

The Role of Botanic Gardens in Propagation for Conservation or Profit[®]

Leigh Morris

Royal Botanic Garden Edinburgh, 20A Inverleith Row, Edinburgh, EH3 5LR. United Kingdom
Email: l.morris@rbge.ac.uk

INTRODUCTION

This paper highlights the vast array of propagation and nursery production being carried out by botanic gardens for the conservation of plant collections; for training and education; and even for the production of plants for sale. Botanic garden staff members possess a huge amount of nursery knowledge and skill, but unfortunately within the U.K. there are relatively few examples of botanic gardens linking with the commercial nursery industry. This paper concludes by identifying an area of potential collaboration between nurseries and botanic gardens.

WHAT BOTANIC GARDENS DO

The Royal Botanic Garden Edinburgh (RBGE) is one of the world's leading botanic gardens, and its work is representative of that carried out by many other botanic gardens. The Royal Botanic Garden Edinburgh's overall mission is to "explore and explain the world of plants," which is achieved in five main ways:

Collection. The Royal Botanic Garden Edinburgh's scientists and horticulturists collect plant material from across the globe. Specimens are collected, pressed, dried, identified, and added to the herbarium in Edinburgh, with duplicate specimens remaining in the country of origin. Living plants are predominantly collected in the form of seeds, and at the same time voucher specimens are created for the herbarium. The RBGE has a policy of increasing the percentage of wild-collected plants within its four gardens, and on the majority of expeditions, scientists and horticulturists work hand-in-hand.

Cultivation. The seeds from collection trips are returned to Edinburgh where they are grown and added into the living collections that are held by the RBGE at the main garden in Edinburgh and the three National Botanic Gardens of Scotland at Benmore, Dawyck, and Logan. The four gardens have quite diverse climates and topography, which enables an extremely broad range of plant species to be grown. At the last count, in 2006, the RBGE held 15,681 species in its living collections, which is more than any other botanic garden in the world.

Classification. Taxonomists at the RBGE spend a great deal of time and effort naming and classifying plants. This is done as part of long-term work such as the production of the Floras of Arabia and Nepal, as well as on smaller projects, such as the production of a checklist of plants of a protected area in Laos. Traditionally, plants have been classified in accordance with their morphological characteristics (shape, size, colour, etc.), but their genetic characteristics, identified through DNA analysis techniques, are increasingly being used because they can reveal evolutionary relationships — or their absence — not obvious from visual characteristics.

Unless you can correctly name a plant and classify it according to its true evolutionary relationship with others, you can't do anything useful with it. For example how could a nursery sell a plant if it did not know its name?

Conservation. The Royal Botanic Garden Edinburgh is involved in a large amount of plant conservation work both within the gardens (ex situ) and in the plants' natural habitats (in situ). Such projects range from the propagation and re-introduction of the British native fern *Woodsia ilvensis* to the conservation of Chinese medicinal plants on the slopes of the Jade Dragon Snow Mountain near Kunming. Everything the RBGE does is in accordance with the Global Strategy for Plant Conservation (GSPC) that arose from the United Nations Convention on Biodiversity (CBD).

Communication. Scientists are measured by the number and quality of published papers, floras, monographs, and articles, but the RBGE also communicates to a wider audience through a range of publications, including its quarterly *Botanics* magazine. The RBGE runs formal education from nursery school sessions right up to post-graduate M.Sc. and Ph.D. programmes, and this includes a significant amount of horticulture and propagation teaching. Finally, interpretation to the public of the living collections in the four gardens is paramount, and this is achieved in a variety of ways including signage, audio wands, and guided tours.

NURSERY PRODUCTION AT RBGE

The RBGE has three nurseries at its main site in Edinburgh, with smaller nursery facilities at two of the regional gardens, Logan and Benmore. The main nursery facility (Fig. 1) grows hardy trees, shrubs, and perennials; the alpine nursery grows higher altitude plants (Fig. 2); and the indoor nursery is a glasshouse facility propagating plants from tropical regions.



