Integration of biotechnology, robot technology and visualisation technology for development of methods for automated mass production of elite trees.

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Integration of biotechnology, robot technology and visualisation technology for development of methods for automated mass production of elite trees.

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Biotechnology has become an integrated part of plant breeding, and in recent years new methods have been developed for breeding and propagation of important plants in the agricultural-, ornamental- and forestry sector.
One of the promising methods is somatic embryogenesis (SE), where plants are produced from single cells without sexual reproduction. SE has some particular advantages for the development of cost effective methods for clonal mass propagation of elite plants:

- It is a very effective and fast method for clonal propagation.
- The method is suitable for automatisation and robot technology.
- The method is, for several plant species, the preferred basis for development of additional biotechnological breeding technologies as e.g. genetic transformation.
- Elite clones can be stored over extended periods in liquid nitrogen at -196°C

However, commercial application of the technology has until now been hampered by two essential problems:

- The production costs per plant must be reduced. Labour costs are low in the early steps of the process whereas they increase dramatically during the later stages (Fig. 1).
- Improved methods must be developed for transfer and acclimatisation of plants from sterile *in vitro* conditions to non sterile (*ex vitro*/*in vivo*) conditions at the nursery.

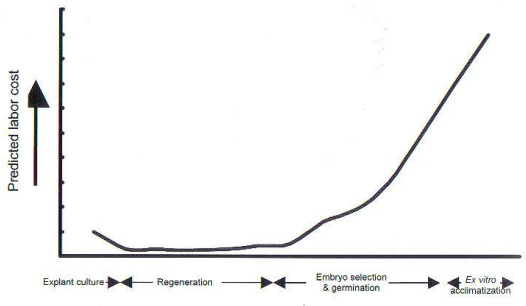

Fig. 1. Predicted labour cost by clonal propagation through somatic embryogenesis.
The labour costs are very low in the early steps of the production, whereas they increase dramatically during the later stages: 'embryo selection & germination' and 'ex-vitro acclimatization'). The aim of the present project is to reduce labour costs associated with the late stages of the production of cloned plants through development of robot- and visualisation technologies. (From Afreen & Zobayed, p. 96, 2005)

The presentation will report on two present project that takes advantage of effective methods for SE in Nordmanns fir (*Abies nordmanniana*) and Sitka spruce (*Picea sitchensis*) developed at the University of Copenhagen. These methods are used as model systems for integration of biotechnology, and development of automated plant production of plants for the forestry industry based on robot- and visualisation technology.

The commercial aspect of the project aims at: 1) the market for cloned elite plants in the forestry sector and 2) the market for robot technology in the production of plants for the forestry sector.