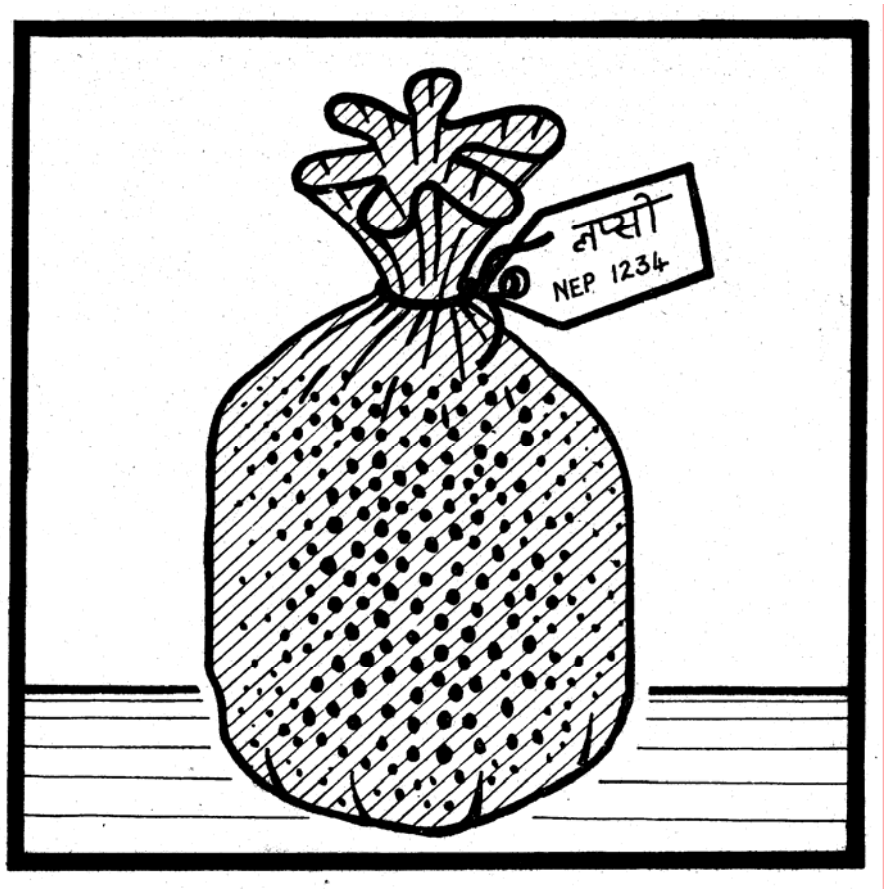
NR Study-note F120d

BASIC RULES FOR STORING TREE SEED



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)

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 astmany 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 reafforestation 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 third 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.
Please send any comments or requests to: marcus.robbins@virgin.net
A.M.J.Robbins
Oxford
July 2004

1 BASIC RULES FOR STORING TREE SEED

2.1 This technical note is one of several produced by the Tree Seed Centre. It has been written for District Forest Controllers and their staff, with the aim of improving seed storage under their control If you have any comments on the note, the Tree Seed Centre would be pleased to receive them.

2 WHY STORE SEED?

2.2 Forest districts will either collect seeds locally, or receive them from the Tree Seed Centre or other supplier already processed. In either case, the seeds will have to be stored for a few days to several months until the right time comes for sowing in the nursery.

2.3 If seed is sown at the wrong time, unsuitable plants will be produced for planting out, and survival will be reduced. Sometimes it is necessary to collect sufficient seed for two or more planting seasons if seed crops tend to be poor in some years. In this case, the seed will need to be stored for a year or more

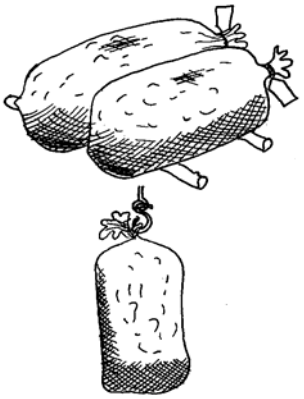
2.4 Storage must be done properly so that the seeds do not lose vigour and viability. Unfortunately, a lot of seeds are lost due to improper methods of storage, and there is need to improve them. This note outlines the basic rules for doing this.

