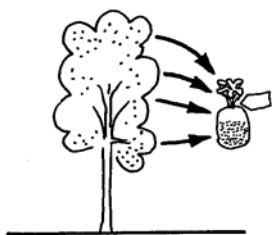
4.6 Avoid unhealthy fruits:

If fruits have a lot of insect attack or are mouldy, do not collect them. Be very careful about collecting fruits that have already fallen from the tree. They may be old and the seeds within may have lost viability.



4.7 Harvest the whole crown:

Try to collect fruits from the whole crown. The more easily accessible fruits on the lower branches tend to have fewer good seeds than those higher up, so the higher fruits are worth climbing for.



5 HOW TO HARVEST FRUITS

5.1 Don't damage the tree!

It is very important to harvest fruits carefully without damaging the tree. The seed collector should realise that you and he may need to collect seed from the same tree again.

5.2 Cut as little as possible:

Whenever possible cut only the fruits and not the branches, so that the young flowers or fruits of next year's collections are not damaged. If the branches have to be cut, try to cut as little of the branch as possible.

5.3 Cut, don't tear:

Fruits or branches should be removed by cutting with a sharp bladed tool. This should be done cleanly. Do not make large wounds by breaking or tearing down branches, as the tree will then easily become diseased.

5.4 Use the right tool:

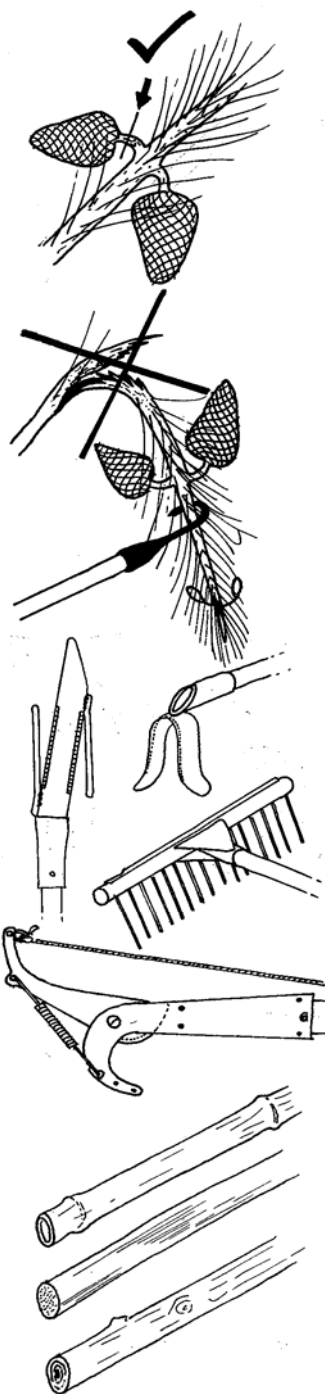
Examples of cutters used for removing fruits are shown opposite. The simple hook can be used for most species. The bell hook is used for most pines. The rake is used for small fruits. If branches have to be cut, then do this using a sharp knife, saw, or pruning shears. The Seed Centre can supply these cutters on request, or drawings showing how to make them.

5.5 Good handles are important:

The cutters should be fitted with rigid, lightweight, and sufficiently long handles; so that the fruits can be reached easily. These should be made locally from bamboo, cane or saplings.

5.6 Gathering fruits:

It is usually easiest to let the picked fruits drop to the ground, and then gather them there. This will be quicker if the ground is cleared of unwanted vegetation so that the fruits can be found easily.



