

THE WINSTON CHURCHILL MEMORIAL TRUST OF AUSTRALIA

Report by - Mark Webb – 2001 Churchill Fellow

To investigate models overseas to guide the development and commercialisation of Australian plants for the local and international ornamental plant markets

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INTRODUCTION

Historically, the selection, breeding and commercialisation of indigenous Australian flora for ornamental (cutflowers, foliage, potplants and bedding plants) production has not been well managed or coordinated in Australia, especially for international markets. Starting with the first botanic expeditions to Australia over 200 years ago, plants and seed, mainly from opportunistic selections, have usually been given away or sold to a range of countries. There has generally been little thought given to the impact of the release on the domestic industry, or to the development of a sustainable and enduring plant breeding and selection program that could return ongoing and increasing benefits to Australia.

The aim of this fellowship was to enhance the plant development programme at Kings Park and Botanic Garden in Western Australia, by investigating models developed for the selection, breeding and commercialisation of local native plants for horticulture by other Botanic Gardens or related institutions and companies.

I would like to acknowledge the assistance of the Winston Churchill Memorial Trust of Australia that provided this Fellowship, the support of the Botanic Gardens and Parks Authority, and the understanding of my wife and children. In addition, I would like to thank all my new friends and colleagues that I met on my trip that freely provided me with information, and went out of their way to make my stay in each place enjoyable. Thanks to you all.

EXECUTIVE SUMMARY

This Fellowship to investigate models developed overseas to guide the development and commercialisation of Australian plants for local and international ornamental plant markets was undertaken by:

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The development of native Australian plants for ornamental horticulture is still in its infancy. With some notable exceptions such as kangaroo paws, there has been almost no strategic or long term development of Australian plants for the local and international plant markets. Where activities have occurred, they have tended to be *ad hoc* and dependent on an individual, and have generally ceased when that individual has moved onto other interests. Kings Park and Botanic Garden is at the forefront of the strategic development of selected native Australian plants for ornamental horticulture.

Botanic Gardens or related institutions were visited overseas that have a development programme on indigenous plants for horticulture, or were commercialising these plants or ornamental plants in general, to learn from their experience and to apply these lessons in Australia. Visits were made in South Africa (Kirstenbosch National Botanical Garden), the United Kingdom (Royal Botanic Gardens Kew), the USA (Chicago Botanic Garden, Moreton Arboretum, Ball Flora), Canada (The University of British Columbia) and Indonesia (Bogor Botanic Garden).

The major lessons learnt included:

- To deliver identified outcomes, a plant development programme must be focussed and concentrate on strengths within an organisation,
- The establishment or maintenance of hybridisation activity is essential to the ongoing development and release of new plants, and to retain control of any innovative breeding processes and of any developed plant material,
- To deliver outcomes in the medium term, and to provide a reasonable return on investment, the programme should focus on the development of local herbaceous perennials or annuals that are cutting grown,
- Selection of a suitable commercialisation partner is essential to guide the breeding programme, and to maximise potential return on investment in any international release, and
- The development of a plant improvement programme should be underpinned from its inception by appropriate legal agreements if external parties are involved in the activity.

These lessons, and the general information provided will guide the further development of the plant development programme at Kings Park and Botanic Garden, and will be disseminated to other researchers and the local industry through personal contact, seminars and conferences.

PROGRAMME

A 40 day programme was undertaken visiting selected Botanic Gardens or related institutions in South Africa, UK, USA, Canada and Indonesia. These gardens or institutions have a development programme on indigenous plants for horticulture, or were commercialising these plants or ornamental plants in general. Preliminary Investigation indicated that there were only a small number of institutions or companies involved in the development of indigenous plants. Approval was given to independently attend a plant breeding conference in Belgium as part of the programme, at which contact was made with institutions or companies that were developing ornamental plants.

Details of people and organisations met or visited are provided in Appendix A. Large quantities of pamphlets, brochures and books were collected that are available for perusal by contacting me.

MAIN BODY

General

South Africa, Australia and some tropical rainforest countries are considered by sections of the plant ornamental world as the last frontiers for the discovery of new plants for ornamental plant markets. The attention of selectors, breeders and marketers especially in Europe, USA and Japan is focussed in the development and exploitation of these plant products. The challenge for countries such as Australia and South Africa is to lead or participate in the development of these plants, and to ensure that some of the benefits of any success of commercialising these plants return to the host country. Funding of plant development activities and especially the conservation of the genetic resource in the wild is crucial for the long-term sustainability of any plant development programme.

