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ICFR Technical Note

Planting eucalypts using hydrogels

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Introduction

Hydrogels have the ability to hold many times their own mass in water and in forestry are used during the planting of eucalypts to supply the plant with a source of readily available water at, and immediately after planting.

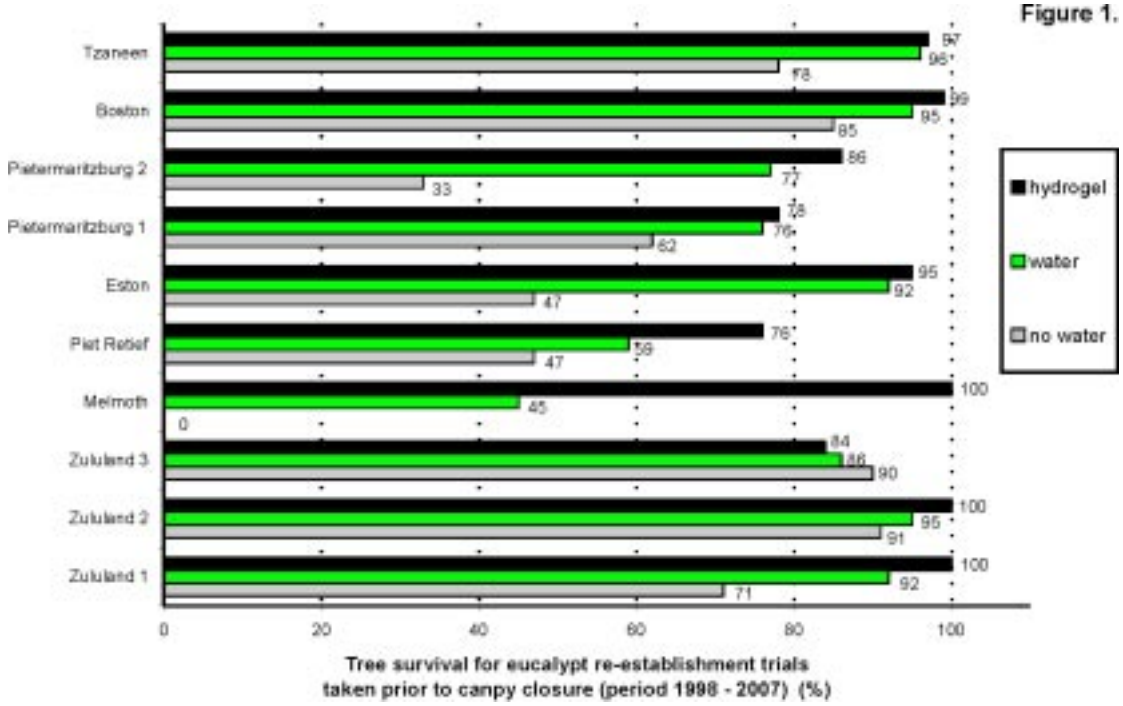
To achieve annual planting programmes forest companies often need to take calculated risks, this can happen when planting through a “normal” planting season (occurrence of dry spells or drought) or when extending planting times into “unseasonable” times of the year in order to achieve budgeted planting targets. These situations can, and often do result in unacceptably high mortality (10 % and higher). The primary objective for using hydrogels under these conditions is essentially two-fold; firstly to significantly reduce overall mortality (to within commercially acceptable levels, i.e. > 10 %), and secondly to be used as a management tool in potentially exploiting unsuitable planting periods thereby increasing the flexibility to plan and manage planting targets.

Hydrogels have the potential to play a specific role for a very short but critical period at, and following planting (1-4 weeks after planting), by initially reducing planting stress/shock by providing the roots with an immediate source of available water enabling continued root growth. This short but critical period allows for eucalypts (under minimal stress) to rapidly establish a root system which has the ability to grow into the soil profile (outside the confines of the planting hole) thus enhancing overall chances of survival.

Planting eucalypts using hydrogels

Research implemented by the ICFR has consistently shown that (as with water) the application of a hydrogel at planting enhances survival and initial growth, especially during periods of adverse climatic conditions (e.g. drought or dry spells). To illustrate this, results from 10 trials planted over a 9 year period to eucalypts in the summer rainfall regions of South Africa were combined. All water or hydrogel plantings were compared against a “dry plant” control **(Figure 1.)**.

