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*Cover photo:* A floral arrangement created by Sue Burden of Manuka Flowers, Franklin Street Manuka and part of the *Colour in Your Garden* exhibition at the Australian National Botanic Gardens, Australia.

# **The Cut Flower Industry**

## **R&D Issues**



CENTRE FOR  
INTERNATIONAL  
ECONOMICS

Australian Centre for International Agricultural Research  
Canberra 1996

The Australian Centre for International Agricultural Research (ACIAR) was established in June 1982 by an Act of the Australian Parliament. Its Mandate is to help identify agricultural problems in developing countries and to commission collaborative research between Australian and developing country researchers in fields where Australia has a special research competence.

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Centre for International Economics. 1996. The cut flower industry: R&D issues. ACIAR Technical Reports No. 39, 80p.

ISBN 1 86320 190 4

Pre-press production by Judy Fenelon, ByWord Services Pty Ltd, Bawley Point, New South Wales.

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# Preface

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This report is the result of a study commissioned by the Australian Centre for International Agricultural Research (ACIAR) to support its evaluation of proposals to fund research for the cut flower industry. It lays out the approach to the evaluation of the case for funding research for cut flowers used in the study, and presents information on the industry and related R&D in the five countries chosen to be the focus of the work — Australia, Indonesia, Malaysia, the Philippines and Thailand.

The overall purpose of the study is to provide information on the cut flower industry in Southeast Asia that is relevant to the question of whether research possibilities for the industry are suited to public sector funding generally and to ACIAR funding in particular. The study involved discussions and interviews with industry groups and representatives in the five case study countries, along with R&D providers and managers. A working group comprising industry and R&D specialists from each country was set up to collaborate with the study and provide inputs to this report.

The aims of the report are to:

- provide an overview of the nature of the global cut flower industry, and more detailed information on demand and supply, costs and returns, production and research expertise, farm level and post-harvest costs, marketing arrangements and the characteristics of farms and firms involved in the domestic and export trade in the case study countries;
- review relevant research being undertaken for the industry, and identify the roles of the public and private sectors in this work;
- define the major constraints to the development of the industry in the case study countries, and identify areas where constraints may be susceptible to technologies developed by ACIAR;
- set up a framework for identifying the role of public and private sector R&D for the industry, and

apply it to the picture of the industry emerging from the study; and

- identify the potential beneficiaries from research for the industry, along with the key factors affecting the size of benefits from R&D, and provide an indicative assessment, using the framework developed for the study, of the suitability for public and private funding of the kind of research that appears to be appropriate to the industry's needs.

The report finds that, on the basis of the rather limited information that is available on the cut flower industry, the case for ACIAR funding of collaborative technical research is not strong. The industry is very small relative to the sizes of other activities where ACIAR is typically involved, and the returns per dollar of investment in R&D do not seem to be large enough to provide an offset. Much of the research that seems most likely to help the industry is of a kind that is better suited to private rather than public funding. In some countries the most important contribution that the public sector could make would seem to lie in removing constraints to private R&D for the industry and improving the ability of industry participants to organise research funding and to access existing research results. The small scale of most growers and the fragmentation of the industry suggest that collaborative funding and research may be difficult to organise. This is a problem that governments can help with, but not one where collaboration across countries would be of much assistance.

In some areas of public policy concern, such as environmental protection, quarantine control and occupational and consumer safety, there may be a role for direct government funding of R&D, especially when issues extend beyond the boundaries of the cut flower industry. However, at this stage it is difficult to identify areas where the broad conditions set by ACIAR's mandate and institutional objectives are unequivocally met.

# Acknowledgments

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This study was completed with assistance from people involved in the cut flower industry and the scientific community undertaking research on the industry in Australia, Indonesia, Malaysia, the Philippines and Thailand. Special thanks are due to those people who participated in the working group set up for the study and to Professor Helen Nair,

Department of Botany, University of Malaysia, Kuala Lumpur; Professor Saichol Ketsa, Department of Horticulture, Faculty of Agriculture, Kasetsart University, Bangkok; Dr Toto Sutater, Head, Institute for Ornamental Crops Research, Department of Agriculture, Jakarta; and Dr Daryl Joyce, Division of Horticulture, CSIRO, Brisbane.



# A Framework for Evaluating the Case for ACIAR funding of R&D

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The Australian Centre for International Agricultural Research has been approached with proposals to fund technical research and development (R&D) for the cut flower industry. To help it develop an informed basis for evaluating these proposals ACIAR commissioned the Centre for International Economics to carry out a study of the industry and associated research issues, with particular emphasis on five countries — Australia, Indonesia, Malaysia, the Philippines and Thailand.

The study involved visits to and discussions with firms and individuals operating in the various facets of the industry in the five countries, and consultations with research institutions, industry organisations and government agencies. A list of contacts made for the study is given in Appendix A.

In addition, a working group comprising representatives of the industry in the five countries, the research community and relevant Australian government agencies was established to help with the study. This group met to discuss a draft report and to offer appropriate perspectives on the content of the study. Copies of the papers delivered are presented toward the end of the report.

The main objective of the study is to provide information to enable ACIAR to decide if it should fund research for the cut flower industry. It is not enough to say that the cut flower industry has potential, that it faces constraints in realising this potential and that R&D may help. Nor is it enough to say that there are interesting and important scientific issues involved. To be useful to ACIAR the study must provide information that relates to the basic question: is funding research for the industry consistent with ACIAR's mandate and institutional objectives?

This chapter of the report lays out the elements of a framework within which ACIAR could address this question, based on the statements of its mission and functions laid out in its annual reports and other publications. This framework is used in later chapters as the basis for organising information.

## ACIAR's Role in Research Funding

ACIAR is an Australian government statutory authority charged with promoting research into improving sustainable agricultural production in developing countries. ACIAR's primary mission is to fund collaborative research by agriculture-related scientists in Australia and developing countries (ACIAR 1994). In doing this, ACIAR seeks to solve agricultural development problems and to strengthen Australia's and developing countries' agricultural research capacity. ACIAR's activities are funded from the Australian Development Assistance Program. Research commissioned by ACIAR focuses on high-priority problems in developing countries in fields in which Australia has particular scientific and technical expertise.

Given ACIAR's role and mission, decisions on funding research activities in a particular industry should hinge on:

- the general role for the public sector in funding R&D and what characteristics of classes of R&D are most consistent with that role; and
- the more specific implications of ACIAR's focus on:
  - agricultural development objectives;
  - regional collaborative research with its emphasis on exploiting Australian expertise; and
  - capacity building.

## The Role of the Public Sector

The role of the public sector in R&D has been extensively discussed in Australia over the past decade and important initiatives, such as the creation of agricultural R&D corporations, have been taken. One important forum for reviewing issues was the Industry Commission inquiry into research and development conducted during 1994. It is useful to summarise some of the main outcomes of that inquiry and how

they bear on perceptions of what governments can usefully do regarding R&D.

Technological progress has played a major role in achieving economic growth and expanding the capacity of nations to meet the social and economic needs of their people. While technological progress is sometimes associated with environmental problems, it also helps nations to respond to concerns about the sustainability of the overall processes of economic advancement. Thus knowledge creation and technological change are matters of great concern to governments and a lot of attention has been devoted to sorting out what governments can do to promote R&D and innovation.

While it is useful to view knowledge as a capital good that generates future streams of income, there are important features that set it apart from most other kinds of capital. In particular:

- the stock of knowledge is **inexhaustible**, whereas physical capital runs into diminishing returns and depreciates;
- new knowledge can be used over and over again (one person's use does not preclude use by others); and
- knowledge is not of much value if there are no tools to apply it and the generation of knowledge requires an existing stock of physical and human capital.

General economic policy plays a critical role in creating an environment in which the creation and use of new knowledge can thrive. Open and competitive markets can provide a stimulus to search for new knowledge, and sound macroeconomic policies create an environment in which people are willing to make the longer term investments needed to add new knowledge. Public investment in education and policies that support the development of research institutions are also important, as is the maintenance of key institutions of civil society, such as the legal framework for the exercise of property rights. Such institutions enable people to reap the benefits from their investments and so provide the incentive to invest.

But beyond these broader actions to create an environment conducive to innovation, the special characteristics of R&D suggest that a more specific role for governments may be warranted.

## Why R&D Is Special

Broadly speaking, in the countries that are the focus of this study the allocation of resources between different activities is primarily decided by people and firms working in a market environment. However, some of the special characteristics of R&D suggest that even efficient markets may produce a less than optimal level of investment in R&D. These characteristics raise the prospect that government action may be warranted to try to redress the shortfall.

Specifically, the so-called public good characteristics of R&D arise from the possibility that:

- it is not always possible to stop others from using the results of R&D and so those who undertake or finance R&D may not be able to appropriate all of the benefits (for example, if plant variety rights are not enforced incentives to breed new material may be reduced);
- the results of successful R&D are typically used many times — one person's use does not preclude anyone else from using the results (for example, a technique for storing flowers in transport could be used and reused by all producers and exporters); and
- undertaking R&D is expensive but dissemination of the results is not (relatively speaking).

These public good characteristics suggest that there may be a role for governments to redress possible private underinvestment in R&D. And other aspects of the R&D process are sometimes put forward as a reason for government involvement. They include:

- the possibility of a common pool problem (for example, if the benefits from R&D are made appropriable by, say a patent system, there may actually be overinvestment in R&D as firms race to be the first to create a patentable technology and the prospect of gaining the excludability that patents offer may diminish incentives for socially desirable cooperation that could reduce the overall resource costs of developing a technology);
- a perception that R&D is inherently risky and small firms may not have the resources or the mechanisms to spread the risk; and
- the prospect that markets may not produce adequate R&D in areas where governments are the main owners of resources likely to be affected or have major public responsibilities.

There has been extensive debate about the implications of these arguments. Many of them were presented in submissions to the Industry Commission inquiry on R&D. Some elements of the discussion that may be important for this study follow.

- The kinds of spillovers that create the appropriability problem that lies at the heart of the public good character of R&D are present to some extent with all goods and services and processes. It is a matter of degree.
- Markets produce a wide range of responses to the problem of capturing sufficient benefits from R&D.
- There is a broad spectrum of possible government responses to the underinvestment problem — including doing nothing. Government actions are not costless and the possibility of market failure does not necessarily mean that there are options available to government that are worth taking. It may also be more appropriate to take actions to facilitate market solutions than to undertake or fund R&D directly from the public purse.
- The extent of the market failure problem and the nature of effective government responses vary considerably over different industries and according to the constituency/jurisdiction that public sector agencies are responsible to, and according to the type of research activity involved. Mature industries populated by large multinational firms may have fewer problems carrying out and capturing benefits from R&D than emerging industries with fragmented structures and many small firms. But even so, firms in less concentrated industries sometimes find ways to pool resources, to achieve economies of scale in research and to spread risks. Spillovers that spread over national borders may deter firms and governments from investing in certain types of R&D, but agencies with a broader mandate for international collaboration may take a different perspective. And there is a general sense that basic research is more prone to appropriability problems than applied and adaptive research.

### **The Role of Public Support for R&D Depends on Industry Structure**

The R&D and innovation process is complex and the scope for market failures — and solutions — varies

so much over the spectrum of activities where the results of R&D may be applied. It is not possible, therefore, to come up with hard and fast rules about the role for government. A particular problem in constructing guidelines for government intervention concerns whether governments have the information to produce better outcomes than the market can.

This issue was addressed in a report prepared by Centre for International Economics (1994, p. 31) for the Rural Industries Research and Development Corporation. The report said:

One policy construction ... is that governments should not 'crowd out' what markets can do well. The implication from this is that government R&D agencies should focus resources on areas where the market appears most likely to fail. That makes sense but there are more dimensions to the issue than that. It is more constructive to think in terms of matching characteristics to a whole range of actions governments might take, many of which will be about making markets succeed.

The theory of markets and knowledge of the characteristics of R&D can help set a useful foundation for policy. In industries where very large firms are economical — say, from the point of view of both reducing costs and capturing market share — it is likely that:

- competitive rather than cooperative behaviour will be a driving force toward innovations; and
  - investment in R&D is likely to be economic because a big firm will be able to appropriate the benefits.
- However, with small firms facing a given price, as is the case for farmers, it is likely that:
- cooperative behaviour will be attractive as the gains from an innovation will show up by way of reduced costs, and increased market share for one does not mean reduced market share for another; and
  - the practical options to get big enough to warrant the R&D are fewer (though the structural responses in agriculture — for example, the growth to agribusiness — should be acknowledged).

This perspective suggests that the structure and organisation of the cut flower industry, the types of market it serves and the sources of its inputs are all important in assessing ACIAR funding of R&D. For example, if producers are dispersed and not well organised and the product is homogeneous, cooperative funding of research may be beneficial but unlikely to occur. Public sector intervention might be desirable. And if benefits from research could spill over into several countries, international cooperation could be appropriate. But if suppliers of inputs (such as planting materials and chemicals) are large and concentrated, they may have found ways to conduct

and reap sufficient returns from a range of innovations that help flower growers. Finally, even if public intervention is warranted, the type of intervention that ACIAR can offer may be less appropriate than other actions governments could take.

This perspective also suggests that governments should not be concerned just with those research activities that have the highest social returns. Rather they should direct attention to those with good returns that the market process would not pursue if left to its own devices. Just because the private sector cannot appropriate and charge for *all* of the benefits from R&D does not mean that it cannot appropriate enough to make investment worthwhile, or that it cannot find indirect ways of reaping returns. As the RIRDC report pointed out, governments should be concerned with the 'orphans' of R&D. This implies that, other things being equal, governments do not need to worry so much about research that might lead to defensible property rights — where, say, registration of plant variety rights or plant breeders' rights is a viable option.

### **ACIAR's Particular Focus**

Because ACIAR is a public agency, the concerns laid out in the previous paragraphs are pertinent to evaluating whether it should become involved in research in a particular field or activity. But there are some specific dimensions to ACIAR's mandate that also bear on this process.

#### **Aid and development**

ACIAR's activities are funded through the Australian Government's aid program. This means that, implicitly or explicitly, the evaluation framework must take account of the broad objectives of that program. At the least, this may have some impact on the choice of regions or countries that are targeted by ACIAR programs. It will also mean that the distribution of benefits from activities is a consideration. This might apply to the distribution of benefits across countries, and across groups of people within countries. Such considerations might lead to favouring activities where poor or disadvantaged groups would gain.

#### **Regional collaborative research**

The focus on regional collaborative research adds some additional dimensions and considerations to the

evaluation framework. ACIAR's approach to this element of its mandate has been discussed in a number of its reports on evaluation methodologies (Davis 1994; Davis and Lubulwa 1994; Davis, Oram and Ryan 1987).

With a regional constituency, ACIAR's activities can help to address the problem of R&D under-investment where strong cross-country spillovers might deter individual governments from supporting R&D. ACIAR might therefore be likely to favour R&D where a large share of the benefits is contained within target regions, but be more cautious about R&D with very wide-ranging spillovers that might more appropriately lie in the domain of larger or multilateral research institutions. One obvious device for homing in on such R&D is to emphasise activities relevant to agroclimatic conditions that occur in Australia and in target countries.

The focus on collaboration implies a concern for the ways in which cooperation might diminish the common pool problem — which is as likely to occur within the framework of national government approaches to R&D as it is to the operations of the market. This suggests that ACIAR could emphasise projects that embody mechanisms for reducing duplication that might otherwise occur.

There is a presumption that research promoted by ACIAR would be in areas that can exploit Australian research and technical expertise. Projects that are high national priorities in cooperating countries might not be accorded the same high priority by ACIAR if there was limited Australian expertise in the area. An obvious first rule of thumb in selecting projects for consideration would be to favour areas where Australian research is already under way or where skills are readily transferable.

The collaboration would be expected to have an impact on the dynamics of research, which could give rise to benefits beyond the reduction of duplication. At one simple level, ACIAR's involvement could reduce barriers to the transfer of ideas and information within the regional research community. But there may be more complex effects on the knowledge creation process. And the gains may be greater than the effect of any one project if ACIAR's activities help to foster a general climate of collaboration and communication across countries and institutions.

## **Capacity building**

Capacity building is an explicit part of ACIAR's mission, as well as a necessary implicit objective stemming from its linkages with Australia's development program. This is addressed directly by ACIAR's involvement in training and other skill development activities (ACIAR 1994). But beyond this, the interest in capacity building could influence project selection and project design.

## **Modalities of ACIAR intervention**

One factor that is more important to the evaluation process involved in this study than it is when ACIAR assesses individual project proposals is the nature of interventions that ACIAR is mandated to undertake. The principal modality for ACIAR involvement in R&D is the commissioning of research. ACIAR has considerable scope for targeting high priority problems through the choice of research activities, collaborating countries and research teams and institutions. But ACIAR cannot pursue other actions that might be the most cost-effective ways of solving the underlying market or institutional failure problem that may be impeding research. It cannot, for example, institute industry levies to fund research or address the legislative framework for intellectual property rights and patents.

Government policies in some countries may discourage private R&D in certain areas through, for example, inadequate legislation on plant variety rights or taxes and trade barriers, which raise costs of materials for research (such as imports of plant material). While an ACIAR-commissioned project may allow some research to proceed, a more appropriate public policy response might be to address the impediment directly and improve the overall climate for research in those areas. And for fragmented industries where producers may find it hard to organise cooperative arrangements for research, facilitating cooperation or instituting an industry levy may be a better response than directly funding research.

In addition, established practice at ACIAR may limit the scope of some interventions for which it does have a mandate. For example, the funding of development and dissemination activities is usually limited to technologies arising from ACIAR-funded research. So it is unlikely that ACIAR would finance, for example, the dissemination of information on

existing flower cultivation and post-harvest management techniques, even though this could be the highest priority activity in some developing countries.

Thus, in identifying possible areas for ACIAR activity, it may not be sufficient to identify high return projects that would not proceed without public sector action. It may also be necessary to ask what kinds of action would best address the reasons why the research is not proceeding.

## **Judgments and Trade-offs**

As with most public institutions the multifaceted nature of ACIAR's role and mandate brings certain tensions to the process of evaluating project proposals and possible areas of activity.

At the broadest level one could characterise ACIAR's role as dealing with a further refinement of the 'looking after orphans' issue discussed earlier. As a public sector agency ACIAR focuses on high return R&D activities that the private sector is unwilling to undertake. But with its orientation toward international collaborative research ACIAR is also concerned with how it can add value to the public sector research process. To make the biggest impact and best use of scarce aid funds, it would seem that ACIAR should also be targeting R&D activities that have high returns but that national public research programs would otherwise not undertake. This would put a premium on projects that have extra-national spillovers that are substantially contained within target regions.

But targeting orphans cannot be the only criterion. If ACIAR can help reduce a public sector 'common pool' problem and enrich the dynamics of research, it may well have a role in areas that national R&D programs are undertaking.

There may also be other trade-offs in the evaluation process. For example, there could be tension between the pursuit of the capacity-building objective and the desire to exploit Australian expertise and solve problems quickly. The quickest route to successful research outcomes may be to do the research where the skills and facilities are greatest — but this may do little to build capabilities where they are weak. Recognising such tensions and the need for trade-offs is an essential step in dealing with them.

ACIAR pursues its mandate through a portfolio of activities. It is the conformity of the whole portfolio

with ACIAR's institutional objectives that matters and it is not necessary for each project, or collection of projects in a particular industry, to achieve high rankings across all of the criteria that ACIAR employs.

## The Approach

The purpose of this study is to provide information to support ACIAR in deciding whether it should fund research in the cut flower industry. It is not about evaluating a particular research proposal — which could allow it to draw on the comprehensive processes that ACIAR has set up for project evaluation. Nor is it about assessing how R&D in the cut flower industry might complement the existing portfolio of research that ACIAR is funding. The approach adopted in this study is one of matching characteristics and objectives.

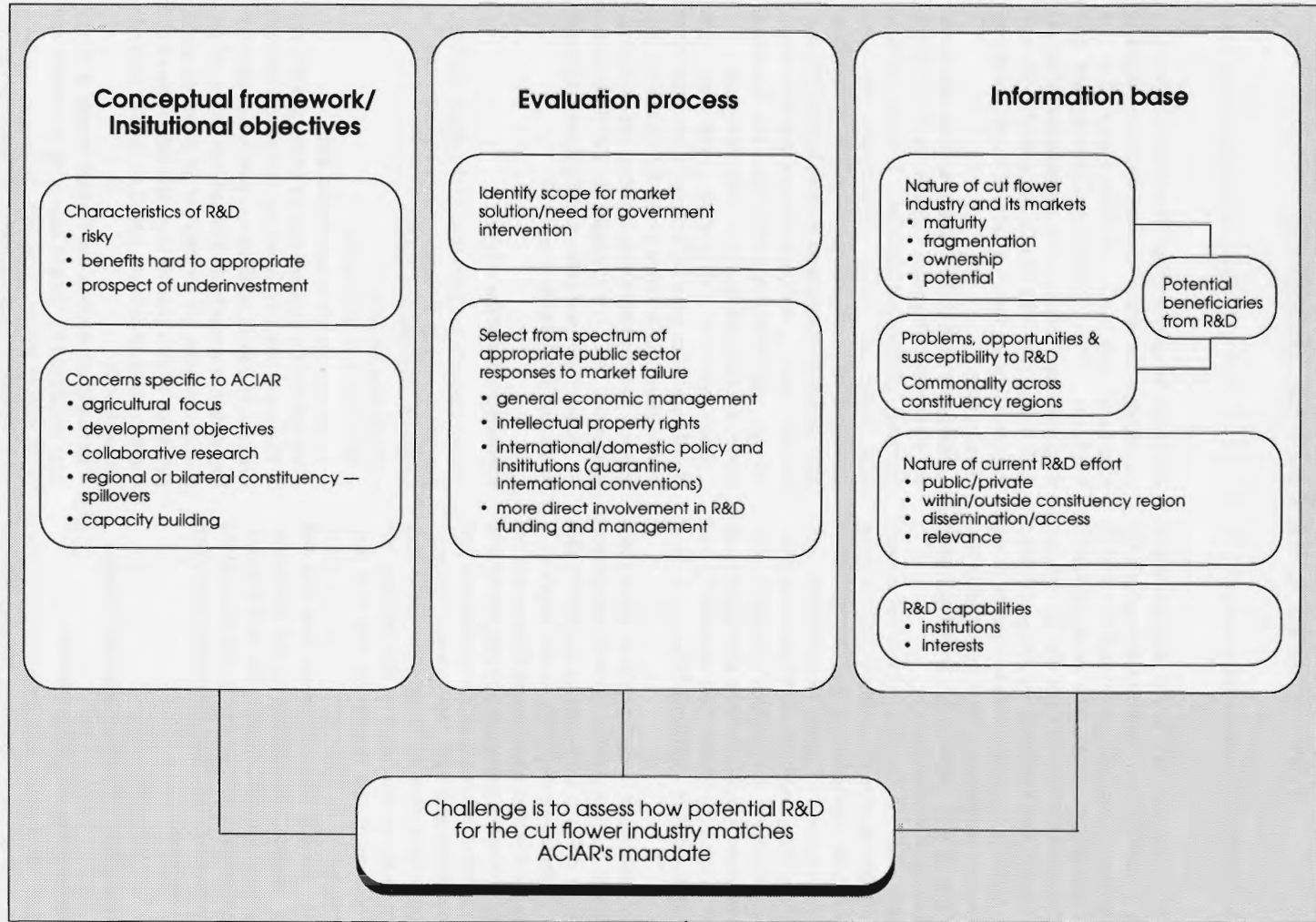
This approach, which is summarised in Figure 1, encompasses the following steps:

- identifying the principal conceptual and institutional objectives that ACIAR is pursuing, embedded in an appraisal of the theoretical rationale for public sector involvement in R&D and ACIAR's special mandate;
- marshalling information about the cut flower industry and the R&D effort in the selected countries to identify characteristics that may relate to the rationale for ACIAR involvement:
  - structure, markets, organisation and ownership,
  - constraints and opportunities, and their susceptibility to R&D based solutions,
  - the nature of current and prospective R&D — who performs and funds it, the appropriability of benefits, the nature of spillovers, the applicability of research being conducted for other industries or in other countries,
  - the institutional capacity for industry-related research and disseminating results to the industry; and
- assessing the consistency or disparity of characteristics of the industry and prospective R&D with the decision framework derived from considering the objectives and rationale for ACIAR's functions.