South Africa

In general, there has been more development of South African plants for ornamental horticulture than has occurred in Australia, but like Australia, most of this development has not provided any tangible benefit back to South Africa.

The National Botanical Institute (NBI), based at Kirstenbosch National Botanical Garden in South Africa has recognised the need to develop a formal programme to focus on plant development. With support funding from Ball Horticulture (Ball), a USA based plant ornamental breeding and commercialisation company, NBI commenced a programme in 1999 to identify potential plants for the international ornamental plant market. Using information from their herbarium and botanic garden collection, NBI is collecting novel forms of target species that they and Ball believe might have some commercial value.

Many aspects of the agreement between NBI and Ball are confidential and could not be discussed. However, it appears that Ball has given NBI a loan against future royalties to provide important glasshouse infrastructure, support staff and operating expenses. In return, Ball has gained the breeding and commercialisation rights to all identified plant material, on the condition that the plants are only used for ornamental purposes. Ball pays a royalty to NBI for all material sold.

The NBI-Ball Agreement is the first of its kind for South Africa. Profits generated by the Agreement will be administered by the NBI Board, to be used for capacity building in botany and horticulture, and as a source of funding for plant conservation and community-based environmental upliftment projects.

There was some vigorous industry and community debate in South Africa in 2000 and 2001 over the NBI-Ball Agreement. From accusations that NBI had sold off the patent rights to huge sections of South Africa's floral kingdom and that the agreement had effectively killed off the potential of local companies to develop the floriculture export industry, to concerns that Ball would own the plants, the agreement has generated considerable adverse publicity for NBI.

The NBI answered its critics on these and other matters, but it was clear that the agreement, while apparently simple in its operation, had some complex implications that had perhaps not been properly identified or thought through adequately. At the time of my visit, there was no intention to develop a plant breeding programme at NBI to develop the next generation of potential plant products. It would appear that Ball, through its own breeding program would effectively own and control all hybrid material developed from the plants introduced from NBI. While NBI will get a royalty from any hybrid material commercialised, over time their equity in the activity will most likely decline, and their only long term involvement may be the injection of novel plants for Ball to use in the breeding programme.

UK

The Royal Botanic Gardens at Kew has a long and distinguished history in developing plant products for a range of plant uses. The horticulture department is currently not involved in any plant development activities, mainly due to a lack of resources, and a limited number of endemic UK species.

Kew has previously developed a range of species from other countries, and has hybridised some of these plants. However, under the proposed Convention of Biodiversity (CBD) Agreement, some aspects of plant development would be more difficult. Although the CBD has yet to be ratified by many countries, Kew is effectively operating under its guidelines.

A UK based ornamental seed company had recently approached Kew, essentially to screen the material in its collections similar to the NBI-Ball agreement in South Africa. Kew was concerned about various aspects of the proposal, including the fact that many plants in its collection originally came

from overseas raising the ownership question, and was thus considering its position on this matter.

One relevant project that Kew was researching was the 'Commercial Use of Wild and Traditionally Managed Plants in the UK'. This project will provide information on the current status of the commercial use of wild and traditionally managed plants in the UK.

A visit was also made to Wakehurst Place, the site of the Millennium Seedbank Project that aims to collect and store 10% of the world's rare and endangered flora by 2010.

Belgium

A side trip was taken to attend the 20th International Eucarpia Symposium, on Strategies for New Ornamentals. A poster was presented on the selection and breeding work at KPBG, and valuable information was obtained on plant development and breeding systems used for other ornamental crops, many of which are transposable to Australian plants.

In addition to the various posters and presentations at the conference, contacts were made with a number of researchers investigating aspects of plant selection, breeding and marketing.

Conference Proceedings were obtained.

USA

The Chicago Botanic Garden (CBG) and the nearby Moreton Arboretum (MA) have a comprehensive plant introduction and evaluation programme. It has traditionally focussed on the testing of non-local trees and shrubs for local conditions.

The Chicago programme was an initiative of Dr Roy Taylor, who had established a similar programme at the University of British Columbia Botanic Garden in Vancouver.

CBG has a Plant Evaluation Garden that evaluates over 7000 plants each year for such characteristics as bloom size, colour, cold hardiness, and disease and pest resistance.

The process of introduction and evaluation on woody plants can take five to twelve years, but does provide a reliable and independent assessment of target plants. Plants that have been assessed, and meet agreed performance standards get a special logo that attracts a royalty on being sold through nominated nurseries. The royalties charged depend on the product ranging from USD0.05-0.15 for perennial plants, to USD0.2 for shrubs and USD0.65 for shade trees. These levels are on the high side of what is generally paid by commercial breeding companies.

