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small quantities and high quality

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FOREST & LANDSCAPE

Guidelines for Distribution of Tree Seed in Small Bags »Small Quantities and High Quality«

FACULTY OF LIFE SCIENCES
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Titel

Guidelines for Distribution of Tree Seed in Small Bags
»small Quantities and High Quality«

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PREFACE

It has been assessed that the majority of trees planted in developing countries are planted by farmers. On-farm tree planting is likely to gain importance in the future as access to natural forests and trees is getting more and more difficult. On-farm tree planting, however, often suffers from lack of access to a diversity of high quality tree planting material. Quality tree seed are normally sold from major seed producers (national tree seed organisations) in a centralised manner, with only 1-3 outlets within the country, and often only in large quantities. Small holders cannot afford to travel long distances and need only small amounts of seed. Therefore the seed will have to be brought to the farmers.

High quality tree seed produced by national tree seed programmes and packed in small bags can be distributed using different existing distribution networks for farm- and horticultural commodities. This is the major advantage of the small bag approach.

Some farmers may prefer to buy plants (seedlings or cuttings) rather than seed. For farmers living in remote areas and for farmers short of cash, the small bag approach has the obvious advantage that tree seed is easier and cheaper to transport and that it requires a smaller amount of cash to buy seed than to buy the corresponding number of plants. Distribution of good quality tree seed need not be a threat to local nurseries. They themselves get easier access to tree seed and may decide on a combined assortment of plants and seed aiming at different »market segments«. In remote and poor areas, seed may be the only option. In other areas, e.g. close to cities or where farmers are relatively wealthy, seedlings may be the better option.

Commercial distribution of seed in small bags has been widely applied for vegetables but not for tree seed. In 2001, it was decided to test this distribution method for tree seed in Nepal through a pilot project entitled »Commercial distribution of tree seed in small bags through agro-vets«. Agro-vets are enterprises dealing with horticultural and agricultural commodities. The pilot project ran from 2003-2004. The partner institutions in Nepal prepared and implemented the project. They designed, produced and packed the small bags with tree seed from five different tree species, and agro-vet dealers located in all the different regions of Nepal sold the bags. A photo of the flowers of the tree was printed on the bags, vital information about the seed was printed on the back, and guidelines of how to make the seed germinate were added inside the bags.

The pilot project showed that the approach of distributing tree seed in small bags through agro-vets had the potential of reaching small-scale tree planters and to become financially viable in Nepal.

In May 2007, Tanzania Tree Seed Agency (TTSA) agreed to try out the system on a large scale. The work of setting up the system is underway as this guideline is published. Dr. Msanga, Director of TTSA and Mr. Urono, Head of Division, TTSA, provided suggestions and changes to the guidelines, which is much acknowledged by the authors.

These guidelines draw on the results from the pilot study in Nepal. Moreover, they are based on substantial experience with tree seed programmes in developing countries (Tanzania, Kenya, Nepal, Indonesia, Nicaragua, Costa Rica, Burkina Faso, Sudan, Ethiopia, Thailand, Laos, Cambodia and Vietnam).

The guideline provides practical information on how to distribute high quality tree seed to farmers and other small-scale tree planters in small bags and through commercial channels. The target groups of the guidelines are tree seed programmes and decision-makers at all governmental levels, international donor organisations, development projects and NGOs with an interest in improved tree planting. The guidelines can also be useful to private enterprises and potential seed dealers. Focus is on technical and marketing issues.

1. TECHNICAL ISSUES

Distribution of tree seed in small bags has some technical implications. Compared to traditional large quantity distribution to few large customers, the smaller quantities, the non-specialised suppliers and a less educated target group often imply that conditions during transport and storage is less optimal for seed survival. For example, large seed suppliers sometimes apply cold storage, especially for difficult seed. This is usually not possible for small-scale distributors in local markets. However, for most orthodox seed cold storage is not needed if the seed has been processed carefully, i.e.:

- Seeds are clean and free from fungal attack
- Seeds are dry with a low moisture content, which for most orthodox seed is around 5-8%

Many species can be distributed as clean, dry seed with no further treatment. Other species need special care.

Good quality tree seed

In order to ensure quality tree plantings with outputs matching the expectations of the tree planters, it is implicit that the tree seed should be of good quality, i.e. helathy, with good germination potential and good genetic properties.