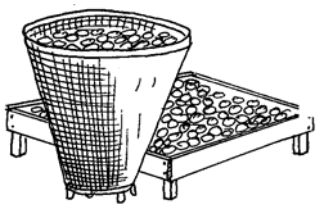
5 BASIC RULES DURING COLLECTION

5.1 If seeds are collected and processed locally, under the control of the district, then it is important to remember that high quality seeds store well, whereas low quality seeds store badly. Observe the following rules:

5.2 Collect mature seed:

Ensure that the fruits and the seeds within are fully mature when collected. Seeds will only store well if they have high vigour and viability to begin with. Immature fruits will have seeds that are not fully developed and weak, and over-mature fruits may have seeds that have lost vigour or even died.





5.3 Store fruits properly:

Keep stored fruits dry, cool, and well ventilated externally before extracting the seed. Fresh fruits respire after collection producing heat and moisture. This will cause the seeds within to lose viability due to fermentation and growth of moulds. Store fruits in open weave hessian sacks, stacked on poles or hung from hooks under shade. Alternatively, 'dokos', baskets, or specially made drying trays with gauze bottoms can be used. Always keep well off the ground so that the bottoms of the containers do not get damp. Protect from rodents!

5.4 Extract seeds quickly:

If the fruits are properly ripened, it is best to remove the seeds as soon as possible. However, do not expose unripe green fruit, such as pods, capsules or drupes directly to the sun, as the moist seeds within are easily damaged by heat. Leave the fruit in the shade until brown or an appropriate colour before putting in the full sun.

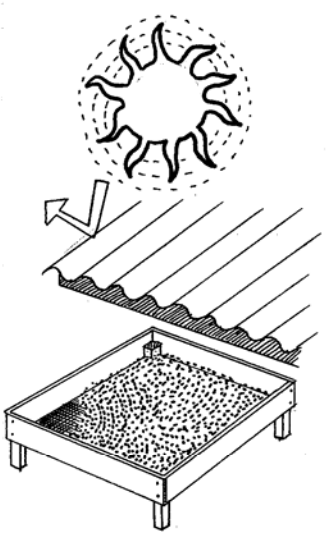
5.5 Treat seeds gently:

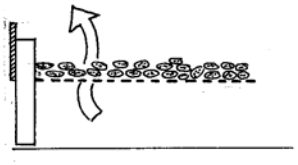
Process fruits and seeds carefully and cleanly to avoid physical damage to the seeds and introduction of insects and fungal spores. Seeds will only store well if they are undamaged and uncontaminated.

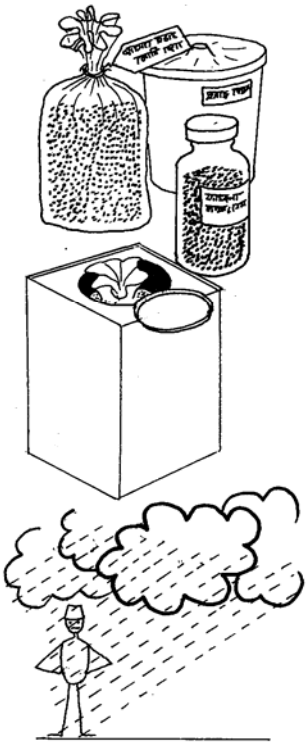
6 THE TWO MAIN CLASSES OF SEED AND STORAGE

6.1 There are two main methods of storage, determined by the class of seed that has to be stored. Most species have seeds that store best when dry ('orthodox' seed), but some species have seed that will lose viability if dried and must therefore be kept moist during storage ('recalcitrant' seed).

6.2 In general, seeds that come from species with fruits that naturally dry out on the tree, or which. are disseminated in the dry season, will be of the 'orthodox' type. However, seeds that are large, or in fleshy fruits that do not dry out, or are disseminated during the monsoon under moist conditions may be recalcitrant. Any seed that is known from past experience to have a very short viability should be treated as 'recalcitrant' - many fodder species appear to be of this type. Note, however, that the majority of species have seed that can be dried (see note 3).







7 BASIC RULES FOR SEEDS THAT CAN BE DRIED

7.1 Dry seeds properly:

It is a general rule that the drier 'orthodox' seeds are, the better they will store, because their respiration is reduced. However, drying should be gradual, so that the seeds are not subjected to stress. Place the seeds in thin layers (2 - 3 seeds deep) on drying trays with a wire gauze bottom (see note 1), so that the air can circulate above and below the seed. Leave for several days in a warm, dry, shaded and well ventilated place, moving the seed every few hours. Complete the drying by placing the trays in the sun on a dry day, raking the seed continuously for 2 hours. Then pack immediately as described later.