The testing and release programme is conducted under the auspices of the Chicago Grows Inc., a non-profit group established in 1988 by stakeholders

being the CBG, the MA and Ornamental Growers Association of North Illinois. The group identifies the requirements of industry for new plant products, which is then delivered through CBG and MA. This service was previously provided free to industry, but a major change has been the requirement for the research partners to seek cost recovery. The imposition of these costs, and some concerns over ownership and royalty issues has resulted in industry re-assessing its partnership with CBG and MA, and increased the likelihood of more new product bypassing Chicago Grows, and being assessed and introduced by large independent nurseries or nursery chains.

The focus of the Chicago Grows programme has been on woody perennials. More recently, a new project has been started on selection of northern American herbaceous perennials, and the intraspecific and interspecific hybridisation of these plants. Genera have been selected that have some suitable horticulture attributes, but that have not been extensively worked on. A priority has been give to the investigation of plants native to the Chicago region. The programme is flexible on the issue of breeding non-US plants, but indicated they are unlikely to do this, concentrating instead on local plants.

The new programme did not specifically select plants from the wild, instead they selected plants that have some track record, or were displayed in local parks or other botanic gardens. The original parent taxa were examined by a plant evaluation team that ensured desirable horticultural traits were present, and approved their selection.

The plant breeding programme at CBG does about 50 to 150 crosses per year, although multiple pollinations per cross may be done. About 60% of the pollinations are successful. Discussions were held on plant breeding systems for target plants.

Ball Flora Plant and related companies are one of the largest ornamental horticulture plant companies in the world. Their selection and breeding programme, and related facilities at the Head Office in Chicago are impressive.

Various discussions were held with Ball about their breeding programme, marketing activities, and support for participating partners. Visits were made to several field facilities where entry was provided to restricted areas upon the signing of a non-disclosure agreement.

Ball has a collection of Scaevolias and other plants of interest to the Kings Park and Botanic Garden, but at this stage, their activity is limited to testing of various selections, and no hybrids are being tested by them. As far as they are aware, no Scaevola hybrids exist apart from the Kings Park programme.

In Scaevola, the market is looking for earlier flowering, compact forms, trailing forms, flowers all over the plant, heat and humidity tolerance, large flowers. Goodenia plants obtained from a WA nursery by Ball were doing very well in Canada.

Where appropriate, Ball is using a utility patent to protect plants. This provides for the protection of a unique plant characteristic, not the actual plant. This is a very powerful technique for protecting a breeding line.

Canada

The University of British Columbia Botanical Garden (UBC) has a plant evaluation programme similar to CBG. Like CBG, the programme at UBC is on testing plants from other countries and determining their suitability for the Vancouver region. The focus is on woody perennials.

There have been some problems in the commercial release of UBC tested plants, with the ownership and royalty issue causing some tension with growers and industry. Accordingly, a new company is being formed that will formalise and guide the marketing of UBC new plant introductions. The intention is that this new company will remain a private company, and will have a proper business structure controlled by a Board of Management. This new company will have the exclusive rights to commercialise UBC plant materials, and share the royalties between the company (80%) and UBC (20%). Detailed information was obtained on the setting up of such a company, and all the questions that needed to be answered before proceeding with a venture of this type.

Indonesia

A short visit was made to Bogor Botanic Garden (BBG) south of Jakarta. BBG displays plants from the south east Asian region, and has a small plant testing programme. The programme has minimal funds and given the low level of ornamental horticulture practiced by the average Indonesian, there is no economic imperative to develop plants for the local industry.

In contrast, there is considerable interest in the investigation of Indonesian rain forest plants for the international ornamental plant market. Various collection trips to Indonesia have been made mainly by private companies over several decades, and especially in the 1990s. However, it appears that many of these recent collections have not utilised the resource at BBG. There is a local *Scaevola* sp. that could be utilised in the development programme at Kings Park and Botanic Garden.

CONCLUSIONS

The plant development activity at Kings Park and Botanic Garden is one of the most focussed programmes of its type being run by Botanic Gardens or related institutions visited on this Fellowship.

The key to any selection and breeding programme is to have a clear goal, develop a suitable strategy, and provide the resources to implement the strategy, stay focussed, and monitor outcomes. Kings Park and Botanic Garden has addressed most of these issues in the development of its programme.