Awareness campaigns can inform farmers about the benefit of using good quality seed and what good quality means. A good distribution system should assure that concerned farmers get access to quality tree seed.

Difficult tree seed

Recalcitrant seed is a category of seed prevailing in many fruit trees and moist forest tree species. »Recalcitrance« refers to their low tolerance to drying and cooling, the two methods applied to keep »normal« (orthodox) seed alive during storage. There are different degrees of recalcitrance. Many recalcitrant species contain about 40% moisture at maturity and does not tolerate drying to less

than 20-30% (in comparison most orthodox seed can be dried to <5% moisture content without losing viability).

Recalcitrant seed will not keep for long under any storage conditions and are thus difficult to distribute over any long distance. It is in general not recommended to distribute recalcitrant seed in small bags.

What is good quality tree seed?

Quality is a relative concept. In connection with tree seed we generally consider good quality as seed that:

- germinate well
- are clean, i.e. not mixed with other seeds, fruit parts or dirt
- are free from insects and fungi
- are dry and can be stored
- come from parent trees growing in sites similar to where the new tree will be planted (site matching, e.g. with regard to climate and soil)
- are collected from a good parent tree with desirable traits such as good fruits, straight stems and good quality wood, or that it is fast growing. Exactly which traits are desirable depends on tree-planters' needs and species in question

Pesticides

Application of pesticides to the seed, to prevent attack by insects and fungi during transport, storage and sale should always be handled with care, but special caution is necessary when seed are distributed in small bags to farmers, since users cannot be expected to handle the pesticides with due care. Powder may leak out and some bags may end up on the kitchen table. Generally it is advised to avoid pesticides altogether or to use harmless alternatives like crushed neem leaves or pyrethrum leaves.

Inoculants

Mychorrhiza, Rhizobia and Frankia are three types of soil living organisms, which form symbiosis with different tree species. Mychorrhiza has a broad role in nutrient efficiency and stress tolerance. Rhizobium and Frankia are linked to biological nitrogen fixation in different species. The rhizobium symbiosis is the most important for leguminous species. The symbiosis is often essential for successful growth of trees. In cases where the soil symbionts are not available at the potential planting site, e.g. a new area for the species, plants must be inoculated to assure formation of the symbiosis. Inoculants must in this case travel together with the seed, so that the user can apply them during plant raising.

Preparation of soil symbionts is made from root nodules (Rhizobium and Frankia), parts of the mychorrhiza fungi (for example infected roots or fruiting body/mushroom) or a dried soil sample containing a concentration of the required symbiont. Inoculant is usually supplied as a separate powder in a small bag or a tablet together with the seed.

Main advantages of distributing tree seed in small bags:

- Seed can be distributed over large areas with many small users
- Seed packed well in small bags can easily travel to farmers through existing distribution networks
- The bags can be used as quality assurance; they can be sealed and provided with a certification stamp together with necessary documentation
- The bags can contain important information for instance on how to handle the seed
- It is easy to market tree seed in small bags by giving them an attractive appearance
- It is easier and cheaper to transport seed than plants
- Poor farmers need smaller amounts of cash money to buy seed than to buy plants

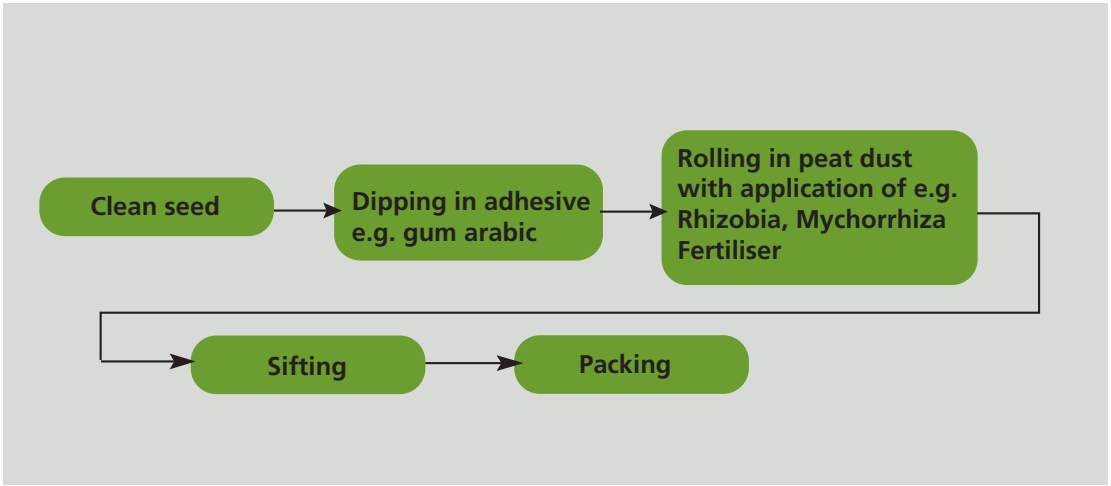
Small bags used for distributon of tree seed in Nepal

