

*PROTEAS  
AN AUSTRALIAN  
CUT FLOWER GROWERS' GUIDE*



**Proteaflora<sup>TM</sup>**



*PROTEAS  
AN AUSTRALIAN  
CUT FLOWER GROWERS' GUIDE*



**Proteaflora<sup>TM</sup>**

L. Mathews

*PROTEAS*  
*AN AUSTRALIAN CUT*  
*FLOWER GROWERS' GUIDE*

*BY*

*DAVID AND ANDREW MATHEWS*

*1994/95 EDITION*



*Published by Proteaflora Enterprises Pty Ltd*  
*PO Box 252 Monbulk, 3793, Australia*  
© Copyright 1994 Proteaflora Enterprises Pty Ltd

## TABLE OF CONTENTS

	Page No.
Foreword	3
The Protea Industry	4
The Market	6
Setting Up a Plantation	7
Plantation Management	12
Pruning	17
Flower Handling	25
The Economics	34
Trends, The Decade Ahead	36
Industry Organisations	40
Suggested Reading	41



## FOREWORD

Proteaflora grows and markets Protea cutflowers as well as operating the largest specialist Protea nursery in Australia. Our cutflower exports are mainly to Japan although we have sent flowers to Europe in the mid 1980's when exchange and freight rates were more favourable.

Proteaflora was established in the early 1970's and over the years we have been asked to provide advice to growers and those considering Protea growing. We have also run training courses covering all aspects of growing and marketing Proteas.

This publication is directed towards the smaller protea plantation, that is less than 10 hectares. Larger plantations will use a higher degree of mechanisation with a strong systems approach.

It has been necessary to qualify many of the suggestions because each growing and marketing environment varies so much. We have attempted to highlight the underlying principles enabling you to apply these to your own circumstances.

For this reason, the contents should not be seen as specific advice or recommendations for your plantation but rather our observations of the Protea Industry. Should you require advice about your own property for Protea growing use the services of a consultant horticulturist or your Department of Agriculture advisor.

Currently the Protea cut flower industry offers opportunities to the serious grower of quality blooms. For Australian growers the major opportunities are in export markets. The challenge is to grow flowers that meet the required standard and bloom at the right time.

The following chapters should help you get started and produce the highest quality blooms.

## THE PROTEA INDUSTRY

The Proteaceae family of plants has been used for many years to provide both fresh and dried flowers. Initially flowers were harvested from the wild with South West of Western Australia and the Cape Region of South Africa being the main production areas.

Protea has been exported from South Africa to Europe for many years, and there is a well-established trade. Australian proteaceae have been exploited to a lesser degree and it is only in recent years that large quantities have been sold from W.A. In both cases these industries were primarily based on harvesting from the naturally occurring plants in the wild.

Since the mid 1970's there has been a trend to growing protea in carefully managed plantations where selected stock is used to produce high quality blooms.

These plantations have been established in Australia, South Africa, U.S.A. (California & Hawaii), New Zealand, Zimbabwe and to a lesser degree Israel, Portugal, Spain and El Salvador. The estimated acreage in cultivation is:-

Australia	-	2000 acres	excludes flowers picked from wild
Sth Africa	-	\$4.4m	This figure includes <u>both</u> cultivated and wild picked flowers but does not include dried flowers US Dollars
California	-	700 acres	
New Zealand	-	200 "	
Hawaii	-	350 "	
Zimbabwe	-	600 "	

These figures are based on 1991 estimates given at the conference of the International Protea Association and published in IPA Journal, Vol 22, March 1992.

Plantation development has resulted in a strong demand for improved genetic stock. To meet this need in Australia, Proteaflora has selected a range of material suitable for cut flower production from its own breeding and selection program. Significant deliberate genetic improvement programs have been undertaken in South Africa and USA (Hawaii) resulting in new material to meet market needs. Proteaflora has already released some of the earlier developments such as Veldfire, Scarlet Ribbon and Mayday.

The new varieties are performing better than naturally occurring species and are finding good market acceptance.

Table 1 shows the development of the industry. Within 15 years the Protea Industry has moved from harvesting flowers in the wild (stage 1) to plantations of selected clonal material (stage 4). Stage 5 has not yet begun and there is still scope to improve the clonal selections by conventional means.



**TABLE 1: DEVELOPMENT OF PROTEAS AS A COMMERCIAL CUT FLOWER**

<b>STAGE 1</b>  HARVESTING FROM NATURALLY OCCURRING PROTEAS IN THE WILD	<ul style="list-style-type: none"> <li>• No Control</li> <li>• No Selections</li> <li>• Dependent on weather</li> <li>• No disease control</li> <li>• High picking cost</li> </ul>	Quality unreliable Quantity unreliable
<b>STAGE 2</b>  PLANTATIONS - RAISED FROM SEED	<ul style="list-style-type: none"> <li>• Efficient layout</li> <li>• Disease control</li> <li>• Irrigation</li> <li>• High replacement rate</li> </ul>	Better reliability Better quality Flower forms variable
<b>STAGE 3</b>  PLANTATIONS FROM VEGETATIVELY PROPAGATED MATERIAL	Improved quality of stock by selection of the best seedling material available. Leucadendron selected for male or female form.	Improved quality and reliability Flower forms still variable
<b>STAGE 4</b>  PLANTATIONS OF SELECTED CLONAL MATERIAL	Selection of material from breeding programs where factors considered include:- <ul style="list-style-type: none"> <li>- flower &amp; leaf life</li> <li>- stem length</li> <li>- disease resistance</li> <li>- packing &amp; travelling ability</li> <li>- productivity</li> <li>- flowering time</li> </ul>	Premium flower quality Uniform product Reliable supply High productivity
<b>STAGE 5</b>  CLONAL MATERIAL FROM GENETIC MANIPULATION. TISSUE CULTURE PROPAGATION.	<ul style="list-style-type: none"> <li>• Rapid response to market requirements</li> <li>• Ability to meet particular requirements eg. colour, vase life, stem length</li> <li>• Rapid response to disease problems</li> </ul>	Premium quality flowers exactly meeting market requirements. Highly competitive with other major flower crops.

## THE MARKET

The demand for Protea flowers has increased dramatically over the past 15 years. When we began growing these plants in the early 1970's they were unheard of and the flowers virtually unseen in Australia. Today they are widely used by florists and recognised by many people.

With the growth of the Australian market there has been interest shown in Australian grown Protea by the European, Japanese, Asian and the US markets.

Europe has seen Proteas from South Africa for many years and is familiar with them. In the past much of this material has been picked from the wild and has been of only average quality. Prices paid have been fairly low when compared with local Australian prices. South Africa has supplied the bulk of material to this market. There is a demand for high quality Protea flowers particularly by Switzerland, Austria and Germany where markets for Australian protea are good. Demand is limited by the high cost of airfreight from Australia. Peak demand period is November - March, particularly December.

Japan is an important buyer of Proteas and there is scope to promote them and substantially increase the demand. Most Australian protea is sold through the Japanese flower auctions which attract a very large number of retail florist buyers. Quality and packaging greatly effect price so it is necessary to understand customers' exact requirements before shipping. Flowers are carefully inspected for pests on arrival. Adequate fumigation and inspection prior to shipping will save money and the embarrassment of a rejected shipment.

Other Asian markets are promising outlets for Protea. Taiwan, Hong Kong, Singapore, Korea and Malaysia are just some of the countries showing interest in Proteas from Australia.

The Asian region is economically very successful and the resultant growth in corporate and personal wealth allows discretionary spending on luxury goods including imported flowers. Access to these Asian markets is relatively cheap, travel time is short and in most cases they are unable to grow Protea themselves. Language and other cultural differences are the potential barriers.

The North American market offers great potential for Proteas if they are well promoted. To date they have been distributed mainly in California. There is some local production in California but it is reverse season to ours (Northern Hemisphere) and local production compliments any imports from Australia. At this stage the North American Protea market is small and often is saturated with surplus supply, thus lowering price. The Californian Protea Growers Association and the International Protea Association have promoted Proteas in this market.

The challenge for all Protea growers is to produce what the customer wants at exactly the right time. You need to understand the customer and at the same time ensure that the customer knows what you and your product can offer.



## SETTING UP A PLANTATION

### THE SITE

The site provides the growing opportunities and sets the limits to what can be grown. In an ideal situation the site will be selected to grow the varieties required by the market. Economic factors will influence the location of growing and favour sites close to the market.

#### Desirable Site Characteristics

1. Drainage suitable: Soil drainage to 60cm. Slope drainage to avoid rising water table (particularly where soils are shallow).
2. Soil: well drained and pH5 to pH 6 for most species.
3. Nutrients: Low levels of phosphorus. Below 15ppm is usually suggested. Low-moderate levels of nitrogen and potash are desirable.
4. Water: a source of clean (disease free) irrigation water low in salts is essential in most situations, for most varieties.
5. Frost: There is a wide variation of tolerance between varieties but a frost free site is preferable. Most varieties tolerate light frosts to - 3°C.
6. Access to Markets/Proximity to transport: Freight can be a major cost and significantly effect returns.
7. Humidity: Air movement is essential.
8. Wind: moderate wind but not extreme.
9. Soil Disease: Check for Armillaria, Phytophthora and Nematodes.
10. Shade/Sun: All day sunshine is preferred by most species. Late afternoon shade is tolerated.

### VARIETY SELECTION

There are three factors to be considered when selecting varieties:-

Market requirements

Growing conditions

Management constraints

Each of these factors is equally important and whether they are fixed or variable will depend on each situation.

Market Requirements. Understand the requirements of the market you will be supplying. e.g. Europe take few flowers between June & September, local florists prefer a wide range of material, special days, occasions require more flowers e.g. red flowers are in demand during December.