Figure 1. The main hardy plant nursery at the Royal Botanic Garden Edinburgh. The nursery grows a wide range of trees, shrubs, and perennials from both wild collected seed and vegetative methods in order to sustain previously collected accessions and also to bulk up plants for conservation programmes.



Figure 2. The alpine nursery at the Royal Botanic Garden Edinburgh located within the main garden.

These three facilities produce an extremely diverse range of plant species. Most is seed propagated, but the nurseries also carry out vegetative techniques to maintain taxa already within the living collections or to increase numbers of certain plants for conservation. One example of this would be the chip budding of three rare species of *Sorbus* from the Isle of Arran.

NURSERY EDUCATION AT RBGE

The range of formal horticultural education programmes ranges from one-day workshops and Practical Certificates in Horticulture, up to a full B.Sc. (Hons) degree programme in Horticulture with Plantsmanship. Within these courses a range of nursery and propagation skills are taught. The HND/BSc (Hons) programme students in Year 1 complete a Horticulture Practices module in which they carry out a range of propagation techniques (Fig. 3) and also have their own individual plot in which they have to propagate and grow a range of different plants. Year-1 students also carry out rotations, working the nursery as part of their Work Experience module.

In subsequent years of the B.Sc. (Hons) programme, students complete modules in Advanced Plant Propagation, Nursery Production, and Plant Retailing. Royal Botanic Garden Edinburgh students also go on a range of nursery visits (Fig. 4), and overall they gain much experience in propagating and growing on nursery plants. The Royal Botanic Garden, Edinburgh also delivers sessions on nursery plant production and procurement to landscape architect students from the Edinburgh College of Art, as well as their own Garden Design Diploma students.



Figure 3. First year students on the RBGE's HND/BSc (Hons) programme in Horticulture with Plantsmanship learn a range of basic propagation techniques as part of their "Horticulture Practices" module. In subsequent years they then progress onto an "Advanced Plant Propagation" module.



Figure 4. The Visits and study tours to nurseries and propagation facilities are an important part of the RBGE's education programmes. Here Geoff Caesar (Managing Director Bransford Webbs Plant Company) is showing RBGE students around Bransford Nurseries as part of their study tour in 2006.

The possibility of studying nursery production in U.K. horticulture colleges has all but disappeared over recent years, but through its Plantsmanship programme, the RBGE has ensured that nursery and propagation skills remain a main focus of its degree course. Similar skills are taught within horticulture programmes at other leading botanic gardens such as the Royal Botanic Garden Kew and the Royal Horticultural Society — the diverse collection of plants grown and propagation methods carried out by these organisations allows students to gain skills and knowledge in a wide range of plants and nursery and propagation techniques.

INTERNATIONAL HORTICULTURAL PROJECTS

The RBGE is involved in a large number of horticultural initiatives around the world, including the development of new botanic gardens and in helping organisations in other countries develop the skills and facilities they need to conserve their own plants. For example, in Arabia, RBGE staff have helped set up of a nursery to grow plants for a new Oman Botanic Garden (Fig. 5). The RBGE horticulturists have also assisted in the development of a nursery/botanic garden on the Yemeni-owned island of Socotra (Figure 6). There are similar projects in Belize, Bhutan, Turkey, and China. Capacity building is a fundamental part of all the international projects the RBGE is involved in — achieved through training workshops in the partner countries and also through staff coming to Edinburgh for formal training courses or to work alongside RBGE staff within the nursery.

COLLABORATION ON PLANT COMMERCIALISATION

Very few of the plants that can be bought in U.K. garden centres today originate from within Britain. For more than 200 years plant hunters have travelled the world in search of new plants to bring back to our islands for garden cultivation. Many of these plant collectors were employed by, or connected to, botanic gardens, and one of the most notable, with links to the RBGE, was George Forrest, who made seven major expeditions, predominantly to China, and introduced hundreds of species to western cultivation.

Although the public interest and publicity surrounding plant collecting has all but disappeared, there are still many expeditions by plant collectors that take place every year all over the globe but no longer with the main aim of collecting plants for commercialisation. Many of these modern day expeditions are by botanic garden staff, including those from the RBGE.