More specifically, the approach involves trying to answer or marshal information relevant to questions about the cut flower industry and related R&D.

- How large is the industry in the case study countries, and what do the size and structure indicate about the extent of possible benefits from successful R&D? What are the prospects for development of the industry?
- What are the characteristics of the demand for cut flowers in terms of price responsiveness and the income characteristics of consumers, and what do these indicate about the possible distribution of benefits from cost reductions and new products resulting from successful R&D?
- How much of the R&D for the industry is currently being carried out by the private sector, and are there reasons to believe that the private sector is underinvesting in R&D? In what areas are public sector institutions involved?
- Do flower growers have access to international R&D, and how relevant is it to their needs and circumstances?
- What are the key knowledge-related constraints facing the industry in each country?
- With regard to each area where R&D might benefit the industry,
  - What are the potential benefits and costs of research in these areas, and to whom would the benefits accrue?
  - Can the private sector be expected to carry out adequate levels of research in the field — and make the results available to growers in the region — and, if not, what might be the most appropriate actions for governments to take to redress under investment?
  - Are the issues and problems being addressed common across potential collaborating countries, and are there spillovers to and linkages with other industries that bear on research funding decisions?
  - Do the big gains in knowledge come from new research or from dissemination and adoption of existing technologies and practices?

These questions are addressed in the following chapters.



**Figure 1.** The approach — assessing how R&D for cut flowers matches ACIAR's mandate.

# The World Cut Flower Industry

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Flowers fill important symbolic and decorative functions in cultures and traditions throughout the world and have long been cultivated for use at religious and social events. The development of commercial production and trade in cut flowers, however, has been driven largely by the consumption habits of wealthier people in urban centres in the more developed countries and the adoption of similar consumption patterns among the growing middle classes in developing countries.

The rapid growth in the production of cut flowers that has occurred in a number of developing countries has been driven largely by opportunities to supply high income markets in Europe, North America and, increasingly, Asia. Improved cultivation and post-harvest management techniques, combined with cheaper and more widely available air transport, are making it possible to exploit cost, seasonality and climatic advantages in producing flowers for these markets.

Broadly speaking, it is the prospect of tapping into export markets that has prompted government interest in supporting R&D in the countries covered by this study. It is therefore important to put together a picture of the world market for cut flowers and the patterns of production and trade. It is also desirable to identify the main elements in the production and distribution chain and their international linkages. This helps to identify areas where innovation may contribute to the development of the industry, the possible sources of this innovation, and who may benefit from it.

However, as will become evident from this and following chapters, information on the production and trade of cut flowers is patchy. National statistics in many countries seem to understate the extent of the industry and international statistical collections often ignore the industry.

## Consumption, Production and Trade

### World consumption and major markets

Consumption of commercially produced cut flowers is concentrated in North America, Western Europe

and Japan. Industry sources identify the United States and Japan as the largest markets, each with purchases of around A\$8 billion in 1990 (Haak, Tap and Heybroek 1992). Italy and Germany are also relatively large markets, with consumption of around A\$5 billion and A\$4 billion respectively. Western Europe accounts for over half of world cut flower consumption.

Consumption in these markets has been dominated by traditional temperate flowers: roses, chrysanthemums, gladioli and carnations. However, markets with higher per person consumption and more developed tastes, such as Japan and the Netherlands, have shown greater interest in other types of flowers. Orchids have a well-established place in these markets, and certain tropical flowers and Australian natives are also finding a place with consumers.

Consumption of cut flowers in the major consuming countries grew by around 10 per cent a year in Australian dollar terms in the five years to 1990. Industry sources forecast that markets for cut flowers and foliage will grow at annual rates of 9 per cent in the United States and Japan and 6 per cent in Europe to the year 2000 (Pullar et al. 1993).

### Characteristics of the market

Market research suggests that, in the major markets, purchases of cut flowers and pot plants can be roughly broken down as follows:

- 50 per cent for gifts;
- 20–30 per cent for own use;
- 10 per cent for use in cemeteries; and
- the balance for business uses by hotels and offices.

There are, however, important differences between markets. In Japan, institutional purchases dominate the market, whereas in the Netherlands around 40 per cent of purchases are for own use. In countries where purchases as gifts play an important role, there can be distinct peaks in demand linked to regular festivals and occasions.

In nearly all markets, cut flowers remain a luxury item purchased by people belonging to middle and upper income groups. Typically, cut flowers are not a youth-oriented product as most cut flower buyers are



between 30 and 60 years of age (SGV & Co 1990). Changes in marketing channels, particularly the growing role of supermarkets as a complement to specialist florists, are making flowers more readily available to consumers at lower prices. These changes, combined with the impact of growing trade between the hemispheres on the availability of cut flowers throughout the year, are beginning to change the demographic profile of the market for cut flowers.

Cut flowers are sold at the retail level singly, in bunches and in floral arrangements. The arrangements in which flowers are displayed have created demands for products to play different roles. In Australia, it is common practice to distinguish four product types: display or primary flowers, focal filler or secondary flowers, filler flowers and foliage. Unit prices are generally highest for display flowers and lowest for foliage, but demand for varied types of foliage has meant that there is a substantial trade in this product.

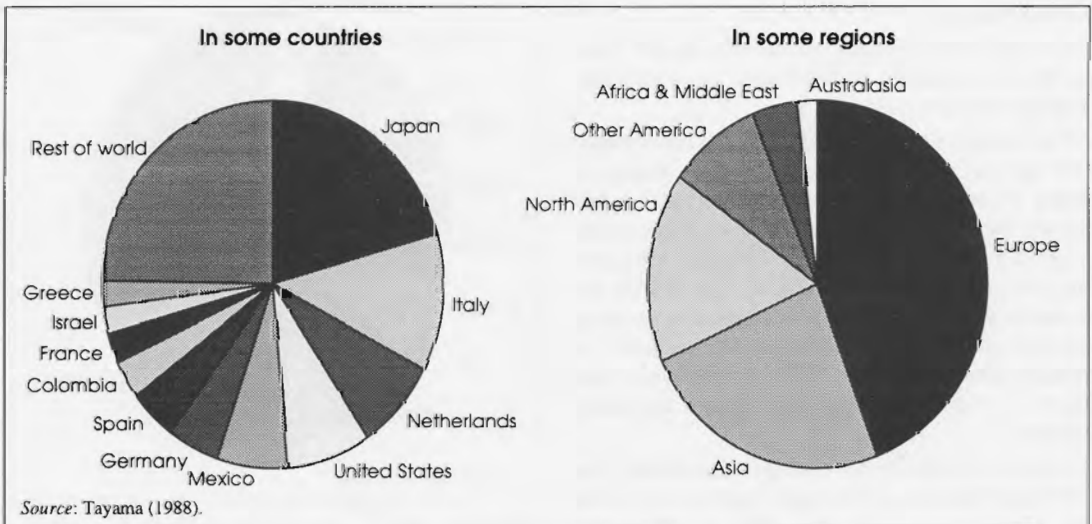
Demand for cut flowers is income elastic. Markets in developing countries have begun to show more rapid growth as per person incomes have grown and, more particularly, as a sizeable middle income group has emerged. The responsiveness of demand to changes in price, which may be important in determining whether it is consumers or producers who benefit most from R&D-related reductions in production costs, is not as clear cut.

The cultural basis of household demand for flowers and the small share of total costs in the business sector of the market that flowers account for point to demand being relatively unresponsive to price changes. However, there are substitutes in certain market segments (for example, pot plants probably compete in the gift segment, as might confectionary), which could affect the price elasticity of demand. And there is some evidence from lower cost marketing channels that suggests that demand does respond to price changes. Cross-country data on prices and consumption also support the idea that demand is price elastic (Haak, Tap and Heybroek 1992). And the growth in international trade in flowers suggests that the demand faced by growers in a particular producing region will be highly price elastic.

**Production and trade**

Although the bulk of the world's production of cut flowers occurs in or close to the main consuming countries, the past twenty or so years have seen rapid growth of production in other countries to exploit the export opportunities in the big markets.

The area under cultivation of cut flowers around the beginning of the 1990s has been estimated at between 55 000 and 60 000 hectares. As can be seen from Figure 2 Japan would have accounted for just over 20 per cent of this area, Italy for around 13 per



**Figure 2.** Estimates of cut flower production areas in selected countries and regions, 1988.

**Table 1.** Cut flower production area by flower type in selected countries.

	Carnation	Chrysanthemum	Gladiolus	Rose	Orchids	Others	Total
	hectares	hectares	hectares	hectares	hectares	hectares	hectares
Japan	456	4 864	307	344	65	7 053	13 089
Italy	1 950	1 025	1 211	812	..	2 602	7 600
Netherlands	287	625	na	829	177	3 163	5 081
United States	235	337	2 590	377	15	1 513	5 067
Mexico	3 500	200	500	50	..	..	4 250
Spain	1 085	na	na	523	na	1 292	2 900
West Germany	117	530	na	420	32	1 439	2 538
Colombia	1 050	600	na	275	na	197	2 122
France	147	76	369	406	na	694	1 692
Israel	259	17	39	140	na	1 028	1 483
Total	9 086	8 274	5 016	4 176	289	18 981	45 822

na Not available. .. Negligible.

Source: Tayama (1988).

cent and the Netherlands, the United States and Mexico for around 7–8 per cent each. Areas under production are not necessarily a good guide to output, however, because the intensity and efficiency of production varies considerably between countries, reflected to a fair degree in the shares of production undertaken under cover and in the open. While Japan has nearly 2.5 times more area under production than the Netherlands, the value of output is about the same in both countries.

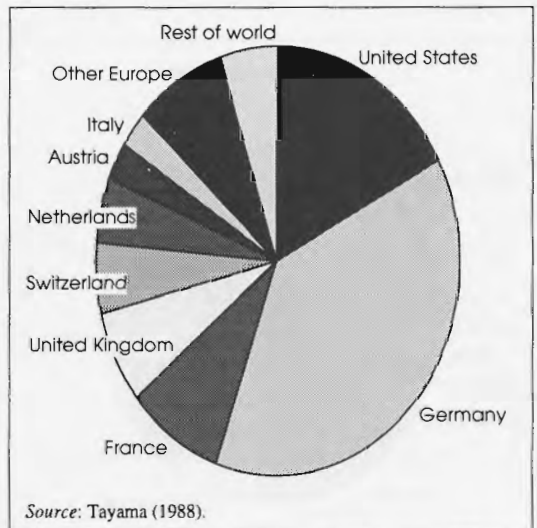
As with consumption, production in the main producing countries is dominated by traditional temperate flowers (Table 1).

The location of production has shifted significantly over the past twenty or so years. Within Europe, a strong emphasis on research and innovation has allowed the Netherlands to capitalise on its proximity to rapidly growing high income markets to become the centre in world floriculture. The search for locations with lower costs and favourable growing seasons prompted production to expand in Mediterranean countries — Italy, Spain, Greece and Israel — and more recently in Africa and Latin America.

Trade in cut flowers has been growing rapidly. The US dollar value of world imports grew at a rate of over 10 per cent a year in the 1980s. In 1988, world imports were estimated to be some 30 per cent of

total supply. Germany and the United States are the largest importers, together accounting for about half of total imports (Figure 3).

The Netherlands is by far the largest exporter of cut flowers, accounting for over 65 per cent of total exports in 1991. As Table 2 shows, a large number of



**Figure 3.** Distribution of world imports of cut flowers, 1986.

**Table 2.** World exports of cut flowers, 1991.

	Value	Share
	A\$m	%
Netherlands	2 598.8	66.50
Colombia	430.6	11.02
Israel	172.9	4.42
Italy	115.1	2.94
Thailand	90.4	2.31
Spain	69.7	1.78
Kenya	64.7	1.65
Canary Isles	24.5	0.63
Ecuador	22.7	0.58
France	22.6	0.58
Zimbabwe	20.8	0.53
New Zealand	20.3	0.52
Mexico	19.6	0.50
Singapore	18.7	0.48
United States	18.6	0.48
Peru	18.1	0.46
Morocco	17.1	0.44
Germany	17.1	0.44
Taiwan	16.9	0.43
Australia	16.4	0.42
Turkey	15.7	0.40
Cost Rica	14.8	0.38
South Africa	13.4	0.34
United Kingdom	12.9	0.33
Belgium-Luxembourg	7.1	0.18
Brazil	6.5	0.17
Mauritius	6.1	0.16
Guatemala	5.3	0.14
Canada	5.2	0.13
Denmark	3.0	0.08
Chile	2.5	0.06
Dominican Republic	2.5	0.06
Ethiopia	2.5	0.06
Zambia	2.3	0.06
Ivory Coast	2.1	0.05
Other Africa (Rwanda, Swaziland, Tanzania)	1.9	0.05
Jamaica	1.4	0.04
Malaysia	1.3	0.03
Martinique	1.0	0.03
Venezuela	0.9	0.02
Ireland	0.8	0.02
Portugal	0.8	0.02
Bolivia	0.6	0.02
Poland	0.5	0.01
Malta	0.4	0.01
Sri Lanka	0.4	0.01
Trinidad and Tobago	0.4	0.01
Greece	0.3	0.01
Total	3 908.2	100.00

Source: Tan (1994).

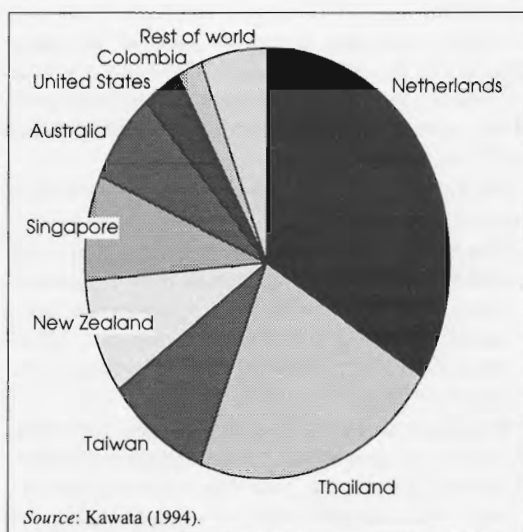
countries have become involved in the export of cut flowers. For many developing countries these exports have become a good source of foreign exchange.

Japan is one of the more rapidly growing markets for imports of cut flowers (Table 3). In volume terms, imports grew by 15 per cent a year between 1988 and 1991. The Netherlands and Thailand account for over half of these imports (Figure 4).

**Table 3.** Japanese imports of cut flowers. Million stems

	1980	1985	1990	1991	1992
Orchid	36	63	112	123	183
Chrysanthemum	30	25	44	31	44
Carnation	2	3	10	13	21
Rose	0	0	1	11	15
Freesia	0	0	11	9	13
Lilies	0	0	1	10	11
Ferns	4	17	51	52	67
Others	11	15	110	109	133
Total	82	123	357	358	441

Source: Kawata (1994).

**Figure 4.** Sources of Japanese imports of cut flowers, 1992.

## Industry Structure — Production and Marketing Chains

Inevitably, the structure and organisation of the cut flower industry varies around the world and within countries. Patterns of ownership, firm and farm size, factor intensity and degrees of specialisation depend very much on resource endowments, infrastructure and service availability, relative prices, the institutional framework for business and the nature of markets being served. However, the broad components of the industry and the links in the input, production and distribution chains are similar throughout the world. This reflects the common requirements of flower growing and the limited nature of off-farm processing associated with floriculture. In turn this means that the areas seen as possible targets for R&D are also similar across countries even though climatic and other factors may lead to significant differences in product and process focus.

Generally speaking, the dominant place that traditional temperate flowers have in markets and production throughout the world and the role that firms in the northern hemisphere (particularly in the Netherlands) have played in supporting the global development of the industry have involved considerable reliance on international private sector R&D and innovation.

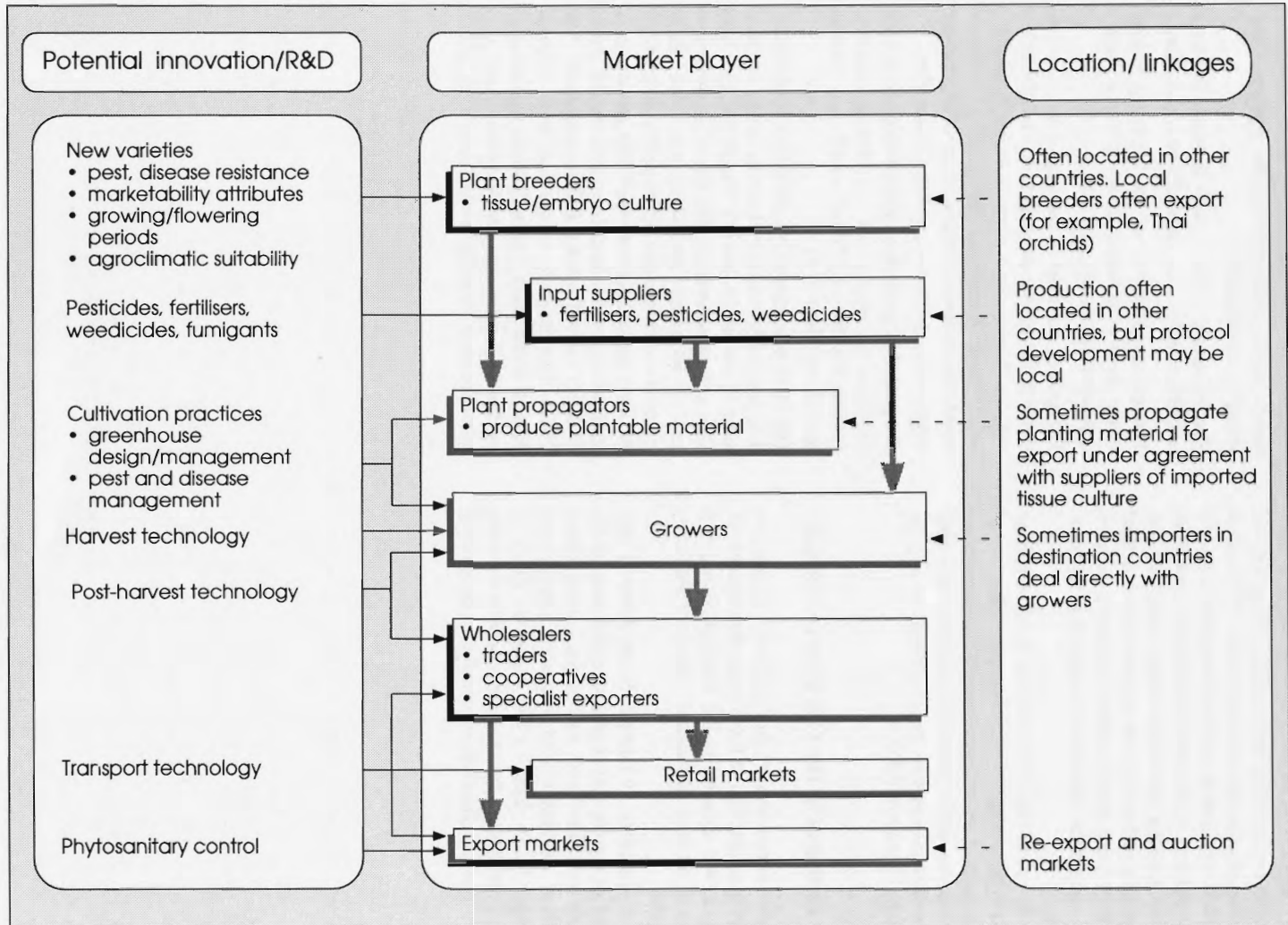
Figure 5 presents a stylised view of the main elements in the production and marketing chains in the industry, the main target areas for R&D and some of the important linkages that channel international R&D into the industry.

The following key market players are identified in Figure 5.

- **Plant breeders** who develop new or improved varieties of existing commercially grown species or select and breed new species for commercial cultivation. In many countries, the industry relies heavily on international breeding companies for new varieties.
- **Suppliers of inputs** such as fertiliser, pesticides, weedicides, greenhouse and irrigation equipment. In most developing countries, imports from the large multinational chemical companies are the main source of chemicals, and greenhouse and irrigation technology is also frequently externally sourced. Because the demands of the floriculture

industry are relatively small, producers often cannot justify the costs of developing protocols for the flower industry or seeking registration for floricultural use in countries with regulations on use of agricultural chemicals. There is sometimes a problem of poor information on treatment regimes that local research and extension agencies try to address.

- **Plant propagators and nurseries** that develop planting material from tissue culture and seeds. While integrated breeding and propagation are common in countries with well-developed industries, specialist propagators with links to overseas breeders are frequently a source of material in developing countries.
  - **Growers**, who may be fairly large scale operators who undertake organised adaptive research on cultivation techniques, or very small scale or part-time operators using rudimentary methods.
  - **Wholesale distributors**. In some countries, such as Japan and the Netherlands, auction markets play a key role in the wholesale distribution system; in others there are organised wholesale markets serving major metropolitan markets; and in others a range of traders play roles in the collection, transportation and distribution of flowers from growers to retail outlets (Foundation for Resource Linkage and Development 1992). Specialist exporters sometimes act as a link between wholesale distributors in destination countries and growers operating under contract. These links can include a flow of planting material and technology as well as market information.
  - **Retailers**, who may vary from specialised florists with markups of 300 per cent, to roadside vendors. In recent years in developed countries, supermarkets and petrol stations have become important, lower markup, retail outlets for cut flowers.
- The floricultural and flower trade in the Netherlands plays a very important role in shaping the worldwide cut flower industry. Dutch breeders and propagators supply parental material to growers all over the world. Dutch marketing companies are a major source of technical assistance to growers in developing countries. The Dutch flower auctions are central to the role of the Netherlands as the centre of world trade in floristry products and a large share of developing country exports to the European market pass through these markets. Nearly 80 per cent of the



**Figure 5.** Market players, international linkages and potential areas for innovation.

roughly A\$6 billion turnover at the auctions in 1990 went to export markets and roughly 10 per cent of sales were of externally sourced flowers. Prices set at the auctions are used as markers throughout the world and the patterns of demand established at these sales influence growing decisions in many countries. The transparency afforded by the system has encouraged growers in many other countries to support the introduction of similar auctions to supply their domestic markets.

The dominant role of Dutch firms is linked to their success in generating — and reaping the benefit from — innovation. The concentration of floricultural trade and production in the hands of Dutch firms may well be a market response to the challenges of appropriating the benefits of R&D.

### **Key Features of the Cut Flower Market**

From the perspective of this study and its concern with the potential role of R&D in the development of the cut flower industry in the selected countries, a number of features of the world market seem to be important.

- The importance of Europe, North America and Japan in current and projected world demand for cut flowers. The tastes and market characteristics (such as seasonality and marketing linkages) of Europe, North America and Japan are likely to shape the demand for cut flower exports for some time. And the structure of demand in developing countries for commercially grown cut flowers seems heavily influenced by the patterns established in these countries.
- The relatively conservative demand in major markets in terms of the types of flower purchased.
- The growth potential of the Japanese market, where there is a strong flower-oriented culture, high incomes and extensive urbanisation.
- The growth potential in the United States where, although per person consumption is relatively low and cut flowers are perceived to be primarily a luxury item, income and population growth combined with increased lower cost marketing through supermarkets point to expanding consumption.
- The potential for southern hemisphere and tropical locations to supply the northern hemisphere markets because of different or all year growing seasons and lower costs.
- The large role played by the Dutch floricultural industry and marketing channels in the development of the world industry. Dutch interests have been heavily involved in the spread of production activity to many developing countries. Plant varieties and technology developed by Dutch firms are used throughout the world and producers of temperate flowers in many countries use the results of R&D carried out by Dutch companies. The Dutch flower auctions are the main channel through which many exporters access the European market and prices in these auctions act as a reference point for trade in other parts of the world.

# The Cut Flower Industry in Case Study Countries

This chapter presents information on the cut flower industry in the five countries covered by the study — Australia, the Philippines, Malaysia, Thailand and Indonesia.