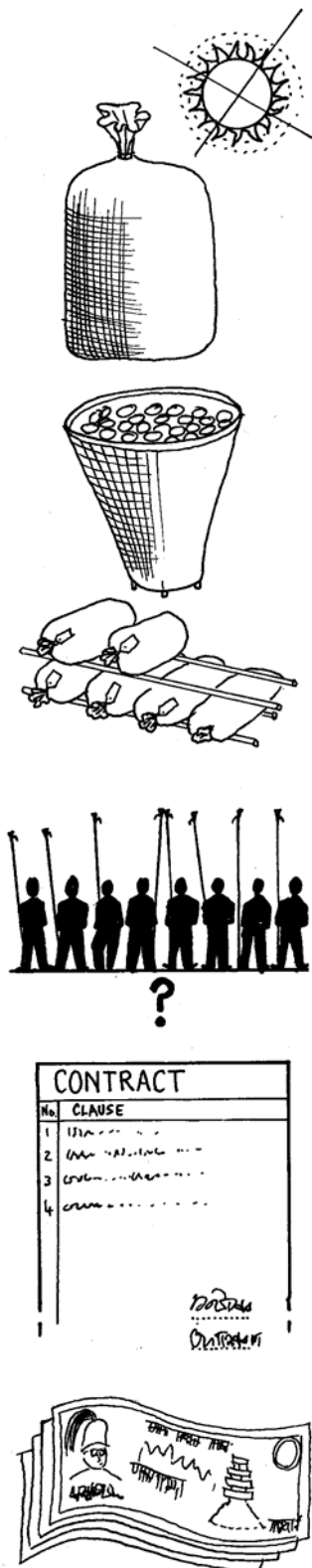
6 TRANSPORT AND STORAGE OF FRUITS

6.1 Keep fruits dry and cool:

The fruits may have to be transported long distances and stored for some time before the seeds can be removed. It is important to keep the fruits dry, cool and well ventilated during transport and storage, so as to keep the seeds inside them healthy.

6.2 Use woven containers:

Suitable containers for transport and storage are sacks with an open weave, or baskets such as a doko. Do NOT use closed containers such as tins or plastic bags. All fresh fruits respire after harvest, and the moisture and heat will be trapped in a closed container, causing the fruits to ferment and go mouldy. This will weaken or kill the seeds inside. Keep containers in the shade with plenty of ventilation. Sacks can be stacked on poles so that there is space between the sacks, and they do not touch the ground. Alternatively, hang them from the roof using hooks or rope.



7 ORGANISING AND PLANNING COLLECTIONS

7.1 Finding enough labour:

The seed of many species mature at similar times, which makes it difficult to find and organise enough people to collect the seed. It is therefore important to plan well in advance how this can be done. National holidays or festivals must be taken into account also.

7.2 Collecting by contract:

One way of solving the labour problem is to contract private individuals to do the collection. However, this makes it very difficult to ensure that the guidelines given in this leaflet are followed. Verbal or written agreements must be very clearly stated and upheld by adequate supervision.

7.3 Getting enough funds:

There are two points to consider here. Funds should be adequate to enable large collections, should a bumper crop occur, and they should be available at the right time. Therefore, plan well ahead, justify your budget carefully, and take into account delays in budget release.

Trees that are heavily exploited for firewood, fodder or fruit may not get the chance to produce seed for collection. In this case, it will be necessary to pay the owner to reserve the tree so that a seed crop can be produced.

If District staff carry out collections, they will have to be paid a daily wage. However, if private individuals are contracted, then it may be better to pay by number or volume of fruit harvested. Care must be taken to set a fair rate of pay, and that no short cuts are taken. This is very tempting when payment is by rate of work (see note 7)

10000 बिस्वाइए
10,000 PLANTS
20% दुसाउने
25% MORTALITY
80% GERMINATION
24% नोवसानी
600 FRUITS / DOKO
600 फल/डोको
1/2 DOKO / TREE
1/3 डोको/रुख

To calculate how much is enough, you should have some idea of the following:

- No. of plants required
- Losses in field and nursery
- Germination percentage
- No. of seeds per kilo
- Yield of seeds from fruits
- Yield of fruits from trees