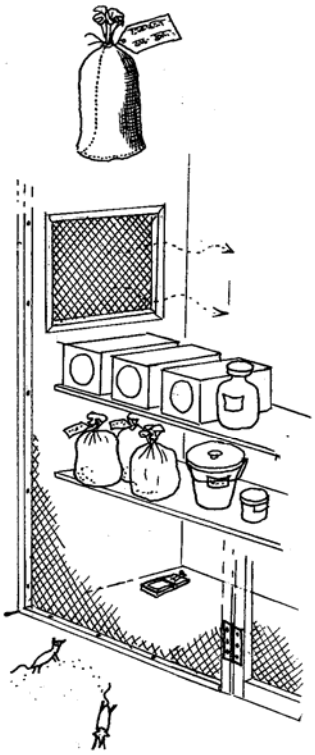
It is important to stir the seeds continuously when exposed to the sun so that they do not get too hot. In hot climates at low altitudes expose the seeds to the afternoon sun only.

7.2 Keep the seeds dry:

If the seeds have been properly dried during dry, sunny weather, they should be put immediately into sealed containers so that they are kept dry. Thick polythene bags, glass or plastic jars, or tins that can be tightly closed are suitable. Polythene bags should be thick (see note 2a), squeezed to remove excess air, and sealed with copper wire, rubber band or string. Jars and cans should have a paper or rubber washer to seal the lid, and should be filled full. Metal tins are best used with a polythene bag inside, which is sealed, as the tin lids do not form a good seal. (see note 2b)

7.3 Take care in damp weather:

If the seeds have been collected during wet and misty weather (eg. the monsoon), they will probably not be sufficiently dried for good storage, and should NOT be placed in sealed containers. This is because the higher. moisture content of the seed will permit greater respiration, producing more moisture and heat which will be trapped in a sealed container, causing the seed to lose viability quickly and encouraging mould formation. Therefore, place the seed in small canvas or cotton bags, and keep them well aerated until the weather improves and the seed can be dried properly. Only when the seeds are properly dried should they be put into sealed containers.

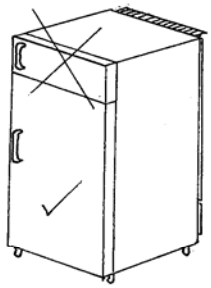


7.4 Keep containers cool:

Another general rule for 'orthodox' seeds is that the cooler they are, the better they will store, since this also reduces respiration, insect and fungus activities. Therefore, store the containers in a cool, dry and well ventilated place, with adequate protection from rodents.

The best way of doing this is to screen off a part of an office or store with a framework of wire mesh (small enough to keep out mice), and store the containers within on shelves with plenty of space around each container. The lower, shaded rooms of a building are best, provided they have plenty of ventilation and are dry. Do not store near to the roof or in lofts as they become too warm.

If the project or district has additional buildings at higher, cooler altitudes, these will be better for storage than lower buildings.



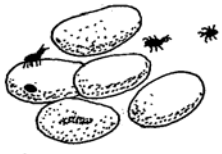
7.5 A refrigerator may help:

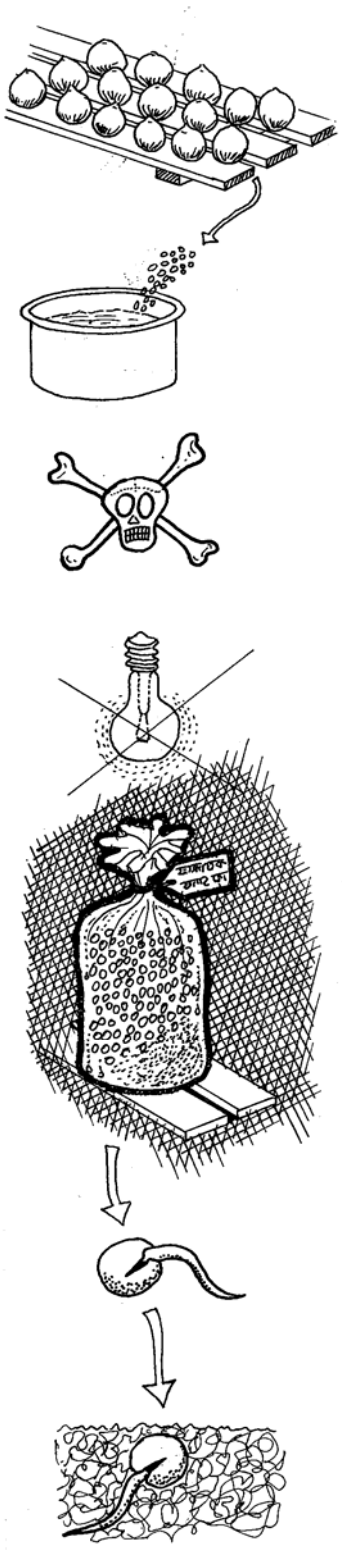
If a refrigerator is available, small sealed lots can be kept in the main compartment (NOT the freezer). Do not use a refrigerator if it is likely to be switched on and off continuously. Fluctuating temperatures are more harmful to seeds than higher constant temperatures.