A common characteristic of the industry in all five countries is the limited coverage of the industry in official statistics and the questionable accuracy of data that are collected. It does not seem possible to put together a comprehensive and reliable picture of the level and structure of activity in the industry. In part this reflects certain characteristics of cut flower growing such as the prevalence of small and part-time growers and the fragmented or embryonic nature of industry organisations that would provide a pressure point for better statistics. In some countries it also reflects the relatively recent emergence of cut flowers as a potential export product to be targeted by official support and promotion.

## Australia

### Industry structure

The Australian cut flower industry can be considered conveniently (if a little simplistically) as consisting of two broad subindustries — one involved in growing and harvesting Australian native flowers and the other producing the traditional temperate flowers that dominate commercial production and consumption throughout the world.

The native flower subindustry is:

- significantly export oriented;
- based on the sale of artificially propagated and bush-picked flowers;
- concentrated in Western Australia and Queensland;
- predominantly engaged in open field (rather than under cover) growing;
- targeted at the 'filler' and 'focal filler' segments of the market — that is, flowers used as background to feature flowers in displays and arrangements of relatively low unit value; and
- developing ties with purchasers (for example, distributors in Japan) and foreign growers (for

example, in Chile) as part of a pattern of international linkages.

The traditional subindustry is:

- predominantly oriented toward the domestic market and beginning to face import competition from low cost growers in Africa and Asia;
- extensively involved in greenhouse production;
- concentrated in Victoria and New South Wales (close to the major markets); and
- enjoying longstanding ties with overseas breeders (especially from the United States, Japan and the Netherlands) and suppliers of technology.

### Consumption, production and trade

There are no reliable estimates of consumption of cut flowers in Australia. Ruralcorp Consulting, in a report prepared for the Rural Industries Research and Development Corporation (RIRDC) estimated that the retail value of the total market in 1991 was in the range of A\$330 million to A\$350 million. This would place Australia in the low range of per person consumption among developed countries.

Australian Bureau of Statistics (ABS) data show that some 3770 hectares were devoted to the cultivation of cut flowers in 1993-94, with a total farm gate value of production of A\$129 million (Table 4).

**Table 4.** Australia: cut flower industry, 1993-94.

	Establishments Value of sales Area		
	no.	A\$m	ha
New South Wales	243	17.5	434.4
Victoria	239	49.0	983.2
Queensland	256	22.5	717.8
South Australia	160	<sup>a</sup>	331.3
Western Australia	173	24.8	830.2
Tasmania	78	<sup>a</sup>	57.5
Northern Territory	13	<sup>a</sup>	8.4
ACT	2	<sup>a</sup>	1.7
<b>Total</b>	<b>1 164</b>	<b>129.0</b>	<b>3 769.1</b>

<sup>a</sup> Confidential — included in totals.

Source: ABS (1995).

Less than 10 per cent of the area under cultivation is in shadehouses or greenhouses. An earlier ABS collection showed that native flowers accounted for just under half of the area growing cut flowers but only 7 per cent of the value of production (Figure 6).

The production data are disputed by growers, and the Ruralcorp report estimated a farm gate value in 1991 of A\$250 million to A\$300 million.

Imports still supply a very small proportion of the market. In 1994-95 the value of imports of cut flowers and foliage was A\$8.1 million, little changed from the A\$8.3 million in 1989-90. Singapore is the main source of imports (Table 5). The role of the Netherlands as a source of imports has been declining as countries such as Zimbabwe have become a more important source, primarily of roses and chrysanthemums. Tropical orchids are the major import from Singapore, Malaysia and Thailand.

Exports of cut flowers have been growing more rapidly, doubling in current value terms between 1989-90 and 1994-95 to A\$26.7 million (Table 6). Japan is the major destination for Australian flowers, accounting for 48 per cent of total exports. The value of exports to the United States has grown very rapidly. A 1993 survey of exporters indicated that

**Table 5.** Australia: imports of cut flowers.

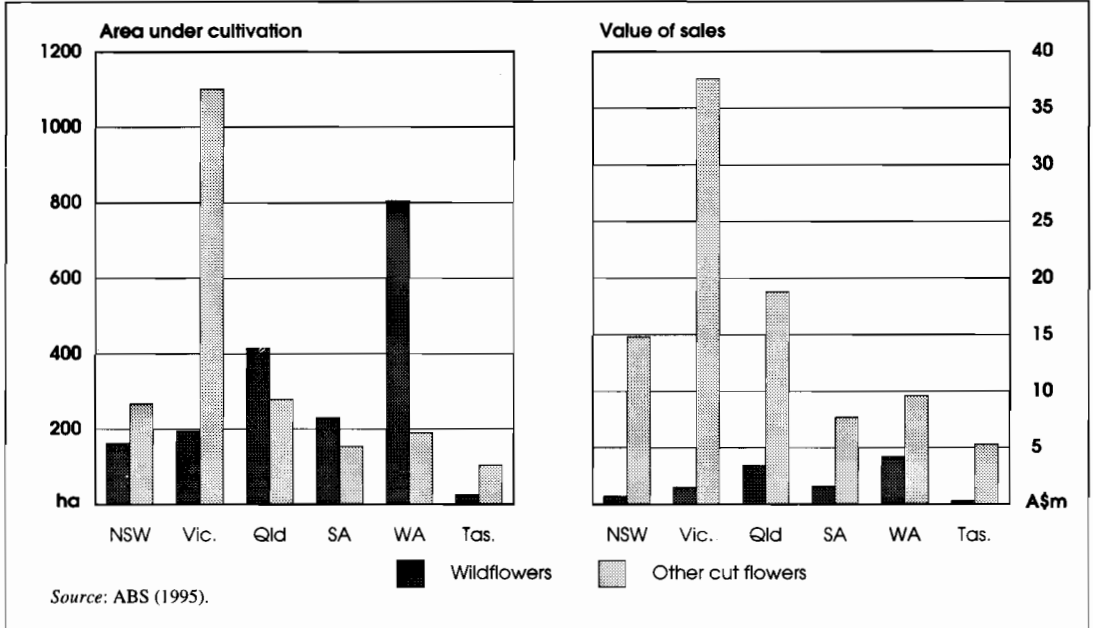
	1989-90		1994-95	
	Value	Share	Value	Share
	A\$'000 fob	%	A\$'000 fob	%
Singapore	2746	33.1	1 864	23.2
Malaysia	838	10.1	1 196	14.9
Zimbabwe	169	2.0	1 030	12.8
Netherlands	2676	32.2	924	11.5
Mauritius	407	4.9	416	5.2
New Zealand	476	5.7	544	6.8
Thailand	573	6.9	276	3.4
Others	408	4.9	1 800	22.4
Total	8 293	100.0	8 050	100.0

Source: ABS (selected years).

wildflowers accounted for over 90 per cent of the value of exports (Karingal Consultants 1994).

#### Enterprise size and ownership structure

The ABS statistics presented in Table 4 suggest that the average area devoted to cut flower production is just under 4 hectares per establishment. It is not



**Figure 6.** Australia: production of cut flowers, 1992-93.



**Table 6.** Australia: exports of cut flowers and foliage.

	1989-90		1994-95	
	Value	Share	Value	Share
	\$'000	%	\$'000	%
Japan	4 791	41.3	12 802	48.0
United States	1 293	11.1	4 891	18.3
Germany	1 080	9.3	2 044	7.7
Netherlands	1 266	10.9	2 188	8.2
Switzerland	520	4.5	756	2.8
Canada	150	1.3	638	2.4
Hong Kong	586	5.1	550	2.1
Italy	242	2.1	433	1.6
Others	1 669	15.7	2 379	8.9
Total	11 597	100.0	26 679	100.0

Source: ABS (selected years).

possible to separately identify average areas devoted to growing under cover and in the open.

There are a large number of hobby farmers involved in the industry and a number of farms where flower growing is only part of the activities undertaken so it is difficult to determine a typical size for a specialised commercial operation. However, industry sources quoted in the Karingal Consultants report suggest that a minimum viable cultivated area for a family-operated wildflower farm is around 5 hectares.

The ABS data also suggest that the average employment per establishment (including working proprietors and partners) is just under four. (Note that this average includes nurseries and producers of cut turf.) Over 80 per cent of establishments provide average employment for 1-5 people. Less than 2 per cent have average employment of more than 21 people.

### Costs and returns

Not surprisingly, given the problems with basic statistics on production and consumption for the industry, data on costs and returns are very limited.

Indicative budgets presented by Karingal Consultants suggest that labour accounts for around 80 per cent of total operating costs on a 'typical' 5 hectare wildflower farm. Fertiliser and chemicals account for around 5 per cent of these costs (Table 7). Table 8 presents an indicative breakdown of costs for an export shipment to Japan.

There is a perception (RIRDC 1995a) that the return on investment in wildflower production is generally lower than in other horticultural activities largely because of the land-extensive nature of current cultivation practices.

**Table 7.** Australia: composition of indicative budget for a 5 hectare farm producing waxflowers.

	Share
	%
Labour	81.1
Farm maintenance	7.2
Harvest	46.2
Post-harvest	27.7
Fertiliser	4.5
Chemicals	1.2
Operating expenses (including plant replacement and irrigation)	7.5
Post-harvest expenses	5.8
Total operating costs	100.0

Source: Karingal Consultants (1994).

**Table 8.** Australia: typical export cost structure for exports to Japan

	Share of return to grower
	%
Return to grower	100
Packaging	5
Freight to point of export	3
Cost to exporter	108
Preparation for export	6
Quarantine inspection	1
Fob cost	115
Air freight	33
Insurance	3
Cif cost	151
Cost to destination (auction/importers charges)	40
Allowance for losses	2
Exporter margin	22
Cost to wholesaler	215
Wholesaler, retailer, margins and transport	285
Cost to consumer	500

Source: Karingal Consultants (1994).

## Marketing

Distribution and marketing arrangements vary between the main metropolitan centres. A report prepared for the Horticulture Policy Council estimated that some 70 per cent of cut flowers sold in Sydney pass through a central wholesale market (Pullar et al. 1993). The Brisbane wholesale market accounts for 35–40 per cent of sales in that city and a flower auction has recently been established to service that market. There is a wholesale market servicing Adelaide. In Melbourne only 15 per cent of sales pass through the local produce markets. There is no wholesale market serving Perth.

As the export business has grown, specialist exporters have emerged, forming linkages with purchasers in key markets, and operating contract arrangements with growers. Karingal Consultants estimated that there are about forty exporters operating in the Australian market.

## Role of government and the private sector organisations

### *Government agencies*

Broadly speaking, the federal government and the state governments have little in the way of direct involvement in the industry, unlike many other rural industries in Australia. Some of the areas where these governments do have an impact on the industry are:

- Regulatory functions
  - They provide quarantine management through the operations of Australian Quarantine Inspection Service (AQIS).
  - They provide protection of intellectual property rights, primarily through the relatively recently established legislation on plant variety rights and plant breeders' rights.
  - They provide environment and safety regulation, particularly through regulation of the use of agricultural chemicals.
  - They regulate the harvesting and export of Australian native plant material.
- Support for R&D through the Horticulture Research and Development Corporation (HRDC), the Rural Industries Research and Development Corporation (RIRDC) and research institutions such as CSIRO and state departments of agriculture

- RIRDC is responsible for organising and investing in R&D for the wildflower industry, which falls within its responsibility for new and emerging industries. Currently RIRDC outlays some \$700 000 a year on R&D for this industry.
- HRDC has a complementary responsibility for R&D for the rest of the floriculture industry.
- Unlike other industries covered by research and development corporations in Australia there is no levy imposed on the floriculture industry to finance R&D and promotion activities. However, a levy has been proposed and extensive consultation has taken place. Should a levy be imposed, 30–50 per cent of the proceeds would be used to fund R&D activities managed by HRDC and RIRDC.
- A survey of institutions conducting horticultural research in Australia for CSIRO estimated that around 40 professionals in public institutions were working on research issues related to the ornamental and nursery industry in 1990 (Fitzpatrick, Gregory and Minnis 1991).

### *Private sector organisations*

Until recently the structure of industry associations and growers' groups was very fragmented. Karingal Consultants identified nearly thirty organisations representing different sectors of the industry and different regions. In September 1993 the Flower Industry Association of Australia was established as the peak industry body to represent the interests of all participants in the floriculture industry.

## The Philippines

### **Industry structure**

The cut flower industry in the Philippines is still in the early stages of development and the transition from backyard operations run by hobby farmers and enthusiasts really began only in the early 1980s. Production is aimed primarily at the domestic market, which has been growing rapidly with the expansion of a higher income middle class and changing consumer preferences, along with expanding institutional demand driven by the growth of tourism. At present only a small quantity of locally produced cut flowers is sent on to the international market and mainly on a trial shipment basis.

The proximity of the Philippines to major import markets combined with low labour costs and favourable agroclimatic conditions offer a potential basis for export oriented development of the industry. Tropical and semitemperate conditions prevail and many islands in the archipelago have highland areas that offer a combination of long hours of daylight and cooler conditions well suited to the production of the traditional temperate flowers sought in the major import markets.

The potential of the industry has been recognised by government, which accorded it priority as a potential export winner in the Key Commercial Crops Development Program of the 1993–98 Medium Term Agricultural Development Plan.

### Consumption, production and trade

The Bureau of Agricultural Statistics estimated that in 1992 around 888 hectares were under cultivation of cut flowers, an increase of about 13 per cent on the area under cultivation in 1989. Gladioli and roses were the two most commonly planted flower types, together accounting for just over half of the total area (Table 9). Orchids, anthuriums and daisies (mainly gerbera jamesonia and shasta daisies) are also widely grown.

Production has been concentrated close to the major metropolitan centres. Luzon has the largest share of the area under cultivation. However, there has been strong growth in the area cultivated for cut flowers in Mindanao, which has the advantage of being outside the cyclone belt.

There are no official statistics on the demand for cut flowers in the Philippines. A recent study (Neele 1993) estimated total demand in 1993 at around 9.4 million dozen stems, with chrysanthemums, orchids, roses, gladioli and daisies the most popular flowers (Figure 7).

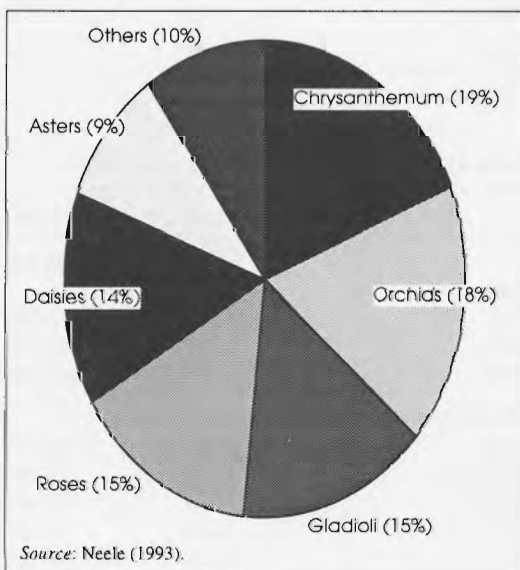
Domestic demand is very seasonal, with peaks around major festivals. Because local production cannot meet these peaks and because some consumers seek a higher quality product than is currently supplied, imports have been growing rapidly, though from a very low base. Official statistics show imports of A\$242 000 in 1992 (Table 10). Industry sources suggest that, because of widespread smuggling, actual imports may be 10–20 times higher (Neele 1993). According to the official statistics, Malaysia and Thailand are the main sources of imports.

**Table 9.** The Philippines: area of cut flowers harvested, by type of flower and province.

	1989		1992	
	Area	Share	Area	Share
	ha	%	ha	%
<b>Cut flower</b>				
Anthurium	45	5.7	63	7.1
Chrysanthemum	103	13.1	91	10.2
Daisies	148	18.9	154	17.3
Gladioli	217	27.7	237	26.7
Orchids	72	9.2	86	9.7
Roses	157	20.0	213	24.0
Others	42	5.4	44	5.0
Total	784	100.0	888	100.0
<b>Province</b>				
Luzon	349	44.5	330	37.2
Visayar	224	28.6	250	28.2
Mindanao	207	26.4	303	34.1
Total	784	100.0	888	100.0

*Note:* The differences between the sum of components and totals are due to rounding.

*Source:* Neele (1993).



**Figure 7.** The Philippines: estimated consumption of cut flowers, by type of flower, 1993.

Exports have been growing rapidly, and amounted to some A\$670 000 in 1992. Japan was the most important destination in that year (Table 11). However, because of the prevalence of trial shipments no steady pattern of destinations has emerged so far. Typically prices for local sales are much higher than those obtained for exports and there are very few firms that export on a regular basis.

### Enterprise size and ownership structure

The industry is largely based on small scale (0.05–0.1 hectare) family-run farms. There are a few medium size farms of 0.5–5 hectares and there are signs of

**Table 10.** The Philippines: imports of cut flowers.

Year	Quantity	Value
	kg	A\$ fob
1985	343	2 852
1989	4 733	31 558
1992	99 308	242 407
<b>Source in 1992</b>		
Malaysia	50 130	139 131
Thailand	36 940	63 216
Australia	4 378	26 491
Others	7 858	13 555
<b>Total</b>	<b>99 308</b>	<b>242 407</b>

Source: Lantican (1994).

**Table 11.** The Philippines: exports of cut flowers.

Year	Quantity	Value
	kg	A\$ fob
1985	8 200	4 358
1989	19 882	92 213
1992	69 438	669 238
<b>Destination in 1992</b>		
Japan	38 835	334 987
Hong Kong	6 014	27 128
France	7 077	93 647
Spain	3 493	55 129
Others	14 019	158 347
<b>Total</b>	<b>69 438</b>	<b>669 238</b>

Source: Lantican (1994).

interest by foreign investors in larger scale operations (Saplala 1995). Many small scale growers are organised into cooperatives that procure inputs and market products on behalf of members.

### Costs and returns

Indicative budgets developed in a major study of marketing systems for the industry (Foundation for Resource Linkage and Development 1993) suggest that labour typically accounts for 45–50 per cent of total operating costs, with fertilisers and chemicals making up much of the balance (Table 12). Most flower growing in Luzon occurs on marginal rice and corn land but in Mindanao virgin forest lands are being developed for farmland. Neele (1993) estimates that trader, wholesaler and retailer markups add around 300 per cent to the price received by growers for flowers sold in the main metropolitan markets.

**Table 12.** The Philippines: composition of indicative budget for a 0.05 hectare farm producing roses and anthuriums in Benguet.

	Roses	Anthuriums
	%	%
Labour	45.0	52.2
Maintenance	38.7	
Harvest and post-harvest	6.3	
Fertilisers	10.3	14.5
Chemicals	41.5	20.1
Utilities	3.2	13.2
<b>Total operating costs</b>	<b>100.0</b>	<b>100.0</b>

Source: Foundation for Resource Linkage and Development (1993).

### Marketing

There are no established wholesale markets serving the main demand centres in the Philippines and a range of traders, assemblers, commission agents, wholesalers and cooperatives handle marketing and distribution functions. There are specialist florists in larger cities but a large share of retail sales are handled by small vendors. There are no national standards for grading the various types of cut flowers and there is considerable variation in the grading practices of growers and traders. Post-harvest handling and packaging is rudimentary and few cut flower growers and traders have cold storage or specialised

transport facilities. While some traders provide credit and supply inputs to growers, there is little in the way of organised contract growing.

### **Role of government and private sector**

#### *Government agencies*

The government has little, if any, direct involvement in the industry. Cut flower producers can benefit from grant and credit schemes targeted at cooperatives and small businesses. A number of government agencies provide training and extension services and the Department of Trade and Industry assists with trade promotion and market development. The Bureau of Plant Industry and Philippines Quarantine Service provide quarantine and disease monitoring services. There is as yet no legislation establishing plant variety and breeders' rights.

Cut flowers have been included in the Key Commercial Crops Development Program in the 1993–98 Medium Term Agricultural Development Plan.

A specific action plan for the sector has been developed by a Technical Working Committee on Ornamentals, chaired by the Bureau of Export Trade Promotion. The plan encompasses:

- the development of low interest loan packages and incentives for large scale producers and cooperatives;
- the adoption of a national breeding program and establishment of an R&D centre to work on the development of new breeds and varieties for export markets, tissue culture and propagation techniques, treatment of pests and diseases, and post-harvest handling techniques;
- infrastructure development;
- the promotion of international investment and sub-contract growing for export markets;
- a range of market development and promotion activities;
- the provision of common post-harvest and marketing facilities in key production and marketing centres;
- the pursuit of policy reforms particularly concerning quarantine procedures, import taxes and the establishment of a plant patenting system; and
- the establishment of a tissue culture laboratory.

Government funded R&D activities are coordinated by the Philippine Council for Agriculture, Forestry and Natural Resources Research and

Development (PCARRD), which is the sectoral planning arm of the Department of Science and Technology responsible for planning and coordinating the national R&D effort.

Following the identification of ornamental crops as a priority sector in the development plan, the council has been developing an expanded R&D program for the industry. A private sector led Technical Advisory Committee has recently proposed a five-year R&D program for the ornamental crop sector for consideration by the council. The program has been costed at around A\$4 million.

#### *Private sector organisations*

There are a number of cooperatives involved in the cut flower industry. The study by the Foundation for Resource Linkage and Development (1993) identified over twenty active cooperatives in the main growing centres but only one, in Negros Occidental, operated as an effective marketing agency.

The National Federation of Cut Flower and Ornamental Plant Growers of the Philippines was formed with government support in 1990 to act as the peak industry body. The federation has been active in introducing new varieties into the country and in facilitating linkages with overseas interests.

## **Malaysia**

### **Industry structure**

Commercial flower growing in Malaysia is concentrated in the peninsular states although there is some growing of temperate flowers in Sabah. On the peninsula two distinct types of growing activities have developed to exploit the different agroclimatic conditions in the lowlands and the highlands. In the lowlands, mainly in Johore and around Kuala Lumpur, production is predominantly of tropical orchids. In the highlands, primarily the Cameron Highlands, there is production of a range of temperate orchids and other temperate flowers.

The important features of orchid production follow.

- Medium to large scale production of tropical orchids is undertaken on the lowlands, with farms being typically 5–10 hectares but some up to 40 hectares. Production in Johore has been developed to serve the Singapore market and has benefited

from Singaporean investment and connections between Malaysian and Singaporean entrepreneurs.

- Small to medium scale production of temperate orchids is undertaken in the Cameron Highlands. This output is targeted at local and export markets. Some growers operate under agreements with Japanese importers and coordinate contract growing operations to supply under these agreements.
- Malaysian orchids are at the high end of the quality range, attracting a premium largely because extensive undercover production allows harvesting with a high proportion of open flowers.

The production of temperate flowers has the following important features.

- It is oriented toward domestic and export markets.
- It occurs mainly in the Cameron Highlands.
- Chrysanthemums, roses and carnations are the main flowers grown.
- Nearly all production is under cover on farms ranging in size from 0.25 to 5 hectares.
- Production is intensive, exploiting the year-round growing season.
- Many farmers use artificial lighting to control flowering.
- Flower growing is displacing vegetable production (which has become unprofitable in the face of growing imports from Indonesia) and is occurring on parts of old tea estates and in newly cleared forest areas.

One characteristic that both sectors share is the extensive use of immigrant labour, mainly from Indonesia and Bangladesh.

### Consumption, production and trade

Official statistics on production and consumption are limited. An estimated 1386 hectares were under flower cultivation in 1993, with approximately a third devoted to commercial orchid production (Tan 1994), of which nearly 70 per cent is in Johore State. Domestic consumption has been estimated at just over A\$9 million in 1992 (Table 13), when production was estimated at just over A\$30 million. However, official trade and production statistics were disputed by participants at the working group meeting, who say that the numbers greatly understate actual trade and production.

Generally speaking, Malaysia imports little in the way of cut flowers. Exports, however, have been growing quite rapidly, peaking at A\$21.2 million in

1992. Japan and Singapore are the main destinations for orchids, whereas Hong Kong and Singapore take the bulk of exports of other cut flowers (Table 14). Australia is becoming an increasingly important destination for orchids. Malaysian flowers have been exported to over forty different destinations.