Growing Conditions. Aim to grow varieties that will thrive on your site. If you have any particular features try to take advantage of these e.g. late/early flowering.

Management Constraints. Select varieties with flowering times that fit into your work program or labour availability.

TABLE 2: HARDINESS LISTING

	PROTEAS	LEUCADENDRON	LEUCOSPERMUM & OTHERS
<b><u>HEAVY SOIL</u></b>  (Drainage must be satisfactory. Treat with gypsum and compost).	cynaroides Pink Ice Ruby Blush Honeyglow neriifolia Frosted Fire eximia	Silvan Red Safari Sunset	Firewheel Lophomyrtus
<b><u>ALKALINE SOIL</u></b>  (Tolerance varies, moderate tolerance (M) and those that prefer alkaline conditions (A))	obtusifolia (A) Pink Ice (M) pudens (M) Honeyglow (M) Ruby Blush (M)	coniferum (A) laureolum (M) Silvan Red (M) Red Devil (M) Yellowcrest (M)	cordifolium (M) patersonii (A)  <b>AULAX</b> cancellata (M)
<b><u>FROST</u></b>  (All Proteas tolerate light frost. The following withstand heavier frost. Protect young plants).	eximia grandiceps magnifica Pink Ice punctata Honeyglow Ruby Blush Possum Magic May Day	eucalyptifolium salicifolium Silvan Red Red Devil Tall Red laureolum Gem Inca Gold	refexum  <b>TELOPEA</b> speciosissima
<b><u>COASTAL</u></b>  (Most Proteas enjoy coastal conditions. Here are some that should do well).	compacta Silk'n'Satin Feathered Red Ruby Blush Honeyglow	coniferum eucalyptifolium laureolum orientale Silvan Red Red Devil Gem Safari Sunset Katie's Blush	patersonii reflexum Firewheel Veldfire Tango Selection 52 High Gold
<b><u>WINDBREAKS</u></b>  (The taller denser Proteas make the best windbreaks).	lacticolor Pink Ice Ruby Blush Honeyglow Silk'n'Satin Feathered Red Frosted Fire	conicum coniferum eucalyptifolium salicifolium Silvan Red Safari Sunset Tall Red	patersonii reflexum  <b>TELOPEA</b> speciosissima  <b>DRYANDRA</b> formosa

Honeyglow and Ruby Blush are P repens selections  
 Silk'n'Satin and Feathered Red are P neriifolia selections



**TABLE 3: MAJOR VARIETIES FLOWERING TIMES**  
(Average times, Monbulk Victoria, Australia).

MONTH	VARIETIES
<b>January:</b>	<i>Protea aristata</i> and <i>repens</i> .
<b>February:</b>	<i>Protea repens</i> and <i>neriifolia</i> , Lcd. 'Red Devil'.
<b>March:</b>	<i>Protea repens</i> , <i>cynaroides</i> , <i>neriifolia</i> , 'Pink Ice', <i>Leucadendron</i> 'Silvan Red' and 'Red Devil'
<b>April:</b>	As for March plus <i>Protea longifolia</i> , <i>obtusifolia</i> , <i>Leucadendron salignum</i> 'Tall Red', 'Safari Sunset' and 'Katie's Blush'
<b>May:</b>	As for March and April
<b>June:</b>	<i>Protea neriifolia</i> , <i>compacta</i> , 'Pink Ice', May Day, <i>Leucadendron laureolum</i> , <i>macowanii</i> , 'Silvan Red', 'Yellow Crest', 'Dragon Eyes'
<b>July:</b>	As for June and <i>Protea</i> 'Frosted Fire'
<b>August:</b>	<i>Protea neriifolia</i> , 'Pink Ice', <i>Leucadendron daphnoides</i> , <i>salicifolium</i> , 'Safari Sunset', 'Silvan Red', 'Inca Gold' and <i>Serruria Sugar'n'Spice</i>
<b>September:</b>	<i>Protea magnifica</i> , <i>neriifolia</i> , <i>obtusifolia</i> , Possum Magic, <i>scolymocephala</i> , <i>Leucadendron coniferum</i> , <i>daphnoides</i> , <i>eucalyptifolium</i> , <i>gandogeri</i> , <i>macowanii</i> (f), <i>orientale</i> , <i>salicifolium</i> , 'Highlights' and <i>Serruria florida</i>
<b>October:</b>	As for September plus <i>Protea cynaroides</i> , <i>eximia</i> , <i>grandiceps</i> , <i>Leucadendron conicum</i> , <i>discolor</i> , <i>platyspermum</i> , <i>rubrum</i> , <i>uliginosum</i> , <i>Leucospermum cordifolium</i> , 'Tango', <i>reflexum</i> , High Gold and <i>Telopea speciosissima</i>
<b>November:</b>	As for October plus <i>Leucadendron</i> 'Jubilee Crown', <i>floridum</i> , <i>Leucospermum</i> 'carnival', 'Firewheel', most forms of <i>Leucospermum</i>
<b>December:</b>	<i>Protea eximia</i> , <i>grandiceps</i> , <i>magnifica</i> , <i>Leucadendron conicum</i> (f), <i>discolor</i> (f), <i>coniferum</i> (f), 'Jubilee Crown', <i>Leucospermum cordifolium</i> , <i>tottum</i> , 'Firewheel', <i>vestitum</i> , 'Goldie'

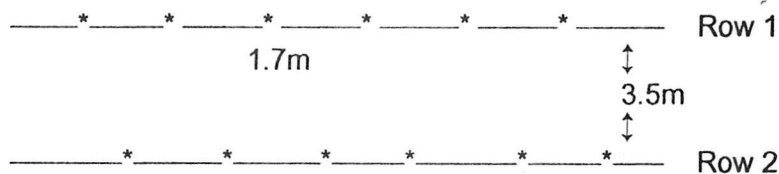
## PREPARATION PRIOR TO PLANTING

Design. Prepare a general plan for your whole plantation and then work out whether you develop in stages or complete it with one planting. This plan should include:-

- row layout
- traffic flows and roads
- packing shed
- irrigation (consult an expert in this field)
- fencing
- drainage patterns (storm water)
- hygiene controls

Site Preparation. Correct preparation before planting will save time and money in the long term. The following sequence is suggested:-

- (1) Peg out planting rows and access roads  
Suggested spacings for most species:



Plants are spaced at 1.7m and rows at 3.5m. Some small plants such as 'Blushing Bride' and 'Sugar'n'Spice'® may be planted closer (1m spacing). Row spacing may be varied depending on equipment to be used for picking, grass cutting and spraying. 3.5m is usually sufficient for a small tractor. Exact row spacing should be related to equipment eg. row width may be related to multiples of slasher width for most efficient grass cutting.

- (2) Rip ploughing rows (if necessary)
- (3) Cultivate planting rows (eg. rotary hoe)
- (4) Mound (if necessary)
- (5) Add humus (if necessary)
- (6) Install main water lines
- (7) Construct access roads (if needed)
- (8) Lay weed mat
- (9) Lay drip irrigation
- (10) Fence plantation for pests eg. rabbits, kangaroos

Plant Selection. In general, selected stock grown from cuttings is preferable to seed-grown material. Where species have been hybridised to give further improvement, these hybrids may be preferred (if suitable for your location).



Some recent releases from Proteaflora are:

P. 'Candy'	a pink form of P. longifolia (August)
P. 'Frosted Fire'	a dark pink neriifolia hybrid (July/Aug)
P. repens	summer flowering Pink selections (Jan/Mar)
Lsp. 'Goldie'	selected late flowering yellow Leucospermum
Lcd. 'Jubilee Crown'	small pink cones (Nov/Dec)
Lcd. 'Pisa'	vigorous hybrid L. floridum (Sept/Nov)
S. 'Sugar'n'Spice'®	beautiful pink hybrid S. florida (Aug/Oct)
Lsp. 'Veldfire'	hybrid yellow/orange leucospermum (Nov)
Lsp. 'Tango'	hybrid orange/red leucospermum (Nov)
Lsp. 'Scarlet Ribbon'	hybrid red leucospermum (Nov).
P. Possum Magic	P. longifolia hybrid, pink flowers Sept/Oct
P. compacta	
improved (hybrid)	flowers Autumn/Winter

Stock selected for planting should be obtained from a reputable hygienic nursery. Proteaflora is an Accredited Nursery. We maintain the very highest level of hygiene which is independently checked by the Nurserymen's Association of Victoria Accreditation program.

Planting. Autumn planting is preferred in winter rainfall areas so that the root system establishes during winter. Where frost is a problem Spring planting may be advisable.

Steps to follow when planting:-

- distribute plants along rows
- cut weed mat (preferably with a hot knife)
- dig hole
- remove plant from pot
- place in ground (pot soil at ground level)
- replace weed mat, use gravel to hold it down
- water in as soon as practicable (within the day)

(approx planting rate - 250-300 per person per day (150mm pots).

#### Follow up Maintenance

Clear a narrow strip of weeds next to the weed mat using herbicide.  
Slash between rows.

Irrigate as required. Depends on rainfall, temperature and soil type.

## PLANTATION MANAGEMENT

Once the selections and layout decisions have been made then the methods of plantation management become critical.

Important factors in a plantation management program are:

- Pest & Diseases
- Irrigation
- Nutrition
- Pruning
- Weed Control

### PESTS AND DISEASES

Proteas are subject to a number of Pests and Diseases. There are three approaches which are best used in combination to manage pest and disease problems:

1. QUARANTINE - avoiding the pest/disease
2. HYGIENE - prevention of spread
3. SPRAYS - chemical treatment.

1. Quarantine - screens and controls all inputs to avoid the introduction of pests and diseases. Areas where this is important are : plant material, machinery, storm water, irrigation water, and vehicle and foot traffic.

