20. IDENTIFYING BEST MANAGEMENT PRACTICE IN FORESTRY NURSERIES

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This paper examines the nature and components of best management practice (BMP) in forestry seedling nurseries, setting out a series of guidelines on how a BMP system could be designed. Key aspects include potting media, disease control, chemical use and record keeping. It is clear that careful planning is required to introduce such a system, but fortunately there is considerable experience to draw on.

WHAT IS BEST MANAGEMENT PRACTICE IN FORESTRY SEEDLING NURSERIES?

Best management practice (BMP) sounds an attractive objective, and something which should be easily achievable, but in practice this often a poorly understood concept that is rarely implemented (Harrison et al. 2008). In essence, BMP sets targets for seedling quality, and specifies nursery procedures by which this quality aspiration can be achieved. A BMP manual or guide offers a checklist for the seedling producer. Following a BMP scheme enables certification and self-improvement for the seedling producer, and provides assurance of product quality for the consumer.

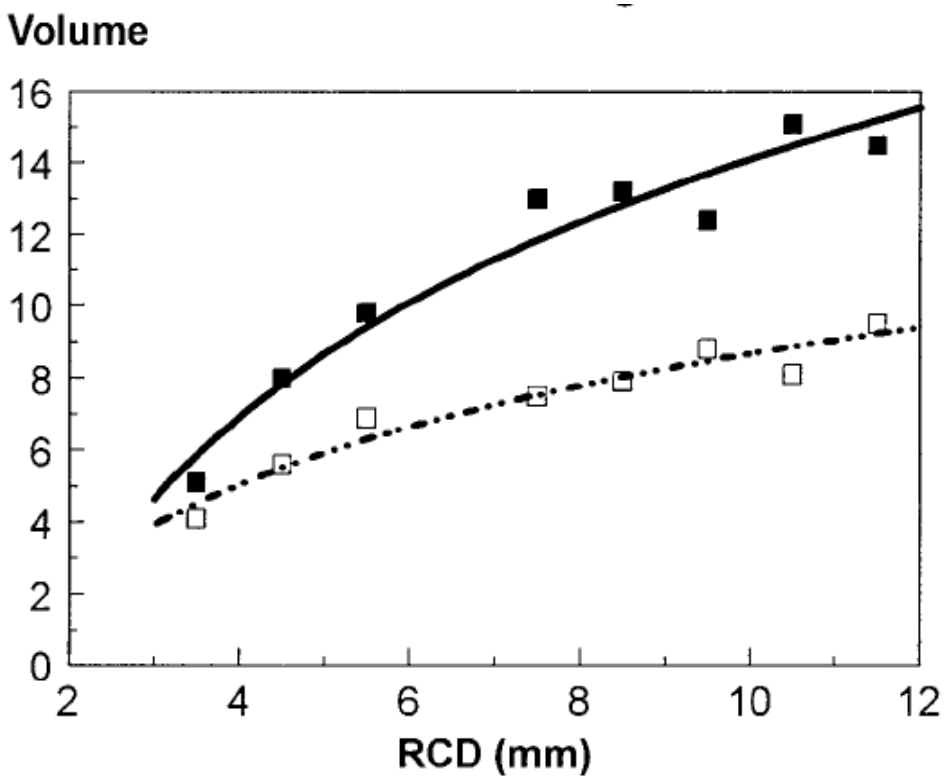
For the person or agency designing a BMP scheme, it is critical at the outset to have a clear plan of what is to be achieved, decide on the scope of the BMP implementation, and know how the BMP relates to other plans and strategies of seeding production. In this process, it is vital to have a project manager who takes overall responsibility, and to use an iterative process and give stakeholders a say in the BMP system and the way it is implemented.

Components of Best Management Practice in Forestry Seedling Nurseries

Best Management Practice could include a wide range of activities in relation to seedling production, for example: personnel management; health and safety of staff (occupational health and safety - OH&S); financial management; plant production systems (for seedlings, cuttings and wildlings); chemical use (fertilizers, pesticides and cleaners); and nursery hygiene (water, re-use of pots and materials).

The overall objective is to produce good planting stock, which may include seedlings, cuttings and wildlings. ‘Good’ in this context means ‘fit for purpose’, and potentially profitable for growers, both industrial and smallholder growers, which requires planting stock to be of good genotype. Planting stock should also be potentially able to restore biodiversity (requiring a range of species and reliable labelling) and able to withstand transport, planting and establishment. In general, desirable qualities include: adequate height, foliage and root collar diameter; good root growth potential and form; appropriate root:shoot ratio, and suitable potting mix and containers.

In many cases, experience can guide BMP. There is often a wealth of experience that can be extrapolated from other situations. For instance, South et al. (2001) observed a strong relationship between root collar diameter and seedling performance after outplanting in Loblolly pine, as illustrated in Figure 1, and this can be generalised to many other species.



Source: Reproduced from South et al. (2001)

Figure 1. Relationship between initial root-collar diameter and intensive management on volume per tree (dm^3) after four years of growth. Solid squares represent intensive management (fertilizer, weed control) and open squares represent minimal care after planting.