### Enterprise size and ownership structure

As mentioned above, the size of cut flower farms varies between 0.5 and 40 hectares, with the majority of operations being less than 5 hectares. While many farms are family run, most employ some immigrant labour. Many farms in the Cameron Highlands are operating on land leased from state governments. With most leases on a short term basis and renewable annually, incentives for sustainable land management techniques are limited. Some farms are on land that has been illegally occupied.

### Marketing

Many orchid growers export directly, exploiting family and other connections in major markets, and there is a growing trend toward contract growing for export by larger operators with linkages in export markets. Some growers of temperate flowers sell their produce to traders in nearby towns who consolidate and transport to retailers in the main metropolitan markets, but many growers distribute their produce directly to retail outlets. There is no central flower market or auction system and few traders have cold storage facilities or dedicated transport vehicles. As a

Table 13. Malaysia: demand and supply of cut flowers.

	1988	1990	1992	1994
	A\$m	A\$m	A\$m	A\$m
<b>Orchids</b>				
Exports	0.4	1.5	3.4	4.0
Imports	0.1	0.1	0.1	0.0
Production	0.6	2.1	4.8	na
Consumption	0.2	0.7	1.5	na
<b>Temperate flowers</b>				
Exports	6.9	9.4	17.8	10.4
Imports	0.1	0.1	0.2	0.2
Production	9.8	13.4	25.4	na
Consumption	3.0	4.1	7.8	na

na Not available.

Source: Tan (1994); Department of Trade Statistics, Malaysia.

**Table 14.** Malaysia: directions of exports.

	1988	1990	1992	1994
	%	%	%	%
<b>Orchids</b>				
Australia	2.3	9.0	11.6	19.4
Germany	6.5	4.9	3.3	0.5
Hong Kong	1.8	0.1	0.3	0.4
Japan	16.6	58.0	23.2	38.8
Singapore	59.6	24.4	50.8	38.6
Taiwan	0.2	0.1	5.3	0.3
Thailand	0.5	0.0	0.0	0.0
Others	12.7	3.5	5.5	1.9
Total	100.0	100.0	100.0	100.0
<b>Other flowers</b>				
Australia	4.6	7.6	1.9	1.0
Germany	0.0	0.2	0.0	0.0
Hong Kong	75.7	59.4	48.1	47.7
Japan	4.9	4.5	1.0	8.2
Singapore	6.8	17.2	39.6	25.4
Taiwan	3.9	4.7	2.7	8.8
Thailand	1.5	1.5	2.3	5.9
Others	2.5	5.0	4.4	2.9
Total	100.0	100.0	100.0	100.0
<b>Orchids and other flowers</b>				
Australia	4.4	7.8	3.4	6.1
Germany	0.4	0.8	0.5	0.2
Hong Kong	71.4	51.5	40.6	34.5
Japan	5.6	11.7	4.5	16.7
Singapore	9.9	18.2	41.4	29.1
Taiwan	3.7	4.0	3.1	6.4
Thailand	1.5	1.3	1.9	4.3
Others	3.1	4.8	4.6	2.7
Total	100.0	100.0	100.0	100.0

Source: Department of Statistics, Malaysia.

consequence, there is considerable wastage of temperate flowers (on average, wastage on shipments of temperate flowers to Singapore is around 30 per cent). The Federal Agricultural Marketing Authority is developing marketing and handling operations for smaller scale growers.

## Role of government and private sector

### Government agencies

The government has no direct role in flower growing. Public policy toward the sector is mainly targeted at supporting institutional and marketing infrastructure.

The government's National Agricultural Policy (1992–2010) envisages a fourfold increase (to some 7000 hectares) in the area under cultivation of flowers by the year 2010 to enable Malaysia to take 3–4 per cent of the world market. To support this expansion policies will focus on:

- shifting highland production toward higher value added varieties and taking better advantage of the year-round growing season to supply off-season demand in the western hemisphere;
- aggressively expanding orchid cultivation in lowland areas including marginal lands such as tailing sites on old tin mines;
- efficiently supplying planting material consistent in quality and standards;
- intensifying R&D to develop new and better varieties that have commercial value and market potential;
- encouraging foreign investment, particularly in temperate flower cultivation and handling;
- actively pursuing product diversification into areas such as dried flowers, fragrance extraction, potted foliage and flowering plants, palms and ferns; and
- aggressively marketing products targeted at western hemisphere markets (Tan 1994).

The Federal Agricultural Marketing Authority is actively engaged in marketing and promotion, and providing market intelligence through a market information system for horticultural products.

State governments have an important indirect influence on the cut flower industry through their land leasing and tenure policies. Much of the land under cultivation in the highland areas is leased from state governments on a fairly short term basis. Insecurity of tenure has a big impact on farmers' decisions about investment in infrastructure, attitudes toward land degradation and environmental sustainability.

There is quite an extensive public commitment to R&D in the industry, targeted mainly at orchids, undertaken under the aegis of the Malaysian Agricultural Research and Development Institute and at a number of universities around the country.

### Private sector organisations

The Malaysian Orchid Society is a well-established organisation, with membership comprising twelve regional orchid societies, forty-five corporations and eighteen individuals. The society is actively involved in promoting Malaysian orchids and in disseminating

information about orchids and the results of technical research through its annual publication, *Malaysian Orchid Bulletin*.

## Thailand

### Industry structure

Thailand has been significant in world markets for cut flowers since before the 1960s. The orchid export industry is well established and Thailand is an important source of planting and genetic material for orchid growers throughout the world. The highland regions in the north of the country offer conditions suitable for growing temperate flowers but this potential is only beginning to be exploited.

The orchid growing industry in Thailand has typically focused on the high volume, lower quality end of the market and is perceived by participants to be stagnating in the face of competition from producers of higher quality flowers in Singapore and Malaysia. Most orchids are grown in the open and so are exposed to weather damage. This, together with cost-cutting cultivation practices such as the use of coconut husks as a growing medium (which increases the risk of disease transmission in high density operations), pushes growers toward earlier harvesting when fewer flowers are open.

### Consumption, production and trade

A recent survey by the Department of Agricultural Extension identified over 13 000 farms growing cut

**Table 15.** Thailand: number of farms, area and production, by cut flower, 1994.

	Number of farms	Production area	Average prod. area per farm	Production (stems)
	no.	ha	ha	million
Orchid	1 965	2 306	1.17	994
Jasmine	3 626	852	0.24	14
Lotus	483	704	1.46	19
Marigold	2 736	644	0.24	206
Rose	1 343	626	0.47	331
Chrysanthemum	1 086	160	0.15	101
Other	2 143	170	0.30	na
<b>Total</b>	<b>13 382</b>	<b>5 462</b>	<b>4.03</b>	

na Not available.

Source: Pituck and Lekawatana, working group paper.

flowers on nearly 5500 hectares (Table 15). Some 2000 hectares, located mainly in the Bangkok, Samut Sakhon and Nakhon Pathom regions of the country, are devoted to growing orchids (Table 16).

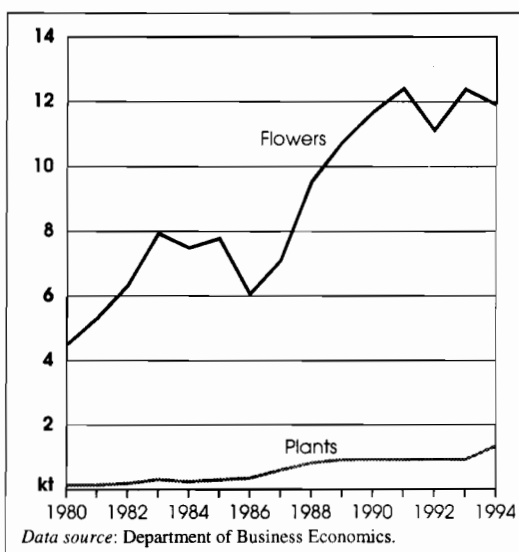
Orchids account for nearly 90 per cent of all floricultural exports from Thailand (Pituck and Lekawatana, working group paper). The volume of orchid exports grew rapidly during the 1980s but has been stagnating over the past few years (Figure 8). Japan is the most important destination accounting for over half of total exports (Table 17).

**Table 16.** Thailand: location of orchid farms.

	1986		1991
	Growing area	No. of growers	Growing area
	ha	no.	ha
Bangkok	741	842	661
Samut Sakhon	273	465	392
Nakhon Pathom	208	231	551
Other	..	..	317
<b>Total</b>	<b>1 222</b>	<b>1 538</b>	<b>1 921</b>

.. Negligible.

Source: Pituek (1994).



**Figure 8.** Thailand: export of orchid flowers and orchid plants.



**Table 17.** Thailand: exports of cut natural orchids by destination, 1991 and 1994.

	1991		1994	
	Value	Share	Value	Share
	A\$m	%	A\$m	%
Japan	18.2	54.7	24.8	57.0
United States	2.6	7.8	4.0	9.2
Italy	3.9	11.7	5.0	11.5
Germany	1.8	5.4	2.2	5.1
Taiwan	0.6	1.8	1.5	3.4
South Korea	0.2	0.6	0.8	1.8
Netherlands	1.4	4.7	1.3	3.0
United Kingdom	0.6	1.8	0.6	1.4
France	1.1	3.9	0.6	1.4
Hong Kong	0.9	2.7	0.6	1.4
Other countries	1.9	5.7	2.1	4.8
Total	33.3	100.0	43.5	100.0

Source: Trade Statistics Centre, Department of Business Economics.

### Enterprise size and ownership structure

The orchid industry is broadly characterised as having many small scale growers supplying large export operations. The average size of an operation is between 0.25 and 0.75 hectares.

### Costs and returns

Indicative budgets suggest that labour accounts for around 40 per cent of the variable costs of producing roses (Table 18).

**Table 18.** Thailand: indicative budget for growing roses.

	Share
	%
Labour	40.0
Soil preparation	14.1
Planting	0.8
Harvesting	21.7
Post-harvest	3.2
Cuttings	14.1
Fertilisers	20.9
Pesticides	22.1
Other	3.2
Total operating costs	100.0

Source: Professor Saichol Ketsa, Kasetsart University, Bangkok, personal communication, November 1995.

### Marketing

The export marketing of orchids is well organised and on a fairly large scale. One exporter has over four hundred growers on contract and employs over two hundred people in its tissue culture and export processing operations. Most exporting is carried out by large scale exporters who collect from contract growers. Don Muang airport has cold storage rooms dedicated to flower exports. There is a large wholesale market serving Bangkok, but no auction system. Most flowers are sold on a consignment basis.

Some large conglomerates are developing contract growing of flowers other than orchids but there is little in the way of foreign investment in this area.

### Role of government and private sector

The government has a limited direct role in the industry. The Department of Agricultural Extension, for example, has been running a project to introduce new temperate varieties supplied from the Netherlands. However, the forthcoming five-year plan is expected to place greater emphasis on cut flowers than has been the case in the past. The plan will focus on:

- increasing production of tropical varieties, initially for the domestic market and then for export; and
- increasing production of temperate flowers to replace imports, which may require introducing new varieties better suited to tropical conditions.

It is expected that the main thrust of policy to meet these objectives will be on technology transfer, finance and marketing. The Department of Agriculture is considering setting up a flower auction system.

## Indonesia

### Industry structure

Although flowers have long played an important role in the various cultures in Indonesia and temperate flower varieties were introduced long before the country became independent, the commercial growing of cut flowers is still a relatively new industry. While there has long been a large number of farmers who devote small areas to producing flowers, organised growing of temperate flowers on a commercial

scale is a fairly recent development and is largely in the hands of hobby farmers.

There are around half a dozen commercial nurseries dealing with traditional temperate varieties. Together they have around 25–30 hectares of greenhouse production. One company accounts for over a third of this capacity. There are a few specialist propagators operating under agreements with suppliers of planting material in the Netherlands.

### Consumption, production and trade

The industry is predominantly oriented toward the domestic market and is concentrated in Java, where some 1000 hectares is thought to be devoted to the production of cut flowers and ornamental plants (Bahar 1994). The main production centres are located close to Jakarta and other major cities: Berastagi, Kabanjahe, Tanjung Morawa and Medan in North Sumatra; Cipanas and Bogor in West Java; Bandung in Central Java; and Tretes, Batu and Pujon in East Java. Consumption in the major cities was estimated to have been around A\$10 million in 1987.

As Table 19 shows, Jakarta is the main market for cut flowers, and orchids and roses are the most popular flowers purchased.

Annual export sales of ornamental products (plants and foliage as well as cut flowers) are around A\$3 million, of which A\$0.9 million are of orchid plants and flowers. There have been trial export shipments of roses and chrysanthemums to Japan. One operation is producing and exporting planting material from tissue culture supplied by New Zealand interests.

### Enterprise size and ownership structure

Most commercial operations are based on 2–4 hectares but the area under cover may be much smaller. Small scale farmers undertaking open growing have much smaller areas under cultivation — 0.02–0.05 hectares being a typical size.

### Marketing

Marketing and distribution channels are rudimentary and the market remains fragmented with distinct centres served by growers in the surrounding region. Some of the larger commercial operations have cold storage and refrigerated transport facilities but handling in the wholesale markets is quite unsophisticated.

### Role of government and private sector

The development of the cut flower industry is very much in the hands of the private sector. The industry historically has been given little priority in government policies, as enunciated in national five-year plans and in the R&D programs coordinated by the Agency for Agricultural Research and Development. However, in March 1995 a new institute for research on ornamentals was established. It will pursue research in six fields: breeding, agronomy, pest and diseases, post-harvest technology, biotechnology and economics.

An association of commercial flower growers (Asosiasi Bunga Indonesia) was established in 1990 to represent the interests of growers. The association has about thirty members who have about 30 hectares of greenhouse area under cultivation.

**Table 19.** Indonesia: weekly sales of cut flower stems by main market, 1987.

	Jakarta	Medan	Bandung	Surabaya	Malang	Denpasar	Semarang	Ujung Padang	Total
	'000	'000	'000	'000	'000	'000	'000	'000	'000
Orchid	225.5	15.0	6.2	4.0	5.5	6.0	3.7	10.2	276.1
Rose	330.9	0.0	35.0	7.0	7.0	8.8	0.0	0.0	388.7
Chrysanthemum	58.7	10.0	10.0	4.7	6.0	0.9	0.8	0.0	91.1
Gerbera	149.2	40.0	15.0	29.0	5.0	0.0	20.0	0.0	258.2
Gladiolus	54.7	15.0	12.5	11.0	0.0	14.0	10.0	0.0	117.2
Carnation	17.3	10.0	15.0	4.0	8.7	3.0	4.0	0.0	62.0
Anthurium	19.2	15.0	10.0	5.7	2.8	5.0	1.0	0.0	58.7
Total	855.5	105.0	103.7	65.4	35.0	37.7	39.5	10.2	1 252.0

Source: Asosiasi Bunga Indonesia.

# Opportunities and Constraints and the Contribution of R&D

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The floriculture industry in each of the case study countries is facing opportunities and challenges from expanding domestic and export markets for commercially grown cut flowers and increasing international competition in these markets.

Each country has locations with the agroclimatic conditions suitable for exploiting the potential created by different and/or longer growing seasons than are enjoyed by growers in the major market countries. And each country has unique native flora whose commercial potential is only beginning to be tapped.

At the same time the industry in each country is confronting a range of internal and external constraints that are inhibiting the ability of participants to take advantage of the opportunities that location, climate and genetic heritage are creating. Some of these constraints have their origin in the structure of the industry and its relatively recent emergence as a potential source of employment, income generation and export earnings. Some are a function of domestic government policies and regulations that inhibit development. But others are linked to the knowledge base of the industry and the extent of dissemination of this knowledge.

This chapter identifies some of the main constraints that appear to lie in the path of development of the cut flower industry and describes the agenda of research that is being pursued in some countries to deal with some of these constraints. The chapter draws on the findings of the visits to producers in the case study countries and the contributions made at the working group meeting.

## The Potential for Growth and the Constraints

There are obviously important differences between the cut flower industries in Australia, the Philippines, Malaysia, Thailand and Indonesia, and in the bases for their future development. The physical and

economic environments differ among the countries, as do climate, the domestic gene pool and other factors affecting conditions for floriculture. Different histories matter too. In some countries commercial flower growing is well established; in others it is a recent development. And differences in tastes and income levels and in the relative prices of land, labour and capital mean that the size and demands of the domestic market, and the incentives to use alternative production technologies, vary considerably among the countries.

Yet there are similarities both in the basis for future development and the constraints that are being faced.

In two of the countries covered by this study, Australia and the Philippines, there has recently been an extensive series of examinations of the issues surrounding the development of the cut flower industry. Table 20 summarises some of the main factors shaping development potential and the main constraints identified in these exercises and expressed by participants at the working group meeting. Common concerns relate to product quality, post-harvest handling, industry and market information, fragmentation and lack of scale, problems in dealing with quarantine procedures, the impact of international agreements on the environment and biodiversity, and the challenges of selling into major markets, including cost, availability and quality of air transport, and dealing with regulations and distribution arrangements.

Broadly speaking, the issues identified in the analysis of the industry in the Philippines appear to be equally relevant in Malaysia, Thailand and Indonesia, although the extent to which the industry — and governments — are coming to grips with them varies.

The main issues are discussed briefly below.

- Planting material is often of low quality. (Frequently very old varieties that were introduced many years ago are being grown; resistance to

tropical pests and diseases is limited; and quality factors such as colours and vase life are inferior to what is available on world markets.) This is beginning to change as propagators and nurseries operating under agreement with international suppliers are channelling new and improved

varieties into the system, but it is still seen as a serious problem in the Philippines and Indonesia.

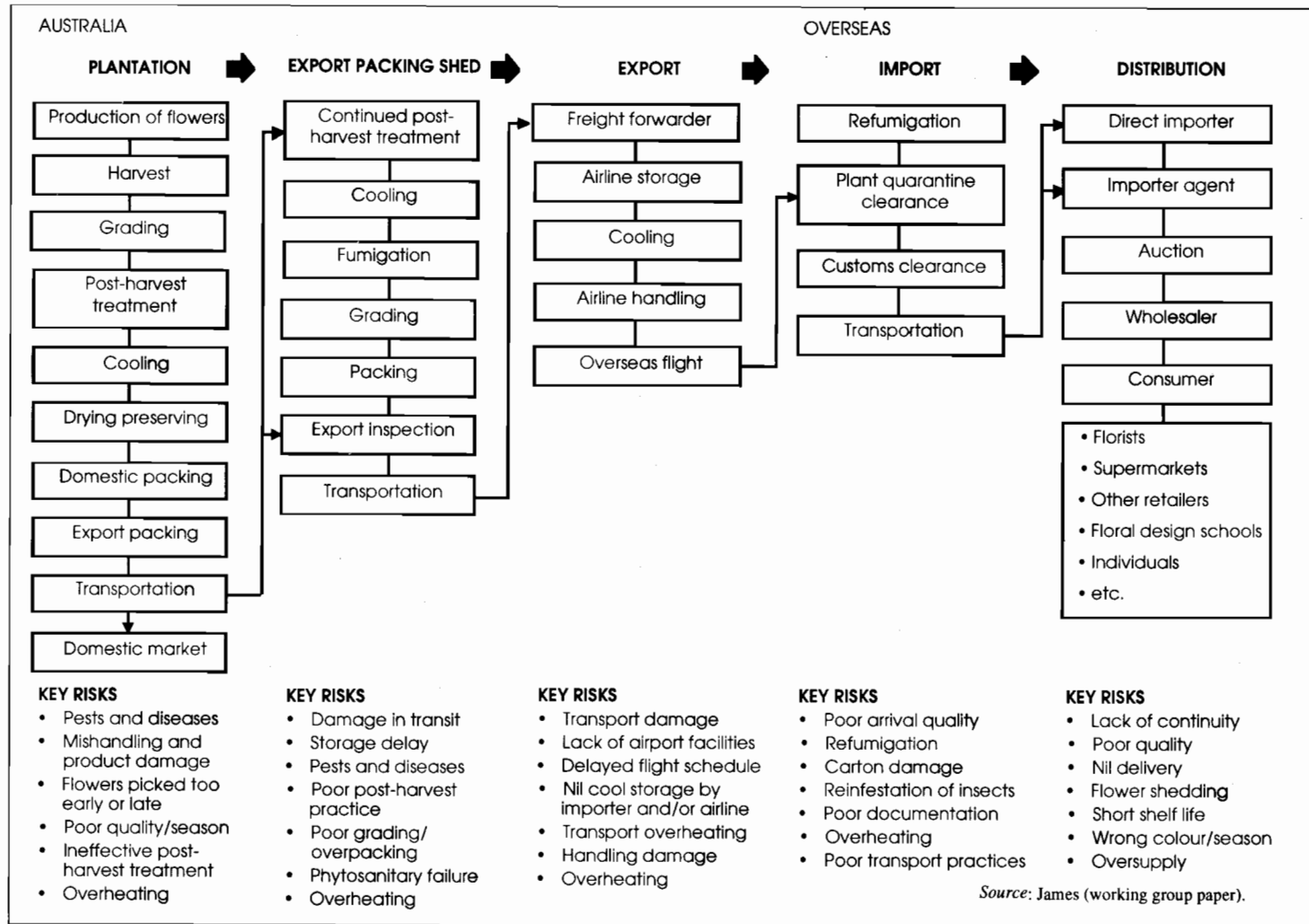
- Cultivation and production practices are far from state of the art, and have a negative impact on product quality and acceptability. Many small scale growers have limited access to information on how

**Table 20. Australia and the Philippines: strengths, weaknesses, opportunities and threats for the cut flower industry**

Australia	The Philippines
<b>Strengths and opportunities</b>	
<ul style="list-style-type: none"> <li>• Unique native flora</li> <li>• Ability to supply major markets in their off-seasons</li> <li>• Proximity to large and growing import markets</li> <li>• Availability of cheap, unexploited land</li> <li>• Agroclimatic diversity</li> <li>• Expanding domestic market</li> <li>• Development of stronger industry organisations</li> <li>• Emerging framework for managing and funding R&amp;D</li> </ul>	<ul style="list-style-type: none"> <li>• Good agroclimatic conditions</li> <li>• Low labour costs</li> <li>• Proximity to large and growing import markets</li> <li>• Available land in lowland and highland areas</li> <li>• Priority in agricultural development plans and national R&amp;D program</li> <li>• Growing domestic market and expanding tourism</li> <li>• Technical support from donors</li> </ul>
<b>Weaknesses and constraints</b>	
<ul style="list-style-type: none"> <li>• Lack of industry data</li> <li>• Variable product quality; poor quality management</li> <li>• Lack of market research and information on export markets</li> <li>• Absence of marketing strategy</li> <li>• Fragmentation and lack of scale among growers</li> <li>• Lack of year-round supply</li> <li>• Low unit value of exported flowers</li> <li>• Insufficient R&amp;D on production systems and cultural practices</li> <li>• Insufficient export promotion</li> <li>• Inadequate coordination in supplying export markets</li> <li>• Weaknesses in distribution chain</li> <li>• Limited and high cost transport</li> <li>• Insufficient public resources devoted to floriculture R&amp;D</li> <li>• High costs of production and low returns</li> <li>• Poor information sharing and cooperation between producers</li> <li>• Cumbersome quarantine systems in export markets</li> <li>• High costs of domestic quarantine services</li> <li>• Excessive or cumbersome regulation of chemicals</li> <li>• Risks of new pests and diseases</li> <li>• Environmental unacceptability of traditional fumigants</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of knowledge about diagnosing and managing pests and diseases</li> <li>• Inadequate pesticides and weedicides</li> <li>• Poor resistance of planting material to tropical pests and diseases</li> <li>• Limited market interest in varieties for which planting material is currently available</li> <li>• Poor vase life of products</li> <li>• Limited access to new technology and planting materials</li> <li>• High capital cost</li> <li>• Cumbersome import and export regulations</li> <li>• Unresponsive and inappropriate quarantine regulations</li> <li>• High input costs</li> <li>• Poor post-harvest management</li> <li>• Non-transparent domestic market</li> <li>• Lack of vertical specialisation</li> <li>• Absence of effective cooperation between industry participants</li> <li>• Poor quality and non-standardisation of packing material</li> <li>• Weak distribution channels</li> <li>• Shortage of cooling facilities</li> <li>• Lack of irrigation systems</li> <li>• Grower ignorance of technologies</li> <li>• Limited, high cost, low quality transport</li> <li>• Lack of information on domestic and export markets</li> <li>• High cost of credit</li> <li>• Infrastructure limitations</li> </ul>

Sources: Karingal Consultants (1994); Pullar et al. (1993); Neele (1993); Foundation for Resource Linkage and Development (1993).