7.6 Beware of pesticides:

Properly dried seeds should not develop mould and should not be treated with fungicide. Check the seed lot from time to time by smelling it - a musty smell will indicate mould formation. If this occurs, remove the seed and dry as soon as possible.

If the seeds are infested with insects, try to remove the damaged seeds and dust the remainder with a suitable insecticide. If seed is already free from insects, properly dried and sealed, then it will not be attacked during storage and should not be treated. It is difficult to see insects in some species, and these should always be treated. (see note 4)





8 BASIC RULES FOR SEED THAT MUST BE KEPT MOIST

8.1 Keep seed moist:

Since many 'recalcitrant' seeds come in fleshy fruits, they can be stored moist for a few days in their fruits. Keep the outside of the fruits dry and well ventilated to prevent mould formation. If the fruits are already old and beginning to ferment, then extract the seeds as soon as possible. For longer periods, the most likely method of maintaining viability is to remove the seed and immediately place in water, and leave for a few days. This will allow the seeds to become fully imbibed, when they will have the best chance of storing well.

8.2 Beware of mould:

The moist seed will be ideal for mould formation. It may therefore be necessary to add a suitable fungicide to the water in which the seed are soaked. This must be done shortly before the water is drained off so as not to damage the seed (see note 4).

8.3 Keep seeds cool, dark and aerated:

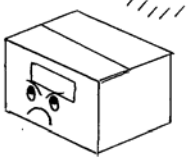
The moist seeds must be kept as cool as possible and in the dark, so that germination is restricted. Since the moist seeds are able to respire, they should be put into a container that will not only keep the seeds moist, but also allow an adequate amount of air. A suitable way of ensuring this is to put the seeds in a thin polythene bag with several pin holes made in it, and seal with wire, string etc. Thin polythene will keep the seeds from losing moisture and allow gases to pass through slowly. Never put the seed in a container that is completely sealed. Keep the bag in the dark in a cool cupboard.

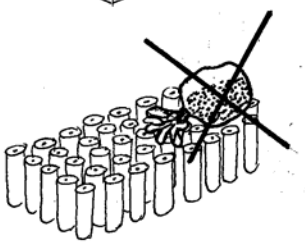
8.4 Refrigerator may harm!

Beware of using a refrigerator for storing the seed, as some 'recalcitrant' species will not withstand temperatures below 12^0C (54^0F) (see note 5).

8.5 Use as soon as possible:

The above rules will only help to reduce the inevitable loss of viability in this class of seed. Therefore, try to use as soon as possible. If seeds germinate, use them immediately. In general, the storage will be increased from a few days to a few weeks.





9 BASIC RULES FOR DISTRIBUTING SEED

9.1 Storage of the seed continues while they are being distributed and ends once they have been sown. Particular care should be taken to ensure that seeds are properly packed, transported and stored in the nursery before sowing.

9.2 Double pack the seed:

Make sure that the seed is packed in polythene bags to protect against the rain, which are then put into cardboard boxes or sacks to protect against rough handling and keep the seeds shaded from the sun.

9.3 Advise the carrier:

When the seed is sent by foot or in a vehicle, make sure that the carrier knows how to handle the seed he is delivering. Make sure he/she knows that the package must not be left out in the rain, or exposed to the sun. Remember that if the package is left on the dashboard of a vehicle in the sun, the seed will be cooked and killed very quickly.

9.4 Advise the nurseryman:

The nurseryman should know when to expect the seed, so that it is put into the nursery store and used as soon as possible after delivery. As a final point in the chain of storage, make sure he/she knows not to leave the seed in a polythene bag on the nursery bed and in the sun just prior to sowing. It is easy to forget this and kill off the seed right at the point of sowing!