The majority of plants collected today by botanic gardens are for taxonomic research or conservation purposes, but some botanic gardens have seen the potential for commercialisation. I first encountered this in 1994 while I was the nursery manager at Pershore College of Horticulture, which was contracted by the South African National Botanic Institute (SANBI) to trial a selection of plants for potential commercialisation in the U.K. I spent a month at Kirstenbosch Botanic Garden in Cape Town, headquarters of SANBI, and a range of plants was then brought back to Pershore for trialing. Some of these plants were launched into the trade in the U.K. as a result (e.g., *Cineraria saxifraga* as a patio plant). Kirstenbosch/SANBI eventually signed a long-term commercialisation agreement with the seed company Ball Colegrave Ltd.

Senior horticulturists on RBGE expeditions today apply an immense knowledge and experience of U.K. garden plants, and the seed they bring back from expedi-



Figure 5. The RBGE's Head of Education, Leigh Morris, training staff from the Oman Botanic Garden in the selection of propagation material collected in the mountains of northern Oman.



Figure 6. Adebe (left) with his son, who, together with help from the RBGE, have set up a small nursery and botanic garden on the Yemen-owned island of Socotra.

tions, therefore, has huge potential value to the nursery trade. Some of these collected species may be directly marketable, but the big potential lies in the selection of distinct forms from the batches of seedlings grown. Over the years the RBGE has compiled a huge number of wild collected plants that are now growing in its four gardens. For example the garden in Edinburgh has around 5,000 of the more than 30,000 species found in China alone. It also has living collections from many other countries such as Bhutan, Chile, New Zealand, Nepal, Turkey, and Socotra. Recent plant discoveries have been commercialised by others (e.g., *Exacum affine* and *Begonia socotrana* from Socotra), and there are potentially many more plants that could be commercialised from the countries with which the RBGE and other U.K. botanic gardens have links.

The 1991 United Nations Convention on Biological Diversity (CBD) resulted in much tighter regulations governing collection and use of a country's living resources. However, this should not be a barrier or a deterrent to commercialisation of plants from overseas. It could be viewed as an opportunity, as the CBD encourages conservation and the propagation and distribution of plants is one strategy that could be used to sustain them. The Wollemi pine (*Wollemia nobilis*) is an excellent example of an endangered species that has been commercialised and sold all around the world to aid in its conservation.

The RBGE has seen the potential in conserving plants through commercialisation and in recent years has set up an agreement to trial Chilean plants for potential commercialisation in Europe. This is a three-way agreement between the RBGE, the University of Valdivia, Chile, and Liss Forest Nursery, Hampshire. Twenty-eight novel Chilean plants have been selected for nursery trials, and twelve are currently being evaluated by Liss Forest Nursery. Examples include *Elytropus chilensis*, *Latua pubiflora*, and *Cortaderia araucana*. No plants have yet been launched to the trade as a result of the work, but it is still early days, and the hope is that it will not be long before plants are available in U.K. garden centres and some money is going back to Chile for use in conservation schemes.

There is potential for nurseries to partner RBGE, and perhaps other botanic gardens, in the creation of a Global Plant Conservation Collection, within which a range of selected plants from temperate regions around the world would be sold through U.K. retail outlets. These could be badged with the logos of the CBD, BGCI (Botanic Gardens Conservation International), RBGE and the producing nursery (Fig. 7). The Royal Botanic Garden, Edinburgh would be helping to conserve plants and promoting the necessity of doing so, the countries of origin would get some money to be used for plant conservation and/or capacity building, and the U.K. nursery would gain income, kudos, and also the satisfaction of knowing that they are contributing to global plant conservation. The garden centres retailing the plants would have an excellent concept to market, and the public buying the plants for their gardens would feel they are helping with conservation, but that they also have something a little bit different and more exotic. Exciting potential and a true "win, win, win" scenario.



Figure 7. A mock up of a plant label for one of the Chilean plants believed by RBGE to have commercial potential within the U.K. The label could be badged with the logos of the CBD, BGCI, the RBGE, and the nursery that takes up this collaborative opportunity.