- to improve production efficiency and product quality, and even on the returns from higher quality products.
- Diagnosis and management of pests and diseases are poor. Many growers use chemicals heavily, which adds to costs and creates health and environmental problems. Management practices suggested by European suppliers of planting material are often inappropriate in tropical conditions.
  - Good harvest and post-harvest practices are not widely used — growers and others in the transport and distribution chain do not take steps to ensure quality at the point of final consumption. Growers are often unaware of the appropriate maturity at which to harvest flowers. Often only the larger export-oriented growers are aware of the benefits of removing field heat after harvesting. Inadequate conditioning and packaging practices lead to excessive wastage and poor vase life.
  - There are constraints on access to credit. In countries with regulated or underdeveloped financial systems there is a concern that credit facilities are not structured to suit flower growers.
  - The costs of chemicals and fertilisers, affected by import duties and inefficient distribution systems, are high. Also, information on appropriate usage for ornamental crops is limited.
  - Market information is inadequate and limited market research is being conducted and made available to growers.
  - Regulations on processing imports of planting material and exports of flowers — such as customs and quarantine procedures — are cumbersome and unresponsive to growers' circumstances, and import tariffs on planting materials are high.
  - Import duties in export markets are high, and import procedures often create delays. While cut flowers enter Japan and Australia duty free, imports into the European Union will become dutiable at 12 per cent from June to October and 8.5 per cent from November to May of each year as part of the implementation of the Uruguay round agreement. And imports into the United States will generally be dutiable at 6.4 per cent. Taiwan levies a duty of 35 per cent on cut flower imports.
  - The availability of air transport to supply export markets is limited. Flowers are given a low priority and cool chain facilities are often not available.
  - Wholesaling systems are inefficient and pricing lacks transparency.
  - Grading and quality standards have not been established.
  - Meeting the phytosanitary requirements of export markets is difficult because of the technical challenge of, for example, meeting the zero insect tolerance requirements of the Japanese quarantine system, and because of the difficulties of getting certification from domestic quarantine services.
  - Growers have limited facilities to explore the potential of local flora.
  - There are problems in implementing the Convention on International Trade in Endangered Species. There is also a set of issues that, although not creating binding constraints now, will become important in the future.
  - Land degradation is a problem in some cut flower growing areas. In some countries poor land management practices seem to be adopted as a result of the incentives created by land tenure systems for farmers to take a short term perspective. At the same time, concern for preservation of native forest lands may affect the availability of highland areas for cultivation of temperate flowers.
  - Occupational health and safety problems are resulting from the use of pesticides, weedicides and fertiliser. These problems may become an issue affecting access to northern hemisphere markets and there are domestic interests in developing appropriate regulation of the use of chemicals.
  - Water quality management may also become important as flower growing is often at the margins of suburban development. However, this issue may be less critical for flower growers than for other horticulturists.
  - Growers will have to find alternatives to ozone depleting fumigants. Methyl bromide, the most commonly used fumigant, has been identified as an ozone depleter under the Montreal Protocol and its use must be phased out before the end of the century (although developing countries have ten additional years in which to effect the phase out). Of particular importance to the countries in this study is how these constraints affect the industry's ability to penetrate export markets. As Figure 9 shows, there are risks in the export chain. Most of the constraints listed increase exposure to these risks, or diminish producers' ability to deal with them.



**Figure 9.** Risk factors in exporting cut flowers.

## A Role for R&D

Resolution of some of the issues affecting development of the industry appears to lie in the realm of adapting government policies or strengthening public institutions to create a more appropriate environment for the development of the cut flower industry. And some problems, such as inadequacy of transport infrastructure and service availability, may be linked to the absence of a 'critical mass' in the industry to warrant investment by providers of services to meet the industry's needs. The fact that service providers in countries with much more generally limited transport infrastructure (for example, Zimbabwe and Kenya) have responded to the opportunities created by trade in cut flowers suggests that, if the returns warrant, the services are likely to be provided. (Although, of course, when large parts of the air

transport sector are in the public sector, or are shielded from competition, eliciting such a response may not be easy.)

But some of the constraints appear to be of a kind that might warrant R&D activity; obviously limited knowledge is a common feature of many of the issues listed above. It is useful to look at some of these issues more closely.

R&D undertaken to assist the industry to meet challenges and exploit potential could cover a wide range of topics. The topics covered in the R&D agendas of RIRDC and HRDC for the Australian floriculture industry give some idea of the possible scope of these activities (see Table 21). Clearly not all of these activities would seem appropriate targets for the collaborative and developmental thrust of ACIAR's mandate and the concern of this study with technical R&D.

**Table 21.** Australia: areas covered by R&D plans for the floriculture industry.

Area	Aim
Industry organisation	<ul style="list-style-type: none"> <li>• Determine the most appropriate structure for a national flower industry body.</li> </ul>
Market research	<ul style="list-style-type: none"> <li>• Identify and develop new markets and monitor, maintain and expand existing markets.</li> </ul>
Quality assurance	<ul style="list-style-type: none"> <li>• Develop industry quality assurance programs and establish standards.</li> </ul>
New product development	<ul style="list-style-type: none"> <li>• Identify and develop new fresh products through programs of selection, breeding and evaluation.</li> </ul>
Value addition	<ul style="list-style-type: none"> <li>• Identify and develop ways of adding value — for example, through developed new dried and preserved productions and new methodology preservation.</li> </ul>
Harvesting and post-harvest practices	<ul style="list-style-type: none"> <li>• Develop and adopt new cost-effective technologies.</li> </ul>
Transport	<ul style="list-style-type: none"> <li>• Foster coordination, cost-effective cool chain delivery and use of standardised packaging and procedures.</li> </ul>
Cultural practices and production efficiency	<ul style="list-style-type: none"> <li>• Improve understanding of water, soil and climate requirements, address problems of propagation and pest, disease and weed control.</li> </ul>
Greenhouse technology	<ul style="list-style-type: none"> <li>• Develop low cost greenhouse technology suited to local conditions.</li> </ul>
Pest, disease and weed control	<ul style="list-style-type: none"> <li>• Develop sustainable pest and weed management systems.</li> <li>• Reduce reliance on agricultural chemicals.</li> <li>• Incorporate resistance and biological control into the total system.</li> </ul>
Continuity of supply	<ul style="list-style-type: none"> <li>• Extend flowering period of natives through production in different regions.</li> <li>• Develop international collaboration in plant improvement, production and marketing.</li> </ul>
Import replacement	<ul style="list-style-type: none"> <li>• Improve international competitiveness of traditional temperate flowers.</li> </ul>
Technology transfer	<ul style="list-style-type: none"> <li>• Achieve effective dissemination of information on technology, cultivation practices, etc.</li> </ul>
Retail handling	<ul style="list-style-type: none"> <li>• Develop education programs for retailers on business management, quality assurance, product handling, etc.</li> <li>• Investigate national marketing system.</li> </ul>

Sources: HRDC (1991); RIRDC (1995a).

### Breeding and development of new varieties

One common concern expressed by participants at the working group meeting and growers in the case study countries is a perceived need for research to select and/or breed new varieties for commercial development. There seem to be two broad dimensions:

- developing commercially viable indigenous cultivars; and
- developing improved varieties of temperate flowers that have resistance to tropical pests and diseases and that are adapted to growing in tropical and semitropical conditions.

Orchid breeding has been actively carried out in Thailand and Malaysia by hobbyists, commercial operators and public sector institutions for some time, and has given rise to quality cultivars adapted to local growing conditions. The study by the Foundation for Resource Linkage and Development identified a number of firms and individuals involved in breeding orchids and anthuriums in the Philippines, and PCARRD has undertaken work on germplasm collection and varietal selection and has supported work on breeding, evaluation and mass propagation of anthuriums (Table 22 and Rosario, Siar and Aurigue

**Table 22.** The Philippines: PCARRD's integrated R&D program for the ornamental plant industry.

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#### Projects completed 1993-94

##### Cultural management

- Growth and development of vanda clones in varying levels of fertiliser.
- Effect of varying levels of organic and inorganic fertiliser on the growth and flowering of anthuriums.
- Performance of anthurium varieties in different growing conditions.

##### Crop protection

- Screening of insecticides against mites on chrysanthemums.
- Survey of pests and diseases of ornamentals in the highlands.
- Survey of diseases affecting anthuriums, chrysanthemums and roses.

##### Crop improvement

- Germplasm collection and evaluation of :
  - different anthurium cultivars;
  - plants for cut flower production;
  - indigenous and introduced ornamental plants;
  - adaptability trial on selected varieties of orchids and anthuriums; and
  - performance test of gladiolus grown under partial shade and open field conditions.

##### Propagation techniques

- Callus induction and plantlet regeneration of selected hybrids.
- Effect of different media on flower production in anthuriums.
- Effect of different culture media on flower production in chrysanthemum cultivars.

#### Future program

Five subprograms for orchids, anthuriums, chrysanthemums, foliage and other ornamentals

- Documentation of existing technologies for production and propagation:
  - varietal collection, breeding, evaluation and mass propagation;
  - integrated pest management;
  - cultural management;
  - finishing, post-production and conditioning; and
  - national cooperative testing.

#### R&D network

##### National R&D centre

- University of the Philippines, Los Baños

##### Regional R&D centres

- Benguet State University
- Davao National Crops Research and Development Center

##### Cooperating stations

- Department of Agriculture
  - Baguio National Crops Research and Development Center
  - CAR
  - Los Baños National Crops Research and Development Center
  - Mandaue Experiment Station
- Don Severino Agriculture College
- Visayas State College of Agriculture

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Source: Information supplied by PCARRD.



1994). And in Australia, RIRDC (1994) and HRDC (1994a) have funded research on the selection, breeding and evaluation of native species. Box 1 describes two different examples of breeding research activity.

One issue that is pertinent to the incentives for research on breeding is the existence and efficacy of legislation establishing and protecting plant variety rights. As the working group meeting was informed, there is currently no plant variety rights legislation in Thailand, Indonesia and the Philippines. In Australia, where legislation has been in place since 1987, there appears to be a sense that it has not been very instrumental in promoting varietal development. The cost of registration is seen to be high and enforcement very difficult. International breeders seem to have developed alternative strategies for appropriating a sufficient share of the benefits of developing new varieties (such as non-propagation agreements). These methods are being applied in countries without legal protection of breeders' rights, but it remains an open question as to how much the absence of plant variety rights legislation has inhibited access to new varieties in countries where this situation prevails.

A related area for more basic research is the identification and germplasm conservation of tropical ornamental plants. Not only is this important for maintaining biodiversity and the search for economically valuable species in areas where the gene pool has been largely untapped, but also for improving the quality of current floristic crops that have been developed from a narrow genetic base (Rao 1990).

### **Management of pests and diseases**

The productivity and product quality of commercial cut flower operations can be seriously affected by a wide range of pests and diseases: fungi, nematodes, bacteria, insects and the viral infections they may transmit.

Not all pests pose a threat to production or yields but phytosanitary requirements in importing countries mean that pest control is important for exporters. And some pests that affect flowers carry viruses that can damage food crops. For example, the western flower thrip, which was recently discovered in Australia, carries the tomato spotted wilt virus (Karingal Consultants 1994). The various species of phytophthora fungi are a major disease problem affecting

### **Box 1. Plant breeding — two experiences.**

#### **Malaysia**

Chin Siew Yin is the only woman orchid farmer in Subang, a major growing centre close to Kuala Lumpur international airport. In 1995 Mrs Chin publicly revealed a new hybrid she had developed in ten years experiments with cross-fertilisation. The hybrid Holttamura Cinta 'Manis' has potential as a cut flower because of its near spotless yellow flower and thin, light stalk.

Mrs Chin's strategy for exploiting the results of her investment has not included registration under Malaysia's plant variety rights legislation. Rather, she built up a large stock of plants for concerted release on the export market. Only when the export market was established was the plant sold onto the domestic market. Considerable effort was made to protect the plants from theft during the propagation stages after a suitable hybrid had been developed.

#### **Australia**

In 1984 NSW Agriculture, a state government agency, began a breeding and selection program to develop novel varieties of the Geraldton wax flower, with superior yields and an extended flowering season. This involved collecting propagation material from wild flower populations, identifying pollination mechanisms to determine methods for embryo extraction and germination in culture, producing some 350 hybrids from over 5000 hand pollinations, and undertaking field trials of 50 selected varieties.

After field testing, 15 varieties were selected for commercial propagation trialing and distribution. Exclusive marketing rights were tendered out to a private company, after most of the varieties were registered for plant variety rights protection.

Widespread adoption of the hybrids was delayed by the selective release strategy adopted by the company that won the marketing rights, and the time taken to register for plant variety rights protection. These delays were compounded by a breakdown in the commercial arrangement with the propagator. An evaluation of the research project undertaken for RIRDC, one of the sources of funding, indicated that these delays, combined with the high cost and long duration of the research effort, seriously postponed the benefit stream from the initial research and resulted in a benefit-cost ratio well below the corporation's target (Fearn 1994).

Australian wildflowers and orchids. *Botrytis* is the major pathogen affecting cut flowers in storage and transport. Some one hundred bacterial and fungal diseases have been reported in orchids, and many of them have been recorded in the Philippines, Malaysia, Thailand and Indonesia (Ganapathi et al. 1990).

While most diseases exist in all countries that are export destinations, and are less of a quarantine risk than are pests, they can cause considerable damage in plantation situations.

Pesticides are the main form of controlling pests and diseases in the flower industry in the case study countries. But there are increasing concerns in many communities about the extensive use of pesticides, and in tropical conditions pests can develop immunity very quickly. In some countries there is a problem in that the appropriate chemicals are not available because of regulatory controls that do not recognise the needs of the flower industry.

Pest control features in the R&D programs of RIRDC and HRDC in Australia and of PCARRD in the Philippines, and there has been extensive work on pests and diseases of orchids in Malaysia. RIRDC, for example, has funded research on field and post-harvest management of insects in native Australian cut flowers, chemical and biological control of certain mites, and pruning management insect control.

HRDC is funding, among other things, the development of a national management strategy for western flower thrip, the development of steam-air treatments for controlling diseases borne by flower seeds, and the development of control strategies for *botrytis*.

PCARRD has undertaken work on screening insecticides against mites on chrysanthemums, and surveyed pests and diseases of ornamentals in the highlands and diseases attacking anthuriums, chrysanthemum and roses.

In Malaysia and Thailand, research on pests and diseases of orchids has been undertaken at a number of universities (see, for example Abdul-Samad 1994), institutes such as the Malaysian Agriculture Research and Development Institute (Hamidah 1990; Lim 1990) and the ASEAN Plant Quarantine Center and Training Institute (Ganapathi et al. 1990), and government departments (Chouvalitwongporn 1994).

One aspect of pest and disease management that is perceived as a constraint on the development of the

industry is quarantine control, as it affects inward and outward flows of flowers and planting material. The main concerns raised by producers relate to management and procedural matters, rather than scientific issues. Australian participants at the working group meeting raised concern about the cost recovery policies of the Australian Quarantine Inspection Service on phytosanitary certification of export shipments and the effectiveness of resources devoted to preventing the introduction of pests and containment of outbreaks. In the Philippines the main issue relates to bureaucratic delays and unreasonable regulations affecting imports of planting material (see Lantican working group paper). In many countries, upgrading the ability of quarantine officials to identify and classify pests entering with floriculture imports is seen as an important management issue.

Although management and regulatory matters are at the forefront of growers' concerns, technical and scientific issues are also important as international trade in cut flowers and live plants expands. With the risk that pests and insects introduced with cut flowers can adversely affect other crops, the costs of inappropriate quarantine protocols may be magnified. By the same token, overly restrictive policies may act as an unwarranted barrier to trade. The success of national quarantine services in negotiating access to export markets and approving management practices in countries supplying imports must presumably be based on sound scientific knowledge and assessment of risks.

### **Cultural practices**

The lack of information about appropriate cultivation techniques such as soil preparation, propagation, planting densities, replacement of planting stocks, fertiliser and pesticide dosages and when to harvest is frequently identified as constraining the development of the industry. To a large extent this is a problem of dissemination, reflecting the fact that government extension activities have been slow in catching up with the rapid development of the industry, particularly in the production of temperate flowers. But much of the available information is not necessarily appropriate to tropical and semitropical conditions. Participants at the working group meeting suggested that there is a need for research to develop protocols for cultivating temperate flowers in the conditions that prevail in countries enjoying such conditions.

Agencies such as PCARRD, which has a well-established technology dissemination program for orchids, have included work on cultural management (PCARRD 1994c).

### Post-harvest practices and technology

Poor post-harvest management by growers and others in the transport and distribution chain — and its effect on vase life and product wastage — has been identified as one of the major reasons for limited success on export markets and slow development of domestic markets.

Cut flowers deteriorate after harvesting for a number of reasons including (Nair 1992):

- hastened ageing of tissue as a consequence of the break from the source of water and foods in the parent plant;
- reduced uptake of water because of damage to or microbial growth in the vessels that carry water;
- pathogenic attack due to organisms present at harvest and arising because of storage conditions; and
- noxious gases, particularly ethylene produced by ripening fruit and present in vehicle exhausts and cigarette smoke, which accelerate senescence. Some flowers produce their own ethylene during the ageing process, and some diseases induce ethylene production.

Poor handling and storage procedures can exacerbate all of these causes of deterioration (Table 23).

Considerable research on post-harvest management of orchids has been undertaken in Malaysia and Thailand and appropriate practices are well defined (Ketsa 1986, 1987; Lim 1994; Nair 1990; Nair and Arditti 1991; Nair, Idris and Arditti 1991; Nair, Tung and Rahman 1986). Protocols for handling temperate flowers in temperate conditions have been developed

in Europe, the United States and many other locations. A question that remains, however, is the applicability of these protocols to tropical climates.

It is not clear that all the post-harvest practices mentioned above are essential. For example, some Malaysian producers of highland orchids are able to export successfully to the selective Japanese market without the use of cool rooms or fumigation, even though exporters in Thailand use cooling facilities and automatically fumigate. And, as the proceedings of the working group continued, the value of additional R&D in this area was disputed. Some producers argue that the established practices are sufficient to assure quality and that the main issue is to ensure that these practices are effectively implemented.

### Market research and industry information

The limited information that growers have on consumer preferences and market requirements in domestic as well as export markets is seen as an important constraint on the development of the industry in many countries. Even in the Netherlands, market research and marketing knowledge are perceived to be areas of weakness in the floriculture industry (Haak, Tap and Haybroek 1992).

In some countries there is also a perception that wholesale and retail marketing systems are undeveloped and lack transparency (see Singh working group paper). This is said to lead to the inefficient transmission of information back to growers about the returns from quality control and post-harvest handling and from exploiting market niches.

The small scale of growers' operations and the fragmentation of the industry would go some way to explaining why there might be underinvestment in market research. Collaborative approaches to market

**Table 23.** Critical elements of harvest and post-harvest activities to minimise deterioration.

At harvest	Storage	Packaging and transport
<ul style="list-style-type: none"> <li>• Identifying and isolating diseased mother plants.</li> <li>• Removing field heat and minimising water stress.</li> <li>• Disinfesting — this may require fumigation.</li> </ul>	<ul style="list-style-type: none"> <li>• Maintaining appropriate temperature control — the metabolic action of flowers is slowed at lower temperatures, but temperatures that are too low cause chilling injury.</li> <li>• Using preservative solutions including sugars, a biocide and an acidifying agent to extend longevity, stimulate bud opening and as a pulsing solution to help extend vase life.</li> <li>• Treating with ethylene inhibitors such as silver thiosulphate.</li> </ul>	<ul style="list-style-type: none"> <li>• Packaging flowers appropriately to protect them against damage — inadequate packaging or overpacking is a common cause of wastage.</li> <li>• Maintaining the cool chain during the transport process.</li> </ul>

research could overcome the scale problem — the successes of the Flower Export Council of Australia are evidence of this. However, collaboration may not eventuate if industry organisations are poorly developed, or communication and other infrastructure deficiencies inhibit cooperation.

There is evidence that non-government organisations and aid agencies have moved to fill this gap in some countries, as the USAID-funded market system

study for the Philippines industry attests (Foundation for Resource Linkage and Development 1993). It is also clear that foreign suppliers of planting material and technology, as well as firms involved in marketing in major import markets, are a growing source of market information, channelled through joint ventures and other collaborative arrangements that are being set up with local growers, or bundled together with material and advisory services.

# ACIAR and R&D for the Cut Flower Industry

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The purpose of this study is to provide information that ACIAR can use to support its evaluation of whether it should fund technical research and development in the cut flower industry.

Chapter 1 of this report suggested a framework within which ACIAR might address this issue, given its mandate and institutional objectives, and identified some of the elements of the information base that would be desirable to support this process. Subsequent chapters of this report have presented some of the information that is available.

As indicated in Chapter 1, a large number of factors must bear on ACIAR's evaluation of whether it should fund research and development in a particular industry. Some of these factors relate to the overall composition of ACIAR's research portfolio, and broader considerations of aid and development policy. This report cannot address these broader concerns. However, to help support the evaluation process this chapter lays out some of the issues that have emerged from the study and the deliberations of the working group that affect the framework proposed in Chapter 1.

## Emerging Issues

### Availability of information

Perhaps the single most important issue is the general paucity of consistent and reliable information on the cut flower industry in the five countries covered by the study. It is difficult to develop a clear picture of the size and structure of the industry, and even of international trade in cut flower products. This adds to the complexity of the evaluation question facing ACIAR. It makes it very difficult to undertake any evaluations of the possible returns from R&D for the industry and to identify with any confidence who the beneficiaries of R&D might be.

However, some broad features of the industry and the market it supplies can be identified, and these

may help in addressing questions about R&D. One strong impression that does arise from the data is that the industry is still relatively small in terms of the number of farmers involved, the area under cultivation and the value of production and consumption.

The small size of the industry is important because it places a limit on the welfare benefits that can accrue from successful research on the industry. For the cut flower industry to compete for public funding with larger industries (say, rice production or even other horticultural crops), per unit benefits of research would have to be extremely large. This study could not identify research projects that might have such large benefits.

### Industry and market structure

The industry produces a multiplicity of products, with varying market and production characteristics. Cut flowers are a luxury product, and fashion plays an important role in demand. This means that colour and other product characteristics sought by the market may change quite rapidly and that there may be limited time to reap returns from the development of new or varied products.

Broadly speaking, it is possible to identify two broad classes of product in the four ASEAN countries studied — orchids and the traditional temperate flowers — which require rather different technologies and are at different stages of development. (There is, of course, production of other tropical flowers, but typically little in the way of indigenous varieties.) In Australia, a comparable dichotomy exists between the traditional industry and the growing of native wildflowers.

In all countries the public sector plays almost no direct role in the industry. However, the degree of policy and institutional support varies, as the cut flower and the ornamental plant industries generally have only recently been seen as having potential for income generation and export development.

The processing chain is short and the main participants in the industry and market can be — a little simplistically — described as undertaking some or all of the following activities: plant breeding, plant propagation, growing, wholesaling, retailing and exporting. Manufacturers and suppliers of non-plant materials such as fertilisers, pesticides, weedicides and irrigation and other equipment are also important players. Overseas producers are an important source of planting material and other inputs.

In most of the countries, growing is predominantly undertaken on a small to very small scale. The fragmentation and lack of scale suggest that growers may have problems in undertaking socially valuable R&D. However, linkages with much larger and mainly international firms involved in other stages in the production and distribution chain are common. Frequently, these firms have been the catalyst for the development of the production of temperate flowers as they have sought to extend the periods of supply into the main northern hemisphere markets, to find lower cost production areas, to spread new development costs and to take advantage of additional growing seasons to accelerate plant breeding programs (Karingal Consultants 1994). These firms have developed a variety of strategies to capture returns from R&D and are major suppliers of technology throughout the world. However, they do not, as yet, appear to have focused to any great degree on the demands of growing temperate flowers in tropical conditions.