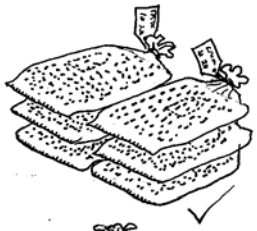
10 SOME GENERAL RULES

10.1 Label properly:

It is ESSENTIAL to keep the seed lots properly labelled before and during storage. Each container should be properly labelled outside with the species and identity number, and an identical label should be put in-side in case the outer one is lost.

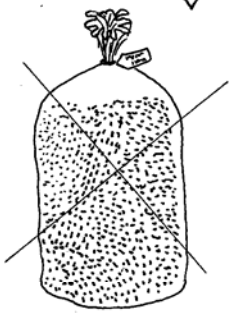
10.2 Open containers infrequently:

Each time a sealed container is opened, particularly in wet weather, the dried seeds will tend to become moister. Try to use many small containers rather than a few large ones that have to be opened often. If the quantities of seed required for distribution are known, pack and store the seed in these amounts so that the containers need not be opened until the seed is used.



10.3 Mix seed before packing:

If many containers will be used for one seed lot, mix the seed lot well before dividing it up, so that the seed quality is uniform.

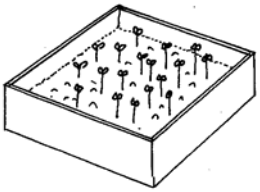


10.4 Test the seed:

Whenever possible, the seed lots should be tested for viability immediately after processing, and also before distribution if they have been stored. The difference in results will enable you to know how good the storage methods are,as well as giving the nurseryman valuable information on the use of his seed.

10.5 Sample properly:

Tests should be done on representative samples. If the seed lot is properly mixed before packing, one sample should suffice. If the seed lot is in several containers, take samples from all the containers and mix; a sample from one container may not be representative.



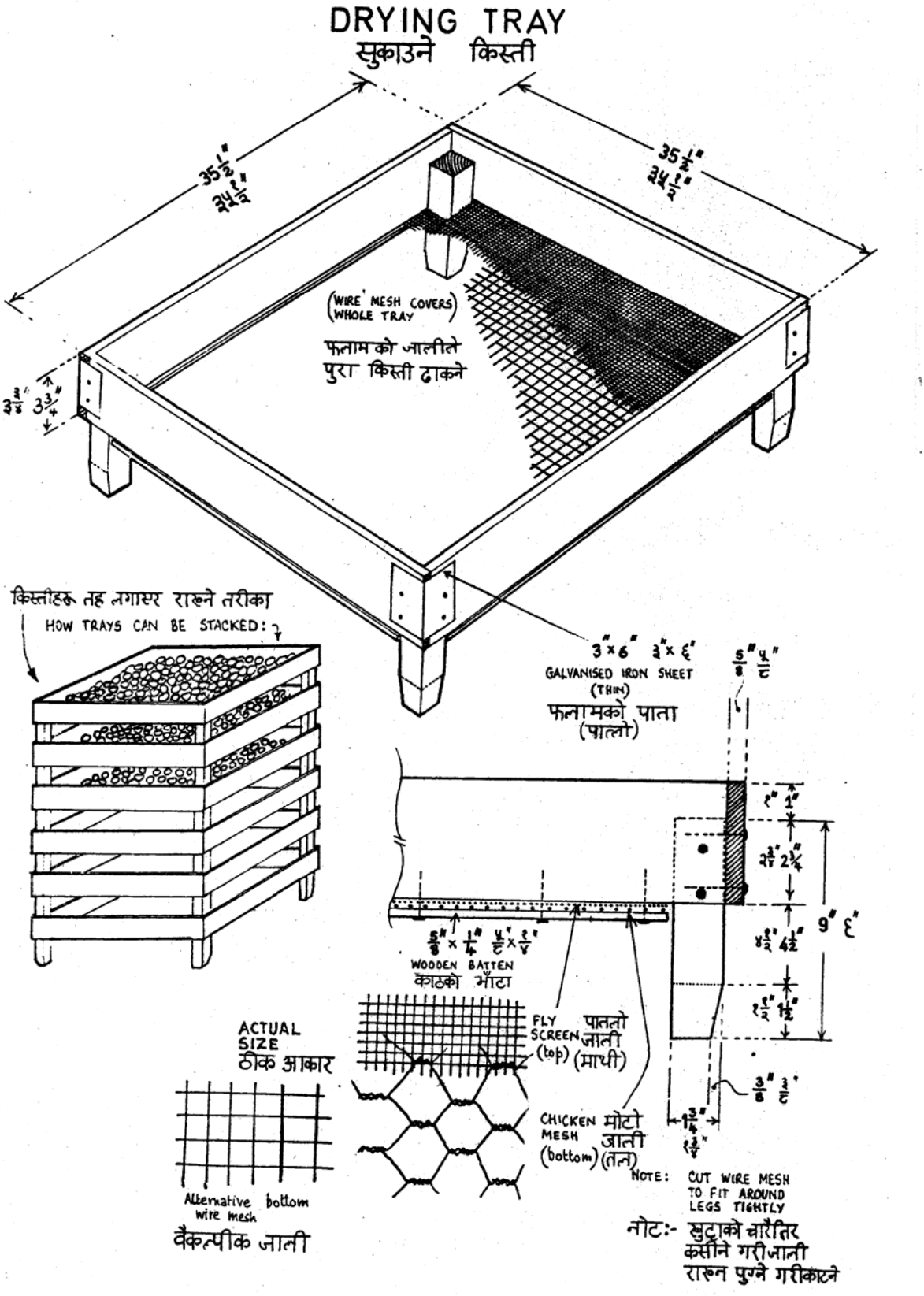
10.6 Repack imported seed:

Seed that is received from outside the district or project may come in packages unsuitable for further storage. If in doubt about dryness, re-dry as described before and pack in a suitable container. Very small packages or seeds such as Eucalyptus can be put together into larger containers.

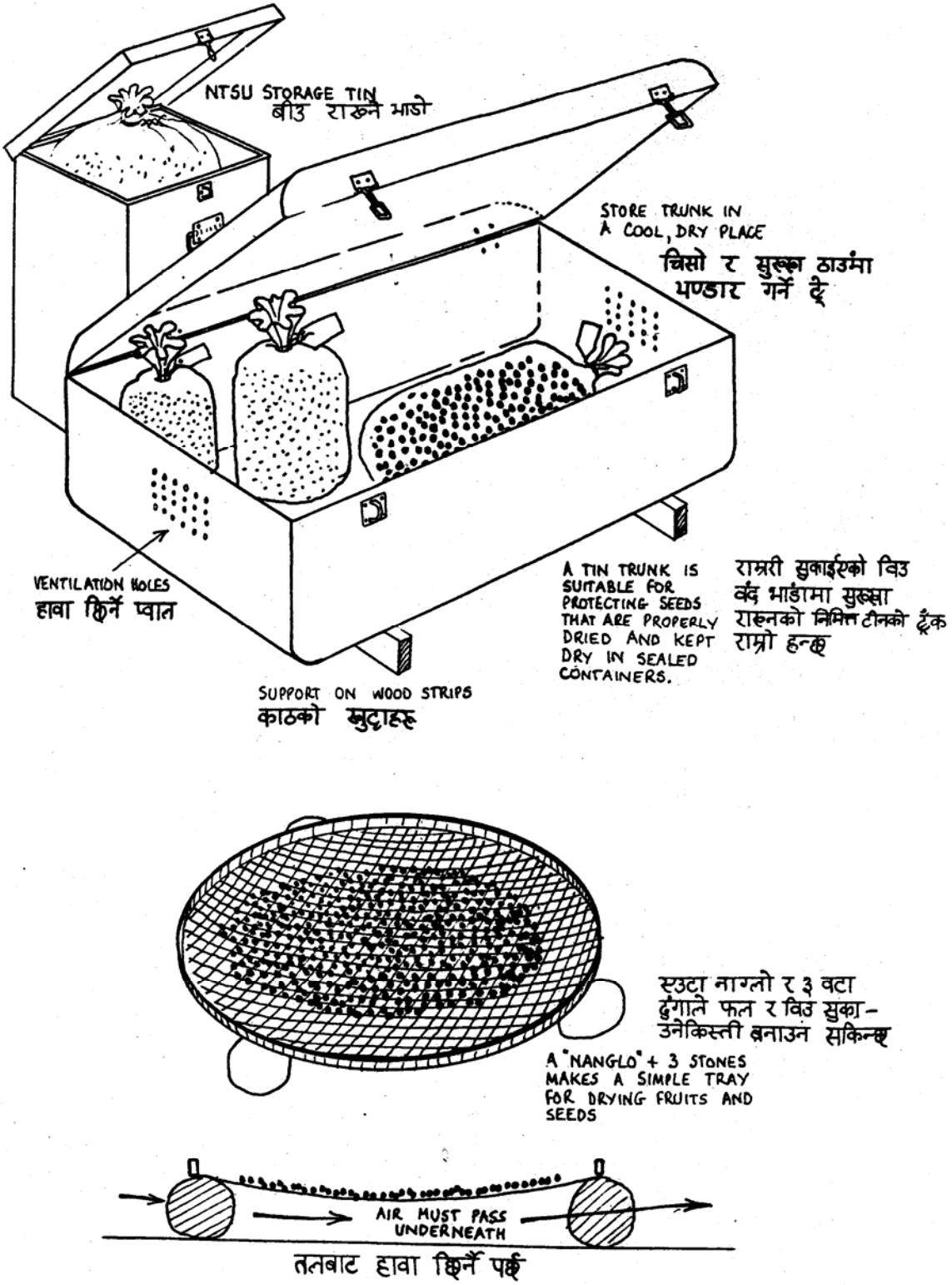
10.7 If in doubt, ask!

