

Production and Use of Containerised Seedlings in Sweden

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The use of containerised seedlings started in Sweden in the early 70s. Today, around 80% of all seedlings are produced by one of five main systems. These are Cellpot, HIKO, Pant, Paperpot and Plant 80.

Production systems for containerised seedlings can be divided into four major groups:

A. Plugs. The seedlings are grown in rigid-wall containers and the plants are removed before planting, e.g. HIKO, Pant.

B. Containers with walls through which the roots can penetrate. The container is not removed before planting, e.g. Paperpot.

C. Tubes – container with a rigid wall which is not removed before planting, e.g. Ontario Tube.

D. Containers without any walls, e.g. Hasselfors' Multicomp.

Of the four groups all but the tubes are represented in Sweden.

The transfer from bare-root to containerised seedlings was started in the north of Sweden by large forest companies. The use of this type of seedling is now fairly well geographically distributed over the country with the exception of the southernmost part.

The reasons for the transfer from bare-root to containerised seedlings are:

- Reduced cost in the planting operation. In certain areas of the country up to three times as many seedlings are planted per time unit.

- Prolonged planting season. The containerised seedlings can be planted throughout the whole vegetation period, except during bud-burst.
- Shorter production time, which makes it possible to adapt to rapid changes in demand.
- More efficient use of seed.
- Lends itself to mechanised planting.
- The possibilities of growing seedlings in a harsher climate.

In containerised production systems the basic unit, the containerset, has a very big impact on the success of the system. The following characteristics are of importance:

- Exact geometry is a pre-requisite for precision filling and seeding.
- The design should not allow any root spiralling.
- The root system should be restricted to the cavity during the growing phase in the nursery.
- The cavity wall should not restrict root growth after planting in the field.
- It should be a practical handling unit in the nursery for transport to the forest and in the field.
- For good plant care it is preferable to use the containerset throughout the entire chain, from seeding in the nursery to planting in the field.

THE HIKO SYSTEM

Containerset

The system's basic unit is a polythene plastic containerset which consists of a matrix of cavities. Different sized cavities can be used, depending on the crop to be grown. The overall dimensions of the containerset always remain the same.

Filling and seeding

Because of the exact geometry of the containerset, it is possible to mechanise the otherwise labour-intensive phase of filling and seeding. The automated line enables filling of peat-moss in two steps to achieve good compression and a high degree of filling. The line is also equipped with a mixing station for perlite or vermiculite.

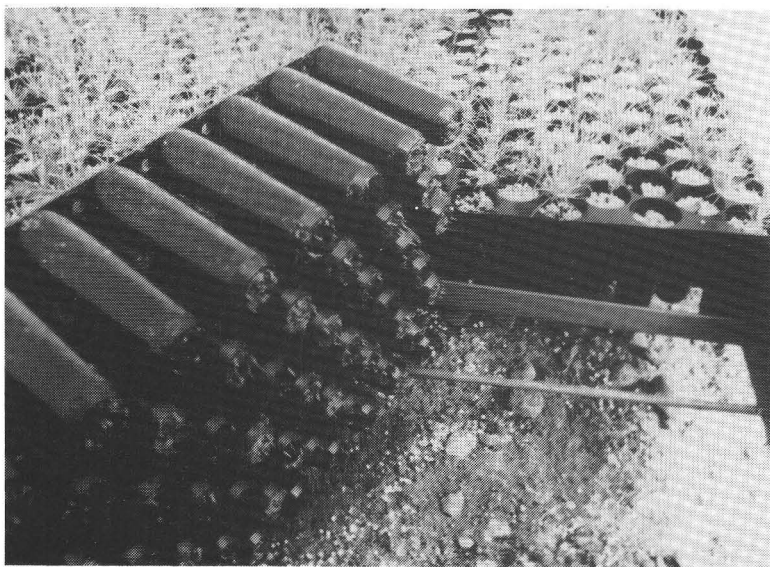


Figure 1 Containerset in growing frame.



Figure 2 The filling and sowing line with frame handling equipment produces about 250,000 cavities per 8-hour shift.

The seeding station enables precision seeding with one, two or more seeds to be placed in the centre of each cavity. The capacity is around 250,000 cavities per 8-hour shift.

Growing frames

Seeding production involves a lot of logistics. The containerset which holds 33, 40 or 67 seedlings, depending on cavity size, is the ideal unit for handling in the field. It is however too small in the nursery. A growing frame holding 60 containersets has been designed to serve both as a handling unit in the nursery and during transport.

Growing

During the growing phase, the containersets are placed in the growing frames. These enable air to circulate under the seedlings. On the inside of the containerset-cavity there are vertical ribs which lead the roots down towards the large bottom hole. When the roots come into contact with the air growth is suspended and new roots are formed within the cavity. This results in improved root-growth and better seedling establishment after planting. Simultaneously, the problem of plants entwining or becoming rooted in the nursery bed is eliminated.

Growing frames from the filling line and seeding line are stacked for transport to the greenhouse. They are then laid out by a machine equipped with a special lifting arm. After 4-8 weeks in the greenhouse, the seedlings are moved out to the holding areas. There they grow for one, or at most, two, vegetation periods.

The large greenhouses – 100m long, 25m wide and 9m high – are designed to create a good growing climate. The huge air volume gives a good buffering capacity, ensuring even growing conditions. All equipment in the house is arranged so that the floor space is kept completely free. This enables the easy use of vehicles for loading and emptying the greenhouses.

Normally, three to four crops per year are cultivated in the greenhouse. For the early crops, the greenhouses are heated and additional light is needed to prevent dormancy being induced.

These, and other growth regulating factors such as irrigation and fertilisation, are controlled, continuously monitored and recorded by a central computer.

The greenhouse is used only for the sensitive germination phase. After germination the seedlings are moved outdoors to continue their final growth and for hardening-off. The growth regulating factors on the holding area are also monitored and recorded by the central computer.

The growing phase does not stop in the holding area of the nursery. The entire growing bed – the growing frame with containersets – is designed to be easily transported to the field. The seedlings can continue to photosynthesise and, with access to water and adequate fertiliser, the seedlings will be in good condition, even weeks after they have left the nursery. For the planter this facilitates planning for distribution and planting.

Planting

In the field the plants are manually transported from the storage area by a specially designed back-pack for the containersets.

When larger planting crews are working in the same regeneration area transport is by forestry tractors either carrying the whole growing frame or special racks for the individual containersets.

During the actual planting work the containerset rests in a hip bracket worn by the planter. Because of the round, somewhat conical shape of the cavities, it is easy to remove the seedlings. To reduce carrying time the site should be divided by base lines from which planting starts. The planter works his/her way to the edge of the planting area where he/she turns and goes back to pick up new containersets.



Figure 3

Seedlings are grown in the holding area for one or two vegetation periods.