

# THE CONTAINER TREE NURSERY MANUAL— AN EXPERIENCE IN TECHNOLOGY TRANSFER

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## THE NEED FOR EFFECTIVE TECHNOLOGY TRANSFER

As Western Nursery Specialist for the United States Department of Agriculture—Forest Service, one of my primary responsibilities is to provide technology transfer to forest nurseries in the western United States. “Technology transfer” is one of those terms that is widely-used, but can be most practically defined as the sharing of information. The motto of the International Plant Propagators’ Society—“To Seek and to Share”—is an excellent example of technology transfer in action.

Technology can be transferred in a variety of different ways ranging from individual personal contacts, such as telephone inquiries and nursery visits, to group approaches, which include workshops and publications (Table 1). All of these technology transfer methods can be effective, but I have found that they are not equally efficient in terms of specialist-to-user time. Nursery visits are one of the best ways to provide technology transfer because they allow personal contact and address specific cultural concerns, but they are relatively expensive in terms of time and travel costs. Because my territory includes the 17 U.S. western states and island territories, I soon found that it was impossible to make regular visits to all the nurseries in my area. And, because I work with all different types of nurseries (federal government, state government, forest industry, and private), I found that it was difficult to provide the same amount and quality of technical assistance to each nursery and avoid any preferential treatment.

**Table 1.** Comparison of Different Technology Transfer (TT) Methods

T.T. Methods	Type of Contact	Program Time	Impact Cost	Specialist <sup>1</sup> Efficiency Ratio	Effectiveness Period
Telephone Inquiries	Individual	Low	Low	Low	Short-term
Nursery Visits	Individual	Medium	High	Low	Short-term
Newsletters	Group	Medium	Low	High	Short-term
Workshops	Group	High	Medium	High	Short-term
Journal Articles	Group	High	Low	High	Long-term
Technical Manuals	Group	High	High	High	Long-term

<sup>1</sup> Specialist-to-User ratio, assuming that a ratio of one specialist to many users is most efficient.

I also noticed that after several years of nursery visits, I found that I was repeating myself quite a bit—explaining the same principle or procedure to different growers. This led me to the conclusion that group methods were the most effective and efficient way to provide technology transfer to forest nurseries, and so I initiated several different publications. Starting in the early 1980s, I developed a newsletter called *Forest Nursery Notes*, which provides a news and literature service to nurseries, and also helped organize workshops and training sessions. Both of these activities have relatively short periods of effectiveness, however (Table 1).

After further analysis, I came to the conclusion that the best way to provide technology transfer to a large audience was through technical manuals or handbooks. These large publications are relatively expensive in terms of specialist time and publishing costs but these must be amortized over the functional life of the manual, which is one of the longest of all the technology transfer methods (Table 1). An additional benefit of a technical manual is that it can be used to increase the efficiency and period of effectiveness of other technology transfer methods, such as workshops or technical assistance visits.

One of my first technical writing projects was to help produce a handbook for growing forest tree seedlings in bareroot nurseries. Working with Mary Duryea of Oregon State University, we published the *Forest Nursery Manual: Production of Bareroot Seedlings* in 1984. After that project was completed, I began working on a counterpart for propagating tree seedlings in containers. The only comprehensive technical manual had been out of print for several years, and so there was an obvious need for an updated source of technical information for container nursery managers.

## THE CONTAINER TREE NURSERY MANUAL

The writing team consisted of Richard W. Tinus, Stephen E. McDonald, and James P. Barnett, all of whom have been involved with nursery research for the USDA Forest Service, and myself. We spent a considerable amount of time planning the new *Manual*, and decided on a different emphasis—to stress basic concepts of plant propagation rather than try to develop a “cookbook” that merely lists a sequence of nursery operating procedures.

Our objective in writing the *Container Tree Nursery Manual* was to discuss the concepts of plant propagation as they apply to forest tree seedling production, as well as document existing cultural techniques. Several sources of information were used to develop the *Manual*. We searched the published literature to find the most relevant information relating to tree seedling culture, using articles

from both the forestry and horticultural fields. We also circulated a detailed questionnaire to container tree nurseries in the United States and Canada to determine the current state-of-the-art in nursery culture, and we documented many new practices that were not reported in the published literature.

We decided to use some innovative formats for the *Manual*, such as publishing it as a series of separate volumes to allow for ease of updating. This would allow the volumes to be accumulated as a complete nursery manual or they could be used separately, by specialists needing information on a particular subject. The *Manual* will be printed in the standard 8.5 x 11 inch format, so that the books would fit onto bookshelves and into files. The series of seven volumes (Table 2) are organized around a numerical indexing system that helps the reader to easily locate information and refer between different volumes. Finally, we used numerous tables, line drawings, and color photographs to illustrate cultural concepts and also break up the text and make it more readable. The color photographs are particularly useful for illustrating seedling disorders such as mineral nutrient deficiencies and nursery pest problems.

**Table 2.** The seven volumes of the *Container Tree Nursery Manual*, *Agriculture Handbook No. 674*, and their planned publication dates

Volume No.	Title	Publication Date <sup>1</sup>	Stock Number and Price
One	Container Nursery Planning, Development, and Management	(1991)	
Two	Containers and Growing Media	(1990)	
Three	Container Nursery Environment	(1991)	
Four	Seedling Nutrition and Irrigation	1989	001-001-00635-1 \$15 each
Five	Biological Influences: Nursery Pests and Mycorrhizae	1990	001-001-00633-5 \$30 each
Six	Seedling Propagation	(1992)	
Seven	Seedling Processing, Storage, and Outplanting.	(1992)	

<sup>1</sup> Dates in parentheses are estimated publication dates

The seven volumes of the *Container Tree Nursery Manual* are being serially published as *USDA Agriculture Handbook No. 674* (Table 2). One very unusual practice is that the different volumes are being printed out of numerical sequence—much to the dismay of librarians. This idea originated from the container nursery survey

in which nursery workers indicated what subject areas they considered most critical. This emphasis on nursery priorities resulted in *Volume Four: Seedling Nutrition and Irrigation* being published first, followed by *Volume Five: The Biological Component, Nursery Pests and Mycorrhizae*. *Volume Two: Containers and Growing Media*, is currently at the printers and will hopefully be published in 1990. The remaining four volumes will be released over the next few years, barring complications in funding or printing delays (Table 2).

#### ORDERING INFORMATION

We feel that, because we have emphasized the basic concepts of nursery culture, the *Container Tree Nursery Manual* will be of interest to many members of the International Plant Propagators' Society. The USDA Forest Service has purchased a limited supply of the Manuals for distribution to cooperators. Contact me at the following address if you would like to obtain one free copy of each of the volumes that have been published so far:

Thomas D. Landis  
USDA Forest Service, CF  
P.O. Box 3623  
Portland, OR 97208-3623 U.S.A.

PHONE: 503-326-2727; FAX: 503-326-5569

Additional copies of the *Manual* can be ordered using the stock numbers and prices listed in Table 2; contact the U. S. Government Printing Office:

Superintendent of Documents  
Government Printing Office  
Washington, DC 20402-9371 U.S.A.

PHONE: 202-783-3238

The availability of the remaining volumes of the *Container Tree Nursery Manual* will be announced in my *Forest Nursery Notes* newsletter.

Response to the first volumes of the *Manual* has been quite favorable, and copies have been mailed to nursery managers all over the world. We hope that the *Manual* proves to be an effective technology transfer tool and helps bridge the gap between pure science and practical application.