From Amateur to Professional Propagator©

Bruce Higgs
Darvill Nursery, 54 Darvill Road, Orchard Hills, New South Wales, 2748
Email: bs.higgs@bigpond.net.au

Unlike most members who grew up in horticulture, I came to the industry later on from a career spanning disciplines of biochemistry, chemistry, and material science. Before starting the nursery, I was employed in multinational corporations in marketing and technical management, as well as corporate strategic planning. Throughout that career the ability to be innovative with products, systems, and markets had been shown, as well as while chairing a number of Australian and international committees. This paper looks at the challenges faced in establishing a nursery, along with a few simple tips found in improving the propagation environment.

All along my wife and I had a desire to have a nursery. In the 1980s we had joined the Australian Plant Society to find out more about Australian native plants. When I could, I continued to collect seeds and propagate plants from cuttings as a hobby. With changes in the manufacturing industry in Australia we set out in 2000 to establish a production nursery.

The first things that come to you when you start a nursery from nothing are the four Ps of marketing:

1) What products?
2) What place and distribution methods?
3) How are they to be promoted?
4) What price/profit could we expect?

Of course the other big questions were who would be our customers and how much did we need to produce? Business planning with various scenarios has proven invaluable.

Scaling up from amateur endeavours around the house, where success was measured in terms of managing to propagate something, to an economically viable level was seen to be a key to our future. Since we owned our own acreage on the outskirts of the significant Sydney market, we decided to build our nursery where we lived.

Our business plan identified that we needed to be a niche player in the native plant market. The intent was to be a propagation nursery, but we needed to build our stock range and volume so we bought in tube-stock from other growers. That's how I was invited to my first I.P.P.S. conference in Canberra in 2001.

Because labour costs are high in the industry we decided to adopt just-in-time manufacturing concepts, automate as much as our budget allowed, and have a philosophy of building in flexibility for the size and range of plants we grew. Production plans with lead times led us to planning an initial 190-m^2 propagation greenhouse, 240-m^2 shade house, and a 500-m^2 growing area with in-ground stock plants around gardens at the property. A small building for a tissue culture laboratory was planned, as were a concrete-floored soil bin and media area and another small covered area for potting up. A focus was on flow of products to minimise handling and movements.

The greenhouse was initially going to be a poly-tunnel construction. But the development application to the local council and discussion with their planning de-

partment stopped that. To meet the building codes for structures in our area we needed a structure capable of withstanding cyclonic winds. Instead of giving up, I researched alternatives with the NSW Department of Primary Industry (Badgery-Parker, 1999a, 1999b, 1999c, 1999d, 1999e, 1999f, 1999g), UWS (University of Western Sydney) Richmond Library, and the Internet. The U.S. National Greenhouse Manufacturers Association (1996a, 1996b, 1996c, 1996d) graciously allowed us use of their standards to assist in the design of our own building. Supplier discussions were also useful sources of information. Our next door neighbour's greenhouse for indoor plants had been a fibreglass-sheet-covered chicken shed with top vents. It was oriented east-west according to experience growing up in Holland. In California the industry orients greenhouses east/west at latitudes above 40° and north/south below that (Nelson, 1998). This minimises heat in summer and maximises it in winter. For the Sydney area (34° South), we decided to orient the building north/south with benches in a herringbone fashion according to Schroeder et al. (2000) and not run lengthwise.

Polycarbonate sheeting was the best long-term compromise for a more expensive building. Our temperate climate did not require double-sided polycarbonate sheeting.

The chosen Greca profile (Fig. 1) had the advantage of maximizing winter light transmission, because sides are inclined about 50° to the horizontal. Summer light transmission is only marginally reduced by reflection.

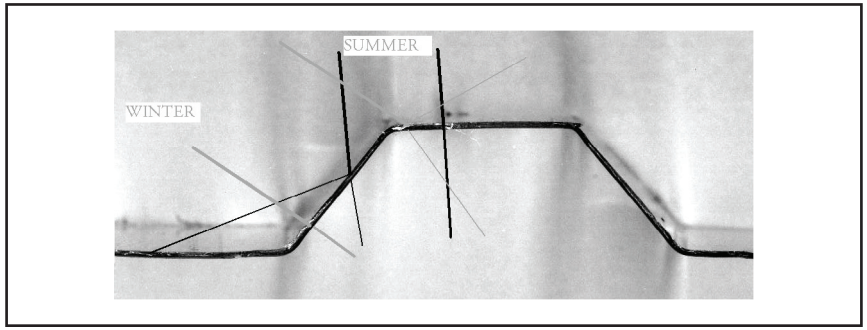

Figure 1. Polycarbonate sheet.

Nursery sprinklers were deployed with a high coefficient of uniformity. From the Waterworks program conducted by the Nursery and Garden Industry Australia (NGIA) an effective way to irrigate was employed to irrigate by overhead sprinklers replacing evaporation. This assumed transpiration losses were relatively small as appears to apply for young containerised plants. The normal way of measuring evaporation is with a class A pan. Traditional equations used by meteorologists to estimate evaporation involve many variables, which have made estimation difficult for most nurserymen. Going back to the physics of evaporation, equations were derived and simplified into a Monograph. This enables a quick estimate of daily evaporation from which irrigation has been set for more than 5 years now, saving significant amounts of water. Container plants in the nursery are initially supplied with 9-month, slow-release fertiliser, and this approach assists in ensuring that nutrients are available for most of this time and not washed out the bottom of the pot.