Plant material should be from a reputable supplier and/or treated for suspected problems prior to planting. Contract machinery should be cleaned prior to entering your property. Storm water needs to be diverted from the plantation, irrigation water must be free of disease, particularly phytophthora and access to the site should be controlled. Shoe dips and vehicle baths may be necessary if the site is to receive visitors and outside contractors.

2. Hygiene - assuming that a certain level of pests and diseases is present on your plantation (or could be introduced at any time) it is important to have in place measures that prevent spread.

Some measure that could help:

- Handwashing - clean-up regularly using a disinfectant eg. Dettol
- Secateurs - dip in a disinfectant, ideally after each bush
- Shoe dips - dip shoes when moving between areas. We use foam rubber in a shallow tray with a cover to prevent dilution from rain. Suitable disinfectants include Biogram and Formalin
- Runoff water - install drainage to prevent water running across the plantation
- Irrigation water - should be clean. Runoff water is unsuitable unless it has been treated. Consult an expert in this area.
- Pruning - well pruned plants allow good air flow making the plants less attractive to pests and disease.

3. Spray programs - identify the problem before spraying. Often expert analysis is required and help should be sought. Incorrect diagnosis can be costly in wasted chemical, wasted time and plant damage. Listed below are some of the common pest and disease problems of Protea.

### PESTS

Pests are those animals which damage the flower crop by reducing the number or quality of saleable stems. Common pests are spiders, caterpillars, earwigs and scale. Inspect plants regularly and apply appropriate chemicals before the pest population is high and damage occurs.

Spiders - sometimes damage growing tips by encasing top leaves and growth tip in web, causing premature branching. They can be a problem for pickers, they are a major problem for exporters and they are not much liked by florists.

It is unwise to completely eradicate spiders from the plantation as they do play a part in the management of other field pests such as scale.

Williams and McFarlane in their paper "Control of Pests in Protea Plantations" presented to the 1987 APGA conference in Melbourne suggest spraying for spiders immediately prior to the commencement of picking the crop. In their experiments they used AMBUSH at the recommended rate.

Caterpillars - These grubs damage the growing tips of Leucadendron and occasionally cause leaf damage on Protea, Banksia and Waratah. By careful observation over a number of years it is possible to anticipate them and spray an insecticide prior to any significant damage. A regular spray program for Leucadendrons will probably be necessary during the growing period.

Scale - Scale is particularly serious where import requirements are stringent. It must be eliminated in the plantation as it is not practical to remove it from the picked flower stem.

Prevention measures include pruning, thinning and weed management which allow air movement and spray penetration through the plant minimising scale development and maximising control measures.

White Oil, Malathion and Supracide have been used as sprays to control scale.

### DISEASE

Identifying disease is a little more difficult than the pests and expert analysis is suggested. In each Australian State, the Department of Agriculture usually offers a disease identification service. For disease diagnostic service in Victoria contact:

Leader  
Diagnostic Service  
Institute for Horticultural Development  
Private Bag 15  
Sth Eastern Mail Centre  
Vic 3176

Sharon Von Broembsens book "Handbook of Diseases of Cut-Flowers Proteas" is recommended reading on diseases and their treatment.

Listed below are some of the common diseases:

#### Root Fungi

Phytophthora cinnamomi (P.C.) - plant becomes yellow due to water stress and then often appears to die suddenly. PC is a water-borne fungus that attacks the root system of the plants.

Prevention is much better than the cure. In the first place minimise the risk of introducing it (Quarantine measures), second assume that it will be present at some time and minimise the risk of spread (hygiene measures). The most effective hygiene measures are shoe dips, storm water management, machinery cleaning and clean irrigation water.

Armillaria - symptoms are very similar to P.C. It can be distinguished by white mycelium under the bark at ground level. The fungus lives on old buried pieces of root. It is often found in recently cleared land. It is difficult to control - remove all infected roots, fumigate ground.

Nematodes - plants show a gradual yellowing of leaves. Mainly occurs in light and sandy soils. Fumigants and drenches are available to manage nematodes.

#### Leaf and Stem Fungi

Botrytis - occurs in cool wet weather, mainly affecting Leucospermum. Leaves turn grey on the tips then gradually shrivel. Disinfect secateurs after each cut to avoid spread. Carefully remove infected growth and spray with fungicide\*.

Colletotrichum - occurs in warm, humid weather, new soft growth turns black, affects mainly Proteas. Follow the same approach as for Botrytis.

Drechslera - affects Leucospermum, leaves develop red/brown streak, gradually curl and then shrivel. The fungus spreads to the stem and the plant collapses. Some clones are more resistant eg. Proteaflora's cordifolium selections. Sites with low humidity are less prone to the problem. The treatment approach is the same as for Botrytis.

Scab disease - symptoms are corky stem and raised brown spots on the leaves. Affects Leucospermum and Leucadendron. Spray with fungicide or remove infected plants. Disinfect secateurs before starting to pick or prune a plant..

#### Bacterial Leaf Spotting

This affects P. cynaroides and P. magnifica and occurs during summer. Spots appear as brown indentations with a red halo. Treat with copper oxychloride. Repeat sprays may induce toxicities. Spotting may also be caused by chewing pests which should be treated with an insecticide.

\*OCTAVE is a fungicide registered in Australia for use on Protea. This chemical coats the leaves with a protective layer preventing the spread of fungi.

#### IRRIGATION

Irrigation is essential to most Protea plantations. Where rainfall is over 1100mm per year irrigation may be needed only to establish the plants and supplement during very dry periods. In areas where rainfall is below 1100mm per year irrigation will play an important role in producing top quality blooms.

The quantity of water required will depend on soil types, age of plants, evaporation rates,



and varieties planted. It is therefore not possible to give a general water requirement. It should be noted that *P. cynaroides* and *Telopea* have higher than average water needs.

Water quality is critical. Irrigation water should be low in salt, free of phytophthora and must not have particles large enough to block the outlets. Run off water must be treated to ensure that it is disease free. Consult an expert in water treatment.

Selection, design and layout can be advised by companies selling and specialising in irrigation equipment.

### NUTRITION

Proteas have a very efficient root feeder system and therefore require lower than average level of nitrogen (N) and potash (K) and much lower levels of phosphorus (P).

Before planting it is necessary to test soil nutrient levels particularly phosphorus. It is unusual to require additional nutrients at the planting stage but there may be excess phosphorus in areas which have received regular applications of superphosphate.

To test your soil you need to obtain a soil test kit which will include instructions on sampling and a questionnaire on past use and proposed activities on your land. In Melbourne these kits are available from:

1. State Chemistry Laboratory, 5 Macarthur Street, East Melbourne 3002  
Tel. (03) 651 2784 or (03) 651 1722
2. Department of Agriculture offices
3. Local Fertiliser suppliers.

Test results usually include recommendations.

### WEED CONTROL

Each region and soil type has its own weed problems and so this discussion must necessarily be generalised.

There are three major techniques of weed control:

- Mulch
- Pre-emergent herbicide (germination suppressant)
- Herbicide (weed killer)

Mulch - a number of options are available.

Weedmat - woven plastic mat allows air and water to pass through but prevents weeds. Manufacturers claim about 5 years life. This is a very economical method which would appear to be effective.

Straw - excellent mulch, some problems with weed growth from seeds in straw. Effective when used with pre-emergent. Requires frequent replacement, more costly than weed mat.

Other organic mulches eg. leaves, newspaper, chips (bark or wood).

Pre-emergent herbicides - we have used Casoron G. (in granular form) which, applied at the correct rate is effective. There is a range of pre-emergent herbicides available and it is essential that you select the right one for the weed to be controlled. At the same time

test to see that it has no adverse effect on the Proteas. This method leaves the ground bare, and in some soils this may cause problems with splash.

Herbicides some common ones used by Protea growers include: -  
Roundup (glyphosate)- which kills most weeds (and Proteas too if it gets on the leaves!). It is Systemic.

Triquat (paraquat and diquat) - knock down spray, kills annuals without a persistent root system. It is not systemic.

#### EQUIPMENT FOR PLANTATION MANAGEMENT

The major activities in a plantation after initial planting are: pruning, flower picking, grass cutting and spraying. The following (or similar) equipment is essential to carrying out these tasks efficiently.

Tractor. A smaller tractor, approx. 20-25 H.P. gives sufficient power and allows closer row spacing. Use 4WD on steeper properties.

Spray equipment. Either linked to tractor or tow behind. Those units attached to the tractor are more manoeuvrable. The trailer units will carry more spray liquid for a given size tractor so there is less time used in refilling. This is an advantage in larger plantations.

Slasher. Larger ride-on unit or tractor attachment.

Secateurs. Use good quality secateurs eg. Felco and ensure that they are always sharp.

## PRUNING

Pruning is essential for successful commercial Protea cultivation. Pruning is undertaken for the following reasons:-

- To clear the area around the base of the plant which improves weed and pest control measures.
- To establish a strong framework.
- To limit the height of the plant for ease of picking and minimising wind damage.
- To control flower stem length.
- To increase productive life of the bush.
- To thin bushes giving better pest and disease control.
- To influence flowering times and flowering patterns.

Protea Leucadendron and Leucospermum can be grouped into categories for pruning these are shown below in Table 4, page 23.

The following chapter deals with Pruning in some detail.

### PROTEAS

#### Group 1

These grow from a lignotuber eg. *P. cynaroides*

##### 1. Initial Pruning

Each shoot arising from the base will usually produce a flower. Branches that develop severe bends or are damaged should be removed before they are allowed to flower. If a bush is single-stemmed it should be cut to within 10cm of the ground.

##### 2. Later Pruning

There are 2 methods of pruning. The method chosen depends upon the variant grown and the environmental conditions.