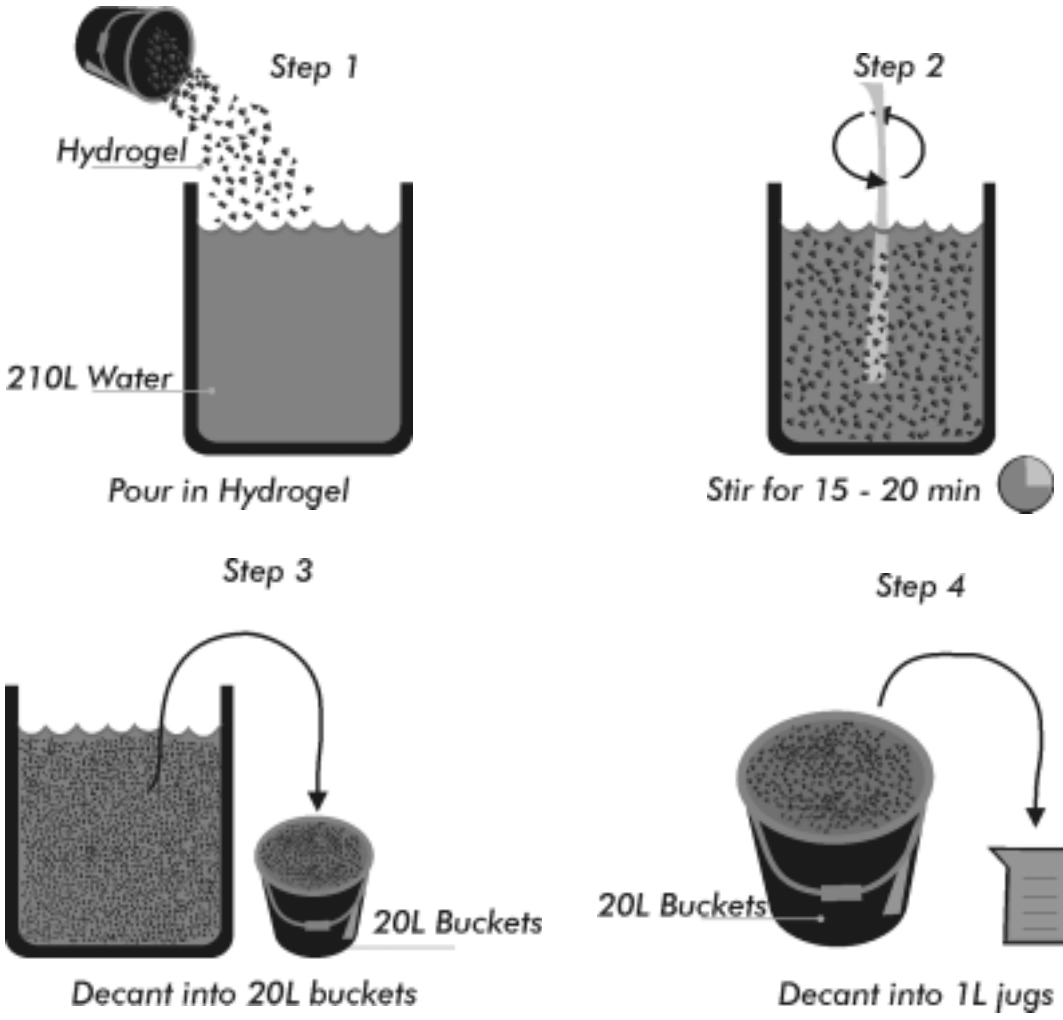
Figure 1.



Preparation required before planting with a hydrogel

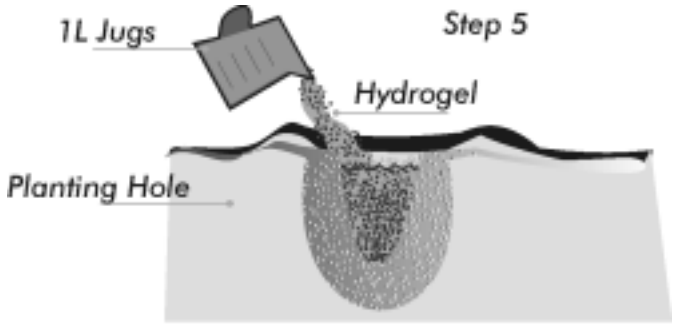
- Planting pits need to be well prepared (soil loosened) ahead of a planting operation using a pick in loam to clay soils, or an agricultural hoe in sandy soils.
- Loosened soil in the pit must be left and not taken out otherwise the pit dries out, with planting preferably to take place as soon as possible after this operation.
- A ratio of 1 L of water and 3 g of hydrogel is the generally recommended rate to be applied per tree. Up to 4 g hydrogel per litre of water can also be used if conditions are expected to be particularly dry following planting.
- It is not necessary to use more than 1 L of water per plant when using a hydrogel, however it is not advisable to use less than 700 ml water when using 3 g hydrogel, as the water/hydrogel mixture must have sufficient "free" water to drain below the pit (this is especially important for sustained root growth outside the confines of the pit during very dry conditions).
- Use at least a 210 L container to mix the hydrogel and water infield (210 L PVC fire retardant drums with the top removed work very well).
- The ratio of 3 g hydrogel to 1 L water (per tree) will calculate to 0.6 kg of hydrogel which is placed into the 210 L drum of water.
- Pour the dry hydrogel granules (similar consistency to sugar) slowly into the drum while stirring with a large stick until the mixture swells up to a slurry consistency (continue stirring for 15 to 20 minutes to ensure product is fully hydrated) **(Steps 1 and 2)**.
- When decanting from the 210 L container into the planting buckets (usually 20 L), make sure the mixture is well agitated, and then place the 20L bucket into container to scoop in the mixture.
- When planting take your jug (i.e. calibrated to 1 L) and scoop the water/hydrogel mixture **from the bottom** of the bucket. **(Remember that hydrogel in solution tends to settle when not agitated, that is why it is best to scoop the product from the bottom of drum/bucket, this facilitates continual mixing while planting) (Steps 3 and 4).**

Note: All products used for the determination of hydrogel recommendations in ICFR trials are available in referenced literature supplied for additional reading.