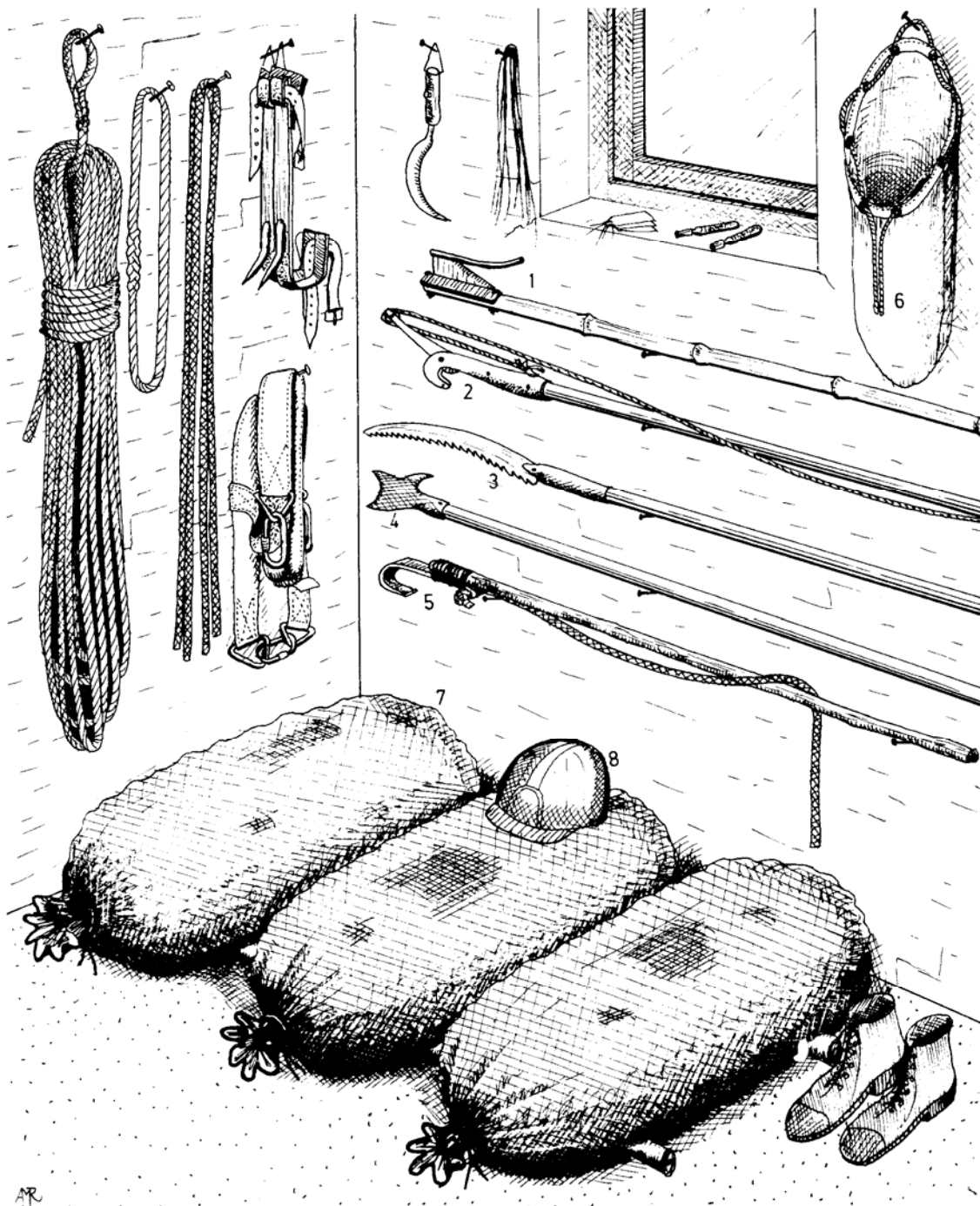
Some of this data may not be available, so a guess must be made. However, with experience, it should be possible to get good estimates, which should be recorded to help further calculations.

Some species give good seed crops only periodically, say every 2 or 3 years eg. Chir pine. In this case, it will be worthwhile collecting 2 or more year's supply in good seed years, and storing the excess at the Seed Centre or one of its regional stores. Besides ensuring that you have enough seed if a seed crop is poor, it is also much cheaper to collect seed during bumper crops. Of course, this can only be done for seed that does not lose viability during storage.

An abundant seed supply must not be an excuse to waste it through improper nursery techniques etc. Seed costs time and money to collect, and is always worth storing properly or arranging for redistribution to other districts without sufficient supplies.

Example of seed collection equipment in nursery seed store

(from: *Forest Seed and Nursery Practice in Nepal*. Ian Napier and Marcus Robbins 1989.
Sahayogi Press, Kathmandu)



NOTE 1:

Altitude and rainfall: Try to match altitude to within 300 metres or 1000 ft. This can be the most important factor and greatly influences temperature and rainfall. It is not advisable to transfer seed over long distances from north to south or east to west. Sites in the western regions have less rainfall of which more falls in the winter than the east.

NOTE 2:

Register of seed sources: An example of a seed source register form is given on page 11 of this leaflet. As you get information from your staff on different sources, enter them in the register and fill in as much detail as possible. To aid reference, each source should be numbered consecutively. If required, separate lists can be kept of seed sources for each panchayat or species, noting the ref. no. only.