###### Method 1:

The flowers should be cut to within 10cm of the ground. This encourages new growth and long stemmed flowers.



*P. cynaroides.*

### Method 2:

The first crop of flowers is picked as in method 1. Subsequent flowers are picked leaving 10cm of stem from where they branched. ie. the same treatment as a telopea.

### 3. Pruning To Influence Flowering

A cut flower stem will take 2-3 years to flower.

#### Group 2

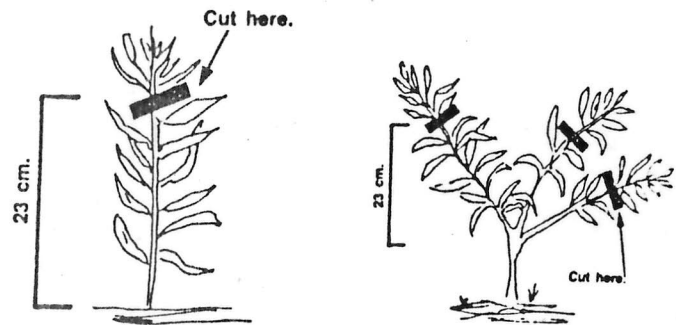
These form small to medium sized branched bushes.

eg. *P. compacta*, *neriifolia*, 'Pink Ice' repens (see Table 4)

#### 1. Initial Pruning

These plants need tip-pruning for the first 2 years. This would be carried out whenever the stems have grown 15-20cm without branching. Cutting-raised plants have the tendency not to branch. This would normally mean pruning in September and March (ie. just before the growth begins). See diagram below.

Cut off shoots that tend to run out at ground level as well as those which grow downwards.



#### 2. Later Pruning

Allow the bushes to produce flowers in the third year.

The flowers should be cut leaving about 10cm of stem on the bush.

Many of the flowers in this group are obscured by shoots thrown out from just under the flower head. If the flower has been allowed to die on the bush it is important that the flower should be cut with a long stem as if picking a fresh flower.

Once the bushes are at their mature size the number of stems capable of producing flowers should be restricted to a number suitable for the species.

After flowering the bushes need to be 'cleaned up' by removing straggly pieces, weak pieces, etc.

### 3. Pruning To Influence Flowering

A cut stem will take 18 months - 2 years to flower.

Varieties such as 'Pink Ice' that flower over a long period need to be pruned as they are picked, rather than being left till after flowering. Late pruning will delay flowering.



### Group 3

*P. grandiceps* *P. magnifica*

#### 1. Initial Pruning

These require less tip pruning than those in group 2 as they tend to branch naturally when seed-raised.

The main task with this group is to cut off the shoots which tend to run out at ground level as well as those which grow downwards.

Any flowers that form in the first 3 years should be removed.

#### 2. Later Pruning

Flowers should be cut leaving 10cm of stem.

*P. grandiceps* forms a dense bush requiring thinning to restrict the number of flowers once mature.

*P. magnifica* flower heads tend to weigh themselves down as they mature. Some of these stems should be completely removed when picking the flower.

#### 3. Pruning To Influence Flowering

A cut stem takes 2 years to flower.

### LEUCADENDRONS

#### Group 1

This group produce single flowers on long stems. eg. *L. daphnoides*, *L. laureolum*, *L. orientale*.

#### 1. Initial Pruning (assuming all are cutting grown)

In the first year if the bushes are not tip pruned they will produce a few flowers. However these flowers will probably not have long enough stems to be marketed. Therefore tip-pruning in the first year whenever stems grow 15-20cm without branching is recommended.

Cut off shoots that tend to run out at ground level.

#### 2. Later Pruning

Flowers should be allowed to form in the second year. These should be cut back leaving 10cm of the stem.



By the third or fourth year it will be necessary to thin the bush by cutting out weaker growth. This is done after flowering.

### 3. Pruning To Influence Flowering

The best quality flowers are borne (12 months later) on the same wood that provided the best flowers the previous year.

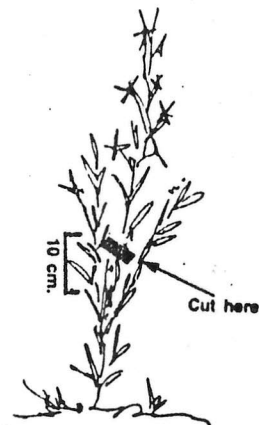
#### Group 2

This group is multi-flowered eg. *L. conicum*, *L. discolor*, *L. eucalyptifolium*, *L. macowanii*, *L. salicifolium*.

#### 1. Initial Pruning

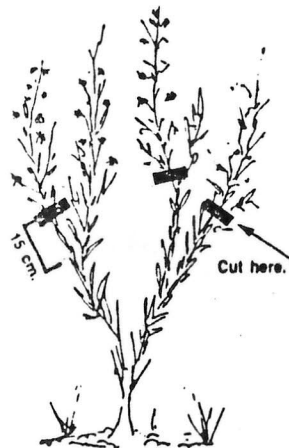
These are fast growing and tend to branch easily. The male plants may produce some saleable flowers in the first year but cones should not be allowed to develop on the female plants in the first year.

Tip pruning and cutting off shoots at ground level should be done for the first year.



#### 2. Later Pruning

Flowers should be cut leaving 10-15cm of stem. This cut should always be made into stem with healthy green leaves.



After flowering, thin and cut back or remove weak material.

#### 3. Pruning To Influence Flowering

A cut stem takes 1 year to flower. Some *Leucadendrons* in this group are used only for foliage and are best picked before flowering (winter/spring). Early picking ensures long stems the following year.

### Group 3

The red Leucadendrons 'Silvan Red', 'Safari Sunset', 'Gem' and 'Tall Red' salignum all can be pruned into upright bushes and have the ability to shoot from old wood.

#### 1. Initial Pruning

This group should be tip pruned when planted. They can be allowed to flower the following season when planted in autumn.

Remove all shoots close to the ground. Encourage a single trunk with 3 or 4 main branches.

#### 2. Later Pruning

Flowers should be cut leaving 10cm of stem on the bush. These plants have the ability to shoot from dormant buds where leaves have dropped off.

After flowering thin, and remove weak shoots. The stronger stems always produce the best flowers the following year.

#### 3. Pruning To Influence Flowering

Bushes will need thinning to ensure long stems. Stem length decreasing from one season to the next could be an indication of the bush supporting too many flowers.

Bushes picked and pruned early in the season will produce early flowers the next year. In some areas two crops per year are possible - one in December and the other in winter.

### Group 4

Small growing salignums.

#### 1. Initial Pruning

Usually none is required unless the plant develops long shoots. These bushes cannot be trained to grow on a single trunk.

#### 2. Later Pruning

Flower picking on long stems (the age of the wood cut doesn't matter) usually is the only pruning necessary. After picking new shoots develop from the lignotuber.

#### 3. Pruning To Influence Flowering

If unpicked for one year long multi-headed stems can be obtained the following year.

## LEUCOSPERMUMS

### Group 1

All varieties except L. cordifolium eg. L. 'Tango', 'Firewheel' (assume all cutting grown).

#### 1. Initial Pruning

Tip pruning is required to produce a branched plant. This should be carried out for the first year.

Cutting off shoots at ground level and those that tend to grow downwards is necessary in the initial years.

#### 2. Later Pruning

They should be allowed to flower in their second year. Flowers should be cut back leaving 10cm of stem on the bush.

After the third or fourth year thinning would be required to limit the number of flowers.

#### 3. Pruning To Influence Flowering

Dis-budding the larger flower buds on multi budded stems will delay flowering by 2-3 weeks.

Re-growth from a cut stem will flower within 12 months.

### Group 2

Lsp. cordifolium

Cordifolium is sensitive to any excess nutrients in the soil. This can become evident as soft, lush green, horizontal growth. If you experience this problem, the horizontal branches should be cut back to encourage upright growth.

To increase the life of the bush and to obtain long stemmed flowers a severe pruning program is required. The number of flowers allowed to form per bush should follow a strict pattern. Below is a general guide\*:

yr 1 | yr 2 | yr 3 | yr 4 | yr 5 | yr 6

---

0 | 4 | 10 | 25 | 50 | 50

\*The actual number will vary according to clone, site and location.

To achieve this:-

1. Thin out by removing stems that will not produce saleable flowers (eg. stems near the ground, at an angle, etc.)
2. If there are still too many stems reduce the number by removing the thinner, weaker stems, keeping in mind the general shape of the bush.

Pruning is done at flowering and a month or so afterwards.



## Pruning To Influence Flowering

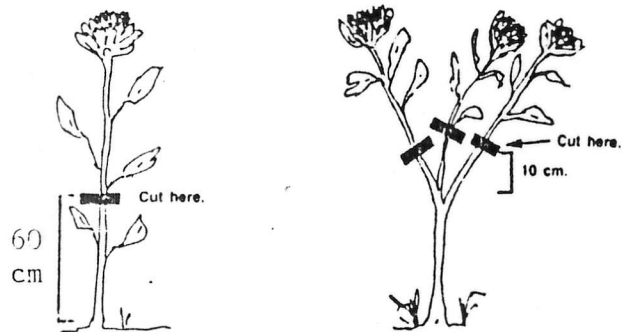
*Cordifolium* responds to dis-budding to delay flowering.

### TELOPEA

The *Telopea* grows from a lignotuber or rootstock. Treatment of these is to allow up to six shoots to come up from the base (seed grown). Cutting-grown *Telopea* tend to have fewer main stems and can be grown on a single main stem.

After flowering, the stems should be cut back to about 0.6m from the ground. These stems will send up three or four shoots, which will each produce a flower.