Market orientation varies between segments of the industry and between countries. In the Philippines, at the moment the industry is primarily oriented toward the domestic market. Thailand has long been a major supplier of orchids to the world market, but other flowers are produced almost exclusively to meet local demand. In Malaysia, the production of orchids and temperate flowers is predominantly export oriented, whereas in Indonesia, the focus is primarily on the domestic market.

Market orientation, and more particularly the price responsiveness of demand in markets, is important because it may determine, to some degree, who benefits from cost reductions that may result from successful R&D. In markets exposed to international competition, demand faced by the local industry is likely to be highly responsive to price changes. In this case, producers are likely to reap most of the benefits of supply enhancing or cost reducing innovations

(although if the innovation is readily applicable across a range of countries, world prices may fall to the benefit of consumers). Demand in domestic markets may be much less responsive to price changes, and if significant parts of the market are insulated from import competition, producers may find that cost reductions lead to lower prices, so that consumers appropriate some of the benefits from innovation. Given the income characteristics of the typical purchaser of cut flowers, consumer benefits from R&D affecting the industry may be accorded a lower weighting in public evaluation processes than in the case of R&D affecting consumer essentials and basic foodstuffs.

### **R&D in the industry**

In a limited study of this kind, it is difficult to get much information on the R&D activities of private participants in the industry. There is considerable work on breeding orchids under way in Malaysia and Thailand and, to a lesser extent, the Philippines, and some large firms operating tissue culture facilities are experimenting with new culturing techniques. Many growers, of necessity, undertake a range of adaptive research as they try to identify the products and practices that best suit the conditions on their farms.

The nature and extent of publicly funded and publicly undertaken R&D for the industry varies between countries. In Malaysia there is a strong tradition of work on orchids in universities and public research institutions, but little has been done on other flowers. In the Philippines a new program of centrally managed R&D that does focus on temperate flowers is being put in place. In Thailand, research on orchids is undertaken in some of the main universities. And in Indonesia, a new institute was recently established to carry out R&D on ornamental plants.

As already mentioned an important source of technology for growing temperate flowers is the plant breeders and traders in the major producing and importing countries.

### **Constraints, Opportunities and the Role of R&D**

Given the expanded international trade in floriculture products and the cost structures, agroclimatic conditions and indigenous floral endowment in the

Philippines, Malaysia, Thailand and Indonesia, there seems to be considerable potential for developing the cut flower industry (and related foliage and pot plant industries) in these countries. But a number of constraints are being experienced, and the knowledge base needs to be extended if the potential is to be realised.

Some of the constraints have their origin in government policies that may need to be amended and in public institutions that may need to be strengthened. For example, import regulations and quarantine controls may need to be streamlined to remove barriers to imports of technology embodied in planting material. Infrastructure and transport constraints, such as limited air cargo space and handling facilities for cut flowers, may be an inevitable consequence of the emerging nature of the industry. But there is a reasonable consensus that R&D and the dissemination of knowledge and new technologies, products and processes should be able to contribute to the development of the industry.

However, as discussed in Chapter 1, the issue for ACIAR is not just whether R&D could help the industry. Important questions concerning the size and distribution of the potential benefits, the role of the public and private sectors, the activities of national public R&D programs, the extent of regional spillovers, and the scope for collaborative research drawing on Australian expertise are all important.

Five broad areas where R&D might benefit the industry have been identified: breeding and the development of new varieties, management of pests and diseases, cultural practices, post-harvest practices and technology, and market research.

Considering the role for ACIAR in these areas involves trying to answer some general as well as more specific questions. Some general questions follow.

- What are the potential benefits and costs of research in these areas, and to whom would the benefits accrue?
- Can the private sector be expected to carry out adequate levels of research and make the results available to growers in the region? If not, what might be the most appropriate actions for governments to take to redress underinvestment?
- Are the issues and problems being addressed common across potential collaborating countries,

and are there spillovers to and linkages with other industries that bear on research funding decisions?

- Do the big gains on the knowledge front come from new research or from disseminating and adopting existing technologies and practices?

### **The benefits from R&D**

As discussed earlier, the distribution of benefits from R&D will depend a lot on the characteristics of the markets being supplied by growers. In addition, the mechanisms for disseminating research results may play an important role in how the benefits are spread within the growing community. In some of the case study countries, the flow of information to small scale growers is quite limited.

Certain types of research, such as breeding new varieties and selecting new indigenous flowers for commercial cultivation, have a long gestation period. Some evidence from the Australian experience suggests that the benefit–cost ratio of such research may not be very favourable when it is handled in the public sector.

### **Private sector involvement**

There is considerable private R&D supporting innovation in the industry in the case study countries. Some of this activity is being undertaken in the countries themselves, but a large proportion is being carried out overseas. The results of this external R&D are being passed on to growers embodied in planting material, chemical inputs and greenhouse technology, through the work of advisers and consultants helping with cultivation practices and through joint venture agreements.

The private sector is involved in breeding activity in most if not all of the case study countries. This activity has tended to concentrate on native wildflowers (Australia) and orchids, rather than temperate flowers. However, international plant breeders, particularly in the Netherlands and Japan, are supplying material for newly developed varieties to growers in the region. It is not clear, however, that the international breeders are focusing on the needs of growers in tropical regions, where pests and diseases and growing conditions may be very different from what is encountered in the northern hemisphere growing areas.

The main objectives of breeding programs are to develop new varieties to respond to or to set trends in

consumer preferences for a fashion item, or to provide greater resistance to local pests and diseases or better adaptation to local growing conditions. Experience suggests that successful breeding often produces very localised results as cultivars that do well in one environment may perform poorly in nearby areas. This also seems to be true of work on cultural practices.

Broadly speaking, the characteristics of breeding and cultural research tend to imply that it ought to be in the domain of the private sector rather than the public sector. However, there may be some regulatory and institutional impediments affecting incentives for private research and the flow of international innovations to local growers.

For example, the absence of plant variety rights legislation in Thailand, Indonesia and the Philippines may be limiting the flow of new varieties from overseas breeders. However, ways around this seem to be available, and it is not clear that enacting such legislation would substantially alter the incentives for local plant breeders. The experiences in Australia and Malaysia, where such legislation does exist, suggest that breeders find that the processes of registration are cumbersome and that enforcement is difficult. As a consequence they use other strategies to reap the benefits from research on breeding and varietal improvement.

In some countries, regulations inhibit flower growers' access to chemical inputs, and the small size of the industry may deter chemical companies from developing protocols for flower growing and for registering products in countries where this is a requirement. Presumably, the appropriate response of governments in such cases is to see if regulatory impediments can be streamlined.

Land tenure arrangements that may affect a wide range of agricultural activities may also work against growers undertaking long term investments in R&D. But inappropriate land tenure systems adversely affect a wider range of farmer decisions than just R&D and need to be addressed directly.

The extensive involvement of the private sector in important areas of research would suggest that the potential role for ACIAR in funding R&D would be limited. It is quite likely that niches are being neglected by the international, northern hemisphere based, private research efforts — for example, on exploitation of tropical species or adaptation of

temperate flowers to tropical environments. However, as the growing body of research on Australian native flowers that is being carried out in Israel and other locations indicates, market forces can stimulate international research on what may seem to be localised issues.

### **Commonality of issues and problems**

The evidence gathered in this study suggests that there is a range of generic issues that are common in all of the case study countries. What is not so clear is whether the results of research to address these problems would have common applications. Evidence suggests that the applicability of results from research on breeding and cultivation practices may be quite localised. On the other hand, market research on the requirements to satisfy major export markets may be widely applicable. However, while ACIAR has funded market research in the past, this has typically been limited to exploring the potential market for technologies developed by other ACIAR-funded activities.

In some areas there are important linkages with other industries, and potential spillovers in research activities that could influence decisions about public funding of research. For example, in the area of pest and disease management and in the specific field of quarantine controls there are important links between floriculture and other horticultural activities. Some of the pests that affect flowers also affect food crops, and methods for dealing with these pests could have spillover benefits (and work on these pests carried out for other crops could be applied to floriculture).

Similarly, environmental and health concerns that are prompting the search for alternatives to chemical pest controls and ozone depleting fumigants are common to many crop growing industries. In some cases, flower growing could expect to benefit from research undertaken for more economically significant crops. However, in other cases, such as the search on replacements for methyl bromide, more targeted research may be necessary, given that the characteristics of flowers differ from those of, say, fruit and vegetables.

### **Dissemination versus new research**

One of the key questions concerning the case for funding R&D in the area of cultural practices and post-harvest technology is whether the main problem being encountered in the case study countries is one



of dissemination and adoption, rather than inadequate research. There is a strong body of opinion among the more progressive growers that large gains in quality could be achieved from wider implementation of existing good practice. This view was reinforced by participants at the working group meeting.

The public policy issue here is to understand the reasons why growers are not adopting existing technologies and procedures. One reason may be that the market returns from higher quality products do not warrant the costs involved, or that the marketing systems are not sending clear signals about the additional returns that may be available. Industry efforts — sometimes supported by government agencies — to establish grading systems may help in the transmission of such information. It may also be that many small scale growers do not have management expertise and are not reached by extension services or the activities of grower organisations.

There may well be an important public sector role in improving the dissemination of information. However, as with market research, ACIAR typically restricts dissemination activities to technologies arising from research it has funded.

## Conclusions

A number of features of the cut flower industry and associated R&D — its size and market characteristics and the extent of private R&D — suggest that it is difficult to mount a strong case for ACIAR to fund R&D for the industry. Compared with other agricultural activities in which ACIAR is involved, the case for public funding of R&D for the cut flower industry

seems weak, and the economic returns do not seem to be large. In other words, even in areas where there may be underinvestment in R&D, the return from a dollar of ACIAR funding of cut flower R&D looks to be much smaller than the returns from funding in other industries.

This does not mean that there is no case for public sector interventions to improve the knowledge base of participants in the industry and to encourage innovation. The small scale of most growers and the apparent fragmentation of the industry suggest that collaborative funding and conduct of research may be difficult to organise. This is a problem that governments can help to overcome with interventions such as the R&D levy systems that operate in Australia.

It may also help if governments address problems created by the absence of legal protection of intellectual property rights. There may also be a useful role for the public sector in assisting dissemination of R&D results and information on best practices. And in some areas of public policy concern, such as environmental protection, quarantine control and occupational and consumer safety, there may be a role for direct funding of R&D, especially when issues extend beyond the boundaries of the industry.

However, at this stage, it is difficult to identify areas where the broad conditions set by ACIAR's mandate and institutional objectives are unequivocally met. In part, this may be a consequence of the limited base of information about the industry, and it is possible that, if the industry expands in response to the opportunities that seem to be available, the information base to support a role for ACIAR may develop.

# Appendix A

## List of Contacts

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## Appendix B: Additional Tables

**Table B1.** Estimates of cut flower production areas in selected countries, 1988.

	Area	Share
	ha	%
<b>Europe</b>	<b>25 982</b>	<b>44.1</b>
Italy	7 600	12.9
Netherlands	5 081	8.6
Spain	2 900	4.9
Germany	3 119	5.3
Greece	1 430	2.4
France	1 692	2.9
Czechoslovakia	650	1.1
Poland	629	1.1
Others	2 881	4.9
<b>Africa and Middle East</b>	<b>2 504</b>	<b>4.3</b>
Israel	1 483	25
<b>Asia</b>	<b>14 142</b>	<b>24.0</b>
Japan	13 089	22.2
Thailand	432	0.7
Hong Kong	343	0.6
Singapore	150	0.3
Indonesia	128	0.2
<b>North America</b>	<b>9 810</b>	<b>16.7</b>
United States	5 067	8.6
Mexico	4 250	7.2
Canada	493	0.8
<b>Central and South America</b>	<b>5 182</b>	<b>8.8</b>
Colombia	2 122	3.6
Brazil	1 000	1.7
Costa Rica	800	1.4
Guatemala	500	0.8
Honduras	400	0.7
West Indies	360	0.6
<b>Australasia</b>	<b>1 111</b>	<b>1.9</b>
Australia	1 111	1.9
<b>Total</b>	<b>58 916</b>	<b>100.0</b>

Source: Tayama (1988).

**Table B2.** Distribution of world imports of cut flowers, 1986.

	Value	Share
	A\$m	%
<b>Europe</b>	<b>1 990.8</b>	<b>77.6</b>
West Germany	978.1	38.1
France	221.1	8.6
United Kingdom	180.8	7.1
Netherlands	125.6	4.9
Italy	70.1	2.7
Belgium-Luxembourg	51.0	2.0
Denmark	37.9	1.5
Ireland	9.5	0.4
Greece	1.7	0.1
Switzerland	136.1	5.3
Austria	72.4	2.8
Sweden	60.5	2.4
Norway	30.2	1.2
Finland	12.6	0.5
Spain	3.1	0.1
<b>North America</b>	<b>486.2</b>	<b>19.0</b>
United States	442.9	17.3
Canada	43.3	1.7
<b>Asia</b>	<b>75.5</b>	<b>7.4</b>
Japan	55.1	2.1
Singapore	9.5	0.4
Hong Kong	10.8	0.4
<b>Middle East</b>	<b>8.0</b>	<b>0.3</b>
Saudi Arabia	4.9	0.2
Kuwait	1.9	0.1
United Arab Emirates	1.2	0.0
<b>Australasia</b>	<b>4.1</b>	<b>0.2</b>
Australia	4.1	0.2
<b>Total</b>	<b>2 564.5</b>	<b>100.0</b>

Source: Tayama (1988).

**Table B3.** Sources of Japanese imports of cut flowers, 1992.

	Value	Share
	A\$m	%
Netherlands	75.8	33.8
Thailand	49.5	22.1
Taiwan	20.5	9.1
New Zealand	19.3	8.6
Singapore	17.7	7.9
Australia	15.3	6.8
United States	7.8	3.5
Colombia	5.0	2.2
Mauritius	2.7	1.2
South Africa	1.8	0.8
Malaysia	1.3	0.6
Brazil	0.8	0.4
Israel	0.8	0.4
Spain	0.8	0.4
Mexico	0.4	0.2
Others	4.8	2.1
<b>Total</b>	<b>224.1</b>	<b>100.0</b>

Source: Kawata (1994).

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## **Working Group Papers**

# The Philippine Cut Flower Industry: Issues and R&D Interventions

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The cut flower industry is a sunshine industry in the Philippines.

The domestic market for cut flowers has grown quickly because of:

- rapid population growth (2.4 per cent a year);
- the influx of tourists;
- the rising number of flower shops, hotels, banks and restaurants; and
- an increase in consumer awareness.

Once just a hobby, growing cut flowers is now a viable export industry with good potential for growth, given the country's inherent advantages of:

- tropical and semitemperate climates;
- competitive wages and location costs;
- strategic geographic location near major importing countries; and
- availability of production technologies to a limited extent.

## Production and Utilisation

Major cut flower cultivars are orchids, anthuriums, roses, gladioli, heliconia and chrysanthemums. In 1992 about 890 hectares in key supply areas in the country were planted to cut flowers, with a total production of 15.2 million dozen. Most local production goes to the domestic market.

## Foreign Trade

### Exports

Exports of fresh cut flowers (cut flowers and buds; roses and orchids) reached US\$340 600 in 1992 and increased further to US\$625 000 in 1993. In terms of quantity, fresh cut flower exports in 1993 were about

127 Mt, more than double the previous year's volume. The major markets for Philippine fresh cut flowers are Japan, France, Hong Kong, Spain and Guam.

The value of exports of dried flowers was negligible (US\$4100) in 1993 in contrast to the 1992 value of US\$152 000. The markets are fairly dispersed — the United States, Spain, France, Australia and the United Kingdom among others.

Despite the upward trend in cut flower exports, the Philippines has lagged behind its Asian counterparts such as Thailand and Malaysia in developing its export markets because local growers have failed to meet the foreign buyers' quantity and quality requirements.

### Imports

Imports of fresh cut flowers declined significantly from US\$337 400 in 1992 to US\$145 700 in 1993 partly because of the increase in domestic production brought about by the expansion in area planted to anthuriums, roses, orchids and gladioli. The major sources are Malaysia for chrysanthemums and Thailand for orchids.

## Issues Shaping the Development of the Philippine Cut Flower Industry

### Institutional support

The industry is currently supported by government agencies such as the Departments of Agriculture, Trade and Industry, and Science and Technology, and academia. Cut flowers are among the commodities included in the Bill on High Value Crops, the Department of Agriculture's Key Commercial Crops Development Program and the Department of Science and Technology's Science and Technology Agenda

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for National Development (1990s). This indicates the high priority given to the industry in terms of technical and financial support to promote the industry.

The private sector actively participates in the industry through cooperatives, federations and other non-government organisations. There has been a rapid increase in the number of cooperatives and associations (22) in major production areas. They provide:

- assembly points or marketing arms for the grower members' produce;
- venues for information dissemination and training of members about production and post-production technologies and practices;
- a source of planting materials, fertilisers and chemicals at lower prices; and
- a conduit of credit provided by the Land Bank of the Philippines.

The National Federation of Cutflower and Ornamental Plant Growers of the Philippines aims to unite its 16 member cooperatives nationwide. It arranged the visit of a Dutch mission to the country in 1992 and the sharing of experiences and expertise in anthurium and rose production with cooperative members in Visayas (Bacolod, Iloilo and Capiz) and Mindanao (Davao City, General Santos City and Cotabato).

Non-government organisations such as FRLD (Foundation for Resource Linkage and Development), SGU, Plan International and SVO have an active role in the industry.

- FRLD, in conjunction with DA-ASAP and USAID, conducted a comprehensive study of cut flower marketing systems in major production and demand areas in the country in 1992.
- They foster effective linkages between cut flower growers and propagators and breeders of quality planting materials, and between cut flower growers and potential buyers.
- They sponsored a seminar on the opportunities and prospects of the cut flower industry and invited resource persons from the United States, Singapore and Malaysia.

### **Government tariff and non-tariff barriers**

Breeders and growers who import planting materials to improve the quality of their planting stocks have complained of the high tariffs:

- 3 per cent for dormant bulbs, tubers, etc. and orchids in flasks;
- 10 per cent for orchids in community pots; and
- 50 per cent in July 1991 (reduced to 30 per cent in July 1995) for all others.

BPI procedures — centralised policy in granting import permits (Malate and Manila) — causes delays in imports of planting materials. Breeders and growers from Visayas and Mindanao argue that regional offices can perform such functions, which would eventually lead to savings in time, effort and resources. The processing of import documents can take as many as seven days and only the BPI Director signs all the documents.

The BPI also sets the limit on the number of flowering plants (8) and types (community pots and seedling types only) of planting materials to be imported.

The plant quarantine process results in high inspection and certification fees charged for import and export permits. Charges for these are based on the number of plants inspected by the plant quarantine officer. Because plant quarantine and customs inspectors are not familiar with all of the varieties and pests of imported plants, there are delays in the documentation and release of shipments, and wrongly prescribed treatments for perceived infestations. Phytosanitary certificates take up to seven days to be issued. The exporters should be allowed to treat their own plants following BPI procedures.

### **Inadequate infrastructure system**

Bad road conditions from the production sites to the demand centres is a major industry concern. Access to the major cut flower producing barangays in Benguet and Cebu is hampered by unpaved roads, especially during the wet season, which is the main cropping season for cut flowers. The road conditions are also responsible for delays in the delivery of produce to market centres and the high costs of transport.

Inadequate and inefficient communication facilities are also a problem. Orders are usually made by telephone but many transactions fail because of inefficient telephone systems.

Traders, particularly in Benguet and Davao City, complain of their inability to get timely information on prices and the supply and demand situation.

Growers rely on the phone for market and price information on cut flowers in demand centres. In areas where a telephone system is not available, growers rely on traders as their primary source of price information.

## **R&D support**

### *Production aspect*

Improving the breeding stock and mass propagation (through tissue culture and clonal propagation laboratories and nurseries) has focused on suitable cut flower varieties for cultivation in specific areas, new varieties from indigenous materials, and established cut flower varieties such as anthuriums and dendrobiums. It is hoped that the establishment of breeding centres in key cut flower producing regions will fill the need of growers for new planting materials.

Pest management requires understanding of the basic biological nature of the more serious pests (weevils, beetles, thrips and mites) and consequently the development of management strategies. Research covers biological control, including parasitoids, predators and pathogens; the searching capacity for parasitoids and predators; the rate of host consumption; the efficiency in reducing the host (pest) population; and the effectiveness of microbial pathogen (species and strain, and method of application).

There has been intensive research on diseases of cut flower planting stocks, with focus on perennial diseases that affect productivity, such as stem and root rot for orchids, bacterial blight for anthuriums, bacterial wilting for chrysanthemums, and corn rotting for gladioli. Newly discovered diseases must also be looked into. Studies must include effects on planting stocks, the seasonality of occurrence, the level of tolerance to chemicals, the habitats and the hosts to properly identify and control diseases. Potential biocontrol agents should be examined, and integrated control strategies should be developed.

Fertiliser and chemical application studies for culture management could be ideally conducted through a government and private sector partnership.

### *Post-production and marketing aspects*

The main objective here is to determine the post-production (packing house) operations that could be employed to extend the vase life of priority cut flowers (orchids, anthuriums, chrysanthemums and gladioli) and prepare the product for the market. Specific post-production operations that need to be investigated for specific cut flowers include the following:

- pretreatments of cut flowers (physical and chemical treatments) prior to packaging, to evaluate the vase life of presoaked priority cut flowers in various holding positions;
- pilot testing of modified atmosphere on priority cut flowers during storage and transport under simulated and actual transport to Japan, Hong Kong and Korea to evaluate the effect on the vase life of cut flowers;
- pilot testing of the use of ethylene absorbents during the storage and transport of cut flowers under simulated and actual transport to Japan, Hong Kong and Korea to evaluate the effect on the vase life of cut flowers; and
- verification trials on the applicability of developed alternative quarantine treatments on Philippine grown cut flowers.

### *Consumer preferences for specific cut flowers*

The study intends to identify specific cut flower types and varieties that are preferred by different consumer groups:

- by location — rural compared with urban;
- by income level — low, medium and high;
- by institutional buyers — hotels, banks, restaurants and fast food chains;
- by the characteristics of cut flowers — colour, size, stem length and maturity (for example, bud, half bloom or full bloom); and
- by packaging materials.

The study also aims to estimate the elasticities of demand for priority cut flowers that can be used in forecasting demand.

# The Present Cut Flower Industry in Indonesia

Dr B. Tjia\*

Old traditional methods of growing, transporting and marketing flowers are still in practice today in Indonesia. They are remnants of colonial days. Plants are mostly grown in open fields and are therefore exposed to environmental elements. Cultural practices rely mostly on cheap sources of production supplies — for example, manure for fertiliser — and maintaining motherstock with no improvements or other soil supplements. Protected growing under structures is very rare. Commercial cultivation of cut flowers for domestic use is influenced by the Dutch from colonial days, who used temperate region plants, which through decades of cultivation in this tropical climate have adapted to the local environment. These plants include polyanthus, roses, gladioli, Easter lilies, asters, chrysanthemums and dahlias.

The production of orchids has gained some momentum recently. Arandas, scorpion orchids and some other hardy species are grown under full sun. There is a trend toward growing other types of orchids, such as dendrobium, phalaenopsis and cattleya, under saran or other simple structures.

It stands to reason that the quality of flowers is not consistently good and depends on the time of year, since quality is dictated mainly by the frequency of rainfall during the wet season.

There is minimal disease and insect control — often none.

The harvesting and transporting of flowers to collection areas, markets, and/or the final consumer are done mostly without any knowledge of scientifically based information so as to increase vase life and aesthetic appearance. Village growers handle flowers pretty much as they do vegetables. Flowers are dumped on their side and stacked in open trucks. Frequently one or more people ride along on top of the flowers. They are unloaded in the same fashion — that is, tossed out of the truck onto the ground — upon arrival at the market.