Pelleting

Seed pelleting is the procedure of »wrapping« seeds in a substance during processing. The process can be used for various purposes. Very small seeds can be inconvenient to pack because they tend to »disappear« during handling. The main purpose of pelleting such seed is to increase the seed size to make them easier to handle; the pelleting substrate would here be a »neutral« compound such as peat dust. Pelleting can also be used to apply special beneficial or essential applicants, for example mychorrhiza, Rhizobia, a starting fertiliser or an anti-fungal treatment. Sometimes dye is applied to make seeds more easily conspicuous. It should be noticed, however, that some compounds are antagonistic: fungicides can thus not be applied together with a mychorrhiza. Pelleting is also not convenient for seed that need pre-treatment, e.g. hot water or acid to beak dormancy.

The pelleting technique consists of two procedures. First seeds are dipped in a sticky substance, e.g. gum arabic. Then they are rolled in a dry powder e.g. peat. Surplus »loose« material is removed by sifting. The amount/thickness of the pelleting cover varies from very thin to up to about 0.7 mm. Note that after pelleting seeds can no longer be morphologically identified – reliability of documentation is thus absolutely necessary.

Pelleting technique



Packing material

Packing material must as far as possible keep the content sound and viable, i.e. protect seed from any environmental damage. This can be moisture (desiccation – wetting), temperature (over-heating), light, insects and fungi. Material must be strong enough not to break or tear and it must be easy to work with, e.g. to seal the bags and write or print on the outside. Transparent material makes it easy to see and control seed conditions (e.g. if there is fungus), but since seed insects also use their eyes to locate seed, transparency can have the drawback of attracting insects. Eventually, price of material and possible necessary operation equipment is fairly important. All materials mentioned are available in most places and in different qualities.

Advantages and disadvantages of different packing materials

	Paper	Plastic (transparent bags)	Aluminium foil
General handling properties	Easy to handle Does not require special equipment. Can easily be made to fit any size. Seal with glue. Easy and cheap to print on	Available in many small sizes from factories. Air-tight closing requires relatively thick material and a small sealing machine. Information can be applied outside or inside the bag on sticker/piece of paper. Transparency makes it easy and convenient to check content	Usually used with a plastic lamination as ordinary foil easily tears Closing with sealing machine. Information can be applied on the bag or inside on sticker/ piece of paper More complicated preparation process and more expensive
Resistance to mechanical damage	Many qualities available Good quality paper is quite strong at normal handling	Many qualities with different thickness available. Good quality material is very resistant to damage	Thin alu-foil tears easily Therefore most resistant when combined with plastic lamination
Permeability to air and moisture	Permeable to moisture Water resistant cover will reduce permeability significantly but also increase price	Generally air and moisture proof. However, thin material gets easily perforated	Impermeable to either
Light and heat	Practically light proof – slight permeability will prevent heating	Transparent. Direct sunlight will cause content to heat up via a 'greenhouse effect'	Light proof
Insects and fungi	Most insects able to tear through paper material but seeds are rarely attacked through bags	Insects can see seed and penetrate bags made of thin plastic Light usually limits fungal attacks	In combination with plastic lamination virtually insect proof
Other concerns	Paper is usually a relatively cheap material Options for many attractive designs – especially with water resistant cover Easy to apply information on the bag	Price depends on quality, but plastic is usually cheap Attractive design and printed information may require attached brochure or stickers	Alu-foil may be more expensive. Options for many attractive designs

2. MARKETING ISSUES

This section provides some general suggestions related to marketing of tree seed in small bags.

Which species?