These are then cut back, leaving 10cm of the flower stem on the bush. The bush will become 10cm higher each year. When it has reached about 2m in height after pruning, it should be cut close to the ground and allowed to regenerate (once in 10 to 15 years).



**1st prune.** **2nd prune.**  
For each shoot arising from the lignotuber.

### SERRURIA

#### 1. Initial Pruning

Tip prune when stems grow 10cm. After bush is about 20cm high allow to flower.

#### 2. Later Pruning

Cut flowers leaving 8-10cm of stem. Flowers are usually in clusters on a long stem.

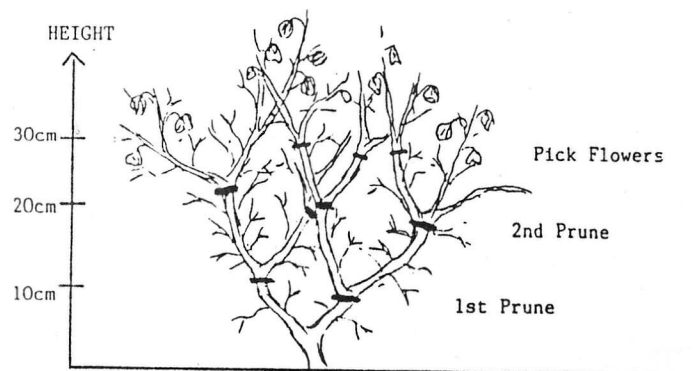


Table 4: Pruning Groups

PROTEA	LEUCADENDRON	LEUCOSPERMUM
<u>Group</u>	<u>Group</u>	<u>Group</u>
1 cynaroides *	2 conicum	2 cordifolium 'High Gold'
3 grandiceps	2 coniferum	2 cordifolium #52
2 lacticolor	1 daphnoides	2 cordifolium
2 longifolia	2 discolor	1 'Firewheel'
3 magnifica	2 eucalyptifolium	1 patersonii
2 neriifolia	2 floridum	1 reflexum
2 Frosted Fire	1 gandogerii	1 'Tango'
2 obtusifolia	1 laureolum	1 Veldfire
2 'Pink Ice'	2 macowanii	1 Goldie *
2 repens	1 orientale	1 Carnival series
2 May Day	1 platyspermum	
2 Possum Magic	2 salicifolium	<u>TELOPEA</u>
2 compacta forms	3 'Safari Sunset' *	speciosissima *
	3 'Silvan Red' *	Shady Lady red
	3 'Gem' *	
	4 'Red Devil' *	<u>SERRURIA</u>
	3 'Tall Red' salignum*	florida
	2 uliginosum	'Sugar'n'Spice'
	4 'Yellow Crest' *	
	2 xanthoconus	
	2 Jubilee Crown	
	1 Maui Sunset	
	1 Baby Bouquet	
	2 Pisa	
	3 'Katie's Blush'*	
	1 Highlights	
	1 Inca Gold	
* plant has a lignotuber (or the ability to shoot from bare wood)		

## FLOWER HANDLING

The handling methods outlined are those required of growers supplying flowers to Proteaflora. Each market will have its particular requirements. Those listed are generally applicable, the specifics will vary.

Research into post harvest handling of Protea is ongoing and treatments and techniques will change as more is learnt.

### HARVESTING

Flowers are usually picked twice a week, irrespective of size of plantation. In the hot months, November to March, it may be necessary to increase this to three times a week depending on weather conditions, and varieties being picked. The number of blooms to be picked will determine the labour force needed.

Genus Leucadendron. The Leucadendron has both female and male flower occurring on separate bushes. The female flower develops into a cone which contains seed.

The flowers (both male and female) are surrounded by leaves (bracts) which colour and take on the appearance of 'petals'.

The male flower is made up of a pollen bearing centre which "breaks open" starting from the base of the pollen centre and it continues until it is covered with pollen. The time to pick this is just before or just after the pollen presenters begin to break open. No more than 25% should be open, otherwise the life of the cut flower is considerably shortened.

The female flower is different. It is a seed bearing cone which develops over a period of two or three months and can be picked at any stage during this period. Some are beautiful as the leaves surrounding the flower become coloured.  
eg.

laureolum  
'Silvan Red'  
salignum  
floridum

Others are more useful when the seed cones have developed.

*L. salicifolium* after 3 months.

*L. conicum* and *macowanii* after 2-4 months (the cones are red) *L. galpinii* after 4 months (the cones are silver).

In some varieties the bracts change colour a number of times. eg. *tinctum*, *orientale* and 'Silvan Red'. They are useful at each of the stages of colour change.

Leucadendron also offer a wide range of types of foliage. The foliage of many varieties can be used at any time of the year for 'fill' or 'background' by florists. Ensure that growth tips are not soft, as these wilt soon after picking.

Examples of foliage are:

- L. salicifolium for large fine leafed branches
- L. galpinii for mauve/grey foliage
- L. platyspermum for yellow green foliage
- L. conicum for a grey/green/pink foliage
- L. argenteum for large silver foliage
- L. xanthoconus and L. uliginosum for silver foliage
- L. pisa for silver foliage

Genus Protea. Proteas are picked, with some exceptions, when they are just about to open. This we will call the 'soft-tipped' stage, when the bracts still cohere but have loosened.

- \* For Protea neriifolia, repens, Pink Ice, longifolia, the bracts should be just beginning to part.
- \* Protea grandiceps and magnifica should be picked just before or just as the bracts begin to reveal the flower mass which they surround.
- \* The broad-leafed Protea cynaroides which flowers in summer should be left until just before the first florets on the outer ring of the flower mass begin to part.
- \* Protea aurea, laticolor and mundii should be picked in pencil form (in bud) when the top of the bud is showing colour and loosening.

Leucospermum. The pincushions are picked as their styles begin to open. The aim is to maximise colour, facilitate packing and achieve longest vase life. To achieve this most are picked when about 50% of the styles are open. Styles usually open first on the north facing side.

TABLE 5: PERCENTAGE OF STYLES OPEN FOR PICKING

VARIETIES	EARLIEST (picked at this stage for export and packaging)	LATEST
Lsp. cordifolium	15%	80%
Lsp. vestitum	40%	90%
Lsp. firewheel/ Caroline	70%	100%

Banksias. Banksias are ready for picking when the first few rows of styles have uncurled. Dryandra are similar. There should be no more than 30% open.

Telopea. These are similar to Leucospermum but they are ready when between 2% and 50% of the styles are uncurled. Pick as early as possible for export.



## FACTORS AFFECTING THE LIFE OF CUT FLOWERS

Protea flowers last very well and are readily transported. This is one of their major advantages when compared with other flowers. This great advantage should not be taken for granted and it is important to understand the factors that do affect vase life so that Proteas gain their maximum advantage on the flower markets.

The genus Protea presents the greatest challenge - in particular, leaf blackening will occur early on many varieties if handled incorrectly.

Tips for improving vase life include:-

1. Select good genetic material when planting.
2. Cool flowers at high humidity.
3. Use an appropriate pulsing solution.
4. Minimise time out of water/pulsing solution.
5. A sharp, clean cut when picking, and stripping of bottom leaves.
6. Clean water.
7. A cool room with lighting
8. Clean buckets/containers
9. Packing and cool rooms free of ethylene gas.
10. Dry packing of all Protea except Leucospermum.
11. Minimise time held before despatch.
12. Care in general handling.

With the exception of material selection, these factors are equally the responsibility of grower, wholesaler and florist. In the U.S.A. this joint responsibility has been promoted under the slogan "The Chain of Life".

Selection of Material. Selection programs are being undertaken to find plants/flowers with desirable vase life characteristics, particularly *P. compacta*, *neriifolia* and *repens* with long lasting leaves. Proteaflora has released Pink Ice and selections of compacta with better vase life.

Cooling at High Humidity. Cool rooms should be kept between 1° and 4°C and a humidity of at least 85%. Temperature is one of the most significant factors affecting vase life.

Preservative Solutions. There are many theories and formulations. At present we add 10 grams of granulated swimming pool chlorine to 100 litres of rainwater. For alternative formulations see R. Jones "Post Harvest Care of Cut Flowers" Institute of Plant Sciences, Melbourne, May 1991.

Flowers should be held in solution for at least 6 hours before despatch.

N.B. Buckets should be about 1/3rd full and topped up regularly, especially in summer. Preservative should be discarded after one use.

Time out of Water. Stems dry after cutting making it more difficult for them to take up water. Ideally stems should be placed directly in water when cut or, recut if out of water for more than about one hour.

Cutting and Stripping. Stems should be cut cleanly, with a minimum of stem crushing. Use a very sharp pair of secateurs with a scissor-cutting action. Leaves should be stripped cleanly from bottom 1/3 to 1/2 of stem. (in particular Proteas). Leaves should not contact water in the bucket as this promotes leaf blackening, bacteria build up and reduces flower life. It may not be necessary to strip the leaves of some Leucadendron.

Clean Water. Total dissolved salts should be very low and water should be clean. Rainwater is preferable.

Cool room Lighting. Fluorescent lighting has been found to slow down leaf blackening. Further experiments are being conducted in this area with good results.

Clean buckets/containers. Use a chlorine based cleaner eg. White King, Sodium Hypochlorite to rinse buckets after each use.

Ethylene Gas. Specific research on Proteas is currently being undertaken. Avoid storage with fruit and vegetables and do not keep dry and fresh flowers together. Keep packing shed clean of old stripped leaves and debris.

Dry Packing. Genus Protea leaves blacken more rapidly if packed wet. For Leucadendron, Banksia and Telopea it is less of a problem, although mould can occur if packed wet. Leucospermum are preferably packed slightly moist.

