

The second thought I will leave you with is this:

Employers sometimes say to me about becoming involved in the training programme. “What if I go to the time and expense of training someone and they leave?” My reply is always. “What if you don’t train them and they stay?”

Containerized Forestry Seedling Production from a Historical Perspective

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The following is a subjective report based on discussions and meetings with nurserymen and researchers around the world, scientific reports and my own experiences.

The North American Indians were probably among the first container growers in the world. They used small fish as containers which they threaded on a rope and hung between two trees. They put a seed in the throat, germinated it and let the seedling grow as long as nutrients and moisture were available in the “container”.

Containerized nursery production systems have evolved during the past 50 years from simple tar paper pots used in the 1930s, plastic bags used in the 1950s, to the wide variety of rigid-walled containers in use today. In the beginning the containers were placed on the ground and very poor growing media was used, often topsoils or mixes with very low air-filled porosity. This resulted in a lot of problems with pathogenic fungi causing damping off and root dieback. It also resulted in very poor field performance with low survival and bad establishment.

Dividing up the “container growing history” in 15-year periods can look like the following:

1950 - 1965

A period of trial and error with quite low success according to field performance. The containers were mainly made of different types of paper during this time.

1965 - 1980

The breakthrough for containerized production came during the mid 1960s when countries like Canada, Sweden, and Finland received the system. Paper pots, hard plastic multi and single pots, and in the beginning of the 1970s even styrofoam trays were used in large-scale forest seedling production. The outer dimension of the trays differed depending on whether the seedlings would be shipped directly in the tray or extracted in the nursery and shipped in paper boxes. Characteristic to all these tray models were small drainage holes in the bottom and no ribs on the inside walls. This design of course, with today's knowledge, caused problems with root spiralling. It also caused continued problems with root diseases even if the growing media were improved and peat-based substrates used. Some nurseries alleviated this problem by using frames or table systems for the trays. This step also made air pruning in the bottom of the container possible. Fertilizing regimes were not developed during this period and inappropriate bareroot regimes were adopted which caused prob-

lems, for instance, starving seedlings with low frost and stress hardiness. The vociferous criticism against root spiralling forced researchers and manufacturers to develop new designs of trays and new pruning methods for container seedlings, like chemical pruning and mechanical pruning.

This led to the next "historical" period.

1980 - 1995

The characteristics for the new models were guiding ribs and increased drainage area in the bottom. The most commonly used material for trays was hard plastic (multi and single pots) and styrofoam trays. The use of paper pots decreased during this period. Several countries around the world received the container system for large-scale, forest-seedling production and in some countries even programs for cutting propagation were developed. It was also a time when results from biological research were applied and programs for fertilization, spraying, storage, and night-length regulation were formed. Chemical root-pruning, like copper-treated trays, became very popular in Canada and the U.S.A. and are still today the most used systems in both countries. The first trays with open sides were developed during this time but they were designed for mechanical root-pruning. The criticism and fear of root deformations continued loudly and resulted in the first scientific reports. These reports were based on results from the first generation trays and showed reduced stability in container-grown trees planted in high altitude and cold soil plantations. In the beginning of the 1990s the development of new tray models increased and resulted in air-pruning containers with vertical slits for stimulation of lateral pruning.

1995 - 2010

Containerized seedling production increases around the world and new countries are adopting the concept, which also means new scientists with fresh ideas will be involved in the development. Air-pruning trays have probably come to stay if the problem with root bridging can be handled in a proper way. This new container system needs good air circulation otherwise it has to be mechanically pruned which is a costly operation. Whether continued use of chemicals for root pruning will be acceptable in the future is a question for politicians. Environmental movements are growing strong today all over the world and politicians have to take this into consideration when making decisions. A good example is the case of the Spotted Owl on the American West Coast. Environmental considerations also advocate hard plastic containers which can be used in production for several years and then recycled in a new moulding process. An interesting alternative in the future could be compressed peat or woodfibre containers if the costs for this system could be kept low.

Finally, I would like to end this presentation with a warning. After 20 years in the seedling growing business there is still one point which concerns me and that is the tendency, all over the world, to grow the container seedlings to the size of a bare-root seedling in a density which is at least five times higher. We must remember that container seedlings are fresh goods and actually need a "best before date".

If we continue to grow the seedlings too long in the container without respect for the seasonal root growth periods, we will surely deform roots irrespective of what kind of container system we are using, in the same manner as the bound feet of upper class women of many Chinese dynasties.