

HAND DIRECT SOWING DATA SHEET

Introduction

The practice of establishing plants in-situ by direct seeding is becoming an increasingly important means of revegetation in Australia. The development and use of purpose built machinery has been particularly significant and has dominated the focus in terms of the refinement of direct seeding methods.

The use of machinery however, is not always effective or efficient, particularly for smaller projects or where the terrain does not allow for the access or safe use of machinery. More significant is the issue that certain site preparation procedures and sowing actions applied in mechanical direct seeding are potentially damaging. The practice of creating soil disturbance and the use of herbicides are part and parcel of mechanical direct seeding. These have the potential to create problems. Large-scale herbicide use, including the use of residuals, can have an adverse impact on the environment if used incorrectly or excessively. Soil disturbance can provide potential for weed growth particularly thistle, dock and nettle. Weed invasion is a major reason for the failure of direct seeding.



Results of Hand Direct Seeding

Hand sowing



An alternative to mechanical sowing is the hand or “niche” sowing technique. This involves little in the way of soil disturbance and allows for more controlled placement of plants within a site. Hand sowing is also useful for smaller revegetation jobs, on steep slopes and in areas where machinery cannot or should not go. Depending on the locations and methods used, hand sowing is as efficient as other planting methods. As a guide, 800 to 1500 plants can be sown per day per person and trials indicate that a 90% success rate is achievable for some species.

Hand sowing may be used to complement other methods of establishment such as tube stock planting, mechanical direct seeding and natural regeneration of remnant vegetation. An important part of hand direct sowing can be the deliberate manipulation of seed prior to sowing by using pre-germination techniques. This will require some basic materials and equipment.

Direct Seeding results

This data sheet details the steps used in hand direct sowing that have been developed to increase the overall success of the technique and the diversity of species which can be established

Equipment and Materials required

For site preparation;

- Knockdown or residual herbicides are used to prepare the sowing sites (Spraying may not be required in low weed situations).
- Spraying equipment - backpack sprayers or micron-herbi “Control Droplet Applicators” are most suitable.

For sowing;

- Quantities of fresh, viable seed (species selection and sowing rates are discussed later)
- Clear polythene bags (resealable sandwich bags are ideal)
- Perlite or similar medium (finer grain sizes are preferable)
- Clean fine soil, germination medium (optional as clarified later)
- Milk cartons, cardboard tubing or some other form of guard for the sowing spot. (This is optional depending on soil type or location.)

Note: The germination medium should be fine enough to allow for the capillary movement of water. A standard potting medium with the coarser materials removed should be adequate. The addition of a moisture retaining substance such as Saturaid may also be advantageous.

Timing

The timing of sowing is dictated by a number of essential factors. The general principle is to sow at times where the natural condition or “cues” for regeneration are evident within the particular environment in which you are working.

A Guide to Sowing times can be generalised as follows:

- Arid areas (Victoria 500mm and below) - Sowing in early to late autumn depending on the time of the first rains and risk of frost
- Dry (500 to 700mm) - Sowing late autumn to early spring
- Wet (700 +) - Sowing early to late spring. (Early summer sowing is also possible in certain locations)

Note: Sowing out of these times may be necessary for particular species. At any time, the key condition is adequate soil moisture levels. Sowing may need to be delayed on frost prone sites.

In the higher rainfall areas using the hand sowing methods discussed here, it may be possible to sow later into the season because the environmental “niche” created by this technique limits the evaporation around the seedling. Warmth of the soil and air, and the lessening risk of frost can promote rapid establishment of seedlings at these later times.

The decision to sow or not, finally rests with the availability of moisture in the soil at sowing time – the lack of moisture deep into the soil means postponing sowing. An important advantage of direct seeding over planting of tubestock is that if the weather conditions are not suitable, you can elect to store the seed for another year until conditions improve. This is not always possible or advisable for container grown plants.

Site preparation

Weed control is the most critical aspect of site preparation. Full weed kill well before sowing will assure good moisture levels and ongoing water conservation around the sowing area. Generally this can be achieved by spraying out 1 metre areas with an appropriate herbicide. Larger areas may be sprayed out if close sowing of stock is required.

Ripping may also be required depending on the existing compaction and wetting characteristics of the soil. In most cases ripping should be completed during the summer to autumn period prior to sowing. In general, cultivation is not recommended as this will stimulate weed germination and mix weed-seed into the soil profile. Remember, weed invasion is the most common cause of failure in direct seeding operations.