NOTE 3:

Register of seed lots: An example of a seed lot register form is given on page 12. As you receive seed lots at your office, note down the details listed. The seed source data can be given as the reference nos. mentioned in note 2.

NOTE 4:

Seed lot identity numbers: The identify no. given to each seed lot should consist of two numbers. The first number will be part of a series that is assigned as the seed lots are received. The second number should be the last two digits of the collection year. When a new year starts, the seed lot numbers will repeat, but followed by the new year. eg:

1/84, 2/84, 3/84, 4/84, 5/84, etc. for 1984 1/85, 2/85, 3/85, 4/85, 5/85, etc. for 1985

When labelling the seed, use the species name and the identity no. If the seed is sent outside the district (eg. for central storage), then you must add the district name as well, since this will distinguish the seed lot from other districts who will use the same identity number system.

It will not be possible to give identity numbers to all seed lots if they do not pass through your office - for instance, with seed collected and sown directly by the nursery naika. However, try to ensure that he keeps a record of his own collections.

Seed lots that are received from the NTSU or regional stations will have their own identity number, prefixed by the letters NEP. In this case, use the NEP no. in all labelling and registers and don't assign your own.

NOTE 5:

Ropes made of local fibre should be at least 1" in diameter and not damaged in any way. A length of 20 feet will be enough to secure the climber in most situations. Please note that if specialised tree climbing equipment is to be used, training must be given in the proper techniques and safety measures. Appropriate training and technical leaflets will be provided by the-TSU.

NOTE 6:

Collection times: The following publications give some details:

Plant propagation for reforestation in Nepal. M.W. Campbell. NAFP Technical Note no. 1/83.

Seed collection times for afforestation species. M. Campbell and S. Joshi. NAFP Technical note 1/78.

Manual on Nursery and Plantation Practices for Community Forestry Development, CFAD.

Booklet on Seed Collection Times, and Calendar. CFAD.

NOTE 7:

The NTSU will be studying collection times, periodicity of fruiting, and methods of estimating ripeness. Please note down your own observations on these aspects as they will be useful.

The NTSU will issue guidelines on rates of collection and pay. Your experience will be valuable, so keep notes on rates of work and yields from trees.

NOTE 8:

Calculating amounts: An example is given below. You must substitute your own figures, of course.

| | | |
|-------------------------------------|---------|------------------|
| NO. OF PLANTABLE PLANTS REQUIRED | 10,000) | |
| Viable seeds per plant = 3 | | |
| NO. OF VIABLE SEEDS REQUIRED | 30,000 | (10,000x3 |
| Germination percentage = 80% | | |
| NO. OF FULL SEEDS REQUIRED | 37,500 | (30,000/8 x 100) |
| Full seeds per fruit = 20 | | |
| NO. OF FRUITS REQUIRED | 1, 875 | (37,500/20) |
| Fruits per doko = 210 | | |
| NO. OF DOKOS OF FRUIT REQUIRED | 9 | (1,875/210) |
| Dokos of fruit per tree =0.5 | | |
| NO. OF SEED TREES REQUIRED | 18 | (9/0.5) |
| If seed is to be ordered by weight: | | |
| Full seed per kilogram = 9000 | | |
| NO. OF KILOGRAMS FULL SEED REQUIRED | 4.2 | (37,500/9000) |

Notes on calculations:

The relationship: viable seed per plant takes into account all losses in the nursery. 3-4 viable seed is typical for an average nursery. You will need to calculate for your own conditions. The germination percentage should be obtained from your own test (see technical leaflet 4) or from the NTSU. The yields of seed and fruit must be estimated at first, then confirmed by many samples over several years. The doko as a measure of volume can be substituted for any other convenient measure. The weight of seed required must be increased if the seed lot is uncleaned, and there are many empty seed in. it.

Examples of record forms

REGISTER OF SEED SOURCES FORDISTRICT

| Ref.No. | Species name Scientific/local | LOCATION AND SITE | | | AREA No. of trees |
|---------|----------------------------------|-------------------|------|-------------------------------------|-------------------------|
| | | Panchayat | Ward | Details of location, trees and site | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

SEED LOT IDENTIFICATION REGISTER.....DISTRICT.....YEAR

| Identity no. | Species name Scientific/local | Sources* | Collector | Date | Notes |
|-----------------|----------------------------------|----------|-----------|------|-------|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

* In the column Sources, enter the reference no. assigned in the register of seed sources