The small scale growers living close to the city or market, transport their flowers neatly arranged on the back of a motorcycle through traffic jams in the heat of day (30–33°C), pollution from cars and dust.

Pretreatments and hardening processes are unheard of and no growers have refrigeration. Hence flowers are harvested and shipped in the evening of the same day. Collection centers and marketplaces do not have any cooling facilities either; nor do most florists. Flower arrangements are often delivered on the back of a bicycle or motorcycle, once again exposed to heat, car fumes and dust. Hence, flower parcels do not last more than one or two days at the final consumer's place except if they are orchids, carnations and anthuriums, with orchids lasting the longest. Roses will not even last one day in the home and are often delivered when fully open. The above practices cause the public to be less than enthusiastic about purchasing flowers.

There is the potential to increase flower sales if keeping quality can be increased. This is the reason why most consumers prefer orchids to other flowers, because of their longer vase life. Even the vase life of orchids can be improved by a factor or two.

Several cut flower operations belonging to wealthy conglomerates and individuals in Java and Sumatra are run in a more contemporary and professional way. These companies grow their products in greenhouses, have coolers at their farms and distribution centres, and hire overseas graduates or foreign growers and managers to run their operations. Consequently, they produce better and more consistent quality flowers because they are less affected by the prevailing weather. Not surprisingly, their products are flowers that are widely popular in western nations, such as roses, carnations, chrysanthemums, anthuriums and Asiatic hybrid lilies, which are mostly imported from the Netherlands.

Tropical plants abound in Indonesia, whether of endemic or imported origin, but they have not yet been as intensively cultivated and used as they should

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have domestically, or explored as a possible export commodity. They include cut heliconias, gingers, calatheas and ornamental bananas and pineapples.

The following restraints confront the present cut flower industry in Indonesia.

- Conglomerates or wealthy individuals with big operations are not willing to talk to smaller scale growers or other interested parties in the business, let alone share information, because they themselves had to pay for the technology.
- Government involvement in, for example, research and dissemination of information on cut flower production is minimal. Research results gather dust in the library because there is no avenue to convey them to small scale growers in particular. There is little support and funding for the betterment of the

industry. However, the President recently promised to increase funding in the public sector for horticulture in general.

- Both public (state) and private universities do not offer any specific practical courses on ornamentals, cut flowers or flowering pot plants.
- There are no specialists available in the field of ornamentals, particularly in the post-harvest life of cut flowers and foliage, and flowering pot plants.
- Indonesian scientists still practise a closed system, in that they do not readily discuss their findings with colleagues in the same field.
- Literature is scarce in Indonesia and there is no grower magazine to help the small scale grower with more accurate and practical information.



# The Floriculture Industry in Malaysia

Mr M. Singh\*

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## Background of the Floriculture Industry

The floriculture industry is one of the agricultural industries that show impressive market potential. This industry has grown rapidly over the past decade. Traditionally, floricultural products have been divided into two main groups: cut flowers and ornamental plants and foliage.

In Malaysia, floricultural products consist mainly of fresh cut flowers comprising tropical orchids and temperate flowers. Ornamental plants are becoming more popular as part of the floriculture industry.

## Area

The total area devoted to the floriculture industry in Peninsular Malaysia in 1994 was around 1400 hectares. Tropical orchids accounted for 43 per cent of this area and highland varieties account for almost 28 per cent, the balance being cultivated with ornamental and landscaping plants, mainly in Selangor and Johor. The industry is characterised by small scale production spread over the whole country.

## Domestic consumption

According to a FAMA consumption survey, total domestic consumption in 1992 was M\$23.8 million. Estimated domestic consumption is currently M\$30 million or M\$1.70 per person — equivalent to 2–3 stems.

## Trade

While production and domestic consumption has increased rapidly over the past five years, of greater significance to the floriculture industry in Malaysia is its export performance. Exports increased from M\$23.1 million in 1988 to M\$59.1 million in 1992, but appear to have declined to M\$44 million in 1994.

Exports of fresh cut flowers are largely to the regional markets of Hong Kong, Singapore, Japan and Thailand. Other than a minor breakthrough to the United Arab Emirates in the Middle East, exports to other markets such as Western Europe remain small.

## Supply

Local production supplies most of the cut flowers and ornamentals in the domestic market though there are some imports. Local production increased from an estimated M\$8.14 million in 1986 to M\$34.3 million in 1990. Total local production in 1994 was estimated to be 221 million stems, with highland flowers accounting for 150 million and lowland flowers 71 million stems. Total imports of fresh orchids, other cut flowers and foliage amounted to M\$2.3 million in 1988, rising to M\$9.2 million in 1991 before tapering off a M\$3.2 million in 1994. Singapore, the Netherlands and Taiwan are the main import sources.

## Distribution

The producers themselves play a strong role in the distribution systems for floricultural products in Malaysia. About 75 per cent of producers distribute directly to local retail outlets and liaise directly with importers in overseas markets.

## Problems and Issues of the Floriculture Industry

Though the floriculture industry in Malaysia has made progress in recent years it is not without problems. Orchids, for example, have been cultivated in the country since the 1960s but have failed to make any major impact in local and overseas markets compared with the success of Thai or even Singaporean products in recent years. Some of the major problems facing the floriculture industry in Malaysia are now briefly discussed.

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### **Lack of new varieties**

As successful market penetration and expansion rely on product differentiation, Malaysia lags behind its competitors in developing new varieties of orchids. Breeding programs have not kept pace with changing consumer preferences in colours, blooms and other characteristics of the flowers. The scenario for temperate flowers is slightly better but only through adaptation rather than through R&D efforts.

### **High establishment costs**

The overhead costs in establishing flower farms are high — M\$200 000 for an orchid farm and an estimated M\$210 000 for temperate flowers per acre, excluding operating costs.

In the case of lowland flowers planting materials make up about 60–70 per cent of total costs while for highland flowers land development and sheds are the main cost contributors. While high overhead costs limit the number of entrepreneurs in the industry, difficulties in obtaining funds from financial institutions for a 'risky' business further compound the situation.

### **Limited cargo space**

Limited cargo space for floricultural products (as for fruits) limits market expansion for these very perishable products, especially temperate flowers. This, coupled with infrequent flights and wide price variations in overseas markets, makes floriculture a risky business. The recent increase in freight rates threatens to undermine Malaysia's competitive position in fresh cut flower exports.

### **Limited marketing facilities**

Limited sales outlets in the domestic market and limited marketing infrastructure (packing houses, fumigation, transport and cold-room facilities) are other problems. Such facilities at the farm level and point of export are inadequate and efforts are being made to address these in the Seventh Malaysia Plan.

### **Grades and standards**

Grades and standards are just being developed. In their absence trade practices are arbitrary compared with the grades and standards of the more developed markets. Standardisation in packing and labelling also needs to be addressed.

### **High import duties**

A more pressing problem now is high import duties imposed by neighbouring countries such as Thailand (60 per cent), Taiwan (35 per cent) and the Republic of Korea (25 per cent). Such duties are detrimental to the growth in exports of Malaysian fresh cut flowers to regional markets. Europe also has high duties during summer.

### **Other constraints**

Other constraints include limited market promotion activities, market information and market extension, poor market transparency, land shortage and stringent phytosanitary conditions imposed by certain countries, including Japan.

## **Market Potential for Floriculture**

While there are inherent problems and constraints facing the floriculture industry in Malaysia, the outlook for the industry is bright. Current problems in the industry are not totally insurmountable and action is already under way to minimise if not overcome them. It is expected that by the end of the current development plan some progress will have been made by the government, including the provision of facilities to ensure orderly growth of the industry. The private sector is expected to play a role in this respect.

The strategic options open to floriculture in Malaysia are in the choice of markets — domestic or export. In essence, both options are attractive. Market potential for floriculture can therefore be analysed at two levels — the domestic market and the export markets.

### **Domestic market potential**

Domestically the floriculture industry is enjoying steady growth. Trade in the domestic market has increased rapidly over the past ten years. Increasingly domestic production has been substituted for imports and imports of fresh cut flowers decreased from M\$1.17 million in 1980 to M\$0.40 million in 1994.

Domestic consumption was estimated at M\$2.44 million in 1986 and M\$24 million in 1992. On a per person basis, consumption was estimated to be M\$1.35 in 1992, up from about M\$0.47 in 1988. The current per person consumption of M\$1.70 is equiva-

lent to about 2–3 stems. Per person consumption is therefore very low, giving tremendous scope for exploiting domestic market potential in the years to come. Three factors will make this possible:

- greater economic development and the consequent rise in household incomes;
- a faster rate of urbanisation in the country; and
- an increase in the population.

Domestic consumption rose by about 65 per cent in the period 1986–90. Prospects look brighter over the next five years as there is no reason to believe that this cannot be increased further. It is estimated that per person consumption of fresh cut flowers will increase to M\$2.40 over the next five years, an increase of about 10 per cent a year. This would place domestic consumption at M\$49 million in 2000, M\$22 million above the present level. This in itself augurs well for the floriculture industry in Malaysia.

### **Domestic market strategies**

However, to fully exploit the domestic market potential, action must be taken on a broad front.

#### *Market promotion*

Market promotion by both producers and marketing agencies to increase consumer awareness and acceptance of fresh floricultural products needs to be stepped up. Such action is necessary to increase local consumption all year round. Current government programs including the annual Pesta Flora and other flower shows have helped to boost local consumer interest in fresh cut flowers.

#### *Mass merchandising*

A necessary prelude to developing the local floriculture industry is a mature domestic market for fresh floricultural products. Towards this end imaginative marketing strategies are needed to increase domestic demand. The traditional florist — with limited markets, promotional activities and high prices — can play only a limited role.

In large urban centres the strategy will entail enticing domestic consumers to buy from convenient, bulk display shelves for personal, casual use. Such a strategy points at mass merchandisers (supermarkets and hypermarkets) which have the obvious plus points — namely, detailed retail sales plans and

promotional budgets — that can be translated into high consumer traffic through their premises.

#### *Marketing infrastructure and channels*

While vegetable and meat wet markets, together with some florists, market floricultural products, more market outlets need to be developed. In most major towns in Malaysia there is a dearth of retail outlets for floricultural products. Kuala Lumpur may be an exception although its estimated 600 retail outlets are hardly noticeable. Cold rooms and refrigerated trucks for local transportation linked to centralised or regionalised collection and storage facilities prior to sale also will facilitate domestic demand by increasing marketing efficiency.

#### *Increased market transparency*

To sustain producer interest and viability there is a need to increase market transparency in the floriculture industry. The existing system, which includes consignment sales, does not pay premiums for good quality and the rules of demand and supply in pricing do not normally operate. The situation is further compounded by an 'open account' system of payment, which translates into late or even non-payment, high arbitrary discounts and commissions. In the face of irregular incomes to producers an auctioning system to increase market transparency is planned for implementation.

#### *Improvements in farm practices and post-harvest handling*

As consumers become more discerning, marketeers of floricultural products need to increase value-added activities such as grading and better product presentation to get a larger share of the consumer dollar.

### **Export potential**

The second and perhaps the more attractive strategic option open to the floriculture industry in Malaysia is to aggressively penetrate the lucrative export markets in East Asia, Australia, the Middle East and Western Europe. Over the past decade the country's export performance in floricultural products was good, and increasing exports will see rapid development of the industry.

Internationally, trade in floricultural products is growing. World imports of fresh cut flowers almost

tripled from about US\$2 billion in 1986-87 to about US\$6 billion. The annual consumption of flowers and plants worldwide is US\$43 billion and by 2015 will be double that.

Traditional suppliers of these products are being replaced by developing nations and there has also been growth in demand in new markets. The International Trade Commission (UNCTAD-GATT) has estimated that annual growth in floricultural trade has been about 15 per cent in the recent past.

In taking advantage of this growing world market for floricultural products, the Malaysian strategy in penetrating the export trade will hinge on a number of positive advantages.

#### *Exploiting off-production periods*

Out of the two main seasons for flowers — summer and winter — the latter offers scope for Malaysia. While the winter is a season of high demand it is also coupled with lower production in major consuming countries. Such a situation is also reflected in higher prices — about 15–20 per cent — offering market opportunity for countries such as Malaysia that do not have wide climatic variations. Floricultural products, including those that can withstand low temperatures, will find wider markets in the period November–April, which favours tropical countries.

#### *Increasing market share in world markets*

Total exports of cut flowers from Asian countries make up 10–15 per cent of total world imports. Growth in the past few years has been negligible even though trading volumes of cut flowers have doubled. Countries such as Malaysia, while having made inroads to world markets, have not kept pace with the overall growth in world trade. Educating consumers in Western Europe, the United States and perhaps even South Africa will create new markets. In addition to cut flowers, Malaysia also has potential to increase exports of potted plants and foliage.

#### *Proximity of emerging markets*

The Far East markets consisting mainly of Japan, Hong Kong, Taiwan, the Republic of Korea and Singapore offer the greatest scope for exports from Malaysia. The per person consumption in Japan is estimated to be one of the highest in the world at M\$120 a year. In South Korea annual per person con-

sumption is M\$30 and in Taiwan M\$15. Japan has enormous potential for further growth but its stringent phytosanitary requirements and grading, product presentation and, most importantly, price competitiveness demands must be met first.

#### *The competitive ringgit*

Over the past 2–3 years the competitive Malaysian dollar (ringgit) compared with the currencies of the newly industrialised economies has boosted floricultural exports regionally. The appreciation of the Taiwanese dollar in 1992-93 forced Hong Kong to look at cheaper import sources such as Malaysia from where about 50 per cent of its requirements are sourced. This competitive edge still prevails.

In terms of export projections, the trend over the next five years will see the industry sustain its present level of growth. On this basis, exports can be projected to increase slightly more than fourfold from the present level to reach M\$120 million by the end of the Seventh Malaysia Plan. The greatest limiting factor to increased exports of floricultural products in the next couple of years will be air cargo space.

#### **Export market strategies**

While there is good export market potential for a small producer such as Malaysia, it is important when developing and increasing the country's share of world exports to have effective marketing management of floricultural products that includes the following features.

#### *Quality and consistency of production*

Quality products imply quality control through post-harvest handling, including temperature management from farm to final consumer, fumigation to meet importers' requirements and good product packaging and presentation. Quality products, even when priced higher, sell well as against cheaper and poorer quality ones.

#### *Commercial cultivation*

Commercial cultivation must be the basis for cut flower production. This implies not only large scale production but professional management to meet requirements and suitable product mix.

### *Development of new varieties*

The industry must constantly have something new to offer. New varieties command higher prices, especially during the lead period of 1–3 years.

### *Brand names*

Brand names are important for image and discriminating buyers. The white lily from the Netherlands is sold as 'Casablanca' in Japan and has been a hit there.

### *Market promotion and research*

Sustained market promotion projecting high quality Malaysian produce does open markets and develops trade. The Dutch penetration of the Japanese market was through market promotion over a few years and an intensive consumer preference study. Malaysia does produce high quality orchids but these tend to be

associated with neighbouring countries, as exports are channelled through them.

## **Conclusions**

The floriculture industry in Malaysia appears to have got out of its gestation period over the past 2–3 years and is heading for growth over the next decade. While there are still critical problems to be resolved, these are not totally insurmountable. Close attention must be given to resolving these problems, with positive support from the government sector. The provision of adequate market infrastructure and a long term solution to inadequate air cargo space and services will have to be given top priority if the industry is to sustain its growth and develop further. It would then not be unreasonable to believe that the enormous growth in the floriculture industry overseas and in Malaysia in recent years will not continue.

# Cut Flowers in Thailand

O. Pituck and Dr S. Lekawatana\*

## Production

Thailand is a tropical country with a total area of 320 million rai (a rai is about 2.5 hectares). It is located between latitude 5°N–21°N and longitude 97°E–106°E. It is mostly flat, has an average temperature range of 23.7–32.5°C and high rainfall. The northern part of the country is hilly and relatively cool. The total agricultural area is 21.6 million hectares.

Only 6383 hectares are devoted to cut flowers — only 0.03 per cent of the total agricultural area. Seventy per cent of this area is in Bangkok and neighbouring provinces — namely Nonthaburi, Pathum Tahni, Nakhon Pathom, Samut Sakhon, Nakhon Nayok and Ratchaburi — where there has long been cultivation of flowers and ornamental plants. Since Bangkok is the centre of transportation, it serves as the centre of cut flower production, distributing the produce to all parts of the country. Moreover, the city has an international airport, facilitating the export of cut flowers.

The rest of the production area is scattered in big provinces with large populations and tourist attractions — for example, Chiang Mai, Chiang Rai, Nakhon Ratchasima, KonKaen, NongKhai and Songkhla.

The top five economic cut flowers of the country are orchids, jasmine, lotus, marigolds and roses. Their total area of cultivation is about 80 per cent of the cut flower cultivation area. These flowers are exported in large quantities. Other cut flowers that are in regular demand are chrysanthemums, milk weed, asters and gerberas. Thailand can also produce certain kinds of temperate flowers in the highlands of the north or areas that enjoy cold weather in the cool season — for instance, gladiolus, carnation, lily, gypsophilla, and alstromeria. These flowers are in great demand but the quantity produced is insufficient.

At present, the policy is to encourage cultivation and consumption of other tropical cut flowers, such as patumma (*Curcuma arismatifolia*), heliconia, anthurium, tuberose, red ginger and torch ginger, which can yield high quality flowers in all parts of the country. In the past they have not been very popular with consumers and growers.

The production of cut flowers in Thailand is determined by the market. That is, growers will start to cultivate or extend areas devoted to a particular flower only when they are certain of the demand. As many flowers cannot be produced in a short time, growers do not want to take any risk.

Some growers in certain areas begin to cultivate cut flowers through the suggestion of local collectors. They will buy the flowers and deliver them to the market. Thus the demand of cut flowers in Thailand can be estimated from the total production of all the flowers.

Farm numbers and production areas for selected cut flowers in Thailand, 1994.

	Number of farms	Production area	Average prod. area per farm	Production (stems)
	no.	ha	ha	million
Orchid	1 965	2 306	1.17	994.00
Jasmine	3 626	852	0.24	14.00
Lotus	483	704	1.46	19.00
Marigold	2 736	644	0.24	206.00
Rose	1 343	626	0.47	331.00
Chrysanthemum	1 086	160	0.15	101.00
Aster	621	65	0.11	na
Gerbera	825	59	0.07	20.00
Gladiolus	408	36	0.09	na
Gompherea	289	10	0.03	na

\* Flower and Ornamental Plant Subdivision, Horticultural Crop Promotion Division, Department of Agriculture Extension, Bangkok.

na Not available.

Source: Survey done by Department of Agricultural Extension.

There are about 11 720 growers of cut flowers in Thailand. Cut flower production in Thailand is carried out mostly by small scale growers on an average of 0.5 hectares per farm.

The largest production area per grower is allocated to lotus. This is because this flower is easy to care for and is mostly grown in former paddy fields. The second largest production area per grower is for orchids. This is because most growers have worked with orchids for a long time and they are quite well off. There are several companies with large production areas, making the average area per farm quite high.

The average area per farm cultivated for a particular kind of cut flower depends on the difficulty of its care and market demand. For example, for chrysanthemums, gerberas and gladioli, which are harder to take care of, the average area per farm is rather low. As for globe amaranth, which is easy to take care of but for which demand is low, it is planted in small plots around the house.

Most cut flowers are cultivated outdoors. An exception is orchids, which need to be in shade structures. The production cost of cut flowers is higher than that of field crops or of other horticultural products. Most growers do not fully or correctly use pesticides and fertilisers, and do not give the plants proper care. Growers generally use the same area for production for a long time, resulting in accumulated diseases from pests. The problem is solved by moving on to other areas. Therefore, at present the tendency is for cut flower production to move out of the outlying areas of Bangkok to neighbouring provinces.

The major problems in cut flower production in Thailand are:

- a lack of new varieties and good distribution systems;
- limited research on propagation, the control of pests and diseases, the quality of production and post-harvest handling;
- no commercial production of plant materials;
- no distribution of new technology and market information to growers; and
- a lack of capital on the part of the growers, which prevents them from using technology that is new and costly.

## Consumption

Consumption of cut flowers in Thailand depends on festivals and celebrations — for example, in January–February there is New Year's Day, the end of the school year and Valentine's Day. In summer, March–June, flower consumption is quite low as it is the vacation period and there are few festivals. Consumption increases in July, which is the month of graduation. After this month consumption decreases to the average level and remains so until November. It picks up in December. According to a survey of florists in Bangkok, the day of the highest number of sales of flowers is Valentine's Day, the month with the highest number of sales is December and the months with the least number of sales are April and May.

Cut flowers that are in biggest demand in the country are still those used as offerings to the Buddha — namely, lotus, orchids and roses. In major cities, however, tastes for cut flowers differ. Preference is given to exotic and high quality flowers. A survey of the favourite flowers of florists in Bangkok in 1993 showed lilies at the top of the list, with roses and carnations close behind. These are temperate flowers that have to be imported as they cannot be produced in great quantity locally. However, orchids and tropical cut flowers that are produced in the country are among the top ten favourites.

The use of flowers in Thailand can be classified on the basis of the following purposes.

- In religious rites, such as offerings to the Buddha, at ordination ceremonies, funerals and festivals. At present about 80 per cent of cut flowers are used for these purposes by consumers in urban and rural areas. They are in great demand on Buddhist holy days and important religious occasions. Popular flowers for these purposes are jasmine, lotus, marigolds and solidago.
- On celebration and other important days, such as New Year's Day, Songkran and Loy Krathong. Popular flowers on these occasions are marigolds, jasmines, roses, orchids and globe amaranth.
- For decoration in offices and buildings, such as restaurants, hotels, hospitals and department stores. Flowers for this purpose need to be of higher quality than those for the two previous purposes. Popular flowers are roses, gerberas, chrysanthemums and orchids.

- As gifts and congratulatory messages on various occasions, such as the opening of an office, wedding, graduation, promotion and Valentine's Day. Flowers for these purposes are of high quality. They are mostly gladiolus, chrysanthemums, roses, carnations, gerberas, gypsophilla and peacock, some of which are imported.

At present the demand for cut flowers for decorating offices and buildings and for gifts is increasing because of better economic conditions. People appreciate flowers more and there have been more campaigns about the environment and using natural objects.

In Thailand flowers are:

- put into bunches with decorative leaves and used as offerings to the Buddha;
- made into mixed bouquets for special occasions;
- arranged in baskets or bouquets;
- put into vases or arranged as decorations;
- made into wreaths and coffin decorations;
- made into garlands; and
- dried and made into pot pourri.

## Marketing

Cut flowers in Thailand are exported; distributed through local markets, and markets of neighbouring

provinces; and distributed through large flower markets or wholesale flower markets.

### Exports

Most growers do not export their products. There are export companies that buy flowers from growers and pack them in boxes ready for export. These companies grow flowers themselves but not sufficient to meet the demands of foreign markets. They, therefore, have to buy from growers. Cut flowers distributed in this manner are orchids. Most other cut flowers are exported by producers. Only some are distributed through exporters. If the quantity of flowers is less than market demand, the exporters will buy from growers whose produce is of high quality. Flowers that are distributed in this way are roses, chrysanthemums, lotus and ornamental pineapple.

### Distribution in local markets and neighbouring provinces

This kind of distribution is for low quality flowers whose consumers are in the province or neighbouring areas. Quality is not the main concern. The demand of local markets is generally constant and quite large on a daily basis.

Growers of the flowers for these markets do not make much use of production technology. They let

### Floricultural exports and imports by Thailand.

	1991		1992		1993	
	Quantity	Value	Quantity	Value	Quantity	Value
	tonne	US\$m	tonne	US\$m	tonne	US\$m
<b>Exports</b>						
Cut orchid	12 399	26.5	11 142	28.1	12 375	29.9
Orchid plant	920	3.6	939	3.5	911	3.3
Other live plants	643	0.9	778	1.2	950	1.0
Dried flower	680	2.1	971	2.3	601	1.6
Dried foliage	325	0.5	336	0.5	582	0.8
Cut foliage	45	0.01	87	0.1	95	0.5
Cut flower	35	0.1	9	0.02	9	0.04
Total	15 047	33.71	14 262	35.72	15 523	37.14
<b>Imports</b>						
Cut flowers	363	1.3	503	1.6	471	1.5
Other live plants	81	0.6	21	0.5	62	0.9
Total	444	1.9	524	2.1	533	2.4



the flower grow naturally without much care. Production cost, therefore, is low and growers do not lose money even though they sell their flowers at low prices. Growers generally sell their product to local merchants at low prices. These merchants then deliver the produce to retailers in the local markets where it reaches the consumers.