It is advisable to start up with 5-10 common promising species, some already used, some envisaged fulfilling a future demand. Customers will usually request specific species, which can then be included.

Many of the common species used by farmers can be distributed and marketed in small bags. Some market-related preconditions can be that:

- there is a supply of good quality seed from a source which matches the planting site (similar ecological conditions)
- the species are in demand
- species have relatively small seed
- the species are not recalcitrant.

Demand, priorities and potentials for new species in a particular area may be assessed during an initial market survey.

How many seeds in the bags?

Quantity should as far as possible meet the need of the individual user/farmer. 5 trees mean 5 seeds if all germinate - 10 if only half germinate. Germination percentage should never be less than 50%. Bags with less than 10 seeds may be inconvenient depending on the size of seed. Very small seeded species may be supplied in larger quantities because 1) they are usually produced in larger amount i.e. a few more seed doesn't add to the production cost and 2) they disappear more easily during handling procedures. There are customers, who will need more seed, for example small-scale village nursery owners. A solution could be to supply different sizes of bags with different quantities of seed. For example smallest bags with 10, 20 or 50 seeds and larger bags with 100, 200 or 500 seeds.

How much should the seed bags cost?

The cost of tree seed in small bags includes the cost of the seed (seed procurement price plus handling cost (cleaning, treatment, storage etc) and packing cost (design and material of the bags, packing) and distribution cost. The price of tree seed in small bags should be determined as total costs plus a profit, which basically makes up the salary and other expenses for the producer and seller. This is just like other marketed products.

Design of seed bags and information

Bags should have an attractive, inviting and informative design and include illustrative pictures. Most people recognise tree species by appearance but it can be difficult to identify a particular tree species from a photo. It is therefore recommended to apply a combination of a simple drawing or photo of the tree with drawings or photos of leaves, flowers or fruits.

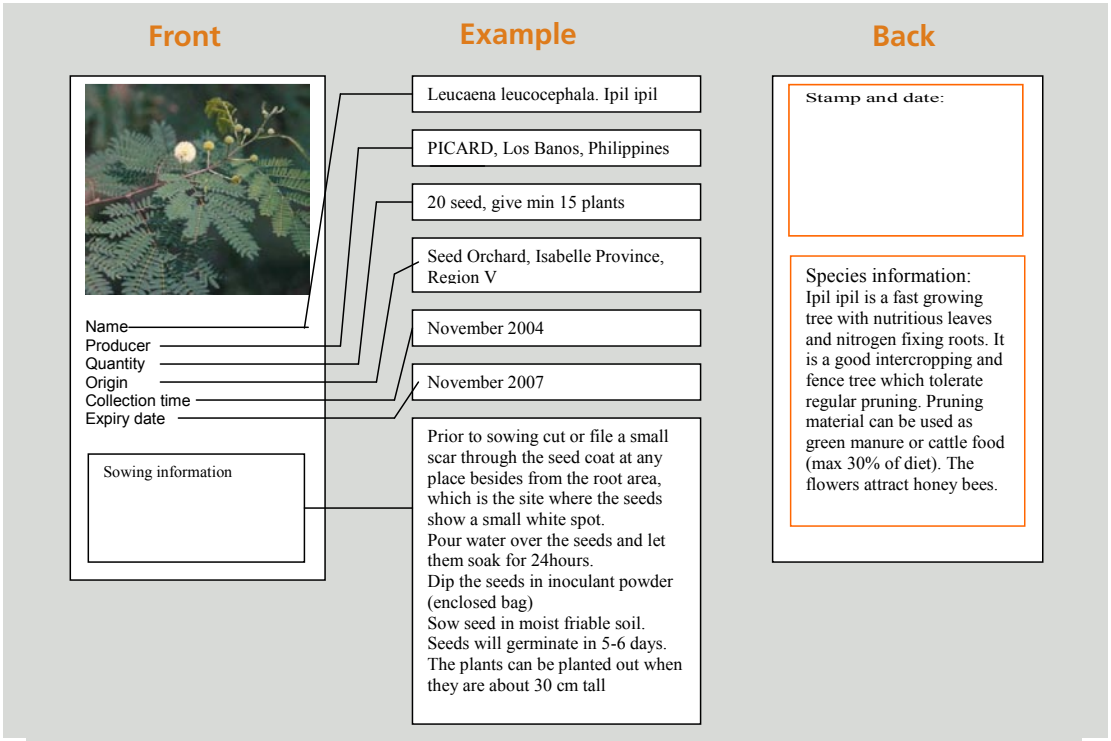
Information about species and seed and simple guidelines of how to make it germinate should be printed on the bags. Essential information includes:

1. Name and address of the producer
2. Species name (local and scientific)
3. Quantity of seed (expected number of plants that can be produced as weight of seed will not tell customers how many trees can be grown from the contents of the bag)
4. Origin or seed source (a location where the seeds were collected and possibly locations where the trees can be grown)
5. Collection date
6. Expiry date (date before which seeds should be sown)
7. Sowing instruction (sowing month, pre-treatment, soil, watering, application of inoculant)
8. Seed treatment usually 'none', but if seed bags contain pesticides or if the seed has been treated in any way then this must appear, e.g. by a clear symbol or illustration

Detailed information, which cannot be added to the seed bags, may be distributed along with or inside the seed bags. Species brochures can contain detailed information on species use, growth habit, propagation, care and maintenance.

Examples of species pamphlets distributed together with tree seed in Nepal

Layout of seed bag



Suggested size of the small bags could be around 8x15 cm. Bags should be sealed and stamped by the producer (e.g. an authorised seed supplier or seed centre), by a producers' organisation, or by government authorities who thereby guarantee that the information provided is correct.

Distribution channels

Tree seed in small bags can be marketed along with other agricultural commodities. In some areas, agricultural commodities are sold by specialised shops, which can easily include tree seed in their assortment. Where specialised shops do not exist other options for commercial distribution are usually available such as general supply stores, local markets, nurseries, moving salesmen, or farmers' organisations and co-operatives.

Another option is to distribute the small bags through government offices such as extension officers, district forest officers, district agricultural officers, and village councils or through NGOs and development projects. This option could however be compatible with commercial distribution and thus not likely to become financially self-sustainable. An additional draw back of NGOs and development projects is that they tend to exist only temporarily.

Advantages and disadvantages of different types of commercial distributors of tree seed in small bags:

Distributor	Advantages	Disadvantages
Private suppliers of agricultural implements (agro-vets or other small shops)	• This is where farmers buy other agricultural supplies such as crop and vegetable seed, fertiliser, equipment, fodder, tools etc. • They know about agricultural supply and can easily be trained to give advice on tree seed • They usually supply best quality material • Practically all farmers in an area will go there regularly. • The suppliers often know their customers	• Specialised shops are not always available in a locality, but it may be possible to organise further sub-distribution through local markets, moving salesmen etc. • Due to the wide assortment of the shops, tree seed may get only superficial attention
Local markets	• Markets are everywhere and all farmers use them. Most people will see the display of tree seed • All types of products are sold - so why not also tree seed in bags • Unauthorised seed is usually sold - display of authorised seed in bags will bring attention to the difference	• It is difficult to enable market vendors to give advice to customers on how to handle the seed
Nurseries	• They are professional tree growers and are qualified to advise on tree seed and propagation • People go there to get seedlings of trees, so tree seed is a natural related product • It avoids competition with nurseries about different types of tree planting material, they sell the plants and they sell the seed	• When there are well supplied nurseries, there may be little need for tree seed
Moving salesmen	• They meet the farmers at their farms • They can reach far • There are no competitors around	• They may not have specific knowledge to advise buyers on the use of tree seed.

Distributor	Advantages	Disadvantages
Farmers or tree-planters organisations and co-operatives	• If organisations and co-operatives are the main suppliers of agricultural implements, they are also natural networks for distribution of tree seed • Information can easily travel through such organisations • In principle, farmers organisations aim at serving the interests of the farmers and hence may minimise profits on quality products	• Farmers' organisations are not always established by farmers but, for instance, by government. Careful assessment is necessary!
Government Forest Offices	• Many such offices exist. Staff has basic knowledge about seed.	• No special interest in seed. No incentives for dealing with seed

3. REFERENCES

*Nathan, I., K.B. Shrestha, P.K. Jha and S. Suvedi 200*5. Commercial distribution of tree seed in small bags – results from a pilot and action research project in Nepal. *Forest & Landscape* Working Papers No. 9-2005 Development & Environment (*http://en.sl.kvl.dk/upload/workingpapersno9.pdf)*

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