To help control internal heat in the greenhouse while promoting adequate light, various types of screens were investigated. Surprisingly, at the time I could not

get a recommendation from suppliers of these screens as to grades suitable for a greenhouse propagation area and shade house. Using light globes as heat sources and thermocouples to measure transmitted radiated heat, both aluminium foil/polyester laminate screen materials and aluminised high-density polyethylene (HDPE) film types, as well as knitted 70% shade cloth were studied. Temperatures recorded were values after figures had stabilised. Shade cloth gave similar results in terms of reducing heat. The reflective grades gave marginally better results in reducing transmitted heat which could be significant in an enclosed building such as a greenhouse, but this would need to be weighed up against the extra costs (Fig. 2). With high air circulation in shade-house constructions, lower-cost knitted shade-cloth was chosen for outdoor protected cropping. A 75% shade aluminium laminate screen was chosen for the propagation area to assist reducing temperature extremes while keeping conditions autotrophic (above 3000 lux).

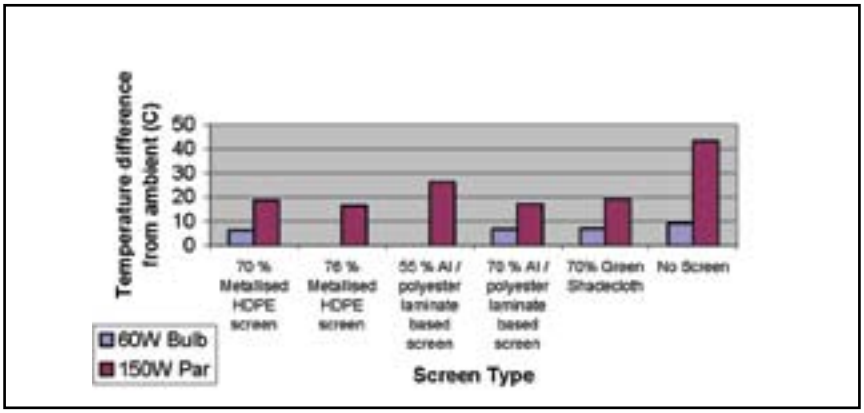

Figure 2. Radiant temperature difference for different screens.

There are many simple tools that have helped control the propagation environment in our nursery. A robust alcohol-type thermometer is used to measure temperature in media with cuttings. A low cost digital temperature/humidity probe is useful to check misting performance and settings on propagation benches. This has helped us maintain 75% to 90% relative humidity throughout the year with a simple balance-arm device. Coloured tags are used to readily identify when cuttings on the bench were taken. Separate tags indicate the time of cuttings, species, and other information. Instead of expensive Materials Resource Planning (MRP), or other database ordering systems, materials such as media and labels are ordered using a Kanban scheduling system as part of a just-in-time philosophy. That is, as they are about to run out an order may be generated.

Now we only propagate tens of thousands of plants and are still looking to the point when it is hundreds of thousands. Most nurseries in Australia have downscaled activities at this time due to the long drought and water restrictions.

So the transition to professional propagator has been harder than first imagined. I continue to learn from experiences and view challenges as opportunities. And, there is still the thrill when that hard-to-propagate species grows adventitious roots; more so when it can be repeated. Understanding the "why did this happen" is often the greatest challenge.

LITERATURE CITED

Badgery-Parker, J. 1999a. Protected cropping technology, NSW Agriculture Agnote DPI/253.

Badgery-Parker, J. 1999b. Protected cropping, NSW Agriculture Agnote DPI/248.

Badgery-Parker, J. 1999c. Building a greenhouse, NSW Agriculture Agnote DPI/250.

Badgery-Parker, J. 1999d. Light in the greenhouse, NSW Agriculture Agnote DPI/254.

Badgery – Parker, J. 1999e. Covering materials, NSW Agriculture Agnote DPI/251.

Badgery-Parker, J. 1999f. Local government and environmental issues of greenhouses. NSW Agriculture Agnote DPI/252.

Badgery-Parker, J. 1999g. The greenhouse. NSW Agriculture Agnote DPI/249.

Chen, S., and **M. Fuchs.** 1999. Measuring and predicting radiometric properties of reflective shade nets and thermal screens. J. Agric. Eng. Res. 73:242–255.

Fox, R. 1995. Open roof greenhouse. Practical hydroponics and glasshouses. Issue 25.

Fox, R. 1999. Greenhouse around the world. Practical Hydroponics & Glasshouses, Issue 45. Casper Publications Pty. Ltd., Narrabeen, NSW, Australia.

Haigh, T. 2000. What is an optimum greenhouse environment? Unpublished paper. School of Horticulture, University of Western Sydney, Hawkesbury, NSW Australia.

National Greenhouse Manufacturers Association. 1996a. Standards for design loads in greenhouse structures, U.S.A. < www.ngma.com/>.

National Greenhouse Manufacturers Association.1996b. Standards for ventilation and cooling greenhouse structures. U.S.A. < www.ngma.com/>.

National Greenhouse Manufacturers Association.1996c. Considerations for internal and external greenhouse curtain systems, U.S.A. < www.ngma.com/>.

National Greenhouse Manufacturers Association. 1996d. Greenhouse insect screen installation considerations for greenhouse operators, U.S.A. < www.ngma.com/>.

Nelson, P.V. 1998. Greenhouse operation and management, 5th ed. Prentice Hall, Upper Saddle River, New Jersey.

Schroeder, G., E.D. Seagle, L.M. Felton, W.T. Kelley, G Krewer, and **J.M. Ruter.** 2000. Introduction to horticulture, 3rd edition, Interstate Publishers Inc., Danville Illinois.