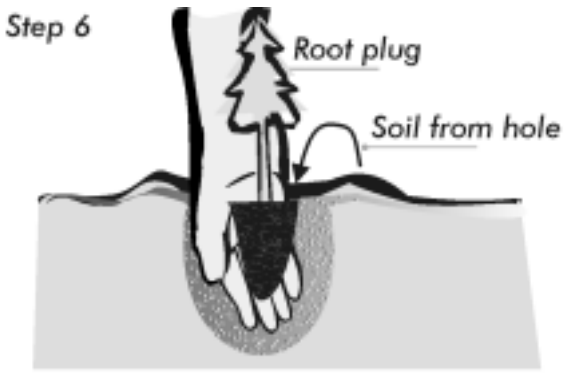


Acceptable Planting Methods

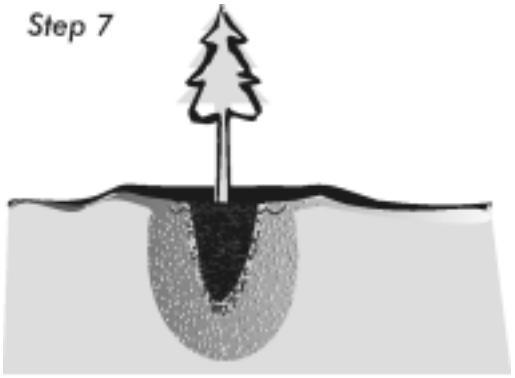
- Acceptable plant quality and seedling transport are assumed to be correct and thus not discussed.
- Plants must be well watered within one hour before being taken to the field; root-plugs must then be kept moist and cool throughout the day, i.e. re-watering at various intervals.
- The planting technique used for applying hydrogels differs to that of planting with water in that generally less water is used, hence the volume of the planting-hole needs to be adjusted proportionally (usually reduced) to ensure the volume of water/hydrogel mixture covers the root plug at planting.
- The planting-hole dimension when using 1 L water/hydrogel is approximately 10 cm x 10 cm wide x 15 cm deep (in a typical "V" shape) – this is currently valid for all soil types.
- The planting-hole should only be made at the time of planting (fresh hole into already pitted soil) using a planting trowel or mattock to the above specifications.
- **Method 1: (Steps 5-7; figures 2 and 3)**
  - Carefully pour water/hydrogel mixture (1 L) into the planting-hole.
  - This mixture needs to fill at least ¾ of the planting-hole, enough to cover the entire root plug, leaving approximately 5 cm between the top of the root plug and the soil surface.
  - Carefully submerge the root plug into the hydrogel using the tips of the fingers and palm of the same hand to support the root plug (this prevents the root plug from bending or J-Rooting).
  - With the free hand carefully move the displaced soil back into the planting-hole (making sure not to displace any hydrogel from the hole) whilst removing the planting hand carefully from the root plug.
- **Method 2:**
  - Carefully submerge the root plug into the planting hole using the tips of the fingers and palm of the same hand to support the root plug (this prevents the root plug from bending or J-Rooting).
  - Carefully pour water/hydrogel mixture into the planting-hole.
  - This mixture needs to fill at least ¾ of the planting-hole, enough to cover the entire root plug, leaving approximately 5 cm between the top of the root plug and the soil surface.
  - With the free hand carefully move the displaced soil back into the planting-hole (making sure not to displace any hydrogel from the hole) whilst removing the planting hand carefully from the root plug.
- NB – The hydrogel mixture poured into the pit **MUST NOT** be mixed with the soil to make a slurry of any form.
- Gently firm the soil around the stem with your hands, **NB – DO NOT** compact the soil around the stem after planting.



Pour hydrogel mixture into planting hole



Submerge root plug below level of the hydrogel, supporting root plug with fingers and the palm of hand. Fill hole with soil



Do not mix soil and hydrogel. Do not compact soil around the stem after planting

Figure 2. *At least ¾ of the pit is filled with the hydrogel with the root plug totally submerged with NO pre-mixing of soil and hydrogel taking place.*

Figure 3. *Soil is carefully placed back over the root plug submerged in the hydrogel.*

A list of references for further reading

Viero PWM, Little KM and Oscroft DG. 2000. The effect of a soil-amended hydrogel on the establishment of a *Eucalyptus grandis* x *E. camaldulensis* clone grown on the sandy soils of Zululand. *Southern African Forestry Journal* 188: 21-28.

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