Time held before Dispatch. The grower should hold the flowers for no more than 24 hours (less in summer if there is no coolstore). The earlier that the flower is delivered to the final purchaser the longer the vase life.

General Handling. All Proteas do bruise if handled roughly. When delivering flowers to the next point of sale, either in buckets, hobby bins or boxes, care should be taken to pack firmly but not to squash flowers together. If too loose, the flowers can damage each other as they are too free to move in the container. If too tight, leaves and flower heads can be crushed. If packed in boxes, place layers of absorbent paper between layers of flowers to avoid stems damaging flower heads in a lower layer and to minimise moisture.

#### GRADING AND STANDARDS

Standards: Standards are set to ensure that:

- product is consistent
- vase life (product performance) is satisfactory
- poor flowers are not marketed

At the moment there are no established standards for Protea but the Australian Protea Growers Association and the Flower Export Council of Australia are considering the issue.

The standards discussed here are those set by Proteaflora for our own flowers and those we buy.

Key areas in which we have set standards:

- Quality of flower heads and stems
- Stem length
- Degree of bend in heads and stems
- Openness of flower

**Flower head Quality:** Flower heads should be unblemished on the top 1/3 of the bloom and be cleaned of cobwebs and spiders. Leaves should be healthy, not spotted, yellow or eaten.

**Stem Length:** Stem lengths are standardised by wholesalers to aid handling procedures. Minimum stem lengths are set to reduce damage to flowers during handling, particularly

in buckets, hobby bins etc. They also relate to the aesthetics of the ratio of flower head size to the stem length. Minimum lengths shown in Table 6 Maximum length 1000mm.

Bend in flower head/stem: Where the angle of the flower head is more than about 30°, the risks of damage during handling are greater. They do not present well in a bunch, nor do they pack well singly in a box. Ultimately they restrict the use to which a florist can put the flower in an arrangement.

Degree of openness: The first part of this chapter sets out when flowers are ready to pick. If flowers are harvested later than suggested in these guidelines the end result is that of a flower with little vase life for the final purchaser to enjoy and a flower that is more easily damaged through normal handling procedures. Risk of damage to varieties such as *P. repens* or *Lsp. cordifolium* increases substantially the more open the flower.

Grading. Grades are set to meet a particular customer's requirements and wholesalers will usually let growers know how flowers are to be graded. Stem length and flowerhead size would be the most common bases for grading. The number of grades and their names vary greatly. Where wholesalers buy ungraded flowers they usually pay less for them and then grade them to their customer's requirements.

Proteaflora buys most flowers in three grades, 'Choice', 'Standard' and 'Other'. Some *Leucadendron* are graded by length in five categories from 400mm to 900mm.

#### Genus *Protea*.

Choice: Stems must be between 600mm and 1000mm. Flower head should be unblemished, clear colour and an appropriate size for the varieties. Leaves near perfect.

Standard: Stems must be 350mm, or 400mm minimum (depending on varieties and flowerhead size (see Table 4) - Flowers should be free of major blemishes. Leaves: Some blemishes are permitted. Smaller head sizes accepted.

#### Genus *Leucadendron*.

*Lcd. multiflora* and *multicone* would be in stem lengths 400mm+.

*Lcd. foliage*, stem lengths 400mm+.

Foliage should be healthy, not spotted or eaten.

*Leucadendron* flowerheads. There is great variation between male and female flowers. There is also great variation in size of flowers between male and female flowers, eg. for *Lcd. laureolum*, the male flower generally being classed as standard. Some varieties grow multiple heads as well as single heads. For *Lcd. discolor* male, which does this, each stem would be judged on its overall merits.

Stem lengths should be not less than 350mm or 400mm - see Table 6. Flowers should be near perfect.

*Lcd Silvan Red*, *gandogeri* and *laureolum* are graded into set stem lengths. Note that superior flower heads are expected with the longer stem lengths. For these flowers the specified length is the exact length required. Measure overall length, top to bottom.

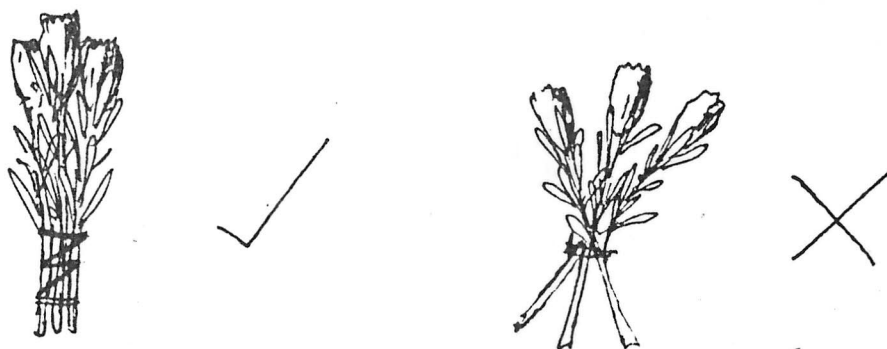
#### Genus *Leucospermum*.

All should have:-  
\* Flowerheads near perfect.  
\* Flowerheads at not more than 45° to stem.  
\* Stem length 400mm or more.

Choice: Flowerhead at not more than 15° to stem. Stems 600mm or more.  
Standard: Stem 300mm+ Flowerheads 15-45°.

### BUNCHING

Protea and Banksia. For Protea and Banksia flowers, where bunching is required (see Table 6), bunches should be secured as shown - banding starts from where the leaves have been stripped to, to the base of the stems. This ensures the bunching process will not damage the leaves and that the bunch is 'stable' and will not spray apart.



Proteas for export usually are not bunched.

Leucadendron. Leucadendron may be bunched as for Proteas and Banksias making sure that the resulting bunch is 'stable' and will not spray apart when handled.

Number of stems per bunch. Table 6 (below) sets out numbers of stems per bunch for Protea and Banksia.

For Leucadendron the number of stems per bunch for single stemmed flowers also has been specified. For Leucadendron multiflora and multicones, the number of stems/bunch will need to vary to give an average sized bunch. The number of stems/bunch is a rough guide only, due to the variability in width of stems, bushiness of foliage and length of stems being produced by different bushes of one variety. An average bunch base diameter of 45 to 55mm is suggested.

### PACKING & TRANSPORT

Cartons. This section is applicable where flowers are carried over longer distances and require packing in cartons.

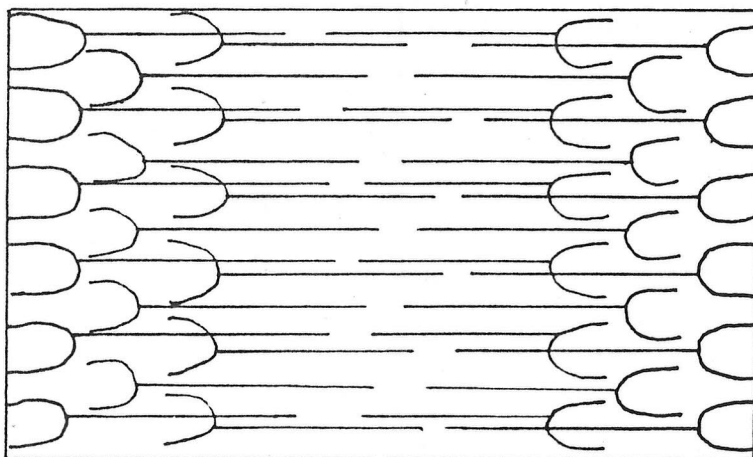
Proteas are packaged dry. i.e. No water on leaves because this can hasten the blackening of the leaves. Do not use newsprint paper with cream Proteas. Use an absorbent paper with all proteas.

Leucadendrons, Banksias and Dryandras are packed dry. Use an absorbent paper.

Leucospermums are sprayed with water and enclosed in polythene sheeting.



The Leucospermum flowers are packed with their heads in rows as follows: -



The box is packed tight and the plastic sheeting is wrapped over the flowers to hold in moisture.

Transport to the Wholesaler. Ideally this would be by refrigerated transport. Alternatively by the quickest and coolest method available. More care should be taken with transport during warmer weather, particularly with Proteas.

#### PLANNING THE PACKING SHED

The layout is important as it can save hours of labour. The shed should be located centrally to the plantation. For operations of 2-4 hectares the following layout could serve quite well. Shed 20m x 7m x 3m high (approx.). The height allows extra storage. Size depends on maximum volume to be handled at any one time and expected storage time.

The shed should be insulated and/or shaded by tall shrubs or trees. Windows for adequate light and ventilation should be provided above the benches. Use additional artificial lighting as required. Do not use skylights as these allow too much heat into the shed. The floor can become wet therefore use cement slab or suitable timber.

There are two distinct functions in the packing shed - (1) cleaning and grading flowers immediately after picking and (2) packing the flowers for transport and sale. It is ideal to separate these two functions.

After flowers have been cleaned they are placed in water for at least 6 hours. Depending on the market they may either be cooled to 3°C or fumigated at 22°C. After this the flowers are ready for packing. If flowers are packed warm (ex fumigation), forced air cooling is necessary to rapidly cool the flowers in their boxes.



