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# Information Sheet No.2-88

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## BROADSCALE DIRECT SEEDING OF TREES ON FARMS

### Introduction

Farmers recognise that two of the biggest threats to their livelihood are soil erosion and salinity. The placement of large numbers of trees in the rural landscape can alleviate these threats and at the same time enhance the aesthetic value of the country, provide natural habitat and connect corridors for birds and other wildlife. The problem has been the cost and time involved in planting and tending seedling trees. Direct seeding - using a combine to sow tree seed directly onto prepared ground - may prove to be a practical way to establish very large numbers of trees on farms.

Direct-sown seed needs ideal conditions to germinate; that is a series of soaking rains after sowing. Given this, and providing they are free of competition for moisture and nutrients, direct sown seedlings grow very rapidly in the first few months. The elimination of weeds from the seed bed is essential as they will compete against the slower growing native species. Despite this, direct seeding is relatively cheap, simple and quick. There is no need to purchase any new machinery - a standard combine does the job. It takes (for example) only a few hours of work in ground preparation to establish a kilometre of trees. Also, direct seeding ensures the early development of a strong root system, therefore, summer watering of young trees is not necessary.

### Ground preparation on old land - ripping

Land that has been cropped or pastured for years develops a compacted layer which young tree roots have difficulty penetrating. Deep ripping (0.40 to 1 metre deep) is necessary to allow roots and moisture to penetrate deeper into the soil profile.

Ripping is best done in autumn or early winter in lines up to a metre apart.

### Weed Control

Established farm land usually has a "bank" of weed seeds in it. The elimination of competition from weeds is the most important factor in establishing trees by direct seeding. The aim is to have the ground to be sown absolutely weed free prior to sowing and control all weeds at least into the first summer after sowing.

This is best achieved on medium and heavy soils by multiple cultivation using a scarifier. It will need to be repeated at least three times so that successive germination from the weed seed bank are killed. On sandy surfaced soils this continued cultivation will leave the prepared land susceptible to erosion. The risk can be lessened by sowing rows of a suitable cover crop to protect the seeded area.

Scalping off the top 5 - 7 cm of soil with a blade or road grader just prior to direct seeding provides very effective weed control into the first summer by removing the weed seed bank altogether. A very light cultivation to loosen the top soil is all that is required prior to seeding. Do not scalp shallow duplex soils where clay will be exposed once the overlying sand is removed, as very poor results have been achieved on exposed heavy soil types.

### Chemical Weed Control

Cultivation or scalping can be supplemented with applications of contact herbicides such as glyphosate or paraquat/diquat PRIOR to sowing. All residual herbicides appear to have a detrimental effect on the germination of tree seed.

Late germinating grasses can be, and must be, controlled with the selective grass herbicides (Fusilade or Sertin) sprayed, at recommended rates, over the top of germinating tree seedlings. Keep a close watch on grass weeds, particularly during the first eight weeks after sowing, and spray as soon as the problem is noticed.

### **Ground preparation on new Land**

Because there is no compacted soil, and no weed seed bank on newly cleared land, ripping and repeated cultivation are usually unnecessary. However, if the soils are shallow and over clay, ripping is beneficial. Otherwise, just a light cultivation immediately prior to sowing and leave the soil as rough as possible. New land can be sown any time after the season has broken; the earlier the better.

### **Difficult Sites**

It is advisable to begin with the sites which are easier to establish i.e. well drained, sand or loam soils which are not salt affected.

### **Late Germinating Broadleaf Weeds**

Sites with late germinating, aggressive broadleaf weeds are a major problem, and should be avoided, as we currently have no practical way of controlling them after the tree seed has germinated. Scalping can be used on such sites prior to sowing to remove the seed store; cultivation and chemical weed control have not proven successful. Fortunately, however, on most sites broadleaf weeds germinate early and can be controlled prior to sowing.

### **Heavy Textured Soils**

Due to 'surface-sealing' of clay soils, direct seeding has proven difficult and further research is required. Many of these soil types (Salmon gum, Red Morrel areas) naturally had few trees per hectare on them and therefore using nursery raised stock is a viable alternative.

### **Deep Sands**

Light sandy soils need protection to avoid sandblast and erosion from wind. A protecting crop of cereal must be planted either side of the direct sown tree strip on these soils. However do not sow grasses with the trees because they will compete for moisture and eventually dominate the slower growing native species. Non-wetting sands present additional problems with direct seeding and unless these sands can be scalped off prior to sowing, direct seeding is not recommended for these sites.

### **Waterlogged/saline Sites**

Germinating seedlings will not survive being waterlogged, even for short periods of time and most species are very sensitive to saline conditions, particularly when young seedlings. Not recommended for direct seeding.

### **Steep Slopes**

Erodible slopes can be difficult to revegetate due to seed being washed away with worked up topsoil. To avoid this the water can be harvested by building small crescent shaped banks across the flow of surface water; that is, on the contour. They should be short - say 10 m long - to avoid excessive overflows that may cause erosion. They can be constructed by using a backblade or roadgrader to bare strips 1 m or more wide. Move the top-soil downhill to form a curved bank that will hold water. In heavier soils the bare area should be ripped with a chisel plough to improve water penetration.

