SUSTAINABLE MANAGEMENT OF BIODIVERSITY (SMB), SOUTH CAUCASUS

GUIDELINES FOR CONTAINERIZED SEEDLING PRODUCTION

RA Ministry of Agriculture

german cooperation
DEUTSCHE ZUSAMMENARBEIT

Implemented by:
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CONTAINERIZED SEEDLING PRODUCTION

High quality planting material is vital for achieving a high level of productivity in reforestation/afforestation work and rehabilitation of landscapes and eroded land. The main methods of establishing and rehabilitating a new forest are containerized seedling production and the bare root seedling production.

Containerized seedling production systems have gradually evolved over the past 50 years, and today seedlings can be grown in a variety of growing containers. A number of differences have been identified between containerized and bare root seedling production. In general, containerized growing has a number of advantages over bare root production.

Those mainly include:

- higher rate of survival and early growth in the nursery as seedlings are normally ready for use within a year;
- no special requirements for soil and site;
- no need for sterilising the nursery soil;
- extended planting seasons, as planting is possible year round;
- higher level of planting efficiency;
- easier transportation of seedlings.

However, containerized seedling production has certain disadvantages as well, which mainly include the following:

- the possibility of root entanglement or deformation inside the containers, which might hinder the development of roots in the future;
- the need for specialized equipment for containerized production while bare root growing requires standard agricultural equipment;
- in the initial phase, the cost for containerized seedling production is much higher than those for bare root production.

1. STEP BY STEP APPROACH

1

Preparing growing media, which includes peat, perlite, lime, and fertilizer. Filling of the growing trays could be done on the floor in the greenhouse on a tarpaulin or using a big table 1,5m x 3m for an ergonomically better work environment.

2

Growing trays should be properly filled and gently compacted to avoid air pockets. Quality checks by nursery personnel must be done regularly by pressing fingers on the top of the cells and also examining the bottoms.

3

A simple compactor could be made for a growing tray model.

4

Gentle compaction.

5

Preparation of seed holes – centring of the seeds is very important since off-centre seeds often dry out and germinate slower.

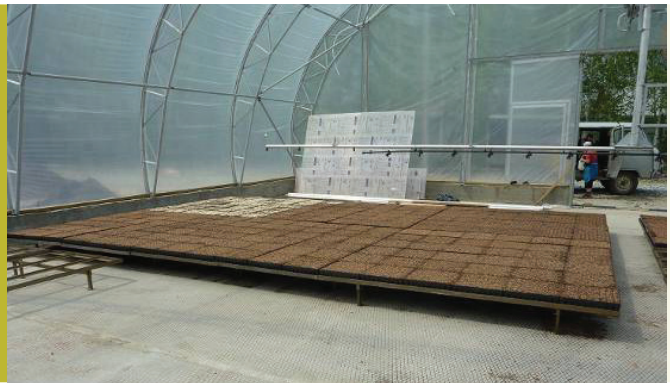
6

The number of seeds per cell depends on the germination percentage (G%). For G% › 95% one seed is sown in each cell. Two seeds are needed if G% is 85 – 90%. For G% of 70 – 85%, three seeds per cell must be sown.

7

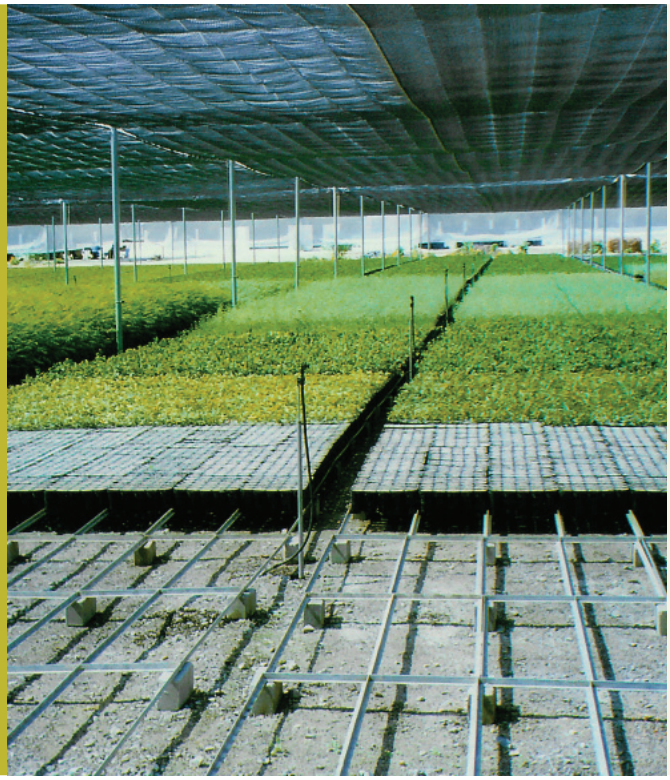
To stimulate germination and avoid desiccation of seeds it is also important to cover or mulch the surface with perlite, fractionated sand or sawdust (size about 1 – 3mm). 0.5 – 1 litre of mulching material is needed per tray. Perlite is available in Yerevan.

8



Place the growing trays on frames in the greenhouse; leave space for an aisle in the middle of the greenhouse and some space in the edges for easier irrigation.

9



Starting up the crop.

Irrigation to field capacity (saturation of the growing media to such extent that it drips under the trays) is the first thing needed to be done after the greenhouse is filled up with seeded trays. It is important to irrigate to field capacity (20- 25 litre of water/ m^2) at once so germination can proceed without any disturbing (cooling down) irrigations. It might take 16 - 20 hours to do this irrigation depending on the type of the irrigation system.

10

The optimal temperature for germination is 23 -28°C at the relative humidity of about 80%. Seedling growth requires 20 - 28°C at 60 - 80% humidity. Rooting of cuttings is best at 20 - 25°C with the relative humidity at 80 - 90%. Temperature in the greenhouse should be monitored 3 times a day. If the temperature rises over 30°C it is recommended to open extra side ventilation.

11

A simple model of irrigation / fertilization regimes could be as follows:

- A liquid fertilizer with a low concentration of nutrients should be used during the whole irrigation process. Optimum weight proportions between nutrients are as follows.

N	100	P	13
K	65	S	9
Ca	7	Mg	8.5
Fe	0.7	Mn	0.4
B	0.2	Z	0.03
Cu	0.03	Mo	0.007

- EC value should be about 1.0 Millie Siemens. If the EC value rises over 2.0 in the leach water use pure water for irrigation for a week or two.

12

- Irrigation of about 10-15 litre / m² would be needed and could be monitored by having a bowl under the growing tray.
- Let the surface of the growing media get dry between irrigations to avoid problems with weeds, pests and diseases. The frequency of irrigation should vary between 2-4 times / week. Try to irrigate in morning hours to avoid wet growing media at night, which can cause problems with fungal diseases.

13

To avoid fast drying out of edges, use protection plastic foam as the one shown in the picture.

14

Too wet conditions stimulate damping-off by fungus.

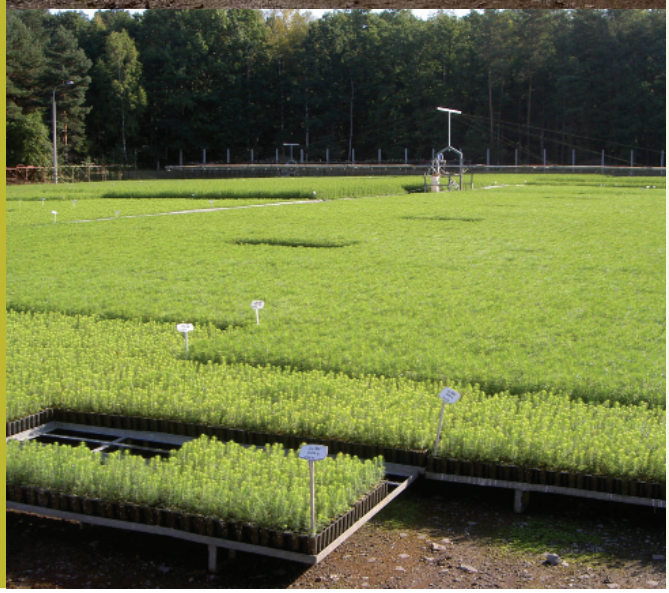
15

After 6 – 10 weeks when seedlings have reached a certain height they should be moved to the holding area for further growth and adaptation to outdoor conditions.

16

Broadleaf species often have a lower level of germination than conifers, and some do not perform optimally if night temperatures are too high. Therefore, it is preferable for broadleaf species to germinate under a protection cloth in the holding area.

17



For holding area management it is a necessity to keep control over irrigation system and monitor the water flow through nozzles regularly. To know the exact water supply per m², information about water flow per time unit and capacity of nozzles need to be monitored.

EC value and pH should be measured every week in the leach water as well as in the fertilizer water. The EC value should be about 0.8 – 1.0 (Millie Siemens) in the leach water and about 0.8 – 1.5 in the fertilizer water, using a complete fertilizer (including both macro and micro nutrients). A higher value should be used during the growth of the seedlings. Optimal pH for conifers is about 5.7 and for broadleaves – about 6.2.

18

There are various types of shading systems available for protection of seedlings from sun, hail and frost.

19

If seedlings need to be stored and protected over winter on their growing beds the trays should be put directly on the ground in late autumn and the sides should be protected with isolation material.

20

Late summer and autumn planting is preferable using containerized planting material. Keeping seedlings in the nursery over winter is always combined with a high risk for root damages in case of heavy frost with no snow covering the seedlings.

21

During the growing season weeding needs to be done a couple of times each month to avoid competition and decreased growth of the seedlings. Good hygienic conditions in the nursery minimize the need of pesticides.

22

Bad management and insufficient preparation of the nursery will cause problems with weeds and diseases.

23

An image of a well managed nursery

All tree and shrub species can be produced as containerized seedlings:

1

Oak seedlings

II

Beech seedlings

III

Pine seedlings

IV

Spruce seedlings

V

Abies seedlings

Growth of Pine Seedlings

a

Germination

b

After 5 – 6 weeks

c

After 8 – 10 weeks

d

After 12 weeks

2. RECOMMENDED QUALITY STANDARDS FOR BROADLEAF SEEDLINGS GROWN IN A CONTAINER

Standards:

Age:	1 – 2 year
Length:	25 – 50 cm
Root collar:	› 5 mm

Healthy seedling free from visible diseases

Root system without deformations

3. RECOMMENDED QUALITY STANDARDS FOR PINE SEEDLINGS GROWN IN A CONTAINER

Standards:

Age: 1 – 2 year

Length: 10 – 20 cm

Root collar: › 3 mm

Healthy seedling free from visible diseases

Root system without deformations

ANNEXES

1. MONITORING OF CONTAINERIZED SEEDLING GERMINATION AND GROWTH

Germination (%)	Count germination 15 – 30 days after starting up the crop. Count 10 trays randomly selecting out of 2500 trays. Avoid selecting the trays placed on the edges.
Establishment (%) (inventory)	Count each month (after germination) until October, start monitoring again in April. Count 10 trays randomly selecting out of 2500 trays. Avoid selecting the trays placed on the edges.
Height growth (cm)	Monitor each month during the growing season. Select 10 seedlings out of 2500 trays and mark them with a stick.
L / m²	The amount of water to be added to the crop each week is about 30 – 40 litre /m². To calculate this it is necessary to have full control over the irrigation system water supply / time unit: Time for the irrigation boom to move 1 turn in minutes x number of nozzles x amount of water / nozzle / minute = total amount of water added ÷ irrigated area = l / m²

2. MONTHLY MONITORING OF CONTAINERIZED SEEDLING PRODUCTION

Year: Month: Species: Start-up date:

Item / date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Germination																															
Height growth																															
Irrigation l/m²																															
Fertilization l/m²																															
EC value Fert / irrig																															
pH value Fert / irrig																															
EC value Leach water																															
pH value Leach water																															
Other treatment																															

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Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Address: Sustainable Management of Biodiversity South Caucasus
4/1 Baghramyan Avenue, 0019 Yerevan, Republic of Armenia
Tel.: +374 (0) 10 581877
E-mail: thomas.eberherr@giz.de
Webpage: www.giz.de

RA Ministry of Agriculture

Address: Government Building 3
Republic Square, 0010 Yerevan, Republic of Armenia
Tel.: +374 (0) 10 541968
E-mail: agro@minagro.am
Webpage: www.minagro.am

Authors: Stellan Karlsson, Forest Nursery Consultant, GIZ SMB, Armenia
Alla Berberyan, National Expert for Bio-Resource Management, GIZ SMB, Armenia

Editor: Armenuhi Pahlevanyan, Forest Nursery Consultant, GIZ SMB, Armenia

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