TABLE 6: GUIDELINES ON GRADING STEM LENGTH AND BUNCHING\*\*

VARIETY	UNIT	<u>MINIMUM LENGTH INCLUDING FLOWERING HEAD (mm)</u>		
<u>Protea</u>	<u>Choice</u>	<u>Standard</u>		
P. coronata	5/bunch or STEM	600mm		400+
P. cynaroides	stem	650		450
P. 'Frosted Fire'	5/bunch or STEM	600		400
P. grandiceps	stem	600		400
P. lacticolor	5/bunch or STEM	600		350
P. longifolia	stem	600		400
P. magnifica	stem	650		450
P. minor	5/bunch or STEM	500		250
P. neriifolia	5/bunch or STEM	600		400
P. obtusifolia	5/bunch	600		350
P. 'Pink Ice'	5/bunch or STEM	600		400
P. punctata	5/bunch or STEM	600		350
P. repens	5/bunch or STEM	600		400
P. scolymocephala				200
P. speciosa	stem	600		400
<u>Banksia</u>				
B. burdettii	stem	600		400
B. baxteri	stem	600		400
B. coccinea	stem	550		350
B. grandis	stem	750		550
B. hookerana	stem	600		400
B. menziesii	stem	500		350
B. prionotes	stem	650		450
B. speciosa	stem	650		450
B. victoriae	stem	600		400
<u>Leucospermum</u>				
Lsp. cordifolium	5/bunch or STEM	600	500	400
Lsp. 'Firewheel'	5/bunch or STEM	600	500	400
Lsp. reflexum	5/bunch or STEM	600	500	400
Lsp. tottum	5/bunch or STEM	600	500	400
Lsp. vestitum	5/bunch or STEM	600	500	400

TABLE 6: GUIDELINES ON GRADING STEM LENGTH AND BUNCHING  
(CONT'D)

<u>VARIETY</u>	<u>UNIT</u>	<u>MINIMUM LENGTH INCLUDING FLOWER HEAD (mm)</u>						<u>Choice</u>	<u>Standard</u>
<u>Leucadendron</u>									
Lcd. comosum	bunch						-		350
Lcd. conicum	bunch						-		350
Lcd. coniferum	bunch						-		400
Lcd. daphnoides	10/bunch						450		350
Lcd. discolor	10/bunch			500			400		300 *
Lcd. eucalyptifolium	bunch								400
Lcd. floridum	10/bunch								350
Lcd. gandogeri	10/bunch	800	700	600		500			400 *
Lcd. laureolum	10/bunch	800+	700	600		500			400 *
Lcd. macowanii	bunch					500			400
Lcd. orientale	10 or 5					500			350
Lcd. platyspermum	bunch					-			350
Lcd. 'Gem'	10/bunch		700	600		500			400
Lcd. salicifolium	bunch								400
Lcd. 'Safari S/set'	10/bunch	800	700	600		500			400 *
Lcd. 'Silvan Red'	10/bunch	800	700	600		500			400 *
Lcd. tinctum	10/bunch								350
Lcd. uliginosum	bunch								350
Lcd. strobilinum	10/bunch								350

\* Bunched to actual length, all stems the same.

\*\* These are Proteaflora's current requirements, June 1994

## THE ECONOMICS

Returns from Protea growing will vary between locations and depend on:

- Site and plant suitability
- Flower Price
- Management practises
- Marketing
- Distance from market

*Site and plant suitability:* the site will effect plant productivity. Selection of appropriate varieties is vital to maximise site advantages. (refer pages 6 -8)

*Price:* price per bloom will vary with supply and demand in the market place. The price performance of the selected varieties over time will effect returns. This can have a dramatic effect on overall returns when only 1 or 2 varieties are being grown.

*Management:* efficient management minimises production costs and maximises number of saleable blooms. Pruning, spraying, irrigation and picking techniques are all part of good management.

*Marketing:* good marketing will ensure best prices are obtained for the sale of the whole crop. Different marketing channels offer widely varying prices with varying degrees of risk and cost.

*Distance from market:* this is reflected as a cost of selling and is measured in dollars, not kilometres.

From the above it can be seen that returns are directly linked to management, expertise and site suitability. The industry experience is one of widely varying returns.

The figures below (in Table 7) are estimates of prices and productivity assuming reasonable management, a suitable site and appropriate varieties.

This information below is provided for you to estimate your own returns taking into account the above variables.

Table 7: Estimates of stems per plant and price per stem

PRICE MELB	VARIETIES	(stems) Years after planting						
		2	3	4	5	6	7	8
1.50	King	-	1	2	5	10	15	15
0.55	Pink Ice	-	3	6	18	30	50	60
0.50	neriifolia	-	3	6	18	30	50	60
0.80	longifolia (Pink)	-	2	5	12	20	30	30
0.20	Silvan Red	2	8	28	50	80	100	100
0.25	laureolum	2	6	18	30	40	65	80
0.50	Blushing Bride	5	15	30	40	40	40	-
0.50	cordifolium	4	10	25	50	50	50	50

Costs can be divided into two areas - establishment and operating costs. The following will assist you in drawing up cost estimates for your own situation.

#### Cost estimates 4000 plants Protea plantation

##### Establishment

Plants (75mm pots)	12000
Labour to plant	800
Weedmat	5000
Irrigation & water treatment	15000
Tractor & Slasher	10000
Spray equipment	3000
Coolroom	12000
Packing shed	10000

##### Operating costs (p.a)

Plant replacements	500
Chemicals	1200
Fuel/Power	1500
Repairs	500
Plantation maintenance	4000
Picking & packing	30% - 40% gross value (Melbourne prices)
Freight	?
Office/Phone/Insurance	?
Vehicle	?

The figures above are intended as a guide only. They are not based on detailed costings for any particular site.

## TRENDS - THE DECADE AHEAD\*

Phillip E Parvin

### INTRODUCTION

It was with great interest, and some concern that I accepted President Maggie Edmond's kind invitation to consider with you, the subject of "Trends - the decade ahead"! After all, it was only six years ago that Joe Hands provided me a similar opportunity during his meeting in Adelaide entitled, "Protea Panorama". Fortunately, we are only half way through that 10 year forecast, so there is still time to take another look in our crystal ball and to look ahead to the dawn of the 21st century.

### Background

How many of you were with us, 10 years ago, when Proteaflora Enterprises convened the first International Protea Conference at the picturesque country inn, Baron of Beef, in the beautiful Dandenong Mountains of Victoria? It was an historic event! 116 people from 5 countries came together to discuss areas of mutual cooperation in the orderly development of a brand new cut flower crop. Our host, Peter Mathews, challenged us in his introduction to the conference, saying that the future of the protea industry depended upon the extent to which proteas, as a legitimate floral commodity, could take a significant share of the world market. This could happen only if growers produced the very best flowers possible, consistently. In order to produce 1st class flowers, support was urged for research in the production of hybrids, propagation, disease control and plantation management. At the conclusion of the conference, everyone agreed that they would like to meet again. An interim constitution was adopted, and the IPA, the International Protea Association, was "off and running".

### Production Base

At our second meeting, in 1983, area representatives reported, as best they could, on the number of acres planted to proteas. Australia reported 750 acres in the ground, of which 200 were in production. California - 500 acres and Hawaii 111 acres. Israel reported 115 acres had been planted and New Zealand - 200 acres. South Africa reported that only a very small acreage was planted, while 3 million dollars U.S. was generated in exports from material gathered primarily in the wild. Zimbabwe rounded out the report with another 200 acres in the ground. So, in 1983, we estimated that there were approximately 2,000 acres of cultivated Proteaceae planted, worldwide. I look forward with great interest to this year's reports, but even 2 years ago, at the 5th Biennial Conference in 1989, the reports totalled 11,000 acres, an increase of 9,000 acres planted in 6 years! The most dramatic increases came in South Africa (7,000 acres in cultivation), and Australia (1,800 acres). California was next, with 700 acres, Zimbabwe with 680, Hawaii - 300, New Zealand - 185 acres, Israel - 78 acres, Madeira - 14 acres, Tenerife - 5 acres and El Salvador - 5 acres.

What will the future bring, in expansion of plantings? It is my fervent wish that we see no "explosion" of production in the near future, until we can work toward the solution of some well defined constraints - both in our ability to produce high quality flowers, to maintain their quality enroute to the customer and to market them effectively and profitably.

\* This paper was presented to the Sixth Biennial Conference of the International Protea Association, Perth, 1991. Phillip E. Parvin is Professor, Graduate Faculty and Research Horticulturist, Department of Horticulture, University of Hawaii.



## MARKET POTENTIAL

During our discussions in the Protea Panorama, emphasis was placed on the importance of determining consumer preferences and demand and controlling production to grow what the customer wants. During our first 2 decades of an emerging protea industry, Economists would say that the market is production driven. That is, the novelty value was so high, and the supply was so low, that almost anything we could get to market was sold, in other words - production determined what was marketed.

In the decade ahead, it is easy to see two things happening. New markets - those where proteas are relatively unknown, will continue to be production driven in the short term. If they don't know what a protea should look like, they may be a bit more tolerant of shorter stems, or less than vivid colours, etc. but, in the 30 years or more, that proteas have been seen on the major markets of Europe and North America, there is a definite swing to a consumer driven market. Once a customer - whether that customer is a wholesaler, retailer or ultimate consumer, gets a taste of quality, then they are spoiled for life! They will refuse to accept the lower quality, at the higher price they once did. The bright and promising future of the protea industry continues to rely upon producing the highest quality flowers, and marketing them in a manner that will produce the highest customer satisfaction - a market driven by consumer preferences - not by grower preferences.

### Size of Market

Is it worth it? Based on the reports from delegates at the last IPA Conference, world wide sales of proteas were estimated to be approximately \$12 million dollars U.S. (South Africa \$4, USA \$4, Australia \$2.5, New Zealand \$1, Other \$0.5) Herb Mitchell, a floral marketing specialist, told the Conference that this represented less than 1/2% of the world's annual expenditure for flowers and floral products of \$25 billion dollars, U.S.