#### **Distribution through central flower market or wholesale flower market**

For this kind of distribution, growers have to produce in great quantities and must not be too far from the market. Local collectors, who may be growers themselves, will buy from individual growers. When they have collected flowers in sufficient quantities they deliver them to a central flower market or wholesale market in Bangkok or Pak Khlong Market. Retailers come here to buy flowers which they then sell to

florists, stalls and street vendors. Buyers are hotels and general consumers.

### **Pricing**

Prices vary according to demand, flower quality and the type of market and fluctuate in a year due to surroundings and climate. For temperate flowers that require low temperatures, the northern produce gets higher prices than that of other regions. For tropical cut flowers, average prices do not vary much.

When prices are high, imported flowers, most of which are temperate ones, are priced higher than local flowers. Prices of imported temperate flowers are higher between November and February and in July, while the prices of flowers produced locally are high in the three months, December, January and February. Prices are lower in September.

# The Export and Wildflower Sectors of the Cut Flower Industry in Australia

Mr K. James\*

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## Industry Overview

As is the case with other Southeast Asian floriculture industries, reliable industry statistics are not as readily available as is desired and are often inadequate or unreliable due to a variety of reasons.

How big is the Australian flower industry? Domestic production is estimated to be valued at A\$270 million at the farm gate and A\$350 million at the retail level. The production area is around 4000 hectares. Exports are about 10 per cent of domestic production and presently exports are valued at A\$26.67 million. The domestic production estimates vary from the 1993-94 ABS survey figures (A\$129 million at the farm gate). Until improved data collection is available, debate about the exact size of the Australian floriculture industry will continue.

## Australia's Unique Flora

Australia is an island continent of about 7.7 million square kilometres that has been isolated for millions of years. The climate varies markedly from the tropical north to the temperate south and from the arid centre to the moist eastern coast. Such climatic differences, combined with changes to topography and soils, provide a wide range of environments for plants, from tropical rainforests to barren deserts, alpine tracts and sandy plains. It is not surprising, therefore, that Australia has some of the most diverse and remarkable flora in the world.

There are 15 000 species of flowering plants, 500 species of ferns, conifers and cycads and a further 12 500 species of non-vascular plants including mosses, algae, lichens and fungi. The native flowers of Australia are renowned for their uniqueness.

Such individuality is reflected in the large number of endemic species of plants that are found only in Australia. It has been estimated that 33 per cent of Australian genera and a remarkable 85 per cent of species are endemic. The peak of their diversity and endemism is found in southwest Western Australia where many examples abound of large, spectacular plant groups that are confined to this region.

## Native Flower Production

The Australian cut flower industry has come of age in the past 15 years, with large increases in the number of growers and production and a leap forward in technology as well as in the range and quality of flowers produced. The industry is still expanding. It is widely accepted that there is significant growth potential in both the domestic and export markets.

Australia has several natural advantages that promote the opportunity to export flowers and foliage. Australia's varied climate gives many species an extended flowering season, which means a longer period of availability. An example would be wax-flower, whose early seasonal production is in Queensland, mid-season in Western Australia and late season in Victoria. When this feature is combined with opposite selling seasons to those in the northern hemisphere and the diverse geographic regions suitable for floricultural production in Australia, it soon becomes apparent that Australia has the potential to produce and export a product range that caters for the world's growing demand of unusual and distinctive flowers.

Two major trends in the past decade have been the increasing interest in cultivating Australian native flora and increasing production of newer and more difficult to grow flowers. As well as a great increase in the diversity of flowers there has been an improvement in the quality and quantity of flowers available.

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## Australian Floricultural Exports

As an exporter, Australia's inherent competitive advantage lies in the unique range of indigenous flowers it is able to offer the world market.

The Australian cut flower industry has several distinct sectors producing both traditional flowers, proteaceae and native flowers and foliage for the export market. Australian flower exporters are becoming increasingly aware that they must provide a stable supply of quality product, understand the market and their competition and undertake a well-planned marketing and promotional program aimed at specific countries and market segments.

If quality is managed and marketed effectively, the Australian floricultural industry is well placed to compete with growing volumes of new and unique flowers and foliage in the world marketplace.

Australia's cut flower exports have increased at an impressive rate over the past ten years. Exports rose

from A\$3 million in 1982-83 to about A\$26 million in 1994-95. In volume terms 1994-95 exports were 3661 tonnes to 40 different countries.

Australia exports some 170 different flowers and foliage. Ninety of these are considered significant export products and 15 major export products. The top export products are waxflower, kangaroo paw and *P. Leucadendron* species. The majority of these are now produced under commercial cultivation, but some are harvested from the wild. Most export flowers and foliage originate in Western Australia.

Fresh flower exports predominate. However, dried flower exports are increasing at a steady rate. Much of the indigenous Australian flora is well received by the international market as dried or processed product, mostly exported by sea. There are some 100 major product lines offered for sale by Australian dried flower exporters. The product range includes flowers and foliage that have been processed in some way, being air dried, bleached, dyed, preserved or

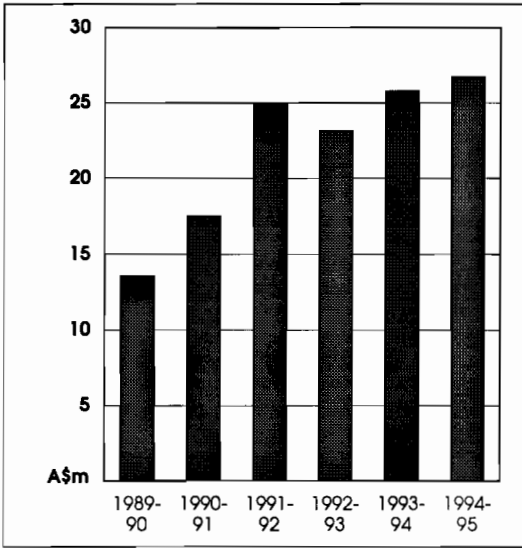
### Australian flower industry enterprises.

State	No. of enterprises	No. of employees	Value of production	Value of exports
<b>Queensland</b>				
Growers	200	800	\$28m	\$1.2m
Retailers	300	800-900	\$40-45m	
<b>New South Wales</b>				
Growers	700	2500	\$80-100m	\$2.1m
Retailers	650	1800-2000	\$90-100m	
<b>Victoria</b>				
Growers	1 000	2000	\$120-160m	\$1.5m
Retailers	700	2 000-2 100	\$90-100m	
<b>South Australia</b>				
Growers	230-350	400-500	\$20-30m	\$0.8m
Retailers	240-260	700-800	\$30-35m	
<b>Western Australia</b>				
Growers	300	800-900	\$40-50m	\$11.4m
Retailers	200-220	600-650	\$30-35m	
<b>Tasmania</b>				
Growers	140-150	420-450	\$6m	\$0.4m
Retailers	100-110	300-350	\$12-15m	
<b>Total</b>				
Growers	2 500-2 700	7 000-7 200	\$250-300m	\$17.4m
Retailers	220-2300	6 200-6 800	\$330-350m	

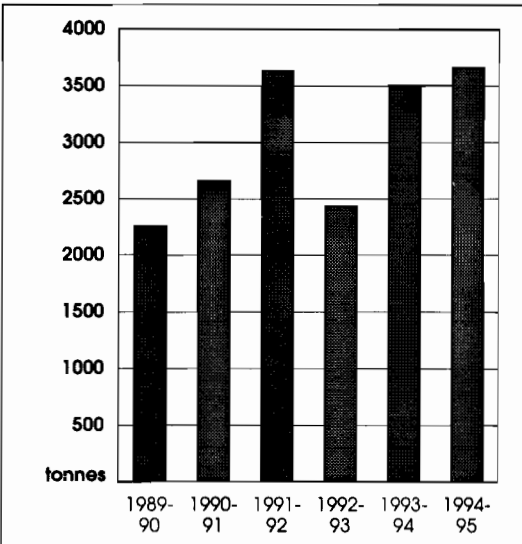
Source: Ruralcorp Consulting Pty Ltd (1992).

freeze dried. Many exports are made to order for special occasions. Most of the dried flower export industry is based in Western Australia.

Australia is also steadily increasing its nursery plant exports, with live plant sales valued at A\$5.23 million in 1993-94.



Australian floricultural exports by value.



Australian floricultural exports by volume.

Western Australia is the largest export state in value and volume terms, followed by Victoria and New South Wales. Orchids are the highest value export product, the majority being produced in New South Wales. Victoria, New South Wales and Tasmania are producing quality lilies, tulips, alstroemeria, limonium and statice for export. Queensland exports have shown marked growth in recent years.

Australia's major export customer for cut flowers and foliage is Japan. Japan takes 48 per cent of Australia's exports by value and 43 per cent by volume. The second largest market is the United States, accounting 18 per cent by value and 19 per cent by volume. The Netherlands and Germany follow, the Netherlands taking 8 per cent by value and 9 per cent by volume and Germany 7 per cent by value and 9 per cent by volume. These countries together with Switzerland, Canada, Hong Kong, Italy, Taiwan and Malaysia make up the top ten export destinations.

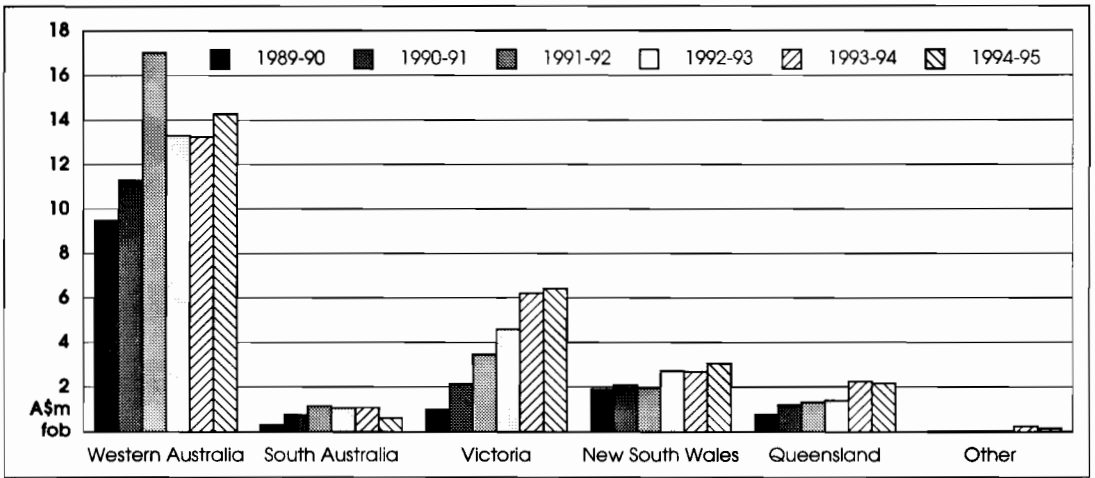
On a regional basis Asia accounts for 54 per cent of exports, North America 19 per cent and Europe 19 per cent.

The large increase in exports since 1988 is attributed to the development and overseas marketing programs for the native flora and proteaceae. The Flower Export Council of Australia has been the driving force behind Australia's numerous promotional programs undertaken in Australia's major export markets over the past five years.

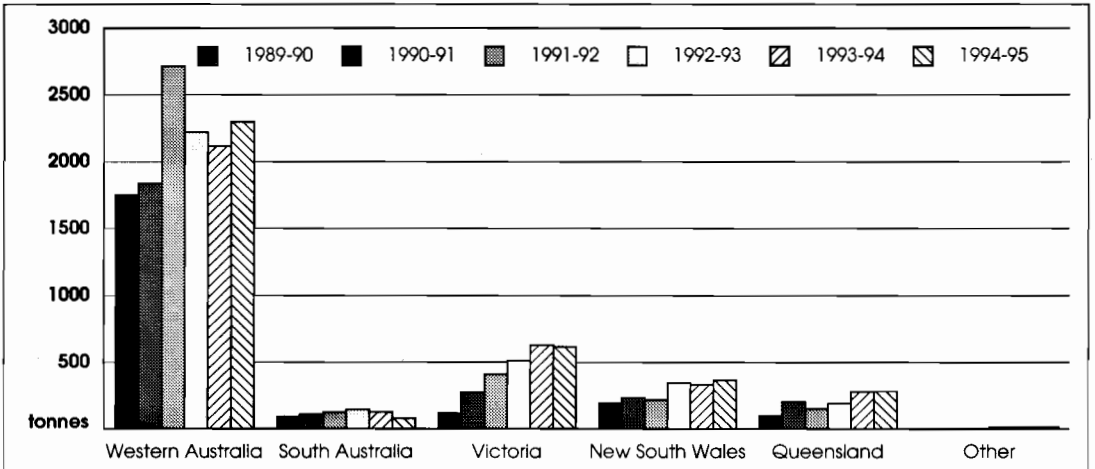
There is a growing world demand for Australia's unusual and distinctive flowers and foliage. And the unique flora and diverse geographical and climatic regions mean that Australia is well placed to supply this demand. Unfortunately, though, Australia has been slow to realise this and other countries, including Israel, New Zealand, Colombia and the United States, have developed export or domestic markets based on indigenous Australian flowers at Australia's expense.

### Floricultural Imports

In 1994-95 Australia imported cut flowers to the value of A\$8.05 million. Major import products were orchids, tulips, carnations and roses. These were sourced mainly from Singapore, Malaysia, Zimbabwe, the Netherlands and New Zealand.



Australian floricultural exports by value and state.



Australian floricultural exports by volume and state.

## Research and Development

Most R&D funding by government agencies, universities and commercial and private research companies has been directed toward Australian native flora.

The R&D sector of the Australian export industry has not been overfunded to date; rather it has been supported by government agencies which, with limited resources, have been innovative in their funding approach, undertaking numerous floricultural R&D projects jointly with industry.

Breeding and selection programs are gradually improving the range and quality of flowers commercially produced for export. Tissue culture and genetic engineering are two aspects of native flower research that are improving R&D results with Australia's export sector.

One of the most significant trends in the floriculture industry worldwide has been the research and development of post-harvest techniques and the adoption of new methods of treatment to prolong the life of fresh flowers.

## Summary of Australian floricultural exports.

	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95
<b>Value by product (A\$'000 fob)</b>						
Fresh flowers	6 931	8 705	14 879	16 765	12 335	10 422
Dried and preserved	5 664	6 478	8 803	5 373	11 524	14 343
Foliage	941	2 333	1 302	997	1 891	1 914
Total	13 536	17 516	24 984	23 135	25 750	26 679
<b>Value by product (tonnes)</b>						
Fresh flowers	1 091	1 317	1 985	2 402	1 722	1 518
Dried and preserved	1 033	956	1 411	817	1 572	1 858
Foliage	135	386	236	217	210	285
Total	2 259	2 659	3 632	3 436	3 504	3 661
<b>Value by state (A\$'000 fob)</b>						
Western Australia	9 494	11 291	17 020	13 313	13 248	14 281
South Australia	317	763	1 163	1 069	1 100	615
Victoria	1 019	2 144	3 466	4 599	6 309	6 413
New South Wales	1 887	2 090	1 958	2 725	2 697	3 045
Queensland	770	1 213	1 326	1 407	2 249	2 172
Other	49	15	51	22	247	153
Total	13 536	17 516	24 984	23 135	25 750	26 679
<b>Volume by state (tonnes)</b>						
Western Australia	1 751	1 839	2 716	2 224	2 119	2 300
South Australia	91	109	126	146	128	79
Victoria	117	273	412	515	629	616
New South Wales	194	232	218	347	334	366
Queensland	99	204	155	191	280	285
Other	7	2	5	13	14	15
Total	2 259	2 659	3 632	3 436	3 504	3 661

Source: Australian Bureau of Statistics.

Some Australian cut flower exporters have been quick to adopt these initiatives, but many still require a technology transfer transplant into their export operations. Such a transfer would certainly be the first step toward improving the quality of exports when they arrive at their destinations.

There is a growing awareness among exporters that correct temperature (especially the use of cool rooms), correct handling techniques, careful attention to hygiene (clean buckets and quality water) and the use of floral preservatives and silver thiosulphate (STS) to treat ethylene-sensitive flowers are essential elements to maintain quality export flowers.

Sensible product packing rates rather than over-packing, correct insect control measures and pro-

fessional fumigation procedures are also key areas for improvement in the Australian export system.

Arrival quality is one area Australia will target for improvement over the next 2-3 years. Australian export standards are slowly improving. However, Australia is still generally perceived to be a supplier of low value, average quality product. Clearly improved research and development programs will greatly assist the wildflower and export sectors of Australia.

The industry also needs to improve the range of varieties available for export by producing new colours and species and to increase the export season by encouraging extended production in various regional areas of Australia.

Performance of top 12 markets for Australian cut flower exports.

	1990-91	1991-92	1992-93	1993-94	1994-95
<b>Japan</b>					
Value (A\$'000 fob)	5 458	7 025	11 001	12 932	12 802
Volume (tonnes)	718	1063	1252	1427	1592
<b>United States</b>					
Value (A\$'000 fob)	2 297	4 015	4 691	5 485	4 891
Volume (tonnes)	430	571	630	816	721
<b>Netherlands</b>					
Value (A\$'000 fob)	1 643	1 329	1 824	1 979	2 186
Volume (tonnes)	289	220	310	397	358
<b>Germany</b>					
Value (A\$'000 fob)	1 320	1 497	1 181	1 778	2 044
Volume (tonnes)	324	255	369	341	343
<b>Switzerland</b>					
Value (A\$'000 fob)	517	733	722	588	756
Volume (tonnes)	98	103	89	84	87
<b>Canada</b>					
Value (A\$'000 fob)	253	377	571	754	638
Volume (tonnes)	61	65	68	116	98
<b>Hong Kong</b>					
Value (A\$'000 fob)	621	814	1 006	600	550
Volume (tonnes)	59	101	124	67	55
<b>Italy</b>					
Value (A\$'000 fob)	327	621	548	439	433
Volume (tonnes)	59	75	101	83	106
<b>Taiwan</b>					
Value (A\$'000 fob)	42	39	101	384	402
Volume (tonnes)	13	10	43	60	48
<b>Malaysia</b>					
Value (A\$'000 fob)	0	5	72	77	401
Volume (tonnes)	0	0	8	8	26
<b>Singapore</b>					
Value (A\$'000 fob)	137	550	198	432	357
Volume (tonnes)	23	7	34	47	41
<b>New Zealand</b>					
Value (A\$'000 fob)	322	195	217	123	298
Volume (tonnes)	29	17	19	13	55
<b>Other</b>					
Value (A\$'000 fob)	4 937	7 784	366	719	921
Volume (tonnes)	556	1145	399	45	131
<b>Total</b>					
Value (A\$'000 fob)	17 516	24 984	23 135	25 750	26 679
Volume (tonnes)	2 659	3 632	3 436	3 504	3 661

Source: Australian Bureau of Statistics.

## Strengths, weaknesses, opportunities and threats of the Australian floriculture industry.

Strengths of the industry	Weaknesses of the industry
<ul style="list-style-type: none"> <li>• Southern hemisphere and opposite season</li> <li>• Unique product</li> <li>• Hardiness and good vase life of native flowers</li> <li>• Reliable growing climate and cheap land</li> <li>• Variety of climatic conditions</li> <li>• Technology advantage over developing nations</li> <li>• Competitive strategic advantage at present</li> <li>• Large undeveloped gene pool of native flora</li> <li>• Strong demand projections for Australian flowers and foliage in Japan to the year 2000</li> </ul>	<ul style="list-style-type: none"> <li>• Ease of entry to the industry</li> <li>• Poor quality and image of Australian flowers overseas</li> <li>• Poor R&amp;D to date</li> <li>• High cost of operation and overheads</li> <li>• Little overseas market research</li> <li>• Undercapitalisation</li> <li>• No available venture capital</li> <li>• Lack of bankable documents (letters of credit)</li> <li>• Low profit margin and high risk</li> <li>• Shortage of air freight</li> <li>• Low priority of flowers as air freight</li> <li>• Lack of industry export ethos</li> </ul>
Opportunities for the industry	Threats to the industry
<ul style="list-style-type: none"> <li>• Develop niche markets in established markets</li> <li>• Develop new Asian markets</li> <li>• Develop new markets for high value native and traditional flowers</li> <li>• Build more airspace out with more inbound tourism</li> <li>• Lengthen the present flowering periods and season</li> <li>• Develop superior new hybrid products</li> <li>• Extend the seasonality in regional Australia</li> </ul>	<ul style="list-style-type: none"> <li>• Southern hemisphere country competition</li> <li>• New Australian varieties being sold overseas</li> <li>• High tariff levels in some countries</li> <li>• Price undercutting by new and existing Australian exporters</li> <li>• Heavy reliance on shipping through few ports (for example, Cairns)</li> <li>• Poor reputation of some exporters</li> <li>• Ongoing lack on industry leadership nationally</li> <li>• Production volume in the west; air freight availability in the east</li> <li>• Ongoing lack of understanding by industry of export ethos</li> </ul>

To continue its export growth both the wildflower and export sectors will require a high level of research and extension support. This is needed to continue the development of new species, varieties and products, the improvement of cultivation technology and the extension of product seasonality.

Improved market research will be required to identify new market opportunities and facilitate the timely delivery of quality products to export markets.

These activities will need to be supported by well-planned, innovative and educational marketing and

promotional programs in established and developing markets.

Most R&D in the Australian export sector will need to be targeted at the key risk areas in the export chain. There will be real improvement in the quality of Australian floricultural products at their export destinations only when each segment of the export chain is foolproof.

The basic handling and distribution of Australian exports and associated key risks are summarised and presented as Figure 9 (p. 36) in this report.



# Perspectives of the Traditional Cut Flower Industry in Australia

Mr G. Lamont\*

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## Strengths and Opportunities

- Increasing consumption of flowers especially via supermarkets, following the trends in the United States and more recently Europe. Supermarkets in some states are presenting the consumer a better quality, more creative and better value for money product than they are in other states.
- Ready access to new germplasm from major breeders; no excuse for not having current varieties and clean mother stock. Consolidation of the number of suppliers of planting material.
- Centralised marketing system in Sydney, Brisbane and Adelaide with plans for a National Flower Market in Melbourne in 1996.
- Close proximity to expanding markets in Southeast Asia. Traditional cut flowers have a greater place in these markets than Australian natives do because of their 'soft' nature, year-round availability and greater versatility as feature as well as complementary flowers.
- Opposite season to northern hemisphere markets not such a major advantage with many traditional flowers that can be grown year round.
- Higher potential profitability of traditional cut flowers.

## Weaknesses and Constraints

- Lack of industry organisation and unity.
- Absence of industry statistics.
- Lack of market research and promotion.
- Absence of quality standards.

- Oversupply of flowers; wide range in quality; falling prices.
- Lack of appreciation among growers of the benefits of correct post-harvest handling.
- Small pool of R&D funds for traditional flowers compared with natives.
- Urbanisation of historical flower growing areas near Sydney, Melbourne and Brisbane.
- Threat of new pests and diseases — unprepared and inability to control; lack of registration of chemicals and long delay for biological control.
- Pesticide resistance; limited new chemicals registered for ornamental industries; phasing out of methyl bromide.
- Relatively poor training in horticulture at a tertiary level; few skilled horticultural managers.
- Greenhouse design needs to be better tailored to domestic environments.
- Diminishing resources from state departments responsible for agriculture (except in Victoria) available for research and advisory services.
- High cost of Australian Quarantine and Inspection Service for importing or exporting plant material.
- Almost total absence of the development of new varieties of traditional cut flowers within Australia; high dependency on Europe, Japan and the United States.
- Cheap imports of exotic flowers especially from developing nations such as Zimbabwe, Sri Lanka, Southeast Asia.

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\* Leo Lynch & Sons, Glenorie, New South Wales.