If you are not certain of the class of seed that you are dealing with, or whether drying methods and storage facilities are adequate, please check with the National Tree Seed Centre. If practical, the seed can be brought in for central storage. Always do this if the seed must be stored for over a year. Remember that it costs a lot of time, effort and money to collect good, viable seed, and it is always worth the extra effort of storing it well.

DESIGN FOR A DRYING TRAY

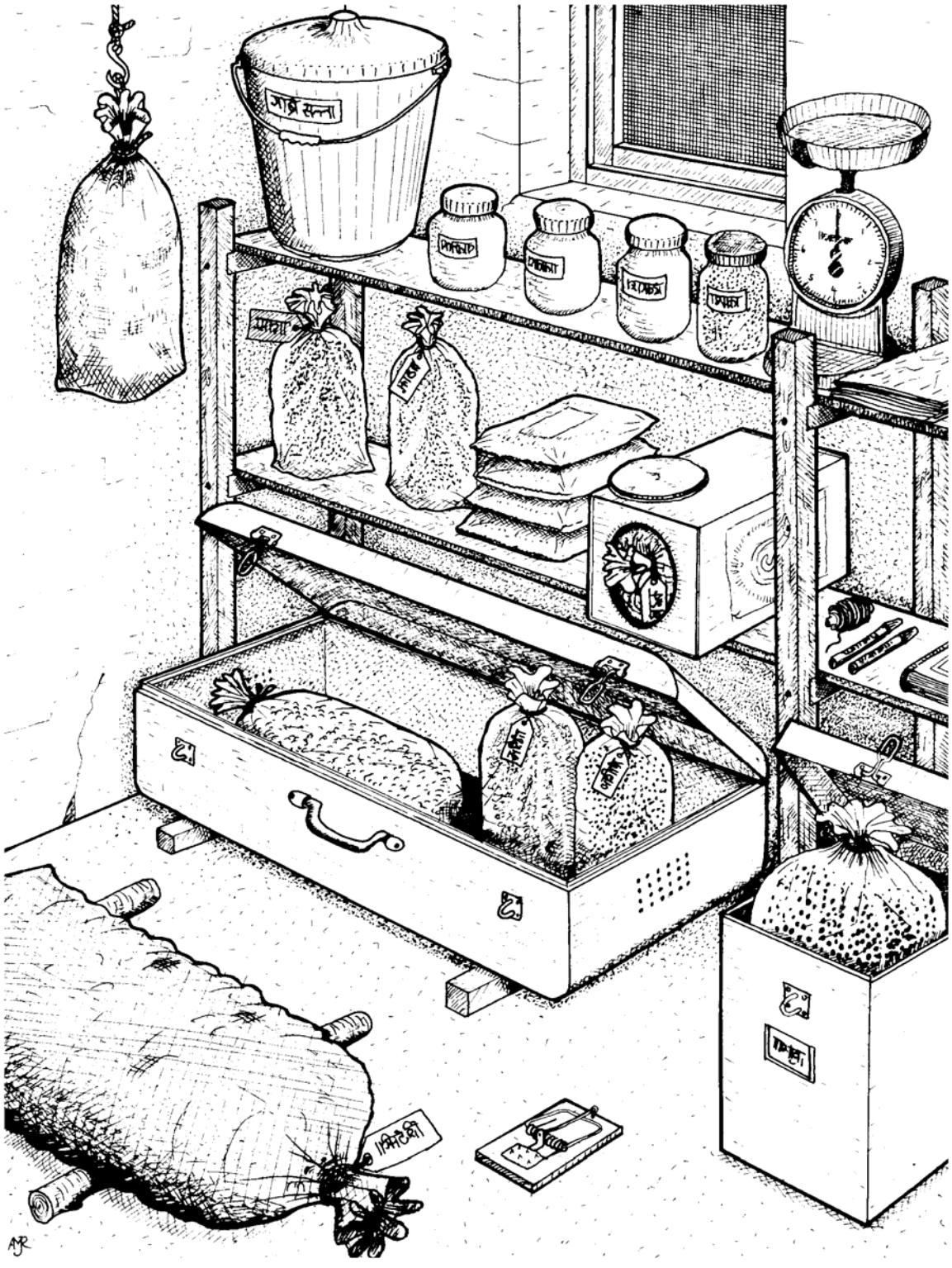


LOCAL CONTAINERS FOR STORAGE



TYPICAL FIELD STORAGE ROOM

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



EXPLANATORY NOTES:

NOTE 1:

Plans for an ideal drying tray are shown on the next page. Materials to make these trays will be available from the NTSU, if required. The timber should be well dried, and the corners nailed and glued, and reinforced with metal sheet. A simple alternative tray can be made from the larger round 'nanglo', supported on three large stones to allow air to circulate underneath.

NOTE 2a:

Polythene suitable for storing dry seed should be as thick as possible (4-5 thousandth's of an inch). The polythene bags commonly available in the bazaars are normally too thin, as they puncture easily and let in moisture. If only thin bags are available, use two, one inside the other. If required, the TSU can supply thick polythene. When sealing the bag, make sure that the polythene is gathered together carefully, and tied tightly. Test by squeezing the bag - air should come out with difficulty. Small bags can be sealed permanently by folding over the mouth (flat), and passing under a candle flame.

NOTE 2b:

Seed that is properly dried, and stored in properly sealed containers, can be placed within the tin trunks commonly available in the Kathmandu markets. These will provide excellent protection from rodents, etc. It is advisable to punch several small holes in each end of the trunk to allow some ventilation. Do not use the trunks for seed that is not properly dried and unsealed, since ventilation will not be adequate. As with other containers, keep the trunk in as cool a place as possible.