Thus water harvesting is used to increase the amount of available water to germinating plants as well as to provide a collection point of seed that would normally be washed away. It is especially valuable in the drier zones of the Wheatbelt, and on erodible slopes.

### **Sowing**

Old land should be seeded when good weed control has been achieved usually in June or July. Trials have shown Spring sowing (August or September) results in very poor germination and should only be contemplated on sites where winter waterlogging is a problem. Most eucalypt seed will germinate two to six weeks after sowing, however during Winter the small seedlings will remain dormant until soil temperatures increase. So seedlings often remain unobserved until as late as October or November.

Seed should be sown at 350 g/ha for new land and between 500 to 1000 g/ha for old country. This is mixed with super in a combine and applied at rate of 100-150 kg/ha going over the area twice to ensure complete coverage. Other 'bulking-up' agents used have been Grade 2 vermiculite, graded sand, bran flakes and chicken pellets. A five metre wide combine over a distance of two kilometres will cover one hectare. The area to be sown must be scarified prior to sowing. When sowing the combine tynes are set just above ground level so the seed drops onto the rough ground surface. The hoses should preferably be disconnected from the boots.

For small seeded species such as most eucalypts, melaleucas and casuarinas the seed may be either left uncovered on the soil surface or very lightly covered by dragging wheat bags, a chain, brush or even a piece of carpet behind the combine. If the seed is buried even 1 cm below the surface, germination is severely affected.

However, large seeded species such as Marri (*E. calophylla*), Coastal Blackbutt (*E. todtiana*) and all legume species (*Acacias*, pea-flowered natives, *Tagasaste*) germinate best when buried to a depth of about 1 cm below the soil surface. This

can be achieved by pulling harrows behind the combine. If a mix of both small and large seeded species are to be sown on the one site we suggest either they are sown separately (the large seeded species first) or if sown together the best compromise would be surface sowing and lightly covering the seed using wheat bags or a chain pulled behind the combine.

Sometimes vibration will separate the seed and super, so it is advisable to have someone agitating the mix during sowing.

Germination can be significantly improved on sandy textured soils by compacting the site with the tractor tyres or a roller, immediately after sowing. Heavy textured soils should not be compacted.

### **Observation Plots**

Due to the small seedling size of many of our native species we suggest 'observation plots' be established i.e. two to three 50 cm square plots per site be permanently pegged, seeded by hand and carefully observed for germination seedlings. Once germination has been observed in the observation plots and you can recognise each species, seedlings can much more readily be observed over the whole site. Regular and close inspections of the observation plots will enable early identification of pest problems such as red legged earth mite, lucerne flea, rutherghen bugs or grasshoppers. Seeded areas should be sprayed when the pests are seen in large numbers.

### **Protecting the seedlings**

Stock, wind and rabbits can all harm the young trees. The area must be fenced, or stock excluded from the paddock, for at least three years. Rabbits should be baited in co-operation with the Agriculture Protection Board.

### **Aftercare**

If the plants are not vigorous at the commencement of the following season, a granulated N.P. (e.g. MAP) or N.P.K. fertiliser application at 150 kg/ha will stimulate growth, especially on light soils.

### **Species selection**

Use a mixture of at least 4 or 5 species to create a mixed windbreak of trees of various forms. This mixture will usually allow for any minor variation in soil types and position in topography. Select species native to the area, soil type and

topographic position that are growing well in your district. If you wish to extend the range choose species from similar soil types and the same or lower rainfall.

### **Collecting Seed**

Collecting seed from your own farm or nearby has many distinct advantages. By collecting tree seed from a provenance close to the proposed direct seeding site you know what to expect when the seeds are sown. You will also be able to take advantage of easily harvested tree seed crops to reduce the cost of purchasing seed, and you have the guarantee of fresh seed.

See Information Sheet No. 5/87 'Native Tree Seed Collection and Storage'.

### **Germination Testing**

The viability of seed can vary enormously through factors such as age, storage temperature, maturity at collection or even the weather when the tree was flowering. A number of species have known inherent poor germination. This is no problem, provided that you are aware of poor germination and you make allowance in the amount of seed used. Seed purchased from reputable suppliers will have been tested prior to sale; seed you have collected yourself will have to be tested. Place a sponge pad (like Wettex) on a saucer and moisten it with water, spread a pinch of seed on the pad. Keep the pad moist and in a warm (20-25°C) position. Most viable seed will germinate within a fortnight under these conditions. A pinch is about 0.2 g and the benchmark is 100 germinants per gram. If you get less than 20 germinants in your pinch you should adjust the amount of seed used in the mix.

### **More Information**

This brochure was compiled from limited experience on research plots. The CALM Rural Advisory Service is keen to hear of any problems, successes or anomalies so that we can form a clearer picture of how direct-seeding works. Similarly, if you require more information to get started, contact an advisory officer at any of the locations below:

State Operations Headquarters,	
Como:	(09) 367 0333
Bunbury:	(097) 25 4300
Esperance:	(090) 71 2088
Narrogin:	(098) 81 1113