In the March, 1991 issue of "EUROfloratech", the 1990 per-capita consumption of floral products in U.S. dollars of the top 15 nations was reported by the Holland flower Bureau. The U.S. figure was \$48. Multiply that by 250 million people, and you have a U.S. national market of \$12 billion. Trade estimates generally agree that the market share for "speciality" flowers is 10%, or \$120 million dollars U.S. If one agrees with Herb Mitchell's assumption that proteas could easily represent 2% of the "speciality" market, then it is reasonable to predict that protea sales in the U.S. alone, could total \$24 million dollars U.S. per year - a potential increase of 6 times over that reported in 1989. The exercise could continue by multiplying the population figures of each country, by their per capita consumption (eg. Norway - \$154, Switzerland - \$143, Sweden - \$126, Denmark - \$116, Italy - \$112, W. Germany - \$101, and Japan - \$53 per person of flowers, only!, it is easy to see why we feel that there is indeed, a great potential market for quality protea production.

## RESEARCH

As our founder Peter Mathews put it so succinctly that October morning, a decade ago, "To produce first class flowers, we are going to have to do what growers of roses and carnations have done - ie. to support research programs - . . ." And in her talk, "Protea - An International Review", at Protea Panorama II, 3 years ago, Dame Joyce Daws concluded her remarks by urging, ". . . support for research . . . (as being) vital to a flourishing industry". And we HAVE! For the first time, an international commodity group

has banded together to support two activities, critical to the development of an industry - PROMOTION and RESEARCH. Support of these activities, through your annual dues, has made it possible to provide "seed" money, or matching funds to encourage research on protea problems of importance to your area, and to all of us.

Research on proteas has expanded drastically since IPA came into existence. In 1981, we heard research reports from 2 men from South Africa, Drs. Van Staden and Jacobs; 2 men from Australia, Greenhalgh and Nichols and I reported on work in Hawaii. In 1983 - Marketing and Promotions for the North American Markets were emphasised, and in 1985, the first international protea research symposium was held in South Africa under the joint auspices of IPA, and the International Society for Horticultural Science, (ISHS) Twenty-four papers and ten poster presentations were given. The complete text of all 34 reports were published by ISHS in Acta Horticulturae #185. Proteas were beginning to be recognised on the world stage. In 1987, our New Zealand conference provided us with a balance of current research reports, local production practices, and international marketing. Our last conference 2 years ago once again jointly sponsored an international protea research symposium, and gave us an insight into growing and marketing - California style. The proceedings of the second international protea research symposium containing 16 reports are available in Acta Horticulturae #264.

Since I firmly believe that our future trends are based on what is happening today, let us take a look at some of the research that is currently in progress, around the world.

#### IPA RESEARCH GRANTS

The IPA is partially supporting three research projects: one is a "non-chemical" approach to disease control - Biological control of *Phytophthora cinnamomi* in proteas by *Pseudomonas cepacia* (Lois Turnbull, University of Queensland), one in cultivar improvement - The establishment of a selection and breeding program to produce cultivars of *Banksia* and *Dryandra* for floriculture (Margaret Sedgley, University of Adelaide) and one in tissue culture - In vitro propagation of *Banksia* and *Conospermum*, Eric Bunn, Kings Park and Botanic Garden). IPA has also approved two student research scholarships - one to Mark Wright, working on an entomology project in proteas, in South Africa, and one to Cathy Girard, working on the effects of temperature and moisture on the survival of *Pseudomonas cepacia*, in Queensland.

#### ISHS PROTEA WORKING GROUP REPORTS

Immediately following the conclusion of the 23rd International Horticultural Congress in Italy, August 27 - September 1, 1990, an international protea research workshop was convened in Israel, September 2 - 7. The abstracts were reprinted in Volume 21, of the IPA Journal. It is interesting to see once again that the focus of research activity depends upon the needs of the client group supporting that activity. The theme for the Israel meeting was, "Intensive Cultivation of Protea". Scientists from the host country reported on cultivation in inert growth media, the use of grafted plants, and foliar micro-element sprays. Dr. Jaacov Ben-Jaacov, leader of the protea research project in Israel, states that, "difficulties in cultivating proteas in Israel are usually related to soil problems". So in addition to looking for cultivars that can grow under there conventional field conditions, they are also developing systems of growing the more sensitive cultivars using volcanic ash and a mix of 3:1 volcanic ash and peat. For potted plants, peat and 20% perlite is used. Fertiliser is added with every watering. Of perhaps greater potential interest to protea growers throughout the world, is the work currently in progress in South Africa and Israel on the development of appropriate rootstocks to overcome soil problems such as disease and adverse pH. What an exciting development it would be, if we could establish our protea plantations on rootstock - resistant to root rots, to nematodes, to high

ph and see the same vigorous growth and production from our superior cultivars grafted or budded on these rootstocks that we get from grafted roses or fruit trees! Then, as cultivars became available, instead of tearing out a field and starting all over again, we could merely "top work" our newest varieties onto the established rootstocks and enjoy a significant reduction in the "down time" before harvesting and sales could be expected. There is also increasing activity on the cultivar improvement front. Gert Brits reported on the interspecific hybridisation in *Protea*, *Leucospermum* and *Leucadendron* at the International Congress, and on breeding programs for *Proteaceae* cultivar development at the Workshop in Israel. Malan gave papers on improving shoot growth and flower quality with sprays of Gibberellic Acid and Benzyladenine, and discussed some of the factors affecting flowering of *Leucospermum* cv Red Sunset. The patterns of growth and flowering, as a guide to future control for market advantage was touched upon both by Dr. Wallerstein, from Israel, and Steven Dupee, from Australia. As the number of improved cultivars increases, the pressure for more efficient methods of rapid propagation increases. Abstracts of 9 papers concerned with propagation, from 4 countries are to be found in the proceedings of the workshop, soon to be published in *Acta Horticulturae*.

## CONCLUSIONS

What are the trends for the Decade ahead? In the short term I see a "settling out" period continuing. We may expect to see some of our growers, who are not serious about the industry, or who unfortunately are located in less than favourable soil and climatic areas with no compensating marketing advantage, drop by the wayside as the market for proteas shifts from being production driven, to consumer driven. There continues to be a bright future for an expanding market for proteas. However, in a consumer driven market, we must be sensitive to what the consumer wants, and when he wants it. We must continue to educate the consumer regarding the existence of proteas and how to handle them. We must continue to improve the quality of our product, not only in the field, but in the marketplace. We must continue our efforts to specialise our product line and grow only what we can grow best and cooperate with others in providing markets with a dependable, high quality product - throughout the year.

With the final decade of the 20th century upon us, it is time to "get serious" we can't do it alone! Through increased cooperation, communication and support of research, we can solve the production problems within our region. Through increased cooperation, communication and support of marketing and promotion, we can tell the world about our product, and deliver it in the form and quality that a consumer driven market demands.

Cooperation and working together within our production area, within our country, and within the International Protea Association, we WILL see the protea achieve the status on world markets that it deserves. WATCH OUT ROSES - MOVE OVER ORCHIDS - HERE WE COME!!!

## INDUSTRY ORGANISATIONS

### AUSTRALIAN PROTEA GROWERS ASSOCIATION (APGA)

The Association was formed in 1984 to:

- represent the interests of protea growers throughout Australia
- organise an annual conference
- assist in the identification of national research priorities and where possible provide funds for this research
- create an environment for the professional marketing of flowers with an emphasis on export.

Current strength is approximately 150 members and membership is recommended:

Further details can be obtained from The Secretary, Australian Protea Growers Association, PO Box 1396, GOSFORD SOUTH, NSW, 2250.

### INTERNATIONAL PROTEA ASSOCIATION (IPA)

The IPA was formed in 1981 at the first International Protea Conference held in Melbourne.

The IPA provides the opportunity for Protea growers, scientists and marketers to meet together and work co-operatively on projects of mutual interest.

The Association sponsors high priority research projects, publishes a journal, has produced a protea diseases manual, organises a cultivar distribution program, produces promotional literature and holds an International Conference every 2 years.

The next Conference will be held in Zimbabwe, October 1993.

Membership is recommended and application details may be obtained from:

The Secretary  
International Protea Association  
PO Box 18  
MONBULK VIC 3793  
Australia

### FLOWER EXPORT COUNCIL OF AUSTRALIA

Formed in Melbourne in 1990 to promote export of Australian flowers and develop markets. It co-ordinates the efforts of members to reliably provide top quality flowers at the best prices to overseas markets.

FECA is making a significant contribution to expanding Australian markets, particularly in USA and Japan.



For further information contact:

Kim James  
Executive Officer  
Flower Export Council of Australia  
PO Box 137  
NEDLANDS WA 6009  
Australia

#### SUGGESTED READING

Australian Horticulture, Monthly magazine for the nursery and cut flower growing industries. For subscription details tel: (03) 287 0900.

Department of Agriculture 'Ag Notes" Contact Department of Agriculture in your State.

Flower Link, Monthly magazine for the flower industry in Australia and New Zealand. For subscription details Tel: (02) 894 3454.

George A.S. "The Banksia Book" Kangaroo Press in Association with The Society for Growing Australian Plants - NSW Ltd.

International Protea Association "Sixth Biennial Conference Proceedings" 1991, Promaco Conventions, Perth.

International Protea Association "Growing and Marketing Proteas" Vols 1, 2, 3 & 4 ed. Mathews, P., 1981-1987, Proteaflora, Melbourne.

Jones, R. "Post Harvest Care of Cut Flowers" 1991, Institute of Plant Sciences, Melbourne.

Salinger, J.P. "Commerical Flower Growing" 1985, Butterworths, Wellington, New Zealand.

Von Broembsen, S. "Handbook of Diseases of Cut-flower Proteas" 1989, International Protea Association, Melbourne.

Vogts, M. "South Africa's Proteaceae, Know Them and Grow Them" 1982, Proteaflora, Melbourne.

Wrigley J.W. & Fagg, M. "Banksias, Waratahs and Grevilleas" 1991, Harper Collins, Sydney.