NOTE 3:

Little is known about the storage requirements of many species in Nepal, particularly those used for fodder. Some species have characteristics intermediate between orthodox and recalcitrant. The TSU will be studying this and providing further information. The lists below are not complete:

Seeds which must be stored moist (i.e. recalcitrant)
Artocarpus lakoocha (Badahar) *A. heterophyllus* (Jak fruit) *Azadirachta indica* (Neem) *Litsea cubeda* (Siltimur) *L. monopetala* (Kutmero) *Shorea robusta* (sal) *Bassia butrycea* (Chiuri) Michelia champaca (Champ) *Syzygium cumini* (Jamun) * *Quercus spp*. (Falant etc.) * *Aesculus indica* (Kandar) * *Castanopsis spp.* (Katus)

Seeds that should be dried, but have short viability
Abies spp. (Thingure) *Acer campbellii* (Kapasi) *A. oblongum* (Ferfere) *Betula alnoides* (sauer) *B. utilis* (Bhaj patra) *Schima wallichii* (Chilaune) *Magnolia globosa*

Most other species not listed should be dried and will store for at least 6 months.Seeds of legumes (eg. Siris, Sissoo, Catechu) will store for several years if properly dried and kept cool. Khote salla and Gobre salla will store for one year. Note that if storage longer than a year is contemplated for any species, it is better to send it to the TSU or one of its regional stores.

NOTE 4:

A suitable fungicidal treatment has yet to be determined. The following species may need to be treated with insecticide, to prevent damage from insects that lay their eggs within the seeds, and can mulitiply very quickly: *Albizzia* spp (Siran, Rato siris etc.) *Acacia catechu* (Khayer)

NOTE 5:

The species marked with an asterix (*) in Note 3 will store quite well if kept cool, and can be put in the lower compartment of a refrigerator (in a plastic bag as described).