Programmes observed that had developed informally over time involving industry partners such as local nurseries had all met with some problems, ranging from minor to substantial. While the intention to assist in industry development through a plant testing and release programme was commendable, any warm and fuzzy feelings associated with researchers and industry working together tended to dissipate when faced with the commercial realities of the need by industry to make money and beat the competition. It is clear that any plant development programme run by a Botanic Garden or related institution must develop a commercial focus from the outset, and that the development of appropriate agreements and of potential commercialisation processes must take priority.

Most programmes visited had concentrated on the development of woody shrubs and trees. It was understood that these programmes were long term, and that while this could once be supported, more recent economic imperatives had resulted in a focus on medium term outcomes, resulting in a shift by some gardens towards including cutting grown herbaceous perennials or annuals in their programme. This concurs with a conscious decision made by Kings Park and Botanic Garden to concentrate its activities towards this group of plants from the outset.

Botanic Gardens collect plant material, document its characteristics, and grow and display these plants. Only a small number of Botanic Gardens have a programme to select unusual plants or forms, and to develop and hybridise these plants for both display and release to the local and international industry. The establishment of a breeding programme is considered essential to the ongoing development and release of new plants, and to retain control of most developed material.

Most gardens usually lack the expertise or resources to commercialise plant products effectively. The commercialisation of plant products is usually most successful where it is done in partnership with an established and experienced company, or through the establishment of a separate company focussed on the activity where the Botanic Garden is a key stakeholder. Depending on the structure of a Botanic Garden and its guiding legislation, its partnership in a private company is not always possible.

For many Botanic Gardens, the development of plants for the local community is core business, and the aim is to test and release new plants that can be used to extend the palette of plants available in their area. While the commercial development of those plants is important, some Botanic Gardens have unrealistic expectation of the likely returns from plant development, or do not have a realistic understanding of the time frames involved. They believe that every plant is a potential winner, and must be protected accordingly. When commercialising plant material, the benefits of any likely returns must be balanced against the anticipated life of the product, and the costs of suitable protection. This requires a subjective assessment, albeit considered, as to the anticipated sales for a particular product. Accordingly in some circumstances, protection may not be the best commercial decision, and

plants are released into the market with the full understanding that the available time to gain a return on investment is potentially limited.

In those situations where the anticipated life of the product is short; expected sales are low; or where costs of suitable protection are high, a decision may be made not to protect the plant material, but to grow and market as much of the product as possible, capture the available royalties, and then accept that 'like' products will enter the market, and the royalty returns may decline. This approach is adopted regularly by the commercial horticulture industry. They recognise that not everything can be protected, or controlled, and make a commercial decision to make as much money as possible while the window of opportunity is available.

RECOMMENDATIONS

These recommendations relate to Botanic Garden programmes, but some have applicability to private activities as well.

1. Any plant development programme must have a clear goal, develop a suitable strategy, and provide the resources to implement the strategy, stay focussed, and monitor outcomes.
2. Kings Park and Botanic Garden should maintain its commitment in the medium term to an effective breeding programme focusing on selected cutting grown herbaceous perennials or annuals that meet market demand. A targeted hybridisation programme located in Western Australia is considered essential to the ongoing development and release of selected new plants, and to retain control of breeding processes, and any developed material.
3. At Kings Park and Botanic Garden, resources are limited and any increase in the plant development activity will require external funding. This funding is not available from normal funding bodies, so an Expression of Interest should be advertised nationally and internationally seeking financial support from companies that have the expertise and experience to add value to the programme.
4. A key outcome of an Expression of Interest should be that Kings Park and Botanic Garden select a suitable company (or companies) to test and commercialise its plant products. Selecting the right partner(s) is the key to guiding the future direction of the programme, and to maximise the potential return on investment from the international release of any new plants. The commercialisation of any plants should be in accordance with the Western Australian Government's Intellectual Property Guidelines.
5. All plant development activities should be underpinned by appropriate legal agreements that satisfy the legislative requirements of Kings Park and Botanic Garden.
6. The potential to produce cutting material in Western Australia for selected hybrids released from the Kings Park and Botanic Garden programme should be investigated to assist local industry development.

Name	Title	Organisation
Mr Roger Jacques	Plant Development Manager	Kirstenbosch National Botanical Garden, South Africa
Mr Phillip Le Roux	Curator	Kirstenbosch National Botanical Garden, South Africa
Mr Anthony Hitchcock	Nursery Manager	Kirstenbosch National Botanical Garden, South Africa
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Dr Nigel Taylor	Curator (Head of Department), Horticulture & Public Education Department	Royal Botanic Gardens Kew, UK
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