Pre-germination of seed to encourage rapid initiation of seedlings - (Optional)

In short, pre-germination (sometimes called seed conditioning or priming), is the process of exposing the seed to an environment where a number of early stages of germination are completed. These stages may include the softening of the seed coat, absorption of moisture, releasing of inhibitors or influencing other factors that control dormancy within the seed. For the majority of species, this is not a complicated procedure and involves only simple processes and materials. Water, temperature and to a lesser extent light, are environmental factors that can be manipulated for the purpose of pre-germinating seed.

For other species, the processes may be more exacting and require treatment with chemical solutions or exposure to specific temperature and light regimes.



The practice of pre-germinating seed for direct sowing is optional but has several advantages including:

- some essential germination cues can be instigated in a controlled environment.

- the seed can be observed for swelling or germination.
- once sown, the germination “event” happens rapidly. This maximizes the plant’s ability to exploit available moisture. The shorter the time before germination, the less chance of the seed being eaten, diseased or robbed by ants.

There are also some risks to bear in mind in when applying pre-germination techniques including:

- if the seed has gone “too far” (ie fully germinated with root emerging), seedling development may be physically damaged or risk shock when sown.
- fungi may infest the seed while pre-germinating.
- seed may die if the site suddenly dries out or there is an extreme event such as heat, cold or a rain downpour.

Pre-germination can be achieved by using a clear plastic bag such as a resealable sandwich bag containing a quantity of wetted Perlite as a germination medium. The seed is then mixed throughout so that it sticks to the damp Perlite beads. Seal the bag tightly taking care not to expel all of the air. Check occasionally to see that there is sufficient moisture but do not drown the seed!

Alternatively, if using larger seed such as Wattles, a clean potting mix can take the place of the Perlite medium. The potting mix used for this should be fine particle size and the addition of some moisture-holding additives may also be advantageous.

Once the seed is mixed through the medium the bag may be placed in an appropriate germination environment depending on the species germination requirements. (Refer to the Treatment Table for suggestions). It is not advisable to “push” the seed too far into the germination process due to the risk of damaging seedling roots at the time of sowing.

The objective at this stage is to “awaken” the seed, not create a seedling.

Site requirements for direct seeding



Direct seeding results

A few essential site conditions are required for the successful establishment of plants by direct seeding. In summary these are:

- removal of competitive weeds at germination and first stages of seedling growth
- adequate levels of soil moisture
- control of stock or vermin

Reasons for the failure of direct seeding include:

- insufficient or inappropriate weed control
- seed is not viable or is in a state of prolonged dormancy
- extremely dry conditions causing seedlings to wither (Wind can exacerbate this)

- seed or seedlings may drown on wet sites or can be washed away
- seedlings can be killed by sandblasting with soil particles moved by strong wind or rain
- seed may be robbed by ants
- seedlings can be eaten by slugs, grasshoppers or Red Legged Earthmites
- certain soil types may crack open exposing the roots of the seedling
- uncontrolled grazing or vermin damaging plants

Sowing the seed

There are several methods of hand sowing. In general, the principles are similar in that each method prepares a germination bed by some form of cultivation and the seed is then applied to the area. Depending on the size of the seed, it may be covered or pressed into the germination bed in order to establish good soil contact. A common method of hand sowing is to use a rake-hoe (fire fighting tool) to scalp a small area of topsoil. The exposed soil is then cultivated with the rake of the implement and seed is scattered over the area. Once the seed is sown, the soil is firmed with the back of the implement. This is adequate on sites where little weed seed is present in the soil.

An alternative to this method is 'niche sowing', where a small hole is created in the soil into which seed is sown. The placement of a tube or cylinder in the depression is optional but can enhance germination and the protection of emerging seedlings. The depression can be made quickly by removing a small plug of soil with a Hamilton Tree Spade or similar implement. The depth of the plug may vary depending on the type of soil but 50mm to 80mm is a guide.



Using a Hamilton Tree Planter to create a 'niche'



The use of a tube or cylinder guard, such as a milk carton or bottomless plant pot, enhances germination by preventing wind drying the seedbed. It can also help prevent soil or other debris covering the seed and assists in keeping the seed in place if there is a heavy rainfall.

Once the plug is removed and the guard placed (optional), it may be an advantage to place a small amount of clean germination medium at the base of the hole. (2 or 3 cm depth is adequate). This can provide both a sowing medium for the seed to be pressed into and also serves to cover any weed seed which may have been exposed when the hole was made.

Once the seed is sown, the area in the depression should be firmed down so that good seed contact with the soil is achieved.

Sowing seed into the 'niche guard'

How many seeds should I sow?

When determining the rate of sowing for direct seeding, it is first important to recognise these general issues:

- a number of seeds you sow may not be viable
- some particles may look like seed but are not (often referred to as decoy seed)
- of the seeds that do germinate in the field, only some will survive
- many species have seed that are so small that they cannot be sown separately

It is therefore necessary to sow a number of seeds per spot or niche.

In general, for larger seed such as wattles, about 10 to 15 seeds should be sown (it could be less if you were confident that seed viability was high). For smaller seeds such as eucalyptus, 50 + seeds may need to be sown



Firming down seed to establish good soil contact

per spot (again, more or less depending on the seed). Do not be concerned if there are multiple seedlings growing in each spot as these will either self thin over time or you may selectively prune unwanted stems as required.

Summary - Why is niche sowing with pre-germinated seed an advantage?

- Pre-germinating seed potentially allows the grower to control some of the factors affecting seed dormancy.
- Pre-germinating seed shortens the length of time until seedling emergence. This can maximize the seedlings chances of survival by allowing full use of available soil moisture, by getting the seedling growing before any weed growth or before being robbed by ants.
- The removal of the small plug for sowing the seed into is quick and does not disturb the surrounding soil. Soil disturbance can promote the growth of weeds.
- Providing a guard around the sowing spot can protect the seedlings from disturbance and may also be useful as a barrier to herbicide drift.

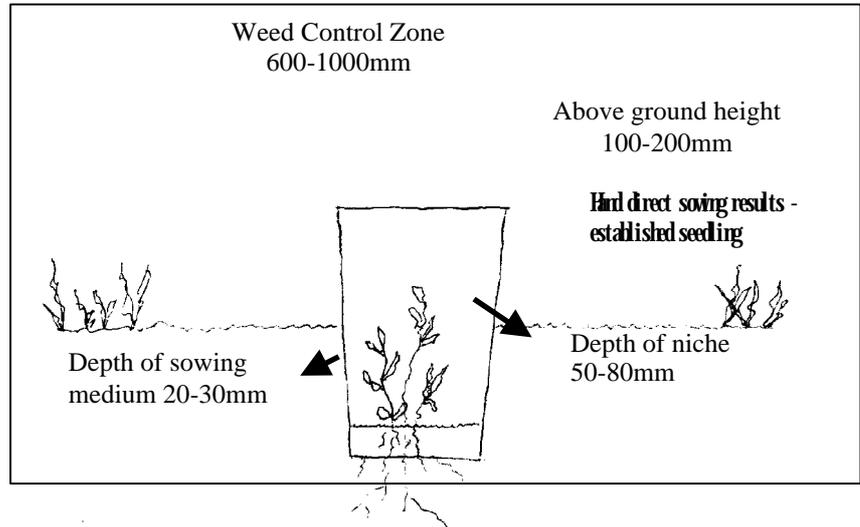
Species giving good results for hand sowing

Species	Method of Pre-germination
<i>Acacia</i> spp. e.g. Silver, Black, Golden,	Crack seed in boiling water and soak. Combine seed in soil medium and place in a Blackwood, Varnish and Lightwood Wattles.black plastic bag in a warm environment for 4 to 8 days.
<i>Eucalyptus</i> spp. e.g. Red, Grey and Yellow Gum.	Seed is mixed with wetted Perlite and placed in a clear plastic bag for 4 to 8 days. For higher altitude species (i.e. from alpine areas), it may be beneficial to place seed in refrigerator (4 degrees celsius) for about a week prior to sowing.
<i>Melaleuca</i> spp. e.g. Tea-trees.	As for eucalyptus
<i>Callistomen</i> spp. e.g. Bottlebrushes.	As for eucalyptus
<i>Allocasuarina</i> spp. required.	As for acacia except that no hot water treatment is required.
<i>Dodonea viscosa</i> medium and keep in a warm	Quickly crack seed with hot water. Mix seed in soil place for 5 to 8 days.
Grasses e.g. <i>Danthonia</i> , <i>Poa</i> , <i>Microleana</i> and <i>Stipa</i> spp.	As for eucalyptus

Other more difficult species worth trying

Species	Possible germination cue
<i>Bursaria</i> spp. e.g. <i>Hymenantha dentata</i> , <i>Coprosma quadrifida</i> .	Place in wetted Perlite and refrigerate for 5 to 15 days.
<i>Lepidosperma</i> spp.	Use smoke water to wet medium.

Planting Measurements



Hand direct sowing results - emerge seedling

Hand direct sowing results at various stages of growth



For further information on hand direct seeding or other revegetation techniques, please contact Jason Horlock or Mark Coffey on:

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