THE MOTIVATION FOR INTRODUCING BMP

Why have 'Best Management Practice'? BMP helps to ensure the quality of seedlings and, in turn, the quality and productivity of trees grown from them. Quality assurance is provided for nursery customers so that they can be confident of plants that are fit for purpose. BMP may help to attract more customers, and to ensure repeat custom from satisfied clients, and so may help seedling nursery enterprises to become more sustainable in financial terms. Critical components of a BMP to achieve these outcomes may include mandatory procedures for acceptance as a BMP nursery, including following a checklist of practices, and a formal certification and periodic auditing scheme.

SOME GUIDELINES FOR GOOD NURSERY PROCEDURE

BMP is about adopting appropriate procedures in the nursery, for example regarding potting mix, chemicals and nursery hygiene. Procedures are required that foster the best possible plant quality. The 'soil' or mixture used for potting planting stock should be free-draining for hygiene, fertile for growth, and cohesive for transport. Containers and practices should be chosen so as to foster good roots (which may include root trainers, air pruning and physical root pruning), to produce vigorous stock (which is not too old at the time of outplanting, and is convenient for transport). Box 1 summarises nursery procedures of Forestry Plantations Queensland (FPQ 2008) designed to achieve high quality seedlings.

Box 1. Forestry Plantations Queensland seedling production system

FPQ nursery procedures

Health and hygiene
Best plant and field growth results when seedlings are raised free of pests, disease and weeds:

- all specified potting media is obtained from quality-assured suppliers and must be disease free.
- stock is raised at least 60 cm off the ground,
- water used for irrigation is chlorinated or otherwise known to be disease free, and
- pots and trays are new or sterilised before re-use.

Potting media
FPQ uses a potting media of 50% pine bark peat, 25% peat and 25% sand (medium-coarse river sand) mixed in the proportions by initial volume.

Fertiliser
The following fertilisers are added to each cubic metre of potting media:

- 10 kg Osmocote® 8–9 month (18:2.6:10 N:P:K)
- 500g Micromax® (Fe 12%, Mn 2.5%, Zn 1.0%, Cu 0.5%, B 0.1%, Mo 0.05%, S 15%, Mg 5.0 % and CaO7.5%)
- 500 g IBDU granular nitrogen
- 600 gm of MoistureAid® to help retain moisture.

Pots and trays
The preferred container for raising seedlings is a Queensland Native Tube (QNT). QNTs have a volume of 220 cc, and are arranged in 50 cell black plastic trays at a density of 277/m^2. Copper induced pruning is used to prevent root coiling and pot binding. The pots are immersed in a copper solution of:

- 11 kg of copper oxychloride
- 19.8 kg of Agridip®
- 77 litres of water

The benefits of using good potting mix should not be underestimated, and can have long-lasting benefits. Haase et al. (2006) found that seedlings that had slow-release fertilizer added to the potting mix were 20% taller and had 70% more stem volume than control seedlings, four years after planting.

Good Procedures: Potting Mix, Chemicals, Hygiene

Nursery procedures should be designed to minimize adverse impacts. This includes effective use of chemicals (fertilizer, pesticide), with application following the principles of right amount, right place, right time, right dilution and no contamination. Attention is required to:

- good hygiene with water, soil, recycled containers,
- careful use of chemicals (e.g. of pesticides and cleaners), with no spillage, no overspray and no waste, and
- safe disposal of waste (e.g. culled plants, chemicals).

Good Procedures: Record-keeping

Record-keeping procedures are required that inform buyers and regulators. Records are needed to assure buyers of the high quality genotype and vigour of planting stock, for example of the seed batch, seedling age and fertilizer used. Records of nursery operations can demonstrate compliance with pesticide regulations. Records for financial transactions

are essential for self-improvement of the business enterprise operation, where it is critical to know the financial position and annual profit and loss from nursery operations. Records of sales, including volume and details of buyers (identity, location, quantity purchased) form part of the business records of nurseries. Such records may also provide useful details for follow-up visits by extension agencies.

IDENTIFYING BEST MANAGEMENT PRACTICE

If the decision is made to introduce a BMP scheme, then several questions immediately become apparent. Can we recognise best practice when we see it? Can consumers recognise it? Can it be measured? Does it involve destructive sampling of planting stock, and if not, will monitoring and certification help? What record-keeping is needed? What supervision and inspections are needed? Who should oversee this?

Some kinds of poor nursery management practice are apparent from the physical appearance of planting stock. Figure 2 illustrates what is obviously poor nursery practice. Polybags are placed on the ground, and some have fallen over, leading to deformed or dead planting stock. Figure 3 illustrates defective rooting systems – in the form of J or L shaped roots and lack of a prominent taproot. Davis and Jacobs (2005) reviewed ways to assess seedline quality, and observed that field performance was correlated with root volume and with the number of first-order lateral roots.

Figure 2. An example of a poor seedling production procedure

Figure 3. Examples of seedlings with deformed root systems

CONCLUDING COMMENTS

Seedlings which have deformed root systems and poor growth on outplanting are not uncommon in small-scale forestry. Production of high quality seedlings is critical for both nursery operators and tree growers. There is considerable experience which can be drawn upon when designing a BMP system, in terms of the critical practices to ensure high seedling quality. This experience allows guidelines to be developed efficiently, enabling high quality